



# Labor market search frictions in developing countries : evidence from the MENA region : Egypt and Jordan

Shaimaa Yassin

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THÈSE

Pour l'obtention du grade de  
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Présentée et soutenue publiquement par

Chaimaa YASSINE

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LABOR MARKET SEARCH FRICTIONS IN  
DEVELOPING COUNTRIES

Evidence from the MENA region: Egypt and Jordan

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Directeur de thèse: FRANÇOIS LANGOT

JURY :

Ragui ASSAAD	Professeur à l'Université de Minnesota
Olivier CHARLOT	Professeur à l'Université de Cergy-Pontoise (rapporteur)
Nicolas JACQUEMET	Professeur à l'Université Paris 1 Panthéon-Sorbonne
François LANGOT	Professeur à l'Université du Maine (directeur de thèse)
David MARGOLIS	Directeur de recherche CNRS
Fabien POSTEL-VINAY	Professeur à l'Université College London (rapporteur)

*L'université Paris I Panthéon-Sorbonne n'entend donner aucune approbation ni improbation aux opinions émises dans cette thèse. Ces opinions doivent être considérées comme propres à leur auteur.*

*En souvenir de ma grandmère, qui me manque.*

*À ma mère, qui m'est tellement chère.*

*À mon chéri, qui me fait vivre les rêves les plus merveilleux.*



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I shall be telling this with a sigh  
Somewhere ages and ages hence:  
Two roads diverged in a wood, and I-  
I took the one less traveled by,  
And that has made all the difference.

Chaimaa Yassine

Paris, December 2015

## Résumé en français

# Les modèles de recherche d'emploi dans les pays en voie de développement

L'élargissement de l'écart entre les nations est un phénomène inquiétant pour tous les pays du monde et particulièrement les pays pauvres en voie de développement. En 2010, la distance entre les pays riches et pauvres s'est élargie énormément. Selon Klugman (2010), le pays le plus riche en 2010 (le Liechtenstein) était trois fois plus riche que le pays le plus riche en 1970, pendant que le pays le plus pauvre (le Zimbabwe) est devenu 25% plus pauvre qu'il était en 1970 (étant lui-même le pays le plus pauvre à l'époque).

Comme L'écart entre les richesses des pays ne cesse de se creuser, les politiques dans les pays en voie de développement visent à augmenter les opportunités d'emploi afin d'élever les revenus et les niveaux de vie des populations. Cependant, ces politiques sont souvent contradictoires. Bien que l'expansion d'emploi devrait soulager la pauvreté, il n'existe pas de consensus sur les meilleures stratégies à adopter dans ces pays, étant donnée leur caractéristiques assez particulières. Les règlements et institutions sont nécessaires pour protéger les droits des travailleurs et pour améliorer leurs conditions de travail. Cependant, ils pourraient en même temps décourager des entreprises à embaucher des travailleurs, ayant alors involontairement une conséquence contradictoire sur les personnes dont les droits et les conditions étaient censés être pro-

tégés. D'autre part, les conditions et les politiques d'emploi du secteur public peuvent contredire ces règlements. Etant donné la stabilité des postes, les "files d'attente" des chercheurs d'emplois (chômeurs ou déjà employés temporairement) s'allongent pour les emplois dans ce secteur. Cependant, les réalités fiscales et les contraintes budgétaires des gouvernements rendent ces postes insuffisants pour satisfaire tous les demandeurs d'emplois. En outre, la non-conformité massive est une norme et les règlements comme le salaire minimum peuvent encourager l'expansion d'un marché informel non réglementé, où les salaires sont encore moins élevés, l'emploi est beaucoup plus flexible et non-stable, et les conditions de travail sont encore plus mauvaises.

Les pays arabes du Moyen-Orient et Afrique du Nord (MENA) représentent un groupe spécial parmi ces pays en voie développement. Ce sont des pays qui ont récemment connu une vague de soulèvements populaires visant à évincer plusieurs présidents de la région, et faisant suite aux accroissements de la pauvreté, des inégalités et de l'exclusion (résultats des faibles performances du marché du travail). Malgré la croissance économique observée dans beaucoup de ces pays, cela n'a pas créé suffisamment d'emplois pour absorber les entrants sur le marché du travail, que cela soit le grand nombre de jeunes ou bien encore les chocs de main d'oeuvre suite au retour de migrants comme par exemple après la guerre en Irak en 2003). De plus, cette croissance a favorisé seulement les emplois de faible qualité avec une faible productivité dans le secteur informel où de nombreux travailleurs se retrouvent piégés et incapables d'échapper à la pauvreté.

Ces soulèvements ont commencé principalement suite à la crise économique mondiale en 2008 qui a elle-même conduit à une érosion des opportunités économiques sur le marché du travail. Pendant ce temps, des pays comme l'Egypte et la Jordanie ont été impliqués dans des réformes structurelles de leurs marchés du travail au cours des précédentes 20 dernières années qui ont eu sûrement plusieurs conséquences sur leur performance. Par conséquent, la compréhension de l'échec de ces institutions et de leurs réformes à pouvoir garantir des débouchés professionnels convenables aux travailleurs est essentielle pour les décideurs politiques, surtout depuis le printemps arabe où ils essayent de répondre à la crise économique et d'offrir des opportunités plus équitables à leurs populations en colère. Pour être capable de faire cela, cette thèse cherche donc

à étudier ces marchés du travail spécifiques, en particulier l’Egypte et la Jordanie, en proposant des modèles structurels originaux qui sont confrontés aux faits (estimations et tests).

La littérature précédente sur les marchés du travail de la région MENA en général, et sur les marchés égyptiens et jordaniens en particulier, s’est basée principalement sur des approches statiques et globales. La recherche scientifique dans la région est faite en utilisant des enquêtes en coupe, pour examiner les stocks et les changements dans ces stocks. Il existe par contre plusieurs limites à cette méthode. Alors que l’on peut être en mesure de mesurer la part du marché informel, le chômage et la non-participation, il devient impossible de répondre à des questions cruciales concernant les transitions de court et long terme sur ces marchés du travail. En effet, le principal problème en économie n’est pas de connaître l’état qu’occupe un individu dans le marché du travail. Ce qui importe vraiment est combien de temps cette personne reste dans cet état et si jamais il/elle le quitte, quelle sera la destination suivante. L’importance de la l’analyse des flux sous-jacents les stocks du marché du travail doit être transmis aux décideurs politiques de la région. D’une part, cela leur permettrait de détecter les points d’inflexion, d’évaluer les tensions sur le marché du travail et de mesurer les réponses aux fluctuations du cycle économique, les chocs et les différentes réformes. D’autre part, pour pouvoir maintenir les taux de chômage le plus bas possible, il est important d’assurer un marché du travail assez dynamique où les créations mais aussi des destructions existent et où leurs niveaux sont assez élevées. Cela garantit finalement une amélioration de la productivité des emplois, car les emplois à haute productivité sont créés et ceux à faible productivité sont détruits, les travailleurs se réallouant alors facilement et rapidement vers les emplois efficaces. En raison de la nature des données disponibles et en raison de l’absence d’ensembles de données de panel annuelles, les chercheurs tentent d’étudier la dynamique des marchés du travail égyptien en se concentrant uniquement sur le processus de création d’emplois, ignorant les destructions d’emplois et les flux de mobilité entre emplois. Des exemples de cette littérature pourraient inclure les tentatives pour analyser les durées de chômage (Kherfi, 2015), les transitions éducation-travail (Amer, 2014 , 2015 ) et le parcours de transitions de vie (Assaad and Krafft, 2013). Enfin, les marchés du travail égyptiens et jordaniens sont



caractérisés par la présence de marchés informels flexibles non réglementés. Afin d'être en mesure de réduire la différence entre les emplois formels et informels, un marché du travail formel dynamique et flexible doit être encouragé. Cela réduit l'écart entre les emplois formels et informels (qui sont flexibles par définition).

Cette thèse vise à contribuer à la littérature, tant sur un plan empirique que sur un plan théorique. Au niveau empirique, ce fut un travail très fastidieux que de construire des bases de données fiables sur les flux du marché du travail de ces pays, compte tenu de la non-disponibilité de statistiques officielles, des données de panel à fréquence courte ou des faits stylisés particuliers, tels que l'emploi informel. Cela a rendu nécessaire d'étudier ces flux à l'aide de toutes les possibles diverses d'approches - des méthodes les plus basiques aux plus sophistiquées. Théoriquement, on propose une extension de la théorie de la recherche d'emploi classique, pour pouvoir expliquer les phénomènes paradoxaux dans les pays en voie de développement en raison de leur nature et leurs caractéristiques particulières. Par exemple, il faut tenir compte de leurs secteurs informels, de la taille non négligeable de l'emploi du secteur public et la corruption. Ce travail propose aussi d'évaluer les institutions du marché du travail et les réformes structurelles qu'ont connus les marchés du travail égyptiens et jordaniens. La thèse tente donc de fournir un cadre théorique d'analyse des principales forces conduisant à l'équilibre sur ces marchés, et propose des recommandations politiques pour les décideurs qui ont besoin de comprendre l'histoire et l'évolution du fonctionnement de leur marché du travail. L'élaboration de ces outils est d'autant plus importants qu'ils ont besoin de prendre des mesures correctrices pour accompagner la transition démocratique actuelle de leurs pays.

Tout au long des différentes étapes de chaque chapitre de cette thèse, on tente de répondre à trois questions ou problématiques principales. Tout d'abord, est-ce que les demandeurs d'emploi en Egypte et en Jordanie arrivent à trouver du travail? Des analyses des tendances et de l'évolution dans le temps des créations d'emploi, des séparations et des mobilités entre emplois, sont donc proposés. Ceux-ci comprennent l'utilisation des données microéconomiques disponibles pour extraire des données de annuels et semi-annuels rétrospectives. Suivant Shimer (2012), ces données microéconomiques sont ensuite utilisées pour construire les séries temporelles macroéconomiques des flux

sur le marché du travail des deux pays (Chapitre 1). Dans le Chapitre 2, ces données de panel rétrospectives sont analysées et comparées aux informations sur les mêmes individus disponibles en coupe. Cependant, il est démontré dans ce chapitre que ces données de panels sont biaisées par des erreurs de mesure, plus précisément un biais de mémoire. Un des principaux apports de cette thèse est donc le développement d'une méthodologie original qui permet de corriger ce biais de mémoire à partir des données agrégées de flux (Chapitre 3) ainsi que de corriger les transitions et les durées des données au niveau individuel (Chapitres 5 et 6). Ainsi, en analysant les flux de créations et de destructions d'emploi, il est monté que les deux marchés du travail égyptien et jordanien sont très rigides. Après ce constat, une deuxième problématique est alors abordée. Elle a pour objectif d'évaluer des réformes structurelles introduites sur le marché du travail et de mesurer leur impact sur les performances et les résultats de ce marché. Il était crucial de déterminer comment le chômage varie en réponse à l'introduction des réformes qui visent à flexibiliser le marché et qui rendent les règlements de protection de l'emploi dans ces marchés plus souples. Pour répondre à cette question, on se sert la réforme visant à libéraliser le marché travail égyptien suite à l'introduction d'une nouvelle loi en 2003. L'impact a été analysé empiriquement (dans le Chapitre 3) et théoriquement (dans les Chapitres 3 et 4). La troisième et dernière tâche de cette thèse a été d'analyser la qualité des emplois auxquels les gens ont accès sur ces marchés du travail. Cela comprenait la caractérisation des flux du marché du travail et l'étude des changements d'emploi et des avancements des travailleurs dans l'échelle de salaires. Ceci a été rendu possible grâce à l'estimation de formes réduites appliquant la méthode de correction du biais de mémoire (chapitre 5), ainsi qu'à l'estimation d'un modèle structurel, permettant alors de révéler les paramètres d'appariement du marché du travail (chapitre 6).

Comme l'analyse des flux est devenue l'outil de base de l'économie du travail moderne, au détriment du paradigme conventionnel de l'offre et de la demande dans un environnement sans frictions, cette thèse cherche à expliquer le fonctionnement des marchés du travail égyptiens et jordaniens en utilisant la théorie de la recherche d'emploi d'équilibre. Il existe deux approches principales pour modéliser la recherche d'emploi sur le marché du travail. Cette classification dépend essentiellement de la nature et de

la façon dont les frictions d'appariement sur le marché de travail sont définies, ainsi que de la manière dont les salaires d'équilibre sont déterminés. La première approche consiste à tenir compte des frictions sur le marché du travail sous la forme d'informations incomplètes sur les postes vacants pour les chômeurs et sur les demandeurs d'emploi pour les entreprises, ce qui génère un délai entre le début du processus de recherche et l'appariement entre un chômeur et un employeur ayant des postes vacants. Diamond (1982), Mortensen (1982) et Pissarides (1985) ont adopté cette approche. Les salaires sont déterminés dans ce cas à travers un processus de négociation de Nash, l'application de cette solution de Nash pour la détermination de salaire d'équilibre étant justifiée par les travaux de (Binmore, Rubinstein, and Wolinsky, 1986). La deuxième catégorie de modèles suppose que les frictions ont pour source l'informations incomplètes des travailleurs sur les salaires offerts. Dans ce cas, les travailleurs reçoivent des offres, à prendre ou à laisser (un offre par période), et ont le choix d'accepter ou de rejeter l'offre avant de pouvoir en tirer une nouvelle. Les modèles de recherche d'emploi ont adopté cette approche dans un cadre d'équilibre partiel, cette limite à l'équilibre partiel résultant des travaux de Diamond (1971). Elle sera dépassée suite au développements proposés par Albrecht and Axell (1984) et Burdett and Mortensen (1998): les salaires sont alors déterminés par des monopsones (les entreprises), les employés ayant quant à eux le "pouvoir" d'être mobiles ce qui permet de sortir de la critique de Diamond (1971) sur la dégénérescence de l'équilibre dans un modèle de recherche d'emploi.

L'évaluation des dynamiques des entrées et des sorties du chômage est possible en utilisant la première approche où les taux de transitions peuvent être obtenus en fonction de la tension du marché du travail, l'intensité de la recherche des travailleurs, etc...(Pissarides, 1990). Les Chapitres 3 et 4 choisissent donc d'adopter cette approche en essayant de comprendre la nature de la dynamique du marché du travail égyptien. Ils visent à étudier si les travailleurs arrivent à trouver un emploi ou non, et comment les emplois sont détruits. Cette méthode ne permet pas toutefois de décrire la qualité des emplois et les avancements des travailleurs dans l'échelle des salaires. C'est une méthode qui est donc moins informative sur les distributions de salaires et aucune fonction de salaires offerts endogène peut être obtenue. Les applications empiriques de cette approche sont par conséquent limitées aux problématiques macroéconomiques. En

revanche, la seconde approche adopte un modèle où les distributions de offres salariales sont endogène et permet de déminer la distribution unique des salaires de l'économie. La distribution des offres de salaire est un élément crucial qui facilite l'estimation et l'application empirique du modèle. Le Chapitre 6 choisit de se concentrer sur la deuxième classe de modèles.

Le manuscrit de thèse est divisé comme suit.

## Chapitre 1

Le Chapitre 1 est introductif, et a pour principal objectif de décrire les principales évolutions observées, ainsi que d'établir un certain nombre de faits et descriptifs majeurs, sur l'histoire récente de ces flux du marché du travail égyptiens et jordaniens. Le chapitre fournit les grandes lignes directrices sur la méthodologie suivie pour construire les bases de données. En particulier, la façon dont les données de panel rétrospectives semestrielles et annuelles sont extraites pour l'Egypte et la Jordanie en utilisant les enquêtes disponibles du marché du travail (ELMPS et JLMPS). Ces données de panel rétrospectives seront utilisés tout au long de la thèse. Le chapitre fournit également un résumé des cadres institutionnels des deux pays. Il examine les statistiques descriptives des flux du marché. Ils soulignent les similarités et les différences entre ces deux pays. Les conclusions de ce chapitre sur la dynamique des marchés du travail égyptiens et jordaniens ne sont pas rassurantes. Celles-ci montrent que les taux de créations d'emploi et de séparations sont extrêmement faibles dans les deux économies. Même, pour les transitions entre emplois, elles ne s'observent en grande partie que dans les secteurs informels où les offreurs de travail peuvent trouver un moins bon emploi que précédemment plutôt que de devenir plus productif et d'améliorer leur position dans l'échelle des salaires. Cependant, le marché du travail jordanien semble être relativement plus flexible que le marché du travail égyptien. Par contre, avec des petites différences entre le taux de créations dans les secteurs formels et informels jordaniens, les chiffres et les tendances observées suggèrent que le marché du travail jordanien est plus segmenté que l'Egyptien.

L'objectif du Chapitre 1 est de définir un certain nombre de faits stylisés sur les flux

du marché du travail égyptien et jordanien durant la dernière décennie en utilisant les données "Egypt Labor Market Panel Survey" (ELMPS) et "Jordan Labor Market Panel Survey" (JLMPS). Bien qu'il soit descriptif, la contribution principale de ce chapitre est de fournir un résumé d'un large éventail d'informations sur la dynamique des marchés du travail égyptien et jordanien à partir de plusieurs angles différents. Le document fournit un aperçu des différentes institutions du marché du travail en Egypte et en Jordanie. Ce sont des marchés généralement caractérisés par de faibles niveaux de l'emploi, un taux de chômage élevé parmi les jeunes, des secteurs publics de grande taille et des marchés informel, non-réglementés par le gouvernement, conséquents. Il fournit également une description de la structure des questionnaires des données qui vont être utilisés dans cette thèse. Il détaille la méthodologie adoptées pour extraire les données de panel rétrospectives. Cette méthode d'extraction de données de panel est cruciale pour les pays en voie de développement tels que l'Egypte et la Jordanie, où les contraintes budgétaires ne permettent pas la collecte de données de panel régulièrement, ce qui est nécessaire pour l'analyse de la dynamique du marché du travail.

Les faits stylisés déduits sur la dynamique du marché du travail sont les premiers de ce genre et peuvent se révéler utiles pour les chercheurs et les décideurs politiques qui travaillent sur les divers aspects des marchés du travail égyptiens et jordaniens. Comme déjà mentionné, la connaissance de ces faits est cruciale pour pouvoir suivre les cycles économiques, détecter des points d'inflexion et d'évaluer la tension du marché du travail (comment la demande de main-d'oeuvre et l'offre "s'équilibrent" dans l'économie). Il est important d'assurer un marché du travail sain et dynamique où les emplois productifs sont créés et les emplois moins productifs sont détruits, les emplois existants devenant alors plus productifs en moyenne. Cela ne semble pas être le cas du tout sur les marchés égyptien et jordanien travail où la plupart du chiffre d'affaires se réalise via les emplois du secteur informel, les taux de transitions d'emploi à emploi étant quant à eux extrêmement faibles. Si ces transitions se produisent, c'est parce que les gens se déplacent à l'intérieur ou vers le secteur informel. Il faut noter cependant que le marché du travail jordanien, compte tenu de l'histoire et l'évolution de son cadre institutionnel, est plus souple et plus flexible que le marché du travail égyptien. Pourtant, il existe des faits qui suggèrent que le marché du travail jordanien est beaucoup plus segmenté

que l'Égyptien; le secteur informel servant surtout comme un intermédiaire en Égypte, en Jordanie, il semble être un segment du marché qui fonctionne sur ses propres travailleurs. L'aspect informel de deux marchés nécessite sûrement des recherches plus avancées.

En Égypte, les secteurs public et privé formel souffrent d'un environnement extrêmement rigide où les travailleurs, une fois qu'ils accèdent à des emplois dans ces secteurs, ne quittent jamais ni ne passent à d'autres emplois. En général, les taux de séparations en Égypte sont extrêmement faibles. Les tendances des flux dans ce chapitre montrent cependant qu'il y a eu de meilleures réponses au ralentissement économique du secteur privé formel qu'auparavant, surtout après la révolution du Janvier 2011. Dans l'ensemble, la rigidité des marchés du travail égyptiens et jordaniens fait baisser dans une large mesure les niveaux de productivité et la croissance au sein de l'économie.

Les principales conclusions de ce chapitre confirment le fait que le chômage en Égypte tend à être dominé par le chômage structurel plutôt que le cyclique. Les tendances obtenues à partir des données brutes pourraient suggérer un rôle croissant du chômage conjoncturel sur le marché du travail égyptien après 2009, suite à la crise financière ainsi que la révolution Janvier 2011. En Jordanie, les composantes de chômage, les créations et les séparations ont connu un changement remarquable dans les tendances après 2003, soit après le retour des Jordaniens après la guerre en Irak et également après le ralentissement des taux de croissance (la baisse du PIB) en 2007. Les marchés du travail égyptien et jordanien sont deux pays arabes de la région MENA qui souffrent d'un niveau très faible de créations, de séparations et de mobilité relativement aux stocks de l'emploi et du chômage. Le chapitre note une tendance à la baisse dans les taux d'embauche égyptiens, reflétant la tendance à la baisse dans le taux de croissance de la population en âge de travailler, montrant que l'explosion de la jeunesse a été absorbé avec succès dans le marché du travail égyptien cours de la dernière décennie. Il montre également une tendance constante de créations de l'emploi en Jordanie suivant le taux de croissance de la population stagnante. Cependant, les tendances montrent qu'il est devenu plus difficile pour un individu non-employé à trouver un boulot. La probabilité que les travailleurs quittent leur emploi ou soient licenciés reste très faible même après une augmentation apparente dans les années les plus récentes des données

de panel rétrospectives, c'est à dire dans les années juste avant l'année de l'enquête. Il faut être prudent lors de l'analyse de ces résultats compte tenu des biais potentiels et des erreurs de mesure dans les séries de données utilisées qui pourraient entraîner des variations artificielles du niveau ou des tendances. En effet, les résultats suggèrent que les taux de séparation atteignent le niveau le plus élevé en 2011 en Egypte et 2010 en Jordanie, mais cela ne représente que 2 % de l'emploi total en Egypte et 4 % en Jordanie. L'analyse montre que la part de la perte d'emploi involontaire a augmenté sur la période 2009-2011 en Egypte. Cela soutient que ces tendances reflètent la réponse du marché du travail égyptien à la crise financière et la révolution de Janvier 2011 plutôt que d'un marché du travail qui est devenu plus dynamique. Cependant, on ne peut pas confirmer cette conclusion étant donné les biais de mémoire potentiels et les préjugés de la conception de la questionnaire. Les chapitres suivants examinent ces erreurs et offrent des solutions et des corrections possibles pour pouvoir utiliser les données dans l'analyse de la dynamique du marché du travail en question.

L'analyse montre également qu'il y a une tendance croissante dans les taux de transitions entre emplois en Egypte, en particulier parmi les travailleurs du secteur informel. En général, le secteur formel reste rigide malgré que les réponses au ralentissement économique du secteur privé formel, ainsi que du secteur public, ont été observées. Les conclusions du chapitre suggèrent que les marchés du travail égyptiens et jordaniens devraient être une source d'inquiétude. Le taux de chômage dans l'avenir, en particulier en Egypte, devrait être sensiblement plus élevé en raison des séparations croissantes et des embauches décroissantes, ainsi que les pressions démographiques plus élevées résultant de l'écho de l'explosion de la jeunesse.

## Chapitre 2

La littérature précédente comme Artola and Bell (2001), Bound, Brown, and Mathiowetz (2001), et Magnac and Visser (1999a) montrent que les données rétrospectives basées sur des déclarations individuelles souffrent de problèmes tels que les difficultés de se rappeler des dates ou même de certains événements. Les données de panel sont des données qui sont recueillies simultanément en différents points du temps pour un

même individu. Elles évitent ce problème parce qu'elles sont collectées à des points discrets dans le temps. Cependant, elles ne fournissent que des informations sur ces points dans le temps et non pas sur le cours des événements entre ces points (Blossfeld, Golsch, and Rohwer, 2012). Ces données sont aussi susceptibles de souffrir d'attrition de l'échantillon et des erreurs de classification (Artola and Bell, 2001). Dans le chapitre 2, en raison de ces problèmes potentiels avec les données rétrospectives et les données de panel, il devient intéressant de comparer les résultats sur les indicateurs de base liés à la dynamique du marché du travail à partir de données de panel rétrospectives et contemporains sur le même échantillon de personnes, afin de déterminer les conditions dans lesquelles ils fournissent des résultats similaires ou sensiblement différentes. à ce jour, aucune étude n'a fait une telle comparaison dans la région MENA. Ce chapitre profite donc d'une occasion unique de pouvoir réaliser une telle comparaison, où à la fois des données de panel et des données rétrospectives sont disponibles pour les mêmes individus en utilisant les vagues de l'enquête d'emploi du marché du travail égyptien ELMPS 1998, 2006 et 2012. Non seulement les périodes des données rétrospectives de chaque vague se chevauchent avec les dates des vagues précédentes, qui permet des comparaisons de données rétrospectives et de panel au même point dans le temps, mais les périodes rétrospectives de différentes vagues de l'enquête se chevauchent les uns avec les autres ainsi, permettant des comparaisons des événements passés dans une vague avec les mêmes événements passés capturés dans une autre vague. Dans les pays, où les budgets de collecte de données représentent un gros problème, ce chapitre cherche donc à démontrer s'il est possible de recueillir des informations sur la dynamique du marché du travail à l'aide de données rétrospectives ou est l'erreur de rappel si grande telles que les données de panel soient la seule option viable. Les résultats montrent qu'il est possible bien que la prudence est nécessaire sur le type d'informations conclu à partir de l'analyse et le niveau de détail utilisé dans l'analyse (pour la différenciation par exemple entre les catégories très détaillées, telles que les travailleurs indépendants et les employeurs ou les travailleurs réguliers et irréguliers, cela peut être trompeur). Les périodes d'emploi passées obtenues à partir de données rétrospectives semblent être assez fiables tandis que aucunes distinctions fines entre les différents états du secteur de l'emploi ne sont faites. Les périodes du non-emploi (chômage et hors de la popula-



tion active) surtout entre les périodes d'emploi, sont toutefois difficile de se rappeler. Les questions rétrospectives suscitant des montants monétaires se sont avérés peu fiables. Les répondants ont tendance à gonfler, en actualisant le montant à leur valeur équivalente au moment de l'enquête.

Ce chapitre fournit également des lignes directrices et des leçons sur la façon dont il faut utiliser les données rétrospectives existantes de l'enquête ELMPS ou d'autres enquêtes similaires. Tout d'abord, en comparant les données rétrospectives à partir de ELMPS 2012 aux données des vagues précédentes, on a déterminé qu'il est préférable de poser des questions sur la trajectoire du marché du travail de l'individu dans l'ordre chronologique plutôt que l'ordre inverse. Il suscite une meilleure information sur l'insertion sur le marché du travail et en particulier à propos de toute période de chômage initiale avant le premier emploi. Deuxièmement, les résultats montrent que de nombreux répondants (et même parfois des enquêteurs) ont mal-interprétées les modules rétrospectives pour signifier juste leur statuts d'emploi, ce qui a contribué à la sous-déclaration rétrospective des périodes de chômage et non-emploi. Il est probablement une bonne idée de demander explicitement de savoir s' il y avait un non-emploi initial ou période de chômage avant le premier emploi et à demander explicitement si la fin de chaque travail a été suivie par une période de non-emploi qui a dépassé une durée d'un à six mois. Troisièmement, il est nécessaire de demander aux individus qui ont jamais travaillé et sont actuellement inactifs pour savoir s'ils ont jamais cherché de l'emploi et la durée de la période dans laquelle ils étaient à la recherche d'emploi, au moins pour la première fois. Quatrièmement, bien que l'ajout d'un calendrier des événements de la vie, qui suscite des informations sur les dates de début et de fin de tous les états du marché du travail contribue à combler certains événements manquants, il peut toujours être utile pour obtenir des informations dans le module rétrospectif du marché du travail en ajoutant un cinquième et éventuellement sixième état du marché du travail pour capturer les transitions des individus qui bougent beaucoup sur le marché.

Compte tenu des contraintes budgétaires et de disponibilité, les données de panel rétrospectives sont actuellement les seuls données de panel disponibles dans la région MENA qui permettent aux chercheurs d'étudier la dynamique du marché du travail, particulièrement les transitions ou les flux à court terme. Après avoir discuté les er-

reurs de mesures et les biais dans les données rétrospectives, il est toutefois important de noter qu'il est possible d'utiliser certains remèdes qui atténuent ces erreurs de mesure et, éventuellement, produisent des résultats non-biaisés (ou peut-être moins biaisés). Une solution possible serait de faire un appariement entre les moments biaisés obtenus à partir de données rétrospectives avec des moments précis et fiables obtenues à partir de données transversales contemporaines auxiliaires. Bien sûr, cela pourrait être obtenu à partir des données de la même enquête ou d'une source de données externe, tant que la comparabilité entre les différentes bases de données est vérifiée et maintenue. Dans ce cas, on suppose que les informations obtenues à partir des données transversales (en coupe) est les plus précises. Les hypothèses sur la forme (fonctionnelle) du taux d'oubli ou de la perte de l'information dans les données rétrospectives seraient également nécessaires. Le Chapitre 3 corrige les taux de transition (au niveau macro) du marché du travail ELMPS entre emploi, chômage et inactivité, obtenus à partir des données de panel rétrospectives, en utilisant cette méthode. Ils supposent que l'année la plus récente du panel rétrospectif est la plus exacte et que les répondants rapportent les événements les plus lointains avec moins de précision. L'erreur de mesure a une forme fonctionnelle qui augmente de façon exponentielle que l'on remonte dans le temps. Cette méthodologie peut permettre la reconstruction des matrices de transitions (taux d'embauche et de séparation) corrigées et donc les séries temporelles de ces flux qui peuvent être utilisées dans l'analyse des tendances macro-économiques du marché du travail. Cela peut même être étendu pour faire usage de l'information au niveau micro disponible sur les transitions sur le marché du travail. En utilisant les erreurs de mesure agrégées estimées pour les différents types de transitions, on pourrait distribuer ces erreurs dans la forme de poids aux individus de l'enquête (Chapitre 5). Encore une fois, des hypothèses doivent être faites sur la manière dont on attribue les poids aux individus. Le Chapitre 5 traite donc deux façons de le faire: (1) une méthode naïve: où tous les individus sont supposés être corrigés avec des poids similaires, c'est à-dire proportionnels et (2) une méthode différenciée: où les poids sont prédits en se basant sur la probabilité d'un individu pour faire un certain type de transition. Tout ce qui précède suppose que l'information dans les données de panel rétrospectives est correcte, juste un peu plus rapporté ou sous-déclarés par rapport aux vrais en coupes

(les moments non-biaisé). Une autre solution possible, avec une hypothèse différente, serait d'estimer le taux d'alignement, peut-être le taux de dire la vérité, et, éventuellement, la création d'un poids tel que les individus qui déclarent la vérité ont un poids plus élevé. Cela nécessite cependant la disponibilité à la fois au niveau micro des informations transversales en coupe et rétrospectives pour les mêmes individus. Dans notre cas, il pourrait être appliqué en Egypte en utilisant les différentes vagues de l'enquête ELMPS mais pas aux autres bases de données, par exemple l'Enquête sur le marché du travail de la Jordanie (JLMPS) juste une seule vague est disponible. Les inconvénients de la représentativité de l'échantillon peuvent être discutés après l'ajout de ces poids.

Une solution possible pour la sous-déclaration des états du marché du travail tels que le chômage et le non-emploi serait de mettre en accent la bonne interprétation des états rétrospectifs dans la formation des enquêteurs. En outre, il est suggéré d'ajouter des questions sur les dates de fin de chaque état tout au long du module rétrospectif plutôt que de compter sur la date de début de l'état suivant. Même si les gens interprètent l'état rétrospectif comme un statut d'emploi, cette information supplémentaire pourrait aider à capturer l'état de non-emploi intérimaire, qui commence à la date de la fin d'un certain emploi et se termine à la date de début de l'emploi suivant.

Pour conclure, les données de panel avec des modules rétrospectifs courts pour combler les lacunes entre les vagues du panel sont les meilleures données que l'on peut espérer, faute de données administratives continues, pour étudier la dynamique du marché du travail. Cependant, en l'absence de telles données de panel, des informations utiles peuvent être obtenues à partir des questions rétrospectives, tant que certaines des leçons tirées dans ce chapitre sont gardées en tête.

## Chapitre 3

Après avoir examiné les données et leurs enjeux dans la première partie, la deuxième partie de cette thèse est consacrée à l'évaluation de l'impact de l'introduction de réformes structurelles qui visent à flexibiliser le marché du travail et donc rendent les règlements de protection de l'emploi plus souples. Le Chapitre 3 propose d'évaluer une réforme égyptienne qui a été introduite en 2003, ayant comme but d'améliorer et de

flexibiliser les processus d'embauche et de licenciement. En général, une seule étude précédente par Wahba (2009) a étudié l'impact à court terme (après deux ans) de la loi, mais sur le processus de formalisation en Egypte. Dans ce chapitre, les enquêtes du marché du travail en Egypte (ELMPS 2006 et ELMPS 2012) sont utilisées pour mesurer l'impact de cette réforme sur la dynamique des taux de séparation et de recherche d'emploi, et pour quantifier leurs contributions à la variabilité du taux chômage global. L'analyse utilise des données de panel rétrospectives extraites et créées à partir des modules rétrospectifs dans les enquêtes de 2006 et 2012. En superposant les deux panels de deux enquêtes, le chapitre estime les probabilités, annuelles et semi-annuelles, de transitions des travailleurs entre l'emploi, le chômage et l'inactivité. Un modèle originale est proposé pour corriger le biais de mémoire et de la conception observés dans les transitions sur le marché du travail obtenus à partir de données rétrospectives. En utilisant les données "corrigée", il est alors montré que la réforme augmente significativement le taux de séparations en Egypte, mais n'a aucun effet significatif sur les taux d'embauche. L'effet combiné net est donc une augmentation des niveaux de taux de chômage égyptien: où les séparations augmentent alors que les embauches restent inchangés. Cet échec partiel de la libéralisation du marché du travail égyptien est ensuite expliqué théoriquement par un effet d'éviction suite à l'augmentation des coûts de mise en place, interprété comme une capture par l'agent corrompu du nouveau surplus, dans le cadre du modèle conventionnel de Mortensen and Pissarides (1994).

L'histoire des institutions dans la plupart des pays en voie de développement a conduit leurs marchés du travail à être très rigides, où les contrats du secteur privé ont approché les règles d'embauche du secteur public. Les grandes organisations internationales ont donc encouragé les réformes structurelles, afin d'introduire plus de flexibilité dans ces marchés du travail. L'importance d'assurer un marché sain et dynamique du travail réside dans la création d'emplois plus productifs et en détruisant les moins productives (voir Veganzones-Varoudakis and Pissarides (2007)). La flexibilité du marché du travail diminue ainsi la différence entre l'emploi formel et l'emploi informel, qui est très flexible par définition. En attirant plus de travailleurs à des emplois formels, les créations des postes dans le secteur formel permet une augmentation des

recettes fiscales des gouvernements et donc réduit leurs déficits budgétaires.

L'importance d'un marché du travail plus flexible a été reconnue par le gouvernement égyptien en 2003, où ils ont introduit une nouvelle loi du travail (No. 12). La nouvelle loi du travail égyptienne a été implementée en 2004 ayant comme but la flexibilisation de l'embauche et de licenciement en Egypte. La loi prévoit des lignes directrices complètes pour le recrutement, l'embauche, la rémunération et le licenciement des employés. Il aborde directement le droit de l'employeur de résilier le contrat d'un employé.

La théorie économique prédit, par contre, des effets ambigus de l'augmentation de la flexibilité sur la performance des marchés du travail. En effet, lorsque le changement de politique est parfaitement prévu, le modèle classique de Mortensen and Pissarides (1994) montre que si on facilite les licenciements, ceci entraîne une hausse des taux d'embauche, mais il a aussi un effet positif direct sur les transitions de l'emploi vers le chômage. Comme le taux d'emploi est une fonction croissante du taux d'embauche, mais une fonction décroissante de séparations, l'évaluation d'une politique qui augmente la flexibilité du marché du travail nécessite l'analyse des différentes élasticités de ces deux taux de transitions à la réforme en question. Même si le changement de politique est inattendu, étant donné que les embauches et les séparations sont des variables de saut "jump (c'est à dire qui réagissent tout de suite), le même raisonnement est valable. Même si les effets sur le chômage sont ambigus, la libéralisation du marché du travail favorise les créations d'emploi et donc une productivité plus élevée.

Il devient donc essentiel d'évaluer l'ajustement des taux de séparation et d'embauche en Egypte (les deux composantes du taux de chômage égyptien) à une telle réforme de libéralisation du marché du travail, introduite par la nouvelle loi du travail de 2003. Le chapitre est en mesure de répondre aux questions de recherche suivantes:

1. Etudier l'évolution des tendances des flux des travailleurs au cours de la période 1998-2012, et de lier les changements dans les taux de créations et les taux de séparation à la nouvelle législation du travail égyptienne implementée en 2004.
2. Construire un modèle qui nous permet de simuler les politiques du marché du travail et d'examiner leurs implications sur la dynamique du marché du travail

D'un point de vue méthodologique, la construction des transitions observées sur le marché à partir de données microéconomiques, développé par Shimer (2005 , 2012), semble être le plus convenable pour évaluer ce type des réformes du marché du travail. C'est une méthodologie qui permet d'exploiter les enquêtes du marché du travail riches, de démêler les changements dans toutes les transitions et d'en déduire en utilisant un simple équilibre des flux, l'impact sur les agrégats, tels que le taux de chômage. Dans ce chapitre alors, on essaye d'utiliser cette méthode de construction, afin de créer les séries macro des flux du marché du travail via des enquêtes microéconomiques suivant le tracail de Shimer. D'un point de vue économétrique, la réforme sera analysée comme une rupture structurelle dans les séries des taux de créations d'emploi et de séparation. L'effet global sur le chômage sera déduit de la composition des effets différenciés des taux de transition. L'originalité du travail réside dans la construction des séries temporelles des flux et donc la dynamique du marché du travail égyptien. Comme dans la plupart des pays dans le projet du développement, les enquêtes micro (panel) qui retracent l'histoire de chaque individu chaque mois ne sont pas disponibles. Seule une enquête du marché du travail où les individus déclarent leurs comptes rétrospectifs et actuels de leurs états du marché du travail est répétée presque tous les 6 ans. Même avec des méthodes de la collecte de données de haute qualité et des questions de validation précises, l'information rétrospective obtenue de telles enquêtes est soumise à un biais de mémoire. De Nicola and Giné (2014) ont montré que la grandeur de l'erreur de rappel augmente avec le temps, en partie parce que les répondants ont recours à l'inférence plutôt que la mémoire. Leurs conclusions sont fondées sur une comparaison entre les données administratives et les données d'enquêtes rétrospectives dans un pays en voie de développement, plus précisément un échantillon de ménages indépendants engagés dans la pêche côtière en Inde. En utilisant les données d'un pays développé (les Etats-Unis), Poterba and Summers (1986) trouvent à travers une étude sur les enquêtes d'emploi que la correction des erreurs de mesure peut modifier la durée de chômage estimé par un facteur de deux. Ainsi, la contribution méthodologique de ce chapitre

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<sup>1</sup>Ceci peut être fait sans aucun problème concernant la critique de Lucas (1976) parce que les taux d'embauches et de séparations sont des variables de saut, et étant donné que le changement de politique est inattendu.

est de proposer une méthode originale pour corriger ce biais de mémoire, en utilisant la structure markovienne des transitions sur le marché du travail. On estime de manière structurelle, en utilisant la méthode des moments simulés (SMM), une fonction représentant le taux d'oubli conditionnelle sur l'état de l'individu sur le marché du travail. Notre modèle est proche de celui développé par Magnac and Visser (1999b). Compte tenu de l'importance de prendre en considération l'entrée et la sortie de la population active, et pour pouvoir refléter le vrai portrait du marché du travail égyptien, on ajoute à l'analyse un modèle à trois états du marché du travail (emploi, chômage et inactivité). On vérifie alors si les résultats sur le taux de chômage, reconstruits à partir des séries de flux du marché du travail corrigées, sont compatibles et robustes. L'étude montre que les estimations des flux corrigés donnent alors des résultats similaires, ce qui suggère que la méthode de correction proposée produit des séries robustes. Par conséquent, on peut conclure que la méthode peut être appliquée à plusieurs enquêtes disponibles uniquement entre deux dates relativement espacées, ce qui est souvent le cas dans les pays en développement.

Dans son article de 2012, Shimer montre que la reconstruction des séries macro des flux des travailleurs via des enquêtes microéconomiques montre que les créations représentent la source principale dans les fluctuations des taux de chômage des états-Unis. Ses résultats contrastent donc avec ceux obtenus par Blanchard and Diamond (1990) et Davis et Haltiwanger (1990, 1992): ces auteurs ont montré que, sur la base des statistiques de créations d'emplois et de destructions (flux de travail), la majorité des fluctuations dans le taux de chômage américain sont les résultats des variations du taux de de séparations. Dans ce chapitre, en dépit de l'utilisation d'une méthodologie similaire à celle proposée par Shimer (2012), on montre que la nouvelle loi du travail de 2003 a eu des effets positifs significatifs sur les taux de séparation, mais aucun effet sur les taux d'embauche. L'augmentation du taux de séparations donc l'emporte sur la non-variation du taux d'embauches conduisant à une augmentation du taux de chômage après la réforme. Ces résultats restent valables même après l'ajout de l'état d'inactivité à l'analyse. L'étude des contrefactuels, montre le rôle dominant des taux de séparation dans les variations du chômage égyptien. Cependant, il est important de noter que les taux de séparations et de créations d'emploi demeurent à des niveaux

extrêmement faibles, confirmant la nature très rigide du marché du travail égyptien.

Ces résultats empiriques peuvent être considérées comme incompatibles avec le modèle classique du Mortensen and Pissarides (1994), où une augmentation de la flexibilité du marché du travail (modélisée comme une baisse des coûts de licenciement) serait certainement suivi par une augmentation des séparations et des créations d'emploi. En effet, une telle politique qui réduit les distorsions fiscales dans le marché devraient permettre l'augmentation du surplus du « job match » (même si la durée du travail sera réduite), et par conséquent le taux d'embauches. à ce stade, il devient donc difficile d'expliquer le non-changement du taux d'embauches, en utilisant le modèle conventionnel du Mortensen and Pissarides (1994). Il est vrai qu'on peut expliquer ce phénomène par le délai entre la réaction des employeurs à la réforme en virant les travailleurs non-productifs tout après la mise en oeuvre de la politique, mais en n'embauchant plus de travailleurs que quand ils se sentent suffisamment confiants sur le marché. Cependant, parmi les explications possibles derrière un tel phénomène paradoxal pourrait être le fait que l'Egypte est un pays en développement où la corruption est l'un des principaux obstacles aux créations d'emplois. Le chapitre essaie donc de montrer théoriquement comment le modèle du Mortensen and Pissarides (1994) peut être adapté pour rendre compte de ce phénomène et donc expliquer les données égyptiennes. Une autre façon d'expliquer ce puzzle est de proposer une extension du modèle Mortensen and Pissarides (1994) pour tenir compte des secteurs informel et public, qui représentent de grandes parts de l'emploi en Egypte. Même si la politique est dirigée vers le secteur privé formel, il affecte certainement l'interaction et la circulation des travailleurs entre les différents secteurs d'emploi. Le modèle classique du Mortensen and Pissarides (1994) n'arrive pas à expliquer ces transitions intersectorielles. Le Chapitre 4 propose donc un modèle de recherche d'emploi à la Mortensen and Pissarides (1994) pour modéliser les différentes transitions entre les secteurs formel, informel et public pour pouvoir expliquer les raisons possibles pour que juste les séparations augmentent suite à la libéralisation du marché du travail.



## Chapitre 4

Le Chapitre 4 essaye donc d'aller plus loin dans l'analyse et propose d'expliquer dans quelle mesure le modèle de Mortensen and Pissarides (1994) est applicable aux pays en voie de développement, tels que l'Égypte, où les grandes parts des travailleurs se trouvent dans les secteurs informel et public. Limiter l'analyse, comme dans la littérature traditionnelle précédente, à seulement un marché du travail privé et non segmenté pourrait être insuffisant pour les différentes transitions entre secteurs sous-jacentes et donc ne reflète pas la nature particulière des marchés du travail de la région MENA. Il existe des essais récents d'inclure dans le modèle de recherche d'emploi un secteur informel (comme Albrecht, Navarro, and Vroman (2009), Meghir, Narita, and Robin (2012), Bosch and Esteban-Pretel (2012), Charlot, Malherbet, and Ulus (2013, 2014) et Charlot, Malherbet, and Terra (2015)) ou un secteur public et un secteur privé non segmenté (Burdett (2012), Bradley, Postel-Vinay, and Turon (2013)). Le Chapitre 4 de cette thèse vise par contre à ajouter à la fois le secteur informel ainsi le secteur public. Les choix d'emploi/non-emploi d'un travailleur sont donc basés sur les comparaisons entre ses valeurs d'emplois attendues dans son emploi actuel ou ses emplois potentiels éventuels, c'est-à-dire dans l'un des trois secteurs d'emploi. Le modèle construit prend également en considération les réalités fiscales, donc la contrainte budgétaire du secteur public. Il est vrai que le secteur public peut augmenter ses salaires, mais compte tenu de sa contrainte budgétaire, il est susceptible de diminuer ses embauches des employés. Ce qui pourrait se faire, comme en Égypte par exemple, en rationnant les postes vacants dans le secteur public. Ce chapitre permet donc d'offrir une autre explication au paradoxe empirique observé dans le chapitre 3 suite à l'introduction d'une nouvelle loi en Égypte qui vise à libéraliser le marché du travail. Même si la politique est dirigée vers le secteur privé formel, il influence certainement l'interaction et la circulation des travailleurs entre les différents secteurs d'emploi. Une analyse qualitative est proposée, où le modèle est calibré et des simulations pour l'impact des réformes structurelles, en particulier de la loi de 2004 Égypte, sont fournis. Les résultats sont même confirmés via les données disponibles sur les flux en Égypte entre les secteurs de l'emploi et le chômage, avant et après la réforme de 2004. Les principaux

résultats suggèrent que l'introduction règles de protection de l'emploi plus flexibles, modélisée par une réduction des couts de licenciements, favorise la création d'emplois et la destruction d'emplois dans le secteur privé formel qui est le but principal de la politique. Il augmente les séparations d'emploi dans le secteur informel et diminue les embauches informelles. En effet, il est démontré que la libéralisation du marché du travail égyptien joue contre l'emploi informel en augmentant la rentabilité des emplois formels. Mais, si les salaires offerts par le secteur public augmentent en même temps que la loi, comme ce qui est arrivé en Egypte (Said, 2015), cela créerait un effet d'éviction, où le nouveau surplus créé par la réforme est que compensée par les nouveaux coûts de la mobilité des travailleurs induits par l'augmentation de l'attractivité du secteur public. Ce résultat est robuste, même si la baisse des couts de licenciement diminue la proportion de la recherche des travailleurs déjà en emploi dans les secteurs formels et informels, vers le secteur public.

Ce chapitre a comme but les principaux objectifs suivants:

1. Proposer une extension du modèle théorique de la recherche d'emploi à la Mortensen and Pissarides (1994) pour montrer l'interaction entre les trois secteurs de l'emploi (public, formel et informel) et le non-emploi.
2. Via une analyse qualitative numérique, calibrer le modèle et fournir des simulations de l'impact des réformes structurelles en suivant les transitions démocratiques des pays de la région MENA, en particulier la loi du travail passée en Egypte en 2004.
3. Estimer empiriquement les flux en Egypte entre les secteurs d'emploi et le chômage, avant et après la réforme de 2004.

Ce chapitre a choisi de se concentrer sur les effets de couts de licenciement et les politiques salariales du secteur public sur les créations d'emploi, les destructions d'emploi, et sur la recherche de l'emploi des individus déjà employés. Cependant, le modèle développé a beaucoup de potentiels et peut être utilisé pour étudier l'effet des variations de beaucoup d'autres paramètres tels que les subventions, le coût du maintien de l'emploi, les chocs de productivité sur les performances du marché du travail. Les résultats et les simulations qui peuvent être obtenus du modèle peuvent

fournir des principales lignes directrices sur la façon dont les futures politiques de l'emploi de la région MENA, qu'il soit public ou privé, doivent être adressées afin d'obtenir des résultats efficaces sur le marché du travail pendant et après la période de transition démocratique.

Ce chapitre cherche également à expliquer dans quelle mesure le modèle classique de Mortensen et Pissarides est applicable aux pays en voie de développement, tels que l'Égypte, où les grandes parts de leur emploi se trouvent dans le secteur informel ou le secteur public. Le secteur informel dans ce chapitre, et aussi tout au long de la thèse, est défini comme l'emploi non contrôlé par n'importe quelle forme de gouvernement. L'absence d'un contrat et d'une sécurité sociale identifie les salariés du secteur informel dans la base des données utilisées.

Comment ces interactions entre les secteurs peuvent être intéressantes? Premièrement, les mobilités des travailleurs entre les secteurs impliquent que leurs options dépendent de leurs opportunités dans tous les secteurs: quand ils négocient leurs salaires dans un secteur particulier, ils intègrent leurs possibilités potentielles dans d'autres secteurs. Par conséquent, si le secteur formel devient plus rentable, le point de la menace des employés dans chaque secteur augmente, conduisant à des pressions salariales dans le secteur informel. Si ce dernier ne respecte pas les changements dans sa rentabilité, les travailleurs se déplacent vers le secteur formel, qui peut soutenir ces salaires élevés. L'interaction entre le secteur privé (formel et informel) et le secteur public est également intéressante. En effet, si le secteur public offre des salaires élevés, il est avantageux pour les employés à la recherche d'emploi, de se diriger vers ces postes bien rémunérés et assez stables. Par conséquent, le secteur public peut agir comme une taxation supplémentaire pour les firmes privées. Les firmes du secteur privé formel payent des coûts d'installation afin d'embaucher des travailleurs, mais au cours de la durée du contrat, certains de ces travailleurs vont choisir de se déplacer vers un meilleur job, dans le secteur public. Le modèle proposé prend également en considération les réalités fiscales rencontrées par le secteur public. Il est vrai que le secteur public peut augmenter ses salaires, mais compte tenu de sa contrainte budgétaire, il est susceptible de diminuer le taux d'embauches des employés.

## Chapitre 5

La dernière partie de la thèse vise à caractériser les flux des marchés du travail égyptien et jordanien en utilisant les informations disponibles dans les données au niveau micro. Comme démontré dans les chapitres 2 et 3, les données de panel disponibles sont soumises à des erreurs de mesure, plus précisément à un biais de mémoire et de conception. Le Chapitre 5 sert comme un chapitre méthodologique d'économétrie appliquée. En se basant sur le modèle de correction des transitions au niveau macro, développé dans le chapitre 3, il propose une méthode pour corriger les données sur le niveau des transactions individuelles (niveau micro). Il crée des poids qui peuvent être facilement utilisés par les chercheurs qui veulent exploiter les données de panel rétrospectives des enquêtes ELMPS et JLMPS. Ce chapitre propose qu'il suffise de faire un appariement entre les moments rétrospectifs biaisés et les vrais moments de population non-biaisé. Pour pouvoir faire cet appariement, des informations auxiliaires, telles que les informations contemporaines (des enquêtes en coupe) d'autres vagues de la même enquête, voire des sources de données externes, tant la comparabilité entre les définitions des variables est vérifiée et maintenue, sont nécessaires. L'estimation du biais, permet ensuite de répartir cette correction entre les observations individuelles/ ou les transactions de l'échantillon sous forme de poids de micro-données. Le chapitre propose deux types de poids: poids proportionnels naifs et poids différenciés. Le chapitre montre que les poids proportionnels naifs offrent l'avantage d'être simple à calculer et facile à utiliser. Cependant, puisque les panels rétrospectifs ne sont pas aléatoires, les poids différenciés essaient de redresser les échantillons pour qu'ils soient aléatoires. La construction de ces poids différenciés est principalement basée sur l'hypothèse que si c'est plus probable pour l'individu de faire un certain type de transition, c'est plus probable pour lui de mal-reporter cette transition. Des poids au niveau de transaction c'est à-dire pour chaque transition pour tout point dans le temps, ainsi que des poids de panel c'est-à-dire pour les durées passées dans un certain état du marché de travail, sont créés. Les résultats montrent que ces poids ont un effet significatif. Cette conclusion est démontrée grâce à une application économétrique de forme réduite qui utilisant ces poids. Les déterminants de transitions sur le marché du travail sont analysés via une

analyse de régression multinomiale avec et sans les poids. L'impact de ces poids sur les estimations des régressions est donc examiné et montré significatif parmi les différentes transitions sur le marché du travail, particulièrement les séparations.

L'application démontrée dans ce document en utilisant les poids de rappel permet d'estimer les probabilités de transitions markoviennes entre les différents états du marché du travail sur le temps en fonction des caractéristiques observables. D'une part, une telle analyse permet de souligner les probabilités des transitions au sein ou entre les différents secteurs d'emploi, mais aussi le chômage et le non-emploi. D'autre part, les estimations obtenues sont évocatrices des rôles de la dépendance de l'état dans ces transitions sur le marché du travail. Les probabilités de transition markoviennes sont estimées principalement entre les trois états du marché du travail, l'emploi, le chômage et l'inactivité, sur une période de dix ans en fonction des caractéristiques observables des travailleurs, des firmes employeurs ainsi que les indicateurs macro-économiques tels que la tension du marché du travail. Le document fournit également, quand c'est possible, les transitions sur le marché du travail entre les secteurs du travail salarié privé formel, travail salarié secteur informel, travail non-salarié (les entrepreneurs) et non-emploi. Etant donné les tailles d'échantillons et la nature des transitions, les constructions des matrices des poids pour les femmes n'a pas été possible. Cependant, une estimation des probabilités de transitions non-corrigées en utilisant une spécification logit multinomial pour les hommes et les femmes a été faite pour avoir une idée sur les différences de ces transitions entre hommes et femmes, ce qui peut être intéressant pour les décideurs politiques afin de chercher des moyens pour augmenter les taux de participation.

## Chapitre 6

Enfin le chapitre 6 utilise un modèle d'équilibre partiel à la (Burdett and Mortensen, 1998) pour estimer les transitions structurelles sur le marché du travail entre l'emploi et non-emploi en Egypte et en Jordanie, tout en exploitant les données de panel rétrospectives corrigées via les matrices des poids proposées dans le chapitre 6. Les panels sont construits pour une période de 6 ans à l'aide des informations rétrospectives disponible

dans l'enquête du marché du travail égyptienne (ELMPS 2012) et l'enquête du marché du travail jordanienne (JLMPs 2010). Le chapitre utilise la caractéristique de correspondance entre les déterminants du travail et mobilité salariale, et les déterminants de la distribution des salaires en coupe, comme proposé par Jolivet, Postel-Vinay, and Robin (2006). Les estimations faites dans ce chapitre permettent donc l'utilisation des données disponibles dans les pays étudiés, (i) pour fournir une mesure quantitative des paramètres d'appariement (les paramètres des frictions) et (ii) pour tester dans quelle mesure le modèle Burdett-Mortensen peut expliquer la réalité et la nature particulière des marchés du travail de ces pays en voie de développement. L'analyse adopte la procédure de deux étapes d'estimation semi-paramétrique, proposée par Bontemp, Robin, and Van den Berg (2000). Les estimations des paramètres sont effectuées en utilisant des techniques du maximum vraisemblance, sur les échantillons des hommes travailleurs entre 15 et 49 ans, avec et sans les poids de correction du biais de mémoire. L'estimation aussi faite pour deux groupes d'âges, les jeunes (15-24 ans) et les vieux (25-49 ans). Les poids de correction du biais de mémoire se révèlent très significatifs quand ils sont utilisés dans l'estimation des paramètres de destruction d'emplois. Les estimations de l'indice d'appariement de la recherche d'emploi est en conséquence très sensible à cette correction. Les paramètres d'appariement dans les deux pays sont généralement très faibles, ce qui confirme la rigidité de ces marchés du travail. Les résultats montrent également qu'en général le marché du travail jordanien est plus flexible que l'Égyptien, surtout parmi les plus travailleurs les plus jeunes. Les durées d'emploi en Jordanie sont alors relativement plus courtes. En revanche, les jeunes travailleurs égyptiens ont des périodes de non-emploi plus courtes que les jeunes travailleurs jordaniens. En Égypte, la durée pour rester non-employé baisse avec l'âge. En Jordanie, cependant, les durées de non-emploi deviennent plus courtes pour les plus âgés. Les jeunes travailleurs égyptiens ont les frictions de recherche d'emploi les plus élevées parmi tous les groupes. Cela implique que le pouvoir de monopsonie des entreprises dans cette tranche du marché égyptien est le plus élevé, conduisant à de faibles niveaux de salaires. Comme les petites entreprises ont tendance à payer des salaires plus bas, il s'agit d'une densité de taille d'entreprises concentrée autour des petites entreprises. Ce résultat est confirmé par les données empiriques pour le marché du travail égyptien.

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# Preface

The increasing inequality gap among nations is surely a distressing outcome generally for the globe and particularly for the poor countries. In 2010, the distance between the richest and poorest countries has widened to a gulf. According to Klugman (2010), the richest country in 2010 (Liechtenstein) was three times richer than the richest country in 1970, while the poorest country (Zimbabwe) was about 25% poorer than it was in 1970 (having been itself the poorest back then). As the distribution of wealth between countries continue to diverge, policy prescriptions for these poor countries struggle to raise their income levels. However, these are often contradictory.

Although providing more employment should alleviate poverty, there is no clear consensus regarding the best policies for expanding employment opportunities in developing countries, given their particular nature. Labor market regulations are necessary to protect the rights of workers and to improve their working conditions however they might discourage firms from hiring workers and thus have an unintended consequence of harming the people they are designed to protect. Public sector employment policies and conditions can also contradict these regulations, where workers would willingly queue for stable public sector jobs. Fiscal realities, however, make it impossible for these government jobs to absorb all these job seekers. Moreover, in developing countries, massive noncompliance is the norm and regulations like a national minimum wage for instance could simply encourage the expansion of a non-regulated informal market, where wages are even lower, employment is more flexible and working conditions are even worse.

The Middle East and North Africa (MENA) arab countries represent a special group among these developing nations. These are countries that have recently experienced an unprecedented tide of popular uprisings resulting in ousting multiple presidents of

the region. Many commentators have argued that the driving forces behind the people revolution are the rising poverty, inequality and exclusion, much of which is related to the labor market and the lack of access to decent work. While many of these economies have been growing, this has not created enough jobs to absorb the labor market entrants (whether new entrants or sudden waves of return migrants resulting in labor supply shocks such as after the Iraq war in 2003), and has fostered only low quality jobs with low productivity in the informal sector where many workers get trapped and unable to escape poverty.

These uprisings began mainly against the backdrop of the global economic crisis in 2008 which has led to a further erosion of economic opportunities. During that time, countries such as Egypt and Jordan have been involved in structural reforms to the labor market over the preceding 20 years which surely had several implications on their labor market performance. Hence, understanding the failure of institutions to deliver decent employment opportunities is vital for policymakers, who have been continuously debating since the Arab Spring on how to respond to the economic downturn and on how to provide more equitable labor market opportunities to their economically and politically agitated People. To be able to do this, this thesis therefore tries to look at those specific labor markets, particularly the Egyptian and Jordanian, under the lens of well-understood and tested structural models.

Reviewing previous literature on the MENA labor markets in general, and on the Egyptian and Jordanian labor markets in particular, it has been found that analyses relied mainly on static and aggregate approaches. Research in the region hinged on repeated cross sections, examining stocks and changes in these stocks. This is severely limited. While one can be able to tell the share of informality, unemployment and non-participation via stocks, it becomes impossible to answer crucial questions concerning short- and long-term labor market transitions. The main problem is not the labor market state an individual occupies. What really matters is how long this individual stays in that state and if he/she ever exits, what would be their following destination. The importance of capturing and analyzing the flows underlying labor market stocks needs to be conveyed to policymakers in the region. On the one hand, it would enable them to detect inflection points, assess labor market tightness and measure responses

to business cycle fluctuations, shocks and different reforms. On the other hand, to be able to keep unemployment rates as low as possible, ensuring a healthy dynamic labor market is achieved when both high job creations and job destructions exist. This eventually guarantees productivity growth, as high productivity jobs are created and low productivity ones are destroyed. Due to the nature of the data available and due to the lack of annual panel datasets, researchers in Egypt and Jordan, when tempted to study labor market dynamics in the MENA region, tend to focus on the job creation process only, ignoring job destruction and job mobility flows. Examples on such literature might include attempts to analyse unemployment durations (Kherfi, 2015), school-to-work transitions (Amer, 2014, 2015) and life-course transitions (Assaad and Krafft, 2013). Finally, the Egyptian and Jordanian labor markets are characterized by the presence of unregulated flexible informal markets. In order to be able to scale down the difference between the formal and informal jobs, a dynamic flexible formal labor market needs to be promoted to shift employment from informal jobs (that are flexible by definition) to formal work.

This thesis aims at contributing to the literature both empirically and theoretically. On the empirical level, this was a very tedious job, given the non-availability of official statistics, short-term panels or stylized facts on labor market flows for these countries. This made it necessary to explore these flows using all the possible various approaches - all the way from the very basic to the most sophisticated methods. Theoretically, the conventional job search theory is also aimed to be extended, to be able to explain paradoxal phenomena in developing countries due to their particular nature and characteristics, for instance take into consideration their informal sectors, their sizeable public sector employer and corruption. By evaluating and assessing labor market institutions and regulations on the performance and outcomes in the Egyptian and Jordanian labor markets, this manuscript tries to provide guidelines and policy recommendations to policy makers who need to understand the inside story and the functioning of their labor markets, to be able to take action, especially since their countries are currently going through a “Democratic” transition.

Throughout the different steps of the chapters of this thesis, the book attempts to answer three main problematic questions. First, do job seekers in Egypt and Jordan



find work? Attempts to analyze the trends of job accession, separation and mobility over time are therefore made. These include using available micro-level data to extract annual and semi-annual longitudinal retrospective panel datasets. Following Shimer (2012), these are then used to construct the macro time series of labor market flows for both countries (Chapter 1). In Chapter 2, these retrospective panels are analyzed and compared to available contemporaneous cross-sectional information. The former are found to suffer from measurement errors, more precisely recall and design biases. One of the main advents of this thesis is therefore the development of a methodology to correct these measurement errors on the aggregate macro-level (in Chapter 3) as well as transitions and durations of the individual level micro-data (in Chapters 5 and 6). Overall, the job finding and separation rates, in Egypt and Jordan, revealed evidence on high levels of rigidity in both labor markets. The second problematic question therefore arises, relying on the evaluation of labor market reforms and their impact on labor market performance and outcomes. It was crucial to determine how does unemployment vary in response to introducing flexible employment protection regulations in such rigid labor markets. Trying to respond to this question, the impact of liberalizing the Egyptian labor market through the introduction of a labor law in 2003, has been analyzed both empirically (in Chapter 3) and theoretically (in Chapters 3 and 4). The third and final mission of the thesis was analyzing the quality of jobs people access in these labor markets. This included characterizing the labor market flows and exploring workers' movements up the job ladder. This was made possible through a reduced-form application to the proposed correction methodolgy (in Chapter 5) as well as a structural estimation of the labor market frictional parameters (in Chapter 6).

Since the flow approach to labor markets has become the basic toolbox to modern labor economics replacing the usual paradigm of supply and demand in a frictionless environment, this thesis has as its central insight explaining the functioning of the Egyptian and Jordanian labor markets using the search equilibrium theory. There exists two main approaches to modeling search equilibrium on the labor market. This classification basically depends on the way the nature of search frictions and the nature of equilibrium wage setting are viewed. The first approach is to account for search

frictions in the form of incomplete information about the available vacancies, which generates a time delay until the matching between the unemployed workers and firms with vacancies takes place. Diamond (1982), Mortensen (1982) and Pissarides (1985) adopted this approach. Wages are determined in this case through a Nash bargaining process as long as the application of the Nash solution to the equilibrium wage determination is justified (Binmore, Rubinstein, and Wolinsky, 1986). The second class of models assumes that search frictions result from workers' incomplete information about the offered wages. In this case workers receive take-it or leave-it wage offers (one per period) and have the choice to either accept or reject the offer before they can draw a new one. Early job search models adopted this approach that was added later on to the search equilibrium framework by Diamond (1971), Albrecht and Axell (1984) and Burdett and Mortensen (1998). Wages are hence determined in these models via a wage posting game among employers.

Assessing the inflows and outflows of unemployment becomes possible using the first approach where the transition rates can be obtained in function of labor market tightness, workers' search intensities..etc (Pissarides, 1990). Chapters 3 and 4 therefore choose to adopt this approach in an attempt to understand the nature of the dynamics of the Egyptian labor market, in terms of whether workers find jobs or not and how jobs are destroyed. This method however does not allow to portray the quality of jobs and movements of workers up the job ladder since it is less informative about on-the-job search and no endogenous wage offer distributions can be obtained. Empirical applications are consequently very limited using the first approach. In contrast, the second approach adopts a model with wage posting and on-the-job search which solves for a unique endogenous wage offer distribution which is a crucial feature that facilitates the estimation and the empirical application of the model. In an attempt to cover all the methods, Chapter 6 therefore chooses to focus on the second class of models.

The rest of this thesis manuscript is divided as follows. Chapter 1 serves as an introductory chapter, of which the primary objective is to describe the main developments in, and establish a number of key facts and descriptives about the recent history of these important Egyptian and Jordanian labor market flows. The chapter provides the main guidelines to how semi-annual and annual longitudinal retrospective panels

are extracted for Egypt and Jordan using the available Labor Market Panel Surveys (ELMPS and JLMPS), which are to be used through out the thesis. The chapter also provides a summary of the two countries' institutional frameworks. It examines the descriptive statistics of the labor market flows showing the similarities and differences between the two countries. Overall, the findings of this chapter on the dynamics of the Egyptian and Jordanian labor markets are not re-assuring. These show that job accession and separation rates are extremely low in both economies, and even job-to-job transitions do take place mainly in the informal sectors with the possibility that people might be experiencing worsening job statuses rather than becoming more productive and moving up the job ladders. The Jordanian labor market appear to be relatively more mobile and flexible than the Egyptian labor market. However, with no big differences between the job finding rates in the Jordanian formal and informal sectors, the figures and patterns observed suggest that the Jordanian labor market is more segmented than the Egyptian.

Previous literature such as Artola and Bell (2001), Bound, Brown, and Mathiowetz (2001), and Magnac and Visser (1999) show that retrospective data suffer from problems such as difficulties in recalling dates or even that certain events occurred at all. Panel data, that is data that are collected contemporaneously at different points in time for the same individual, avoid this problem but because they are collected at discrete points in time, they only provide information at those points in time and not on the course of events between those points (Blossfeld, Golsch, and Rohwer, 2012). These are also likely to suffer from sample attrition and misclassification errors (Artola and Bell, 2001). In Chapter 2, due to these potential problems with both retrospective and panel data, it becomes worthwhile to compare results on basic indicators related to labor market dynamics from retrospective and contemporaneous panel data on the same sample of individuals, in order to determine the conditions under which they provide similar or substantially different results. To date, no study has undertaken such a comparison in the MENA region. This chapter therefore takes advantage of a unique opportunity to undertake such a comparison, where both panel and retrospective data are available for the same individuals in the Egypt Labor Market Panel Survey (ELMPS) using 1998, 2006 and 2012 waves. Not only do the reference periods

of the retrospective data of each wave overlap with the dates of the previous waves of the survey, allowing for comparisons of retrospective and panel data at the same point in time, but the retrospective periods from different waves of the survey overlap with each other as well, allowing for comparison of past events in one wave with the same events as captured in another wave. In countries, where data collection budgets represent a big issue, this chapter therefore tries to demonstrate whether it is possible to collect information about labor market dynamics using retrospective data or is recall error so great as to make panel data the only viable option. Findings show that it is possible although caution is required on the type of information concluded from the analysis and the level of detail used in the analysis (for instance differentiation between very detailed categories such as self-employed and employers or regular and irregular workers might be mis-leading). Past employment spells from retrospective data are shown to be fairly reliable so long no fine distinctions between employment states are made. Interspersed non-employment spells (unemployment and out-of labor force) between employment spells are however hard to recall. Retrospective questions eliciting monetary amounts proved to be unreliable. Respondents tend to inflate the amount to their equivalent value at the time of the survey. This chapter also provides guidelines and lessons on how to use existing retrospective data from the ELMPS or other similar surveys.

After having discussed the data and its issues in the first part, the second part of this thesis is dedicated to evaluating the impact of introducing flexible employment protection regulations on unemployment rates in developing countries. This becomes possible in chapter 3 which proposes to evaluate an Egyptian labor market law which was introduced in 2003, aiming to enhance the flexibility of the hiring and firing processes. In general, only one earlier study by Wahba (2009) investigated the short term impact (i.e after two years) of the law but on the formalization process in Egypt. The Egypt labor market panel surveys (ELMPS 2006 and ELMPS 2012) are used to measure the impact of this reform on the dynamics of separation and job finding rates, and to quantify their contributions to overall unemployment variability. Using extracted longitudinal retrospective panel datasets created from the retrospective accounts of the 2006 and 2012 cross-sections and by overlapping the two surveys, the chapter estimates

annual and semi-annual transition probabilities of workers among employment, unemployment and inactivity labor market states. A unique novel model is built to correct for the recall and design bias observed in the aggregate labor market transitions obtained from retrospective data. Using the "corrected" data, it is then shown that the reform increases significantly the separation rates in Egypt but leads to non-significant effects on the job finding rates. The combined net effect is therefore an increase in the levels of the Egyptian unemployment rate: separations increase whereas hirings remain unchanged. This partial failure of the liberalization of the Egyptian labor market is then explained theoretically by an increase in the set-up costs, interpreted as a capture by the corrupt agent of the new surplus, in the Mortensen and Pissarides (1994) model.

Chapter 4 takes the analysis to a further step and attempts to explain to what extent the Mortensen and Pissarides (1994) model is applicable to developing countries, such as Egypt, where big shares of their employment lies in the informal and public sectors. Limiting the analysis, as previous traditional literature, to only an unsegmented or segmented Private labor market might be insufficient or might fail to explain the inside story of the underlying different transitions and the particular nature of the MENA region labor markets. While recent attempts tried to include within the job search model an informal sector (such as Albrecht, Navarro, and Vroman (2009), Meghir, Narita, and Robin (2012), Bosch and Esteban-Pretel (2012), Charlot, Malherbet, and Ulus (2013, 2014) and Charlot, Malherbet, and Terra (2015)) or a public sector and an unsegmented private sector (Burdett (2012), Bradley, Postel-Vinay, and Turon (2013)), Chapter 4 aims to add both an informal and a public sector to the conventional Mortensen and Pissarides (1994) model. A worker's employment/non-employment choices are therefore based on the comparisons between his/her expected job values in the current or all prospective jobs i.e in any of the three employment sectors. The model built in this paper also takes into consideration fiscal realities faced by the public sector. It's true that the public sector can increase its wages but given its budgetary constraint, it is likely to decrease the rate at which it hires employees. This could be done, as in Egypt for instance, by rationing public sector vacancies. This chapter therefore makes it possible to offer another explanation to the empirical paradox observed in chapter 3 following the introduction of flexible employment protection in Egypt. Even though

the policy is directed to the formal private sector, it surely affects the interaction and the flow of workers between the different employment sectors. Using qualitative analytics, the model is calibrated and simulations for the impact of the structural reforms, particularly the Egypt Labor Law implemented in 2004, are provided. Supporting evidence from available data on flows in Egypt between the employment sectors and unemployment, before and after the 2004 reform are also shown. The main findings suggest that introducing flexible employment protection rules, modelled as reduced firing taxes, favors job creation and job destruction in the private formal sector which is the main aim of the policy. It increases job separations in the informal sector and decreases workers finding informal jobs. Indeed, it is shown that the liberalization of the labor market plays against the informal employment by increasing the profitability of the formal jobs. But, if at the same time, the wages offered by the public sector are increased, as what happened in Egypt (Said, 2015), this would create a crowding out effect, where the new surpluses created by the labor market reform are more than compensated by the new costs of worker mobility induced by the increase in the attractiveness of the public sector. This result is robust, even if the introduction of reduced firing taxes decreases the proportion of on-the job search towards the public sector of both workers in the formal and informal sectors.

The last part of the thesis aims at characterizing the labor market flows in the Egyptian and Jordanian markets by exploiting the micro-level information available in the data. Since as has been discussed earlier, the data suffers from measurement errors, Chapter 5 serves as a methodological applied econometrics section that building on the macro model developed in Chapter 3, it proposes a method to correct the data on the individual transaction level (i.e. micro level). It creates user-friendly weights that can be readily used by researchers relying on the ELMPS and JLMPS retrospective panels. It is suggested that it is sufficient to match the retrospective moments with true unbiased population moments, from auxiliary information such as contemporaneous information from other waves of the same survey, or even external data sources, so long comparability between the variables' definitions is verified. As a measurement error is estimated, this can be then distributed among the sample's individual observations/transactions in the form of micro-data weights. The chapter

proposes two types of weights: naive proportional weights and differentiated predicted weights. The chapter shows that naive proportional weights offer the advantage of being simple to calculate and handy. However, since retrospective panels are not random, the predicted differentiated weights attempt to re-obtain random samples within these panels. This is mainly based in the assumption that if the individual is more probable to transit, then he is more probable to mis-report. Both transaction-level weights i.e. for each transition at a certain point in time, as well as panel weights i.e. for an entire spell are created. The effect of these weights is shown significant through an application using these weights. The determinants of labor market transitions are analyzed via a multinomial regression analysis with and without the weights. The impact of these weights on the regressions estimations and coefficients is therefore examined and shown significant among the different labor market transitions, particularly separations.

Finally Chapter 6 uses a rudimentary partial equilibrium job search model à la (Burdett and Mortensen, 1998) to estimate the structural labor market transitions between employment and non-employment states in Egypt and Jordan, exploiting the corrected extracted longitudinal retrospective panels obtained from 6-year panels using retrospective information available in the Egypt labor market panel survey (ELMPS) fielded in 2012 and the Jordan labor market panel survey (JLMPS) fielded in 2010. The chapter uses the close correspondance between the determinants of labor turnover and wage mobility, and the determinants of the cross-sectional wage distribution, as per Jolivet, Postel-Vinay, and Robin (2006) to be able to exploit the datasets available for the countries in question, *(i)* to provide a quantitative measure of the search frictions and *(ii)* to test to what extent the model fits the data i.e. reality and the particular nature of these developing countries' labor markets. The analysis adopts Bontemps, Robin, and Van den Berg (2000) two-step semi-parametric estimation procedure. The estimations are carried out using maximum likelihood techniques delivering frictional transition parameters for each country, for the samples with and without longitudinal correcting panel weights, as well as for two different age groups. The chapter shows that correcting for the recall and design bias in the used datasets matters significantly to the estimation of the job destruction parameters. The estimates of the index of search frictions is as a result sensitive to this correction. The frictional parameters

in both countries are generally very low reflecting the rigidity of these labor markets. Findings also show that in general the Jordanian labor market is more flexible than the Egyptian, especially among the younger group of workers, where job durations are relatively shorter. In contrast, Egyptian young workers have shorter non-employment spells. In Egypt, the duration of remaining non-employed declines with age. In Jordan, however, non-employment durations get shorter for the old group of workers and are shorter than that for the Egyptian old workers. Young Egyptian workers are found to have the highest level of search frictions, relative to the older Egyptian workers and Jordanian workers -both young and old. This implies that the firms' monopsony power in this trench of the Egyptian market is the highest leading to low levels of salaries. Since small firms tend to pay lower wages, a higher density of small sized firms is captured for the Egyptian market. This result is confirmed by the empirical data.



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# Part I

## Data and Descriptives

# Chapter 1

## Labor Market Flows: Facts from Egypt and Jordan <sup>1</sup>

### 1.1 Introduction

The issue of labor market dynamics is crucial and central to understanding how they function and how they create more and better jobs. Previous traditional literature on Middle East and North Africa (MENA) countries, where analyses relied on static and aggregate approaches, as well as repeated cross-sections to view stocks and changes in stocks, are severely limited. It's true that via stocks, one is able to point out if an individual occupies an informal type of work, is unemployed or is even out of the labor force. However, what really matters and might be extremely problematic is how long an individual stays in that state and what is likely to be the destination after leaving that state. In most developing countries, especially the MENA region, the readily available cross-sectional data allow to only capture the stocks or the changes in stocks, but not the flows underlying these stocks.

The recent introduction of new waves of surveys in the region as well as new empirical techniques has now made possible more profound and thorough dynamic research. Researchers, demographers and policy makers became increasingly interested in understanding employment histories or the worker's life course after schooling, with a focus

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<sup>1</sup>This chapter is mainly based on the paper "Job accession, separation and mobility in the Egyptian labor market over the past decade" (Yassine, 2015).

on events, their sequence, ordering and transitions that people make from one labor market state to another. Since the Arab Spring, the MENA countries are continuously debating on how to respond to the economic crises and on how to provide more equitable opportunities through their labor markets. Consequently, policy-relevant research on labor market dynamics becomes particularly valuable.

Given the availability of data, the research conducted in this thesis provides evidence from two developing MENA arab countries, Egypt and Jordan. Previous research on labor markets in Egypt and Jordan has paid close attention to the stocks of the employed, the unemployed and the inactive (i.e., those not working or looking for work), as well as to the balance between labor demand and supply often referred to as “tightness”. However, the labor market stocks and aggregate indicators are fundamentally driven by the behaviour of flows between employment, unemployment and inactivity. Egyptian and Jordanian labor market dynamics remain therefore an unexplored research topic where even official statistics lack records of these flows, namely job accession (transitions from non-employment to employment) , separation (transitions from employment to non-employment) and mobility (job-to-job transitions).

An understanding of all the relevant flows is essential to the comprehension of labor market dynamics and business cycle fluctuations. For policy makers, knowledge of those facts can help improve the monitoring of business cycles, the detection of inflection (turning) points and the assessment of labor market tightness. To guarantee productivity growth along with economic (GDP) growth, it is important to ensure a healthy dynamic labor market where low productivity jobs are being destroyed, higher productivity jobs are being created and existing jobs are getting more productive. Liberalizing labor markets is also important in the case of developing countries to scale down the difference between formal and informal jobs, that are flexible by definition given that this a part of the economy that is not taxed or monitored by any form of legal-institutional framework. This paper can hence be seen as a guideline to the creation of a number of measures of dynamics from the Egyptian and Jordanian available datasets. It provides a summary of the two countries’ institutional frameworks. The paper examines the descriptive statistics of the labor market flows showing the similarities and differences between the two countries.

The preliminary results of this paper are not reassuring in terms of the dynamics of the Egyptian and Jordanian labor markets where job accession and separation seem to be extremely low in the economy, and even job-to-job transitions do take place mainly in the informal sectors with the possibility that people might be experiencing worsening job statuses rather than becoming more productive and moving up the job ladders. The Jordanian labor market appear to be relatively more mobile and more flexible than the Egyptian labor market. With no big differences between the job finding rates in the formal and informal sectors in Jordan, the figures and patterns observed suggest that the Jordanian labor market is more segmented than the Egyptian market though. Overall, the key answer to a healthy and dynamic labor market is simply firms and workers becoming better at what they do, and for this to take place, policies in these countries should encourage in the formal private sector all three types of transitions: job accession, separation and mobility.

To the best of my knowledge, this paper is the first attempt to assess from a descriptive point of view the transitions within/between employment and non-employment states in the Egyptian and Jordanian labor markets. Discussions and debates in the region's seminars suggest that these labor markets are very rigid, where a worker can spend his entire working lifetime in only one job. There is a need however to assess such claims with concrete descriptive evidence, using recent panels and datasets, which shall be the mission of this paper.

Thus the objective of this paper is to describe the main developments in, and establish a number of key facts and descriptives about the recent history of these important Egyptian and Jordanian labor market flows. The paper points out the characteristics of labor market transitions, stayers and movers among the different labor market states, and explores the key determinants to move, leave or quit a job. The analysis tries to highlight remarks, if any, particularly for Egypt, on the period after the January 2011 Uprising, after which it has been claimed that many workers lost their jobs.

In this paper, both semi-annual and annual longitudinal retrospective panels over the period 1998-2012 for Egypt and 1996-2010 for Jordan are extracted. This is done by combining information obtained from retrospective job histories, unemployment

spells, a life events calendar (when available) and current job status details available in the Egypt and Jordan Labor Market Panel Surveys (ELMPS and JLMPS respectively). The innovation of obtaining an employment/non-employment vector for each and every individual every six months over a period of ten years (for each country) allows to monitor the fullest possible range of job accession, separation or job-to-job transitions occurring in the Egyptian and Jordanian labor market during the observed period. I am therefore able to quantify and characterize these transitions and hence provide the literature with stylized facts and descriptives about Egyptian and Jordanian labor market dynamics that even official statistics have lacked.

The rest of the paper is divided as follows. The second section surveys previous literature on the evolution of the institutional framework of the Egyptian and Jordanian labor markets. The third section briefly presents the structure of the questionnaires and the data used in the analysis, the creation of semi-annual longitudinal retrospective panels, and the resulting potential errors. The fourth section provides an overview of the average gross flows of jobs and the macroeconomic labor market trends in Egypt. The fifth section explores the characteristics of job leavers/losers and movers as opposed to job stayers. Section 6 concludes.

## **1.2 Stylized Facts About Labor Markets in Egypt and Jordan**

Egypt and Jordan are two arab MENA labor markets which share certain common characteristics with their neighboring arab countries. In general, these are countries that are characterized by oversized public sectors, high rates of youth unemployment, very weak formal private sectors and high shares of informality. The educational level of the labor supply in these countries is rapidly growing on the one hand but highly distorted on the other (Assaad, 2014a). It has also been well established that these are countries with stagnant low female labor force participation rates when compared to other regions. This section surveys the stylized facts and indicators provided by previous literature, not only showing the key features of these two labor markets but even showing more evidence to how it is crucial to study the flows driving their stocks.



Showing evidence from Gatti, Morgandi, Grun, Brodmann, Angel-Urdinola, and Moreno (2013) in figure 1.1, Assaad (2014a) shows that the public sector constitutes high shares of employment in arab countries as opposed to countries, either developing or developed in other regions. Jordan is at the lead of these arab countries where on average 40% of employment in the 2000's has been concentrated in the public sector. Egypt, on the other hand, has been experiencing a relatively retreating share of public sector in employment which reached 25% in the 2000's. This however has not always been the case. In the 70's and 80's, all industrial employment was virtually public sector and heavily unionized. The crisis of the beginning of the 90's, compelled the government however to look to the International Monetary Fund (IMF), World Bank and the Paris Club for support, and that was when Egypt was required to undergo a structural adjustment package as a counterpart to receiving a stand-by credit. The result was an increase in economic activity, and a relatively stronger growth in the private-sector since then.

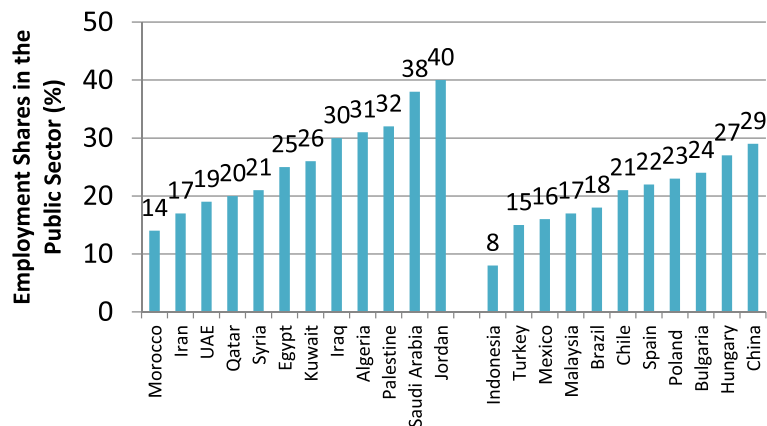


Figure 1.1: Employment shares in the public sector (%), averages in the 2000s.

Source: Assaad (2014a) based on Gatti, Morgandi, Grun, Brodmann, Angel-Urdinola, and Moreno (2013)

Assaad (2014a) argues in his paper that the public employment in the arab countries constitute an important share of the employment of politically significant groups such as the educated middle class (which is mainly the case of Egypt and Jordan), citizens of oil monarchies, and members of key sects, tribes or ethnic groups. These are also authoritarian regimes that sort of offer implicit deals to these politically significant groups as in to provide them with such stable well-compensated jobs in the bureaucracy or

the security forces, in exchange for either political quiescence or even sometimes their loyalty (Amin, Assaad, al Baharna, Dervis, Desai, Dhillon, and Galal (2012), Desai, Olofsgård, and Yousef (2009)).

Figure 1.2 shows more evidence of an oversized public sector relative to the size of the MENA region economies. Using data on a sample of 12 MENA countries, it shows that the central government wage and salary expenditure accounts to about 10% of the GDP, which is higher than any other region in the world, while the share of general government expenditures on wages is about 12%. This is similar to the average of the OECD countries but higher than the other developing regions.

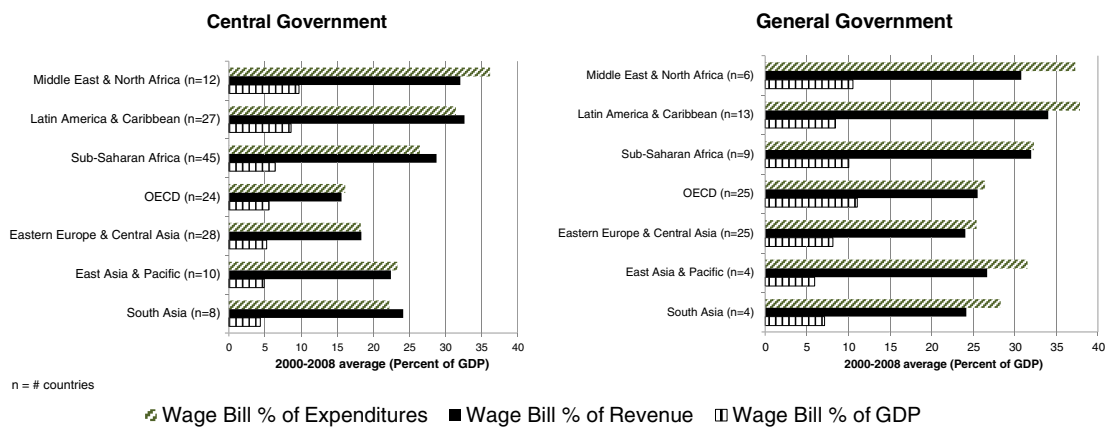


Figure 1.2: Size of central and general government wage bill relative to government expenditures and revenues, and GDP by region.

Source: Assaad (2014a) based on World Bank and IMF data.

Having such an oversized public sector, it follows that the private sector would typically be anemic and small. Gatti, Morgandi, Grun, Brodmann, Angel-Urdinola, and Moreno (2013) discuss that the private sector in this case would mostly be relying on government welfare and rent-seeking in order to be able to survive. Given fiscal realities, it's impossible for these public sectors to continue increasing their workforce. And since the private formal sector lacks flexibility and faces a number of creation and survival hurdles, the informal sector grows in these labor markets.

Informal employment represents that part of the economy that is not taxed or controlled by any form of government. Its output is not included in any gross national product (GNP) accounts. Informal workers could be unpaid workers, workers with no contracts, social security or health insurance coverage. Also, small or micro-firms that

operate outside the regulatory framework, and formal (small or large) registered firms that partially evade taxes and social security contributions might be considered informal. The literature uses three main measures of informality (1) the Schneider Index (Schneider, Buehn, and Montenegro, 2010) which uses a broad set of country correlates to estimate the share of production not declared to tax and regulatory authorities, (2) the share of employed workers without social security coverage, and (3) the prevalence of self-employment.

Figure 1.3 shows that a typical non-GCC MENA country produces about 28% of its GDP and employs 65% of its labor force informally. It also shows how the MENA region ranks using the different informality definitions, among the other regions of the world both developed and developing regions. The question becomes where do Egypt and Jordan rank among these MENA countries. In figure 1.4, it is obvious that while Egypt is below the MENA region median of employing workers informally, it produces 35% of its output in the shadow economy. As for Jordan, it employs like a typical median MENA country about 61% of its labor force informally and its undeclared output amounts to 20% of its GDP (slightly below the MENA median). In order to be able to capture the vulnerability of employment as a result of informality, the analysis throughout this thesis relies on the first definition of informality, i.e. the lack of contribution to social security. The data used relies, as will be discussed in the next section, on labor market surveys. The individuals are asked if they are employed whether they have (1) an official registered contract with the employer and (2) social insurance. Based on a positive response to any of these two questions, an individual is categorized as formally employed.

The above structure of the labor market gives a sense of the framework of the labor markets in the two countries in question, namely Egypt and Jordan. It's important to recall at this point that the MENA region where these countries belong displays on average low levels of employment and high levels of unemployment in comparison to other regions of the world (Gatti, Angel-Urdinola, Silva, and Bodor, 2014).

Another important point that the reader has to keep in mind all throughout the analysis conducted in this thesis is the differences in the labor law regulations of these two countries. Contextualizing the analysis according to the labor market regulations

of each country is crucial in order to be able to build robust conclusions about their labor market dynamics outcomes.

The legal framework in Jordan is mainly comprised of the Jordanian Labour Law (8) of the year 1996 and its amendments. This regulates the relationship between the Employer and the Employee. In this law, two types of contracts are considered; definite duration contracts and indefinite durations contracts. The termination of the contract without legitimate and adequate justification is possible, so long either party shall compensate the other for the harm incurred. The contract of employment terminates at the expiry of a fixed-term contract or at the completion of the task for which the contract was concluded. The contract is considered renewed if both parties continue to abide to the contract after its expiry. This legal framework for employment contracts in Jordan has been applied since 1996. However in Egypt, the definite duration type of contracts and the right of an employer to terminate an employee has only been introduced via the 2003 Egypt Labor Law (12), which was implemented in 2004. Before 2004, workers were at some sort appointed for their entire working lifetime in the private sector. The employer had very weak rights to terminate employers or to put end to their contracts. It's important however to note that the 2004 law regulations were only applied to those who accessed jobs and signed their contracts after 2004. Having said that, one can conclude that the Jordanian government has been trying to liberalize its labor market way before the Egyptian.

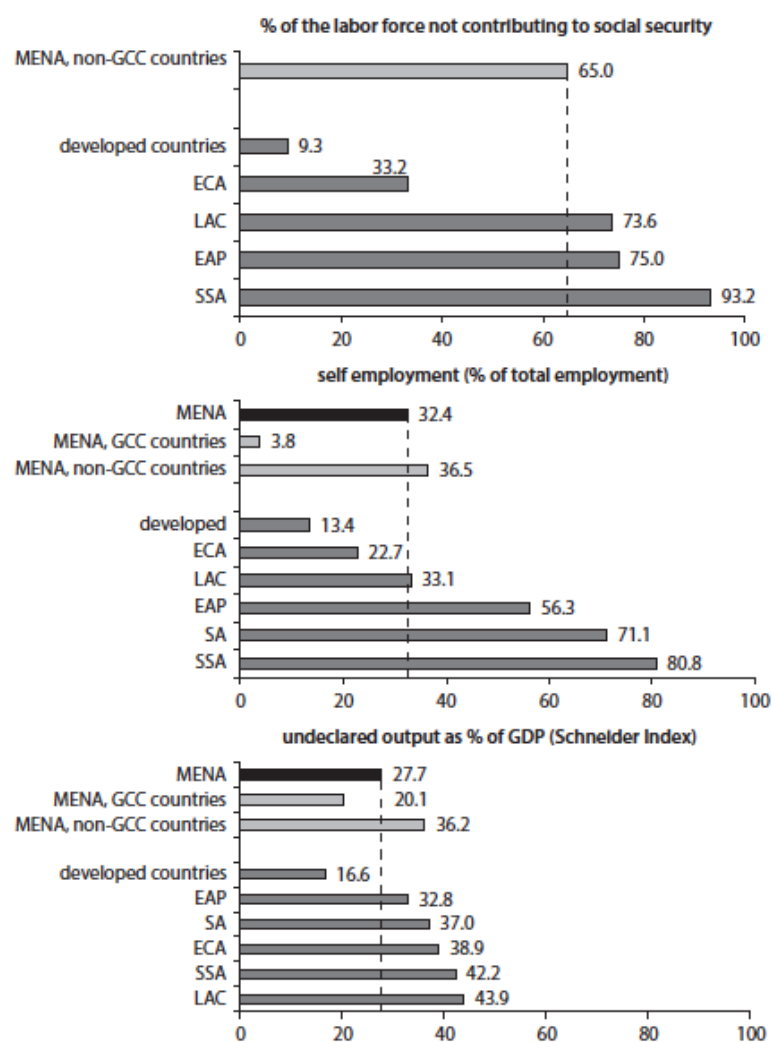


Figure 1.3: Informality in the MENA region Versus other world regions.

Source: Gatti, Angel-Urdinola, Silva, and Bodor (2014) based on Schneider, Buehn, and Montenegro (2010) and WDI data.

Note: GCC: Gulf Co-operation Council, ECA: Europe and Central Asia, LAC: Latin America and the Caribbean, EAP: East Asia Pacific, SA: South Asia, SSA: Sub-Saharan Africa

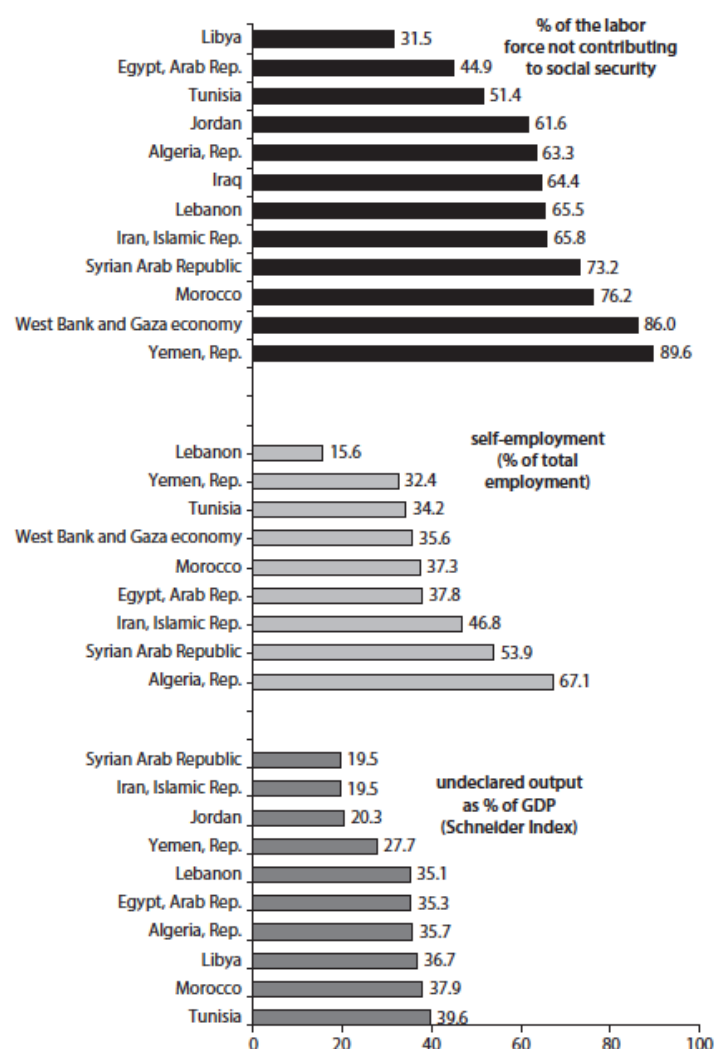


Figure 1.4: Informality in Egypt and Jordan versus a selected number of non-GCC MENA countries.

Source: Gatti, Angel-Urdinola, Silva, and Bodor (2014) based on Loayza and Wada (2010)

## 1.3 Methodology: From Stocks to Flows

### 1.3.1 Questionnaires

The analysis relies mainly on the Egypt Labor Market Panel Survey (ELMPS) fielded in 2012 and the Jordan Labor Market Panel Survey (JLMPS) fielded in 2010. The ELMPS 2012 is the third round of a periodic longitudinal survey that tracks the labor market and demographic characteristics of households and individuals interviewed in 2006 and 1998. The JLMPS 2010 is however the first round of the survey in Jordan. A second round in 2016 is planned to track the same individuals that were interviewed in the first wave. Both datasets are designed to be nationally representative.

The ELMPS 2012 has a total sample of 12,060 households and 49,186 individuals, who were interviewed. The JLMPS 2010 has a total sample of 5102 households and 25,969 individuals. The questionnaires have similar structures with some minor differences some of which will be discussed in the next paragraph.

The samples used in the analysis through out this thesis rely heavily on retrospective accounts available in both questionnaires. These are questions that apply to all individuals who ever worked and who are above the age of 6. In the ELMPS 2012, these retrospective questions were asked in a chronological order, starting at the first status of the individual in the labor market or as he exits school (whichever is earlier) and ending at the the fourth status (if needed). Individuals were also asked explicitly about their status three months before the January 2011 Uprising in case it was not similar to their current status at the time of the interview in 2012. For the JLMPS 2010 as well as the ELMPS 2006 and 1998, the order of the statuses was reversed. Individuals were asked about their current status<sup>2</sup>, their previous status and the previous-to-previous status. It's important to note that these statuses in both questionnaires can be employment, unemployment or inactivity states. For the JLMPS 2010, ELMPS 2006 and ELMPS 1998, there was also an extra section to ask about the first job. Table 1.1 shows the list of questions asked for each of the above individual's statuses, as well as their responses' codes .

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<sup>2</sup>This usually coincides with the current status obtained from the current employment and unemployment chapters of the questionnaire. The latter chapters included much more detailed questions about the job and the unemployment spells though.

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**Date of start of the status (month and year)**

**Employment status**

- |                              |   |
|------------------------------|---|
| 1. waged employee            | 9. full time student  |
| 2. employer                  | 10. <15 years old and neither works nor studies *                   |
| 3. self employed             | 11. does not want work*   |
| 4. unpaid working for family | 12. retired (<65 years old) does not work and has no desire to work |
| 5. unpaid working for others | 13. temporarily disabled  |
| 6. unemployed worked before  | 14. Unpaid leave for a year or more                                 |
| 7. new unemployed            | 15. more than 65 years old  |
| 8. housewife                 | 16. other   |

**Occupation** ( 6 digit - based on ISCO88)

**Economic activity** (4 digit - based on ISIC 4)

**Inside Establishment/ In same or another Establishment/Out of Establishment**

- |   |                          |
|---|--------------------------|
| 1. Same establishment/ in establishment | 2. Another establishment |
| 3. Outside establishment                |                          |

**Economic sector**

- |                                  |                         |
|----------------------------------|-------------------------|
| 1. government                    | 4. investment**         |
| 2. public enterprise             | 5. foreign**            |
| 3. private                       | 6. non-profitable NGO** |
| 7. other including co-operatives |                         |

**The size of the economic unit\***

- |            |                           |
|------------|---------------------------|
| 1. 1 - 4   | 5. 50 - 99                |
| 2. 5 - 9   | 6. more than 100          |
| 3. 10 - 24 | 7. don't know, very large |
| 4. 25 - 49 | 8. don't know             |

**Job stability**

- |              |             |
|--------------|-------------|
| 1. permanent | 3. seasonal |
| 2. temporary | 4. casual   |

**Contract**

1. Yes, indefinite duration  
2. Yes, definite duration  
3. No ———> 11  
4. N.A ———> 11

**Did you acquire this contract at the time you obtained your job?\***

1. Yes ———>12 2. No

**When did you acquire this contract?\*** ———>12

**Did any other workers within your firm have a contract?\***

1. Yes 2. No 3. N.A.

**Social security**

1. Yes 2. No ———> 15

**Did you acquire social security at the time you obtained your job?\***

1. Yes ———> 16 2. No

**When did you acquire this social security?\*** ———>16

**Did any other workers within your firm have social security?\***

1. Yes 2. No

**Work location**

**Reason for change from this status to the next status \***

- |   |   |
|---|---|
| 1. terminated by the employer                     | 4. Suspension of the project (employers and self- employed) |
| 2. Contract ended and not renewed by the employer | 5. No change  |
| 3. Quit volutarily/resigned                       | 6. Other (Specify)  |
- 
- 

Table 1.1: Questions asked to individuals in the retrospective sections of the Egypt and Jordan Labor Market Panel Surveys

(\*) These are questions/categories that are only available in the ELMPS2012.

(\*\*) The distinction between these three categories was not made in the JLMPS 2010. There was only a category for co-operatives and a category for international organizations.



Exploiting the raw data from these retrospective accounts allows to extract a worker's lifetime trajectory every six months<sup>3</sup> for only individuals who ever worked. These showed when and for how long the individual has been employed, unemployed or inactive in a certain spell. These semi-annual panels are then augmented by adding in information from sections about current employment and current unemployment in the questionnaires. These are large and detailed sections that include detailed questions on employment and unemployment detection over the past 7 days, all the job's and firm's characteristics in terms of contracts, social insurance, stability, vacations (in case of employment) and all unemployment search and reasons for not working questions (in case of unemployment)<sup>4</sup>. Finally, people who were never employed or unemployed are added to the sample as inactives throughout the entire panel. It was possible in the case of Egypt (ELMPS 2012) to cross validate the dates of start and end of statuses/jobs, due to the availability of a life events' calendar. This calendar pointed out changes in and spells of employment, education, marriage and residence.

### 1.3.2 Definitions and Potential Problems

The available information on the individual's career trajectory, not only allows to tell if the individual is/was employed at some point in time, but also enables the detection of the type of employment he/she occupied as well as some of the job's characteristics. Distinction is made in the analysis between public sector wage workers, private formal wage workers, private informal wage workers and non-wage workers (including self-employed, employers and unpaid workers).

As mentioned above, a worker is defined to be employed in a formal job if he or she has a contract and/or social insurance. Only the ELMPS 2012 questionnaire makes it possible to determine the formality of the firm where a firm is defined as formal when the worker interviewed has a formal job or other workers in the firm have contracts and/or social insurance. These are firms that partially evade taxes and social security contributions. Questions about the firm's formality are more detailed in the current employment section; e.g. workers are asked explicitly whether their employer keeps

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<sup>3</sup>It was impossible to draw these trajectories every month given the size of the samples and the high rate of missing observations obtained when asking about the month of start of the status.

<sup>4</sup>The full questionnaires are publicly available on the website <http://www.erfdataportal.com>

registers and accounting books or not. These are questions that are not asked in the retrospective chapter.

The extra questions added to the ELMPS 2012 questionnaire about the time lag between accessing a job and acquiring a contract or social insurance made it possible to capture as fully as possible informal-to-formal job-to-job transitions that the individuals have gone through during their work history. It is important to make this distinction even if it is within the same job in the same firm. Not only that this allows to capture an extra job-to-job transition, but also to detect for how long this employment has lasted informally with no legal framework i.e. no government monitoring, no tax payment and no contribution to the social security system. Moreover, assuming that an individual was first employed informally in a job, which then became formalized and then later on this individual moved to the public sector. If one ignores the formalization of the job, the final transition would be recorded as *Informal*  $\rightarrow$  *public*, which does not actually convey the true story. In reality, this individual moved from his job even though it got formalized (i.e. a formal private sector job) to the public sector for some specific reason. The motive behind a *formal*  $\rightarrow$  *public* transition would definitely be different than the motive of an *informal*  $\rightarrow$  *public* transition.

Due to missing observations of the month of the start of a certain status, the observed transitions were not realistically distributed over the 2 semesters of each year. The semi-annual transitions were therefore not representative for the size of these transitions during a period of 6 months. In attempt to make use of the maximum possible information available in the surveys, two longitudinal retrospective panels were extracted, one where the individuals are being followed every six months (i.e. semi-annually) and the other where they are being followed annually. Stocks refer to and are calculated based on a specific aggregate at the beginning of the year. These stocks are therefore derived from the annual trajectories. For the transitions however (job accession, separation and switches), these are flows that occur during the year in question, and since the aim is to capture the most possible number of transitions the interviewed individuals went through during the year  $t$ , transitions are derived from the two semestrial panels of year  $t$  and then aggregated to give the total number of transitions observed in the year  $t$ .

Given the above steps adopted to create the longitudinal retrospective panels, the final sample obtained from the raw data includes all individuals, 6 years and older, who have ever worked in the Egyptian and Jordanian labor markets as well as the new labor market entrants (i.e new unemployed) and individuals who have been permanently out of the labor force. Throughout the rest of the thesis, different sub-samples are used and hence are described in detail in the relevant section.

In general, using panel surveys may suffer from attrition bias, which is addressed by using the attrition weights attributed in this dataset and which are used to expand figures to the population level (Assaad and Krafft (2013)). These are referred to, hereafter, by expansion weights.

Missing values about the month of start of a job tend to be problematic when creating the longitudinal retrospective panels. A set of assumptions, when creating the data sets, are therefore being adopted. In the survey, a status could not be recorded unless an individual has spent at least 6 months in it. If the month values are missing and two job statuses started in the same year, it is assumed that an individual has spent the first half of the year in one job and the second in the other. If the month of start of a job is missing and only one job status started in that year, I assume that the status started at the beginning of the year. If the year of start of the status was missing, nothing could be done about this and the individual would have had to be dropped from the sample. Fortunately enough, very few number of individuals had the last case and the missing dates were mostly among the very old statuses. If one limits the panel to the most recent 10 years for example, these missings should therefore not affect the final sample.

Another potential type of measurement error the data is susceptible to is response error. This includes recall error which I try to reduce by limiting the analysis to the most recent years prior to the year of the survey i.e. not going too far back in time. Response errors also include “present” mis-report bias, that is when some people deliberately mis-report their current employment status and information, even though they have given exact and correct information about their work history, just to avoid

taxes and government registers<sup>5</sup>. That both these types of error are occurring becomes obvious when the analyses using ELMPS 2012 and ELMPS 2006 were overlapped and when unemployment rates from stocks and flows were compared. Further research and investigation are done in Assaad, Krafft, and Yassine (2015) (chapter 2) to explore the extent of bias (whether recall or response) comparing longitudinal retrospective panel data sets constructed using the retrospective questions and the available ELMPS cross-sections 1998, 2006 and 2012. Langot and Yassine (2015) (chapter 3) proposes a method to correct this bias.

The analysis is carried out over the period 1998-2012 for Egypt and 1996-2010 for Jordan. Going back in time, the sample should have included people who were alive in the past but passed away before 2012 and hence did not respond to the ELMPS. This is defined as “backward attrition”. In an attempt to avoid this type of attrition, the age of individuals in the sub-samples is limited to between 15 and 49 years old in year  $t$  in the retrospective panel constructed prior to the year of the survey.

### 1.3.3 Concepts of Labor Market Dynamics <sup>6</sup>

In this paper, the working age population at year  $t$  ( $W_t$ ) comprises 3 stocks of individuals; employed  $E_t$ , unemployed  $U_t$  and inactive (out of the labor force)  $I_t$ .

$$W_t = E_t + U_t + I_t \quad (1.1)$$

The labor force  $L_t$  is made up of the employed and unemployed.

$$L_t = E_t + U_t \quad (1.2)$$

Total employment in year  $t + 1$  is determined by the employment in the previous year  $t$ , the hiring flow from the pool of unemployed  $M_t^{UE}$  and inactive  $M_t^{IE}$ , less the gross

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<sup>5</sup>The ELMPS 2012 and JLMPS 2010 survey were conducted by the official National statistical offices' personnel and hence for the interviewed households, it was government authorities collecting the information.

<sup>6</sup>In this section, concepts discussed by Gomes (2012) and Shimer (2012) are summarized.

separation flows to unemployed and inactive respectively;  $S_t^{EU}$  and  $S_t^{EI}$ .<sup>7</sup>

$$E_{t+1} = E_t + M_t^{UE} + M_t^{IE} - S_t^{EU} - S_t^{EI} \quad (1.3)$$

Similarly, the unemployment stock changes over time, however this time flows between the unemployed and inactive stocks  $G_{UI}$  and  $G_{IU}$  are added.

$$U_{t+1} = U_t - M_t^{UE} + S_t^{EU} - G_t^{UI} + G_t^{IU} \quad (1.4)$$

The empirical literature has studied labor market dynamics using different approaches. Emphasis has been put on gross flows in work Blanchard, Diamond, Hall, and Murphy (1990) and Bleakley, Ferris, and Fuhrer (1999), and also on transition rates like work by Shimer (2012), Fujita and Ramey (2009) and Davis, Haltiwanger, and Schuh (1996). Since this paper is a first attempt to explore facts and statistics about the Egyptian and Jordanian labor market dynamics, the best would be to provide a thorough survey of both approaches using the ELMPS 2012 and the JLMPS 2010. It is extremely important to note that throughout the paper when talking about job accession, I differentiate between hiring rates  $h$  and job finding rates  $f$ . The hiring rate measures the rate at which employment expands between two points in time calculating new jobs created as a rate relative to the existing number of jobs. It resembles the job creation rate discussed from the firm dynamics point of view (Davis, Haltiwanger, and Schuh, 1996)<sup>8</sup>. The job finding rate represents the probability that a non-employed individual finds a job (Shimer, 2012). To be able to understand this difference, it is crucial at this point to distinguish between two concepts used in the analyses of labor market dynamics; job turnover and labor turnover. The economy-wide job turnover rate is simply the absolute sum of net employment changes across all establishments or

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<sup>7</sup>The superscripts  $ij$ , where  $i \neq j$ , denote the origin state  $i$  (the state from which an individual is transiting) and the destination state  $j$  (the state to which an individual is transiting).

<sup>8</sup>This is what is referred to in the literature as job creation rate (in this analysis it does not include unfilled vacancies, since estimates are obtained from an individual workers' survey). This is usually calculated from individual firms' level data. I therefore choose to call it hiring rate. It is also important to note that the job turnover by definition does not include job vacancies that remain unfilled, which explains why the ELMPS synthetic panel data set can be used to calculate the Egyptian job turnover.

firms, expressed as a proportion of total employment. By simply comparing two points in time, it is an indicator of the expansion or contraction of employment within establishments or firms in the economy. Labor turnover is simply the sum of job turnover and the movement of workers into and out of ongoing jobs in establishments or firms. Workers find and leave jobs regardless of whether the firm, or even employment in the economy itself is growing or declining. For this reason, the analysis in this paper distinguishes between the hiring rate (new jobs as a proportion of employment i.e. the expansion of employment in the economy) and the job finding rate, which is simply the probability an unemployed worker finds a job and moves into the stock of employed.

To summarize, the flows discussed in this paper, can be categorized into three types;

- **Job Accession:** when a non-employed individual (unemployed or inactive) gets a job. This is described by the hiring and job finding rates.
- **Job-to-Job Transitions:** when an employed worker changes jobs (employers), or changes formality status within the same job.
- **Separation:** when an employed worker exits his or her job. It is important to note that this includes voluntary (quits) and involuntary (job loss) exits, which will be discussed in detail below.<sup>9</sup>

## 1.4 General Macroeconomic Trends

Labor market stocks and aggregate indicators are fundamentally driven by flows between employment, unemployment and inactivity. This section discusses these flows and their evolution over time as well as the characteristics of individuals who are at risk of these transitions. The sample includes only male workers within the working age population (between 15 and 64 years of age). Female workers are excluded from the sample since transitions of female workers follow special patterns and are related to different factors such as marriage, child-birth and sector of employment.

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<sup>9</sup>For details about how the gross flows and transition rates are formalized in equations, see appendix 1.A.

### **1.4.1 Average Gross Flows and Transition Probabilities over the period 2002-2012 for Egypt and 2000-2010 for Jordan**

Figures 1.5, 1.6, 1.7 and 1.8 summarize the average annual gross worker flows for males between 15 and 64 years of age over the periods 2000-2010 and 2002-2012 in Jordan and Egypt respectively. These figures report the total (expanded) number of people that changed status in thousands (t) and as a percentage of the working age population (p) and as a transition rate out of the stock of employed workers (e).

According to the ELMPS data, over the period 2002-2006, there was an average 400,000 net increase in employment in Egypt every year whilst over 2007-2012 the increase was 300,000. The JLMPS showed that over both periods 2000-2004 and 2005-2010, the annual net employment increase in Jordan amounted to 20,000 jobs. Of course substantial gross flows hide behind these values. An annual average of 190,000 Egyptian male workers moved out of employment over the period 2000-2006, approximately 80% of whom moved into inactivity. Over the period 2007-2012, 290,000 Egyptian workers per year moved out of employment, of whom about 70% to inactivity. In Jordan, over the period 2000-2004, about 20,000 moved out of employment yearly, 50% of them leaving the labor force. Over the period 2005-2010, the number of people leaving employment every year increased to 35,000 and only 40% of them moved to inactivity. During the first Egyptian sub-period (2002-2006), 590,000 male workers moved into employment and over 2007-2012, it was 550,000, while in Jordan these transitions increased from a yearly average of 43,000 during the first sub-period to a yearly average of 56,000 during the second. The majority of people transiting from non-employment to employment, over both periods in Egypt, were entrants from inactivity, being 78% over 2002-2006 and 72% over 2007-2012. In Jordan, the share of entrants from inactivity in transitions into employment was lower, being 62% over 2000-2004 and 44% over 2005-2010. In general and in both countries, the percentage of the working age population that moves out of employment into unemployment almost doubles between the two periods and increases slightly for employment-to-inactivity moves. Hiring from inactivity (which is most likely new labor market entrants) slows down in both Egypt and Jordan.

Hiring slightly increases for workers entering the employed pool from unemployment in Egypt but almost doubles in Jordan. The flows in these figures also show very low transitions between unemployment and inactivity, which is normal and expected since usually the frontiers between unemployment and inactivity are not perfectly defined. This also mainly comes from the fact that the information obtained from the retrospective accounts of non-employment spells depend on the interpretation of the interviewer and the interviewee of the definition of unemployment. As previously mentioned, the retrospective section doesnot contain detailed unemployment detection questions as in the case of the current status. Moreover, given the questionnaire's structure, it is hard to detect in case the individual has never worked if he has ever been unemployed in the past. Unless, the never worked individual is currently unemployed, the data would contain no record of unemployment spells for him/her.

It is also worth noting here that the values reported in this paper maybe inappropriate to compare with other countries' estimates (with panel surveys of different structures) due to the existence of multiple transitions. To avoid people reporting summer internships and very short-term type of jobs, the ELMPS 2012 and JLMPS 2010 questionnaires are only designed to capture a job status that has lasted for at least 6 months. Now, suppose someone is unemployed in the first month, then moves to inactivity in the second, and then back to unemployment. While a monthly survey (as in the case of many developed countries' labor market data) would pick up all transitions, the semi-annual synthetic panel would not detect any. It is possible to overcome the problem of multiple transitions by correcting for time aggregation (as in Shimer (2012)). For this to hold true, one has to assume that the conditional probabilities are equal across monthly transitions that generate the observed semi-annual probabilities. It is therefore impossible to make final conclusions about the rigidity of the Egyptian and Jordanian labor market at this stage, not only because of the multiple transitions problem but also given the recall error and other data problems discussed in the previous section.



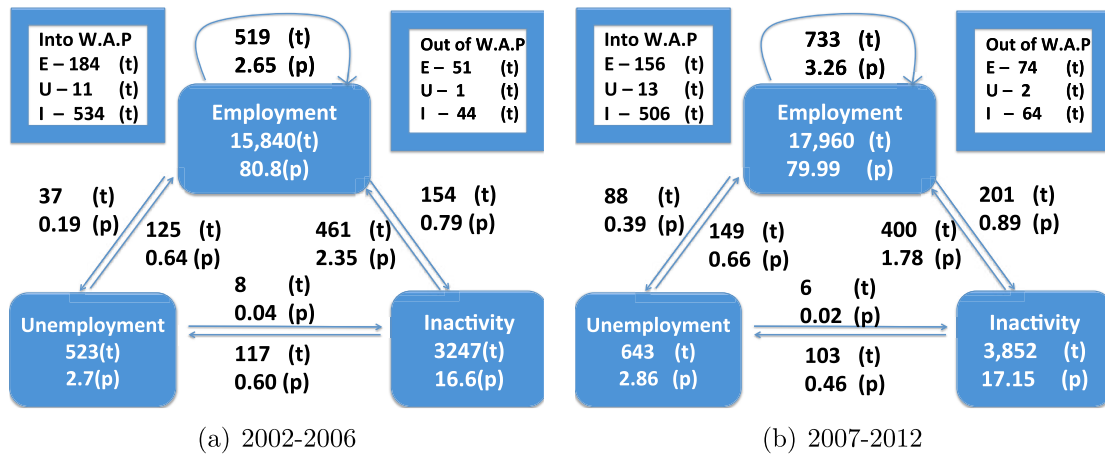


Figure 1.5: Average annual gross flows, over the period 2002-2012, for Egyptian male workers between 15 & 64 years of age

W.A.P: working age population

*p*: percentage of working age population

*t*: thousands

Source: Author's own calculations using ELMPS 2012. Yearly expanded and unexpanded number of transitions are provided in the appendix 1.B.

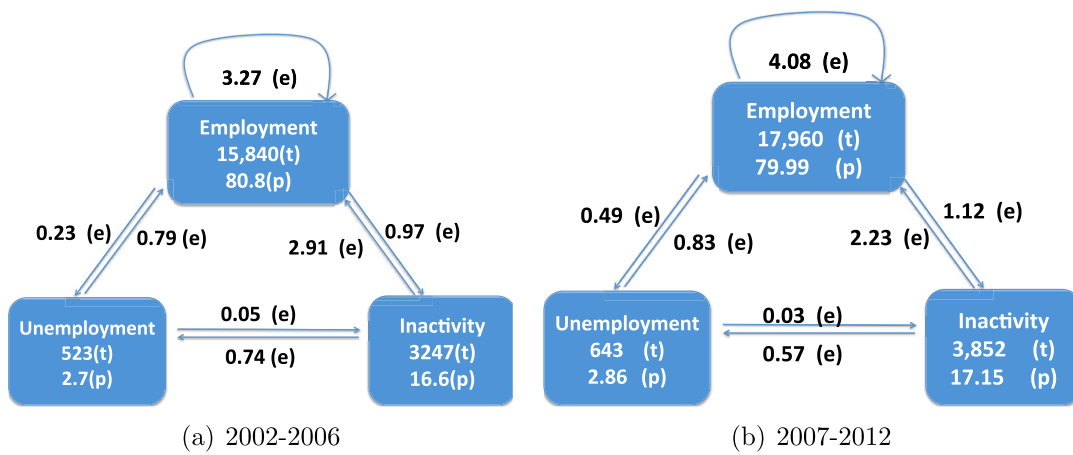


Figure 1.6: Average annual transitions (as a percentage of employment), over the period 2002-2012, for Egyptian male workers between 15 & 64 years of age

*e*: transition rate out of stock of employed

*p*: percentage of working age population

*t*: thousands

Source: Author's own calculations using ELMPS 2012. Yearly expanded and unexpanded number of transitions are provided in the appendix 1.B.

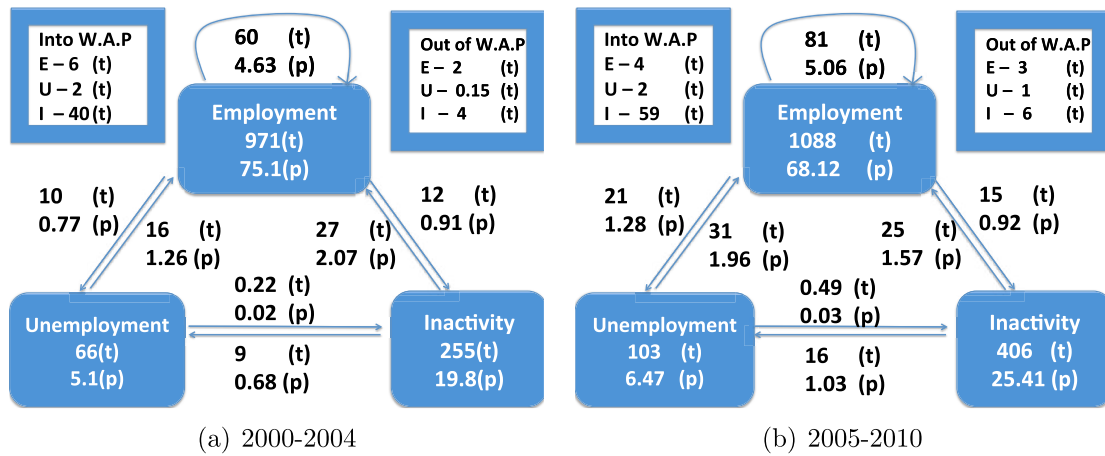


Figure 1.7: Average annual gross flows, over the period 2000-2010, for Jordanian male workers between 15 & 64 years of age

W.A.P: working age population

$p$ : percentage of working age population

$t$ : thousands

Source: Author's own calculations using JLMPS 2010. Yearly expanded and unexpanded number of transitions are provided in the appendix 1.B.

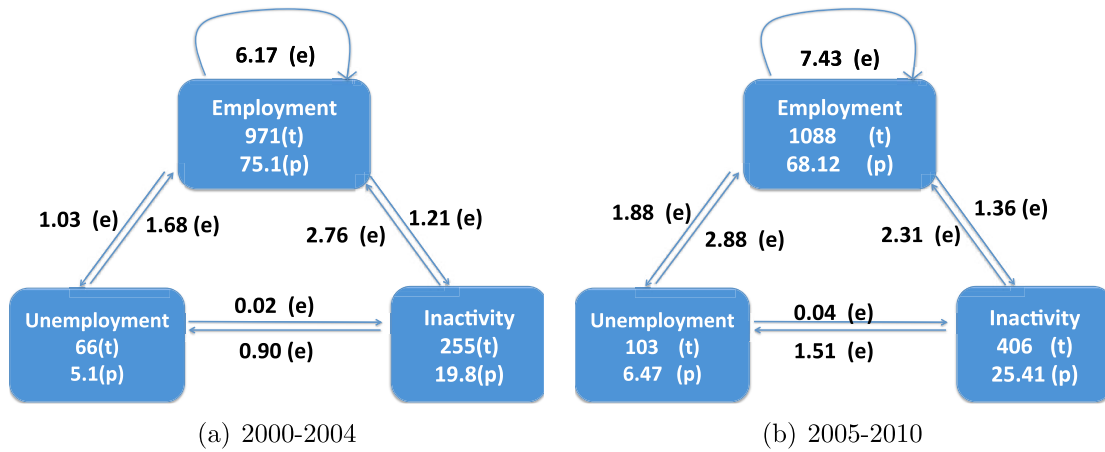


Figure 1.8: Average annual transitions (as a percentage of employment), over the period 2000-2010, for Jordanian male workers between 15 & 64 years of age

$e$ : transition rate out of stock of employed

$p$ : percentage of working age population

$t$ : thousands

Source: Author's own calculations using JLMPS 2010. Yearly expanded and unexpanded number of transitions are provided in the appendix 1.B.

## 1.4.2 Evolution of Labor Market Flows & Business Cycles

Figure 1.9 shows the evolution of hiring, separation and job-to-job transition rates over the period 1998-2011 in Egypt and 1996-2010 in Jordan, for both male and female workers. The figure also includes jobs created, jobs lost, and the GDP growth rate over time. In Egypt, the trend of the aggregate job flows is relatively stable within the sample over time. However, for male workers, there appears an inflection point at the year 2009. It is a possibility that part of this abrupt change in trends observed, particularly in both the job accession and separation rates, is a result of the downturn of the economy after the financial crisis and the January 2011 Uprising. The following chapters however show that this increase is mostly artificial and is driven by measurement errors in the data (see Assaad, Krafft, and Yassine (2015) (chapter 2) and Langot and Yassine (2015) (chapter 2)). This turning point in trends happens earlier for the Egyptian job-to-job transition rates. Assaad, Krafft, and Yassine (2015) (chapter 2) show that conclusions built on trends of job-to-job flows from retrospective data are relatively reliable. Levels however can be underestimated. As for Jordan, the general trend of these job flows, whether hiring, separation or job-to-job, is an increase over time. Separation and hiring rates were stable or slightly increasing between 1996-2004, with a much steeper increase afterwards especially for separation rates between 2009-2010. The job-to-job and hiring flows continue to increase up to 2009, where again a turning point is observed, dropping the rates abruptly by 1 percentage point for the hiring and about 3 percentage points for the job switches. The magnitude of these flows, for both males and females, is in general higher than their counterparts in the Egyptian labor market. Even if these trends or levels are partially artificial and biased, they provide preliminary evidence to the Jordanian labor market being more flexible and mobile than the Egyptian.

In both countries, female workers have higher separation rates than their male peers. They usually move out of employment for personal reasons such as marriage and child-birth. This is why most labor market transitions analyses exclude female workers from their samples. It is worth noting here, that since female workers stay for a much shorter period in the labor market, they experience higher hiring rates than the male workers, other wise the stock of female employment would not have been maintained in the economy. However, this does not mean that females are more likely

to get hired. It simply shows the rate at which female employment expands with respect to already existing jobs occupied by female workers. When comparing the female and male workers' job finding rates (i.e. the probability a non-employed worker finds a job) over time in both countries, in figures 1.10 and 1.11, it is quite obvious that the probability of finding a job for a non-employed female worker is much lower than a non-employed male worker. It is true that this can partially be explained by employers preferring to hire male workers rather than female workers. Yet, it can also be explained by female job-seekers being more selective about what jobs they will take. Moreover, since female workers tend to stay for a shorter period in the labor market, they tend not to move much between jobs and therefore they have lower job-to-job transition rates than their male peers in the same country (figure 1.9). It is interesting how the job-to-job transition rates of Jordanian female workers (the lowest in the Jordanian market) are on average similar, or even slightly higher, than the levels of the job-to-job transition rates of Egyptian male workers (the highest in the Egyptian market). This shows more evidence to the flexibility of the Jordanian labor with respect to the Egyptian. This definitely originates from the differences in the history and evolution of the labor market legal institutions over time. It might also suggest differences in employment cultures between the two MENA countries.

When limiting the age to 15-49 years old, the above trends are more or less the same for both male and female workers, in Egypt and Jordan. The sharp increase in separation rates in the most recent years still persists in figure 1.12, showing a one percentage point jump between 2010 and 2011 in Egypt and 2009 and 2010 in Jordan. Throughout the rest of the paper, the analysis tries to investigate and characterizes this observation; this increase in separation rates in Egypt for instance seems to be logical knowing the precariousness of the Egyptian labor market after the January 2011 Uprising. Yet, doing the same exercise using the ELMPS 2006 dataset and overlapping the retrospective panels obtained from the two waves (2006 & 2012), the same sharp increase in separation rates was observed in figure 1.13 between 2004 & 2005 aggregates, which suggests an underestimation of the job transitions using retrospective data. Figure 1.11 supports this argument for Jordan as well. Calculating separation rates over the period 2007-2010 based on annual transitions data from the Jordanian

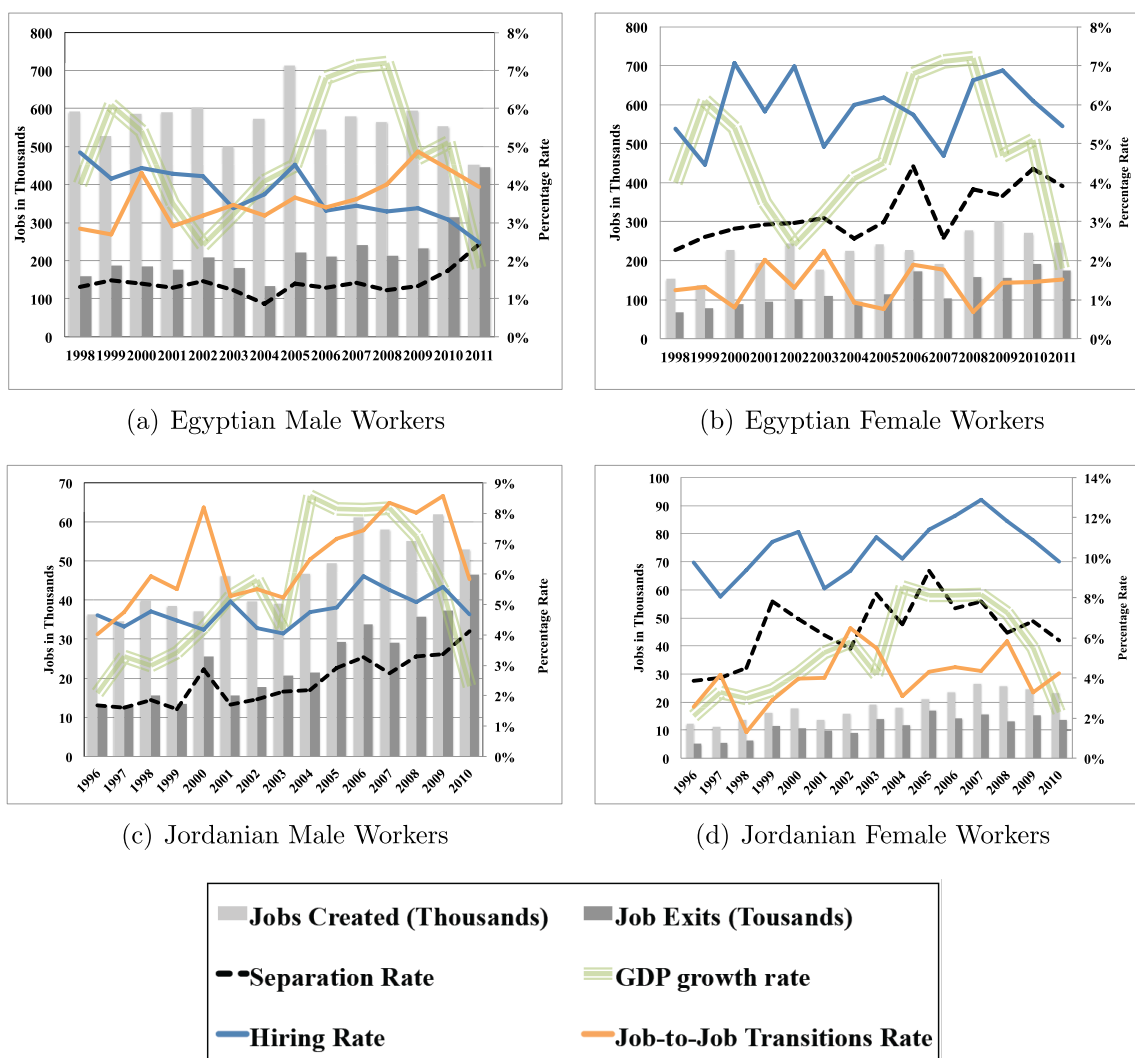


Figure 1.9: Evolution of hiring, separation and Job-to-job annual transition rates for workers between 15 and 64 years of age, over the period 1998-2011 in Egypt and 1996-2010 in Jordan.

Source: Author's own calculations based on ELMPS2012 and JLMPS 2010. Yearly expanded and unexpanded number of transitions are provided in appendix 1.B. GDP growth rates are obtained from World Bank (WDI) data.

Job Creation Surveys and stocks from the Employment and Unemployment Surveys (EUS), the retrospective JLMPS separations appear to be under-reported<sup>10</sup>. In his paper, Assaad (2014b) discusses that the reason behind difference in levels of net employment between the JLMPS and the JCS on is not entirely apparent. From his point

<sup>10</sup>The Job Creation Survey (JCS) and Employment and Unemployment Survey (EUS) are two surveys conducted annually by the Jordan Department of Statistics (DOS). They are therefore official surveys that collect cross-sectional information and not retrospective accounts that might suffer from measurement errors as in the case of the JLMPS.

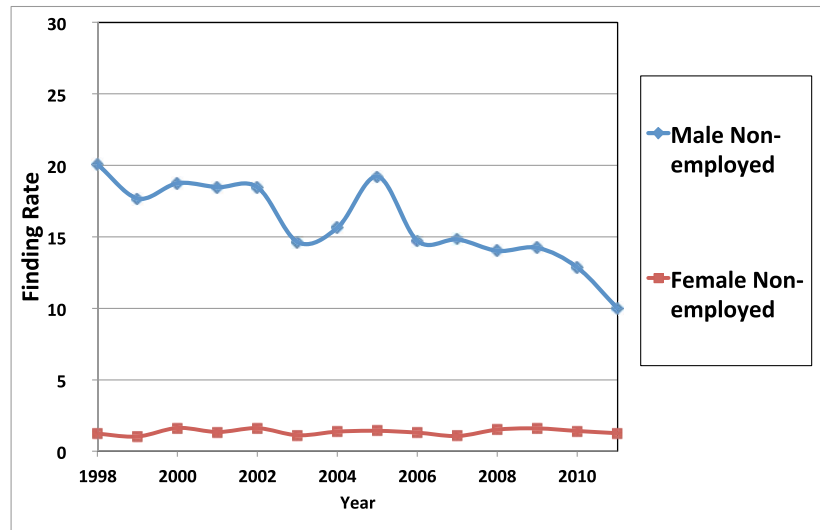


Figure 1.10: Evolution of annual Job finding rates for male and female non-employed individuals between 15 and 64 years of age, over the period 1998-2011 in Egypt

Source: Author's own calculations based on ELMPS2012. Yearly expanded and unexpanded number of transitions are provided in appendix 1.B.

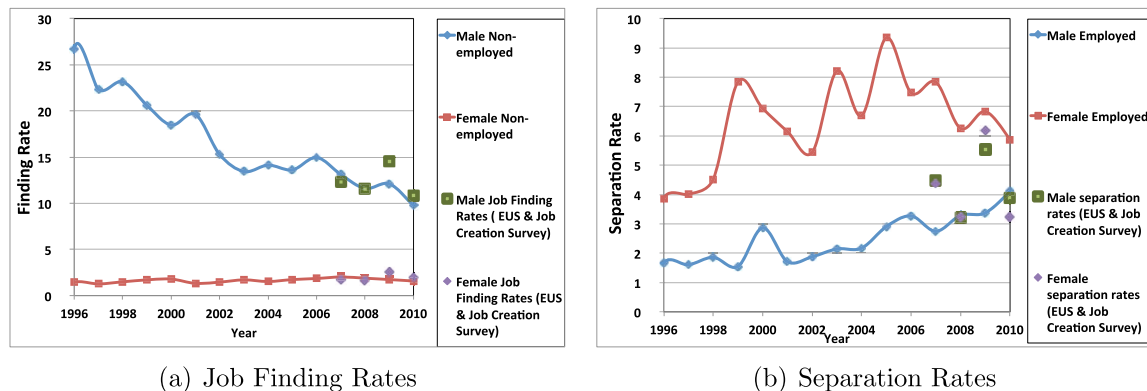


Figure 1.11: Evolution of annual Job finding rates for male and female non-employed individuals between 15 and 64 years of age, over the period 1996-2010 in Jordan

Source: Author's own calculations based on JLMPS 2010, JCS and EUS surveys 2007-2010. Yearly expanded and unexpanded number of transitions obtained from JLMPS 2010 are provided in appendix 1.B.

of view, both surveys are household surveys and will therefore not be representative of the large number of foreign workers than do not live in traditional households. However, it is very unlikely that job growth among foreign workers accounts for the difference, since, according to the 2009 JCS survey, 90% of the 69 thousand net jobs created that year went to Jordanians. In this thesis, chapters 2 (Assaad, Krafft, and Yassine, 2015) and 3 (Langot and Yassine, 2015), show that this bias originates mostly from the po-

tential measurement errors discussed in the data section, particularly recall and design bias. Given the availability of data, the comparison between the ELMPS retrospective data and panel data would therefore be of a valuable further investigation in a separate research paper to reveal all aspects of such a bias (see chapter 2 (Assaad, Krafft, and Yassine, 2015)).

It is intuitive and very likely that when reporting their job market histories, individuals would not recall all (sometimes any of) their unemployment spells, especially the short ones. Consequently estimates of the separation rates over previous years are likely to be underestimated. Still, considering the highest value of separation rate in both time series, Egypt and Jordan, these rates are of an extremely low level. This suggest how rigid the Egyptian and Jordanian labor markets are, where once an individual finds a job, he/she rarely quits or loses that job before retirement.

It is striking how the Egyptian and Jordanian transition rates, particularly separation rates, are very low when compared to other countries, even those known for the rigidity of their labor markets and high employment protection regimes. For instance, using the French LFS, Hairault, Le Barbanchon, and Sopraseuth (2012) obtained a corrected monthly French separation probability of 1.2% which is 14.4% yearly. Gomes (2012) estimated a quarterly average rate of about 3.2% of separations in the UK, which is 12.8% yearly. In Peru, Herrera and Rosas Shady (2003) estimated the separation rate of men between 1997 and 1998 of about 12.5% in the urban areas and 4.2% in the rural areas.

In general, the low transitions rates obtained from the ELMPS and JLMPS retrospective panels may be driven by the fact that all spells in the data, whether employment or non-employment, are truncated from below at six months. The questionnaire of the survey is designed that way however to avoid all types of casual very short-term jobs, summer internships..etc. The extent to which such an assumption biases the transition rates downwards is not thought to be however of a substantial magnitude given the culture of employment and the nature of labor market institutions in these countries.

Since recall error is suspected among unemployment spells, these transitions might be observed in the panel as a job-to-job movement and not necessarily an employment

to non-employment transitions. As observed in figure 1.12, job-to-job transition rates are still low relative to the economy's employment and non-employment stocks; these transition rates (of male workers, i.e. the more mobile) reach a maximum of 5.5% in Egypt and 9% in Jordan over the past decade.

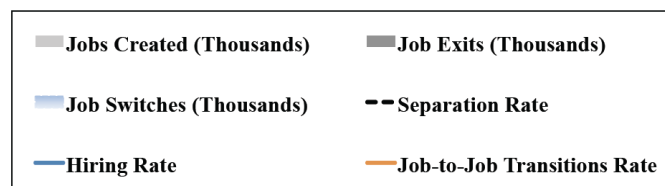
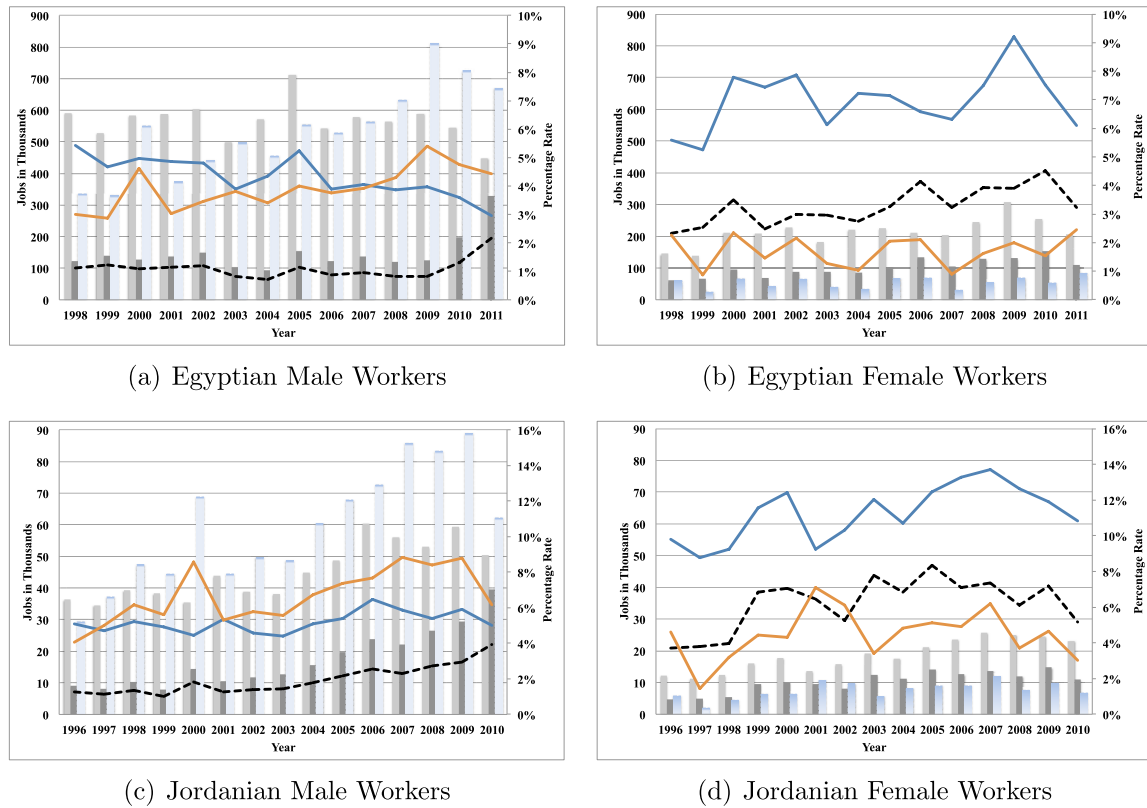


Figure 1.12: Evolution of Job finding, separation and Job-to-job annual transition rates for workers between the age of 20 & 49 years, over the period 1998-2011 in Egypt

Source: Author's own calculations based on ELMPS2012 and JLMPS 2010. Yearly expanded and unexpanded number of transitions are provided in appendix 1.B.

In figure 1.12, both the Jordanian and Egyptian males' job-to-job transition rate have increased over time. For Egypt, there has been substantial increase of 2 percentage points between the years 2007-2009 suggesting that the market was becoming more dynamic over that period, then a retreat between 2009-2011. For Jordan, a continuous increase in the job switches has been noted over the period 2003-2007. The rate, then



stabilizes between 2007 and 2009 and finally slowing down between 2009 and 2010. The increase in the job-to-job transitions in Jordan followed (1)the increase in the GDP growth rates i.e. the up-turn in the economy and (2)the return of the many Jordanian emigrants, after the Iraq war in 2003. As the economic growth slows down in 2007, the increase in the job-to-job transition rates retreats. It is very unlikely that people change their jobs during the economy's downturn, i.e. in times of recession when labor slagness is usually at its maximum. The same scenario applies in Egypt, especially for the decrease in job switches noted between 2009-2011. This decrease follows the financial crisis as well as the 25th of January Uprising. The next section shows that the biggest share of these job-to-job transitions tend to occur within the informal sector (by workers moving from or to the informal sector), which can simply be explained by the fact that these are workers, who can not afford being unemployed and hence move from one informal job to the other, until they are able to find a formal private or public sector job, if ever.

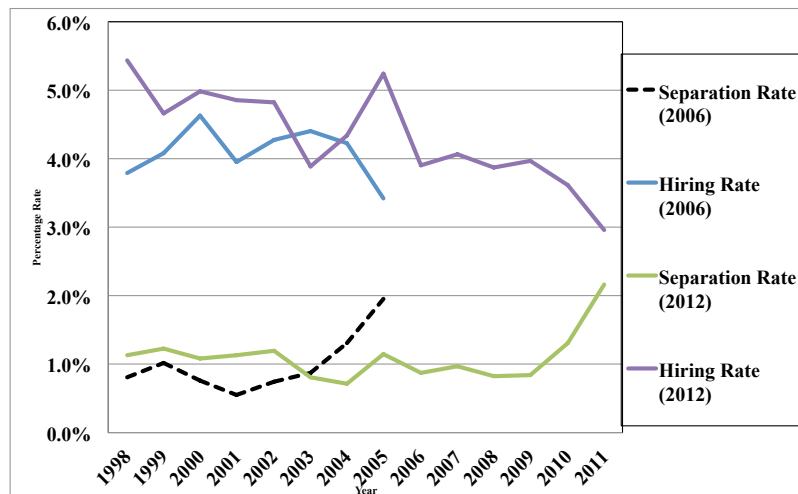


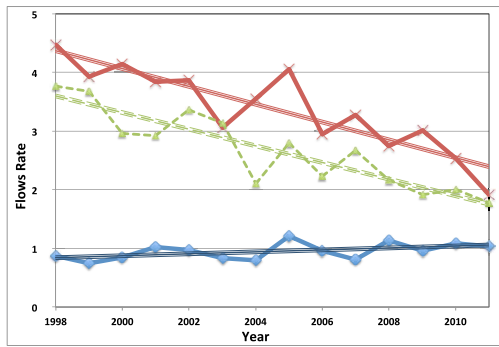
Figure 1.13: Evolution of job finding and separation (annual) rates for workers between the age of 15 & 49 years, over the period 1998-2011 in Egypt, using ELMPS 2006 and ELMPS 2012.

Source: Author's own calculations based on ELMPS 2006 and ELMPS 2012. Yearly expanded and unexpanded number of transitions obtained from ELMPS 2012 are provided in appendix 1.B. The percentage of transitions made by individuals who have also been interviewed in 2006 is also reported. This is particularly important to note how small the sample size can get if one tries to correct measurement errors in the data on the micro level (see chapter 5).

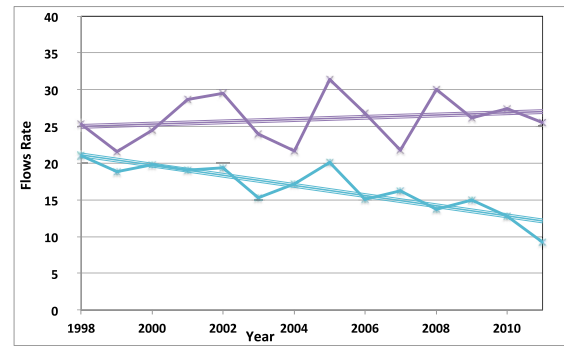
Job accession and separation rates are equally important determinants of unemployment fluctuations; it is therefore necessary to analyze the trend of each separately.

Figure 1.14 shows the employment inflows, specifically hiring and job finding rates from inactivity and unemployment, for male workers between 15 and 49 years of age, in Egypt and Jordan. As explained earlier, when referring to hiring rates, the reference stock is the stock of employed in year  $t - 1$  while the job finding rates are based on the unemployed and/or inactive stock in the year  $t - 1$ . In figure 1.14(a), the unemployment to employment hiring rate in Egypt is flat over time, while the inactivity to employment hiring rate has a decreasing trend parallel to the declining working age population growth. This shows that the general declining trend in the expansion of employment has been tracking the decline in the growth of the working age population, as the Egyptian youth bulge moves forward over time and gradually gets absorbed in the Egyptian labor market. In Jordan (figure 1.14(c)), the growth of the working age population has been constant over time. This has been tracked by a constant trend in the expansion of employment over time. The composition of hirings has however changed. While the rate of hirings from inactivity has been declining, it has been compensated by the increasing hirings from unemployment. As the non-employment to employment finding rates are plotted in figures 1.14(b) and 1.14(d), it is noted that they decline at a much faster rate than the hiring and working age population growth rates. The probability for a non-employed individual to find a job decreases substantially over time especially among the new labor entrants, as shown by the decreasing inactivity to employment finding rates. A sudden decline in the inactivity to employment finding rate is observed in Egypt between 2009-2011, showing possibly that the situation gets even worse with the financial crisis and the January 2011 Uprising after which the rate dropped by about 10 percentage points from 25% to 15%. This drop suggests that new entrants are taking longer to find jobs after the January 2011 Uprising. Consequently, in 2011, an Egyptian inactive person (most probably a new entrant) has an annual probability of 15% to find a job, while an unemployed person has an annual probability of 30%. Again, the fact that this sudden decline is the image of the sharp increase observed in the separation rates and that it is kind of observed in similar patterns in both the ELMPS and the JLMPS, suggests that this might be partially artificial and requires further investigation. In Jordan, in 2009, the gap between the job finding probability between an unemployed and inactive is even wider than in Egypt, with a job finding

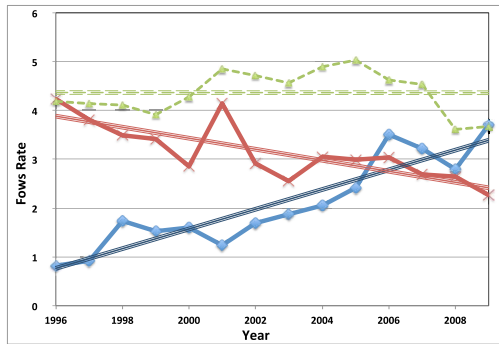
rate of 40% for the unemployed and 7% for the inactives. These estimates therefore suggest that an Egyptian unemployed can stay up to 3 years until he finds his next job, while in Jordan, it would take him about 2.5 years. Comparing these values to other countries the Egyptian and Jordanian labor markets have a problem in the job finding process. Even among existing jobs (whether old or newly created), there are obstacles on both the labor demand and supply sides to becoming matched. According to Hairault, Le Barbanchon, and Sopraseuth (2012), the average monthly French job finding probability amounts to 7.5%(90% yearly).



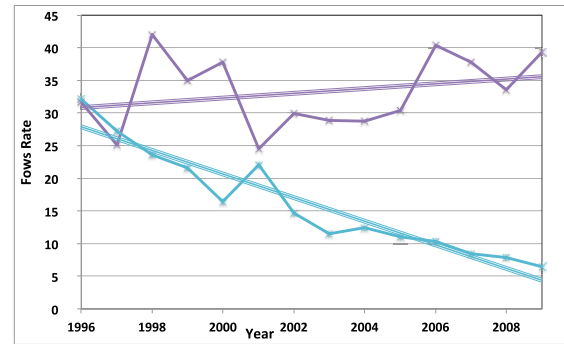
(a) Hiring Rates and Working Population growth rate in Egypt



(b) Job Finding Rates and Working Population growth rate in Egypt



(c) Hiring Rates and Working Population growth rate in Jordan



(d) Job Finding Rates and Working Population growth rate in Jordan

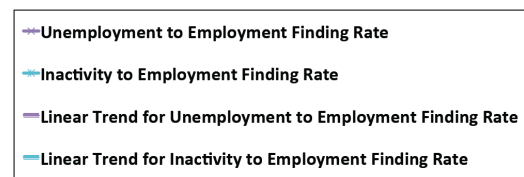
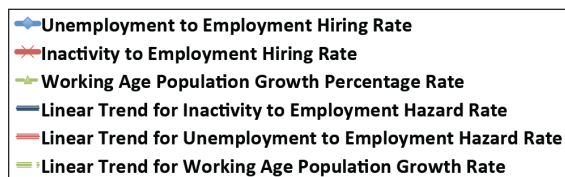


Figure 1.14: Employment Inflows Annual Hiring and Job Finding Rates, Male Workers between 15 & 49 years of age, over the period 2000-2011.

Source: Author's own calculations based on ELMPS2012 and JLMPS 2010. Yearly expanded and unexpanded number of transitions are provided in appendix 1.B.

Turning now to the employment outflows in figures 1.15 and 1.16, the observation period has been dominated by two main trends for both employment to unemployment and employment to inactivity transition rates in Egypt and for employment to unemployment in Jordan. In Egypt, between 2000-2009, the employment to unemployment separation rate follows a slightly increasing trend, while the employment to inactivity rate declines from about 0.6% to 0.3%. This further analysis of employment outflows has revealed that the separation rates, both employment to unemployment and employment to inactivity, experienced a huge increase after 2009 of almost 0.8 (to unemployment) and 0.5 percentage points (to inactivity). In Jordan, the employment to unemployment separation rate remained constant over the period 1996-2003, then increased substantially after 2003 by about 1.7 percent. The employment to inactivity separations, on the other side, have been continuously slightly increasing over time. These trends, as have been mentioned previously, are questionable and are to be studied in the following chapters.

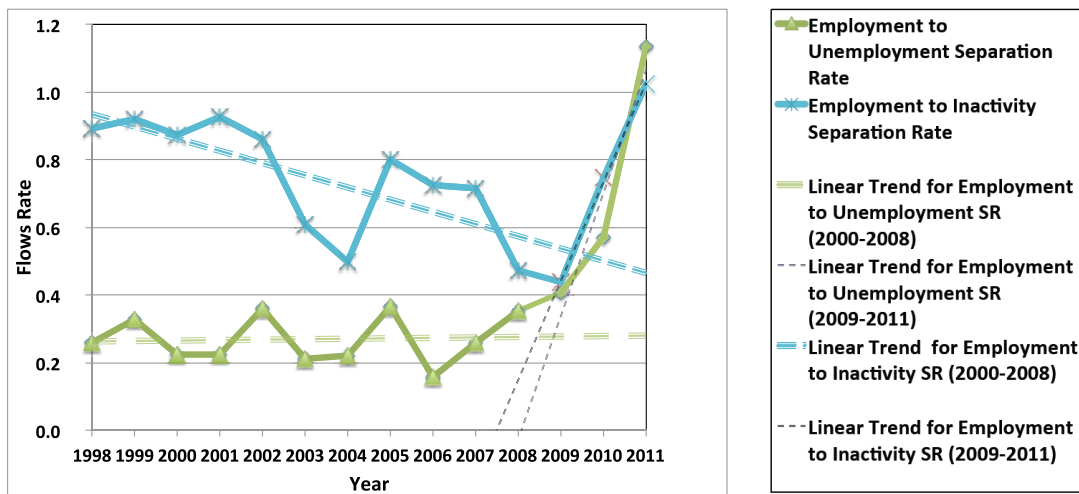


Figure 1.15: Employment Outflows Annual Separation Rates, Male Workers between 15 and 49 years of age, Egypt 1998-2011.

Source: Author's own calculations based on ELMPS2012. Yearly expanded and unexpanded number of transitions are provided in appendix 1.B.

It is important to note however that the separation rates remain at relatively low levels with respect to the persistent high non-employment stock in both economies. Moreover, the detection of the inflection point in the separations in Egypt could be partly explained by a reaction to the slowdown of economic growth following the fi-

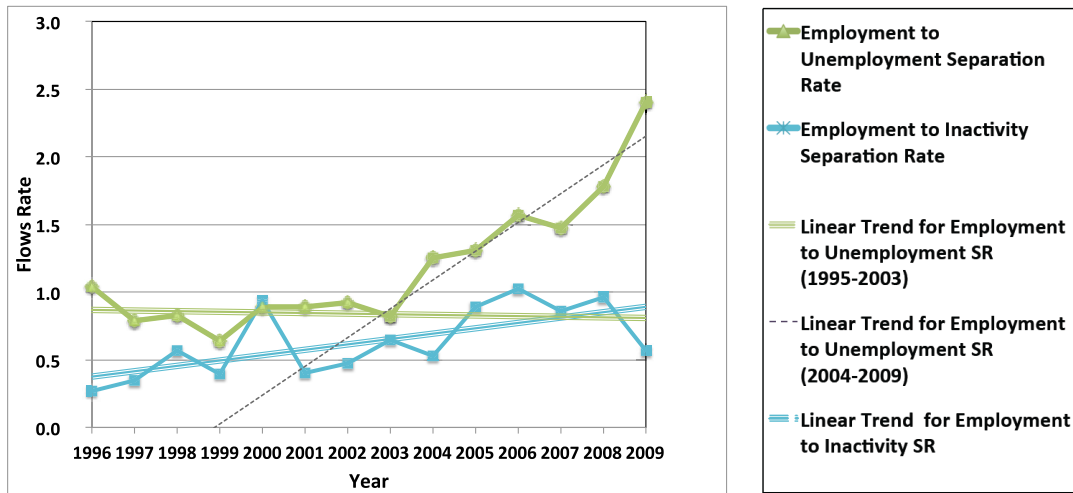


Figure 1.16: Employment Outflows Annual Separation Rates, Male Workers between 15 and 49 years of age, Jordan 1996-2009.

Source: Author's own calculations based on JLMPS 2010. Yearly expanded and unexpanded number of transitions are provided in appendix 1.B.

nancial crisis in 2008 and the January 2011 Uprising more than a movement towards a more dynamic labor market. This is consistent with the evidence explained below in figure 1.32, where an increase in the proportion of involuntary quits is observed.

It has been well established in previous literature on the Egyptian labor market unemployment in Egypt is mostly structural and that the cyclical component is very small and almost nill (see for example Assaad and Krafft (2013)). If one assumes at this point that the data conveys the real trends and that starting in the year 2009, separation rates has been rising following the financial crisis and the 25th of January Uprising, this is suggestive to an increase in cyclical unemployment. This rise in the separation rates was not offset by the job finding rates. On the contrary, job findings has been declining, showing that the Egyptian labor market remains rigid in terms of transitions and is not growing dynamic by any means. In such times of crisis, unemployment is therefore growing high because of two factors; jobs are hard to find and also those who were employed are entering the stock of non-employed through the elevated separation rates. Over the past several years the increase in the Egyptian unemployment rate was very small because the cyclical increase was offset by the absorption of the youth bulge in the Egyptian labor market over time. Decreased demographic pressures have eased the situation in the market. The unemployment driven by the structural component was

actually decreasing (Assaad and Krafft, 2013). This should be a source of worry, since in the near future, the echo of the youth bulge in Egypt will enter the labor market causing extra pressure and a rising structural unemployment trend worsening the situation and causing the rate of unemployment to increase substantially. Consequently and in that case, one would expect, over the long run, a substantial increase in the prevailing Egyptian unemployment rate if job finding probability of the non-employed continues to fall, separation rate continues to rise along with the increasing demographic pressures resulting from the echo of the youth bulge.

## **1.5 Characterizing Labor Market Flows**

In this section, the aim is to characterize the job flows observed above, specifically job accession, separation and mobility. With a focus on the observed transitions out of employment after 2009 for Egypt and after 2003 for Jordan, the analysis illustrates the individuals' and firms' characteristics that tend to affect the likelihood of staying in, leaving/quitting or switching jobs. It is important to note at this point that when analyzing a job quit/leave or a job-to-job switch, the characteristics of the job before the change occurs (the characteristics of the origin job status) are explored. When discussing a job accession, the characteristics of the new job created after transition (the destination job status) are analyzed.

### **1.5.1 Characteristics of the Egyptian and Jordanian Job Flows**

Figures 1.17-1.19 show the evolution of the mean age of male workers in each type of transition over the observation period for both Egypt and Jordan. In both countries, entrants to the labor market from inactivity are younger than those entering from the unemployment stocks. This verifies the fact that these represent the new labor market entrants, who are accessing jobs for the first time in their labor market history. Individuals accessing jobs in Jordan from unemployment are however slightly older than their Egyptian peers. In Jordan, workers moving out of employment to an unemployment spell are on average younger than those transiting from employment to inactivity. These job quitters/losers are older than the sample's average and are also much older

than their Egyptian peers. Workers moving from one job to the other, in both Egypt and Jordan, are in general of as old as the sample's mean age.

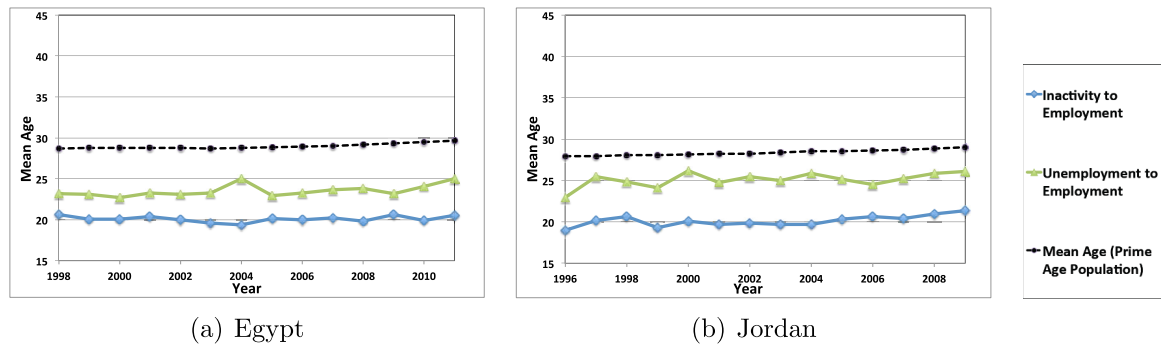


Figure 1.17: Evolution of the mean age of male workers accessing jobs over the period 1998-2011 in Egypt and 1996-2009 in Jordan

Source: Author's own calculations based on ELMPS 2012 and JLMPS 2010. Yearly expanded and unexpanded number of transitions are provided in appendix 1.B.

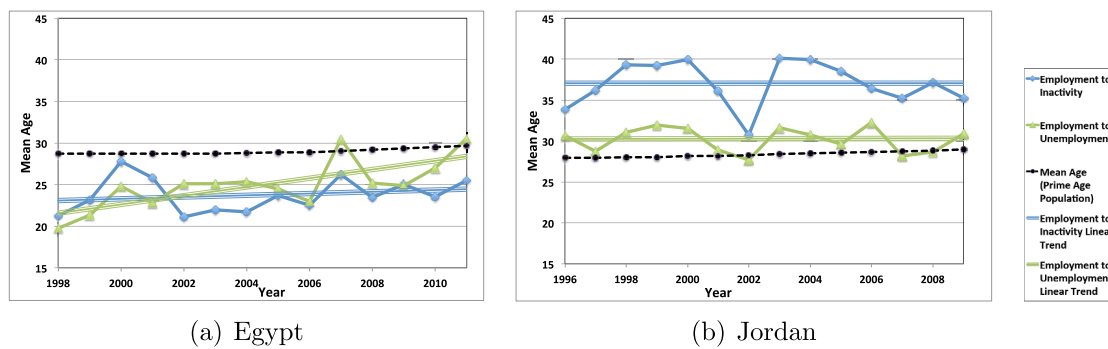


Figure 1.18: Evolution of the mean age of male workers quitting/losing jobs over the period 1998-2011 in Egypt and 1996-2009 in Jordan

Source: Author's own calculations based on ELMPS 2012 and JLMPS 2010.

Categorizing separation rates by education level, figure 1.20 illustrates monotonic trends for all three education levels, similar to the general trend explained in the previous section, except for the university graduates finding jobs in both countries. The observed sharp increase in the separation rate in Egypt between the year 2010 and 2011 exists among the three education groups (below secondary, secondary and above and university and above), but is slightly amplified among workers with secondary and above education levels. This group includes workers with vocational secondary education, who are more likely to be present in small informal firms. It is shown below

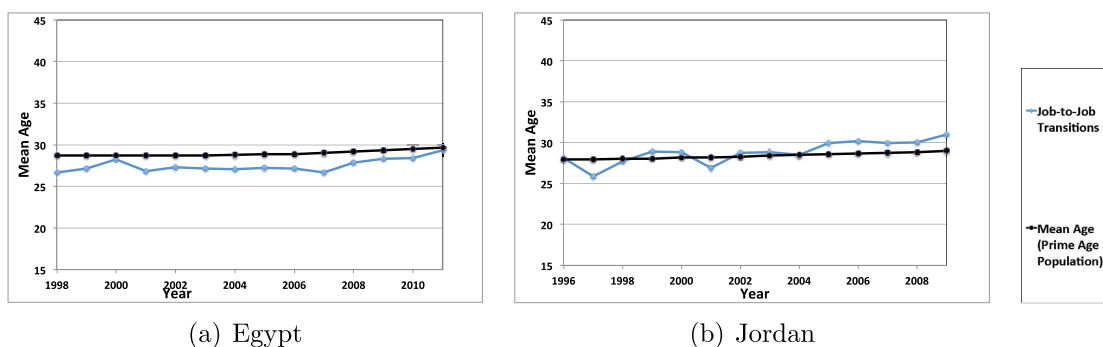


Figure 1.19: Evolution of the mean age of male workers switching from job to the other over the period 1998-2011 in Egypt and 1996-2009 in Jordan

Source: Author's own calculations based on ELMPS 2012 and JLMPS 2010.

that workers within informal employment experienced a large increase in separation rates of about 1.5 percentage points between the years 2010 and 2011. In Jordan, the continuously increasing trend is observed for the below secondary and secondary groups. For the university graduates, the increasing trend is observed up to 2006, but afterwards the curve gets fuzzy possibly due to the small number of observations (the point in 2006 is most probably an outlier). Generally however and in both countries, the most educated group of workers are the least probable to quit or lose their jobs. Their separation rates are the lowest (sometimes almost nil). For the labor market entrants, education seems to play an important role over the observation period. Observing the trends for the job finding probability of a non-employed person, it is interesting that over time and in both countries, it is first observed up to 3 years before the year of the survey, that it's the most difficult for a university graduate to find a job. This ranking is however reversed in the last three years, which again confirms a potential bias in these trends especially in the very old years of the retrospective panels. It is interesting to note however, that the university and above educated group appear to be the least affected by the drop in the job finding rates observed after the financial crisis and the January 2011 Uprising, in the case of Egypt. Yet again, these trends seem to be very artificial with an abrupt increase in the finding rates 3 years prior to the survey in both countries.

As for the transitions from one job to the other, the least educated group in Egypt seems to be the most stable. These workers are more likely to be poor. They can not



afford to be unemployed and since their job finding probability from unemployment is low, they will not search (on-the-job search) unless they are forced to leave their job. In Jordan, no much difference is observed between the different education groups.

To examine dynamics by the type and sector of employment, figures 1.21-1.28 show that generally non-wage workers experience very little changes over time of relatively lower transition rates (accession, separation and mobility). Interestingly, for the job-to-job transitions in both countries, some points are as high as the wage workers' though. All the observed turnover however seems to occur among the wage workers whether discussing job accession, separation or mobility. Moreover as public and private wage employment are distinguished, one notes that job-to-job transitions for the public sector are generally lower in both Egypt and Jordan, while separations are extremely low for the government employees in Egypt. Wage workers who are losing their jobs are mainly workers in the informal sector while those moving from one job to the other are those employed in both informal and formal private sector (with the informal sector having slightly higher rates). In Jordan, the differences between the formal and informal sectors in terms of both their separations and job-to-job transitions are much less emphasized than in Egypt. It's true that this might be due to the fact that the Jordanian labor market has been liberalized earlier than the Egyptian, but could also be a signal to how much more segmented it might be, especially that the difference between the different sectors' job finding rates is minimal while in Egypt, the sector that a job seeker is targeting matters a lot. In Egypt, workers tend to take the informal sector as an intermediary waiting for a formal job either in the private or the public sector (which have much lower job finding rates) depending on their preference. In Jordan, this does not seem to be the case, where the labor market appears to be segmented and its segments are functioning in parallel. Workers are finding jobs in the three sectors at the same rate, probably because workers are getting hired in the sector that is most suitable for them and relevant for their case. It is also important to note that private wage workers have the highest job-to-job transition rates especially in the most recent years, which are most likely the most reliable years. The sharp increase in separations in Egypt was exclusively limited to the private sector wage workers. According to these raw data flows, both formal and informal private wage workers experienced an increase

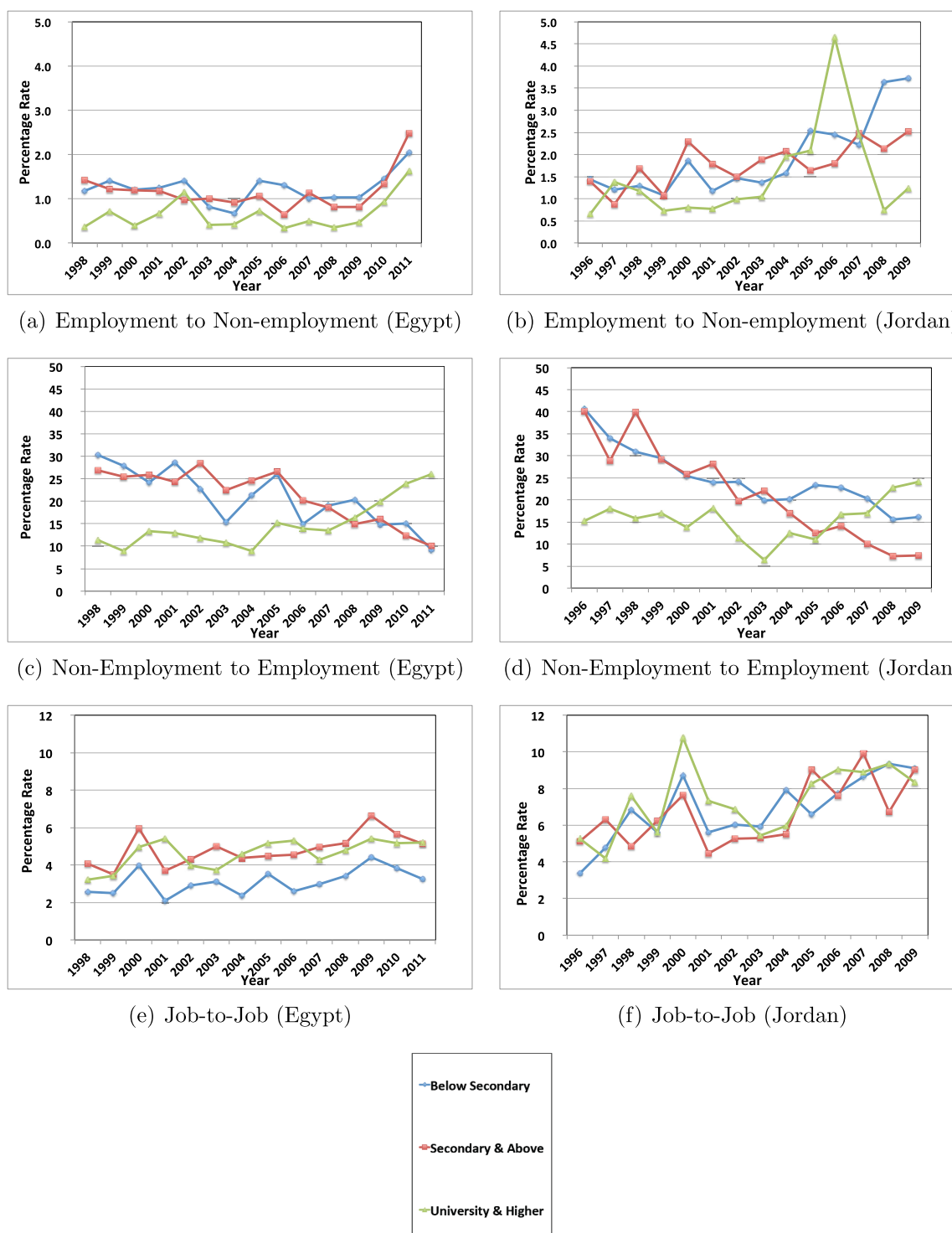


Figure 1.20: Evolution of transition rates for male workers, between 15 and 49 years of age, by education level in Egypt and Jordan

Source: Author's own calculations based on ELMPS 2012 and JLMPS 2010.

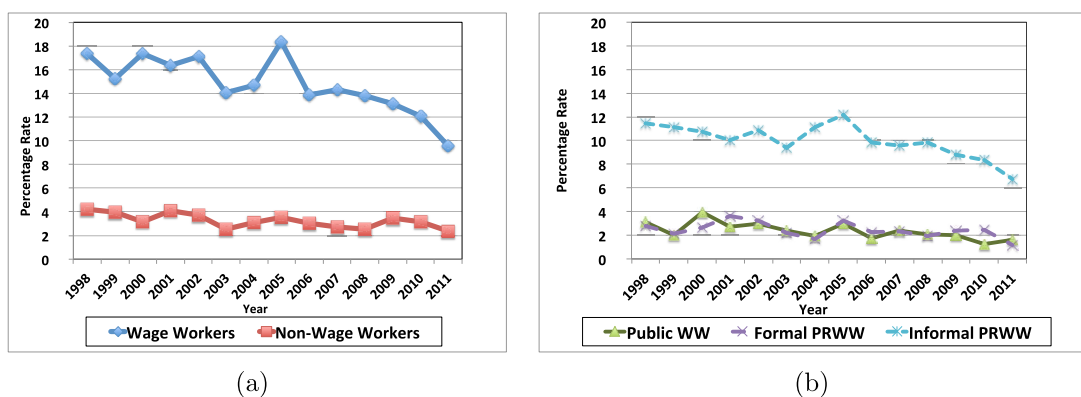


Figure 1.21: Evolution of job finding rates for male workers, between 15 and 49 years of age, by type and sector of employment in Egypt.

Source: Author's own calculations based on ELMPS 2012.



Figure 1.22: Evolution of hiring rates for male workers, between 15 and 49 years of age, by type and sector of employment, in Egypt.

Source: Author's own calculations based on ELMPS 2012.

in separations, of about two percentage points each. Following the reasoning that part of this increase is tracking the downturn in the economy, obviously both formal and informal employers resorted to large-scale layoffs during the crises of 2009 and 2011, in addition to hours or wages reductions.

Figure 1.29 highlights the distribution of wage workers who quit or lose their jobs over time. The pattern in general confirms that the majority of workers losing or quitting their jobs are originally wage workers in the informal sector. The most noticeable though is the slightly increasing trend in Egypt in the share of formal wage employment over time. This share has however been stable or slightly declining in Jordan.

As observed based on the job-to-job transitions in figure 1.30, the increasing trend

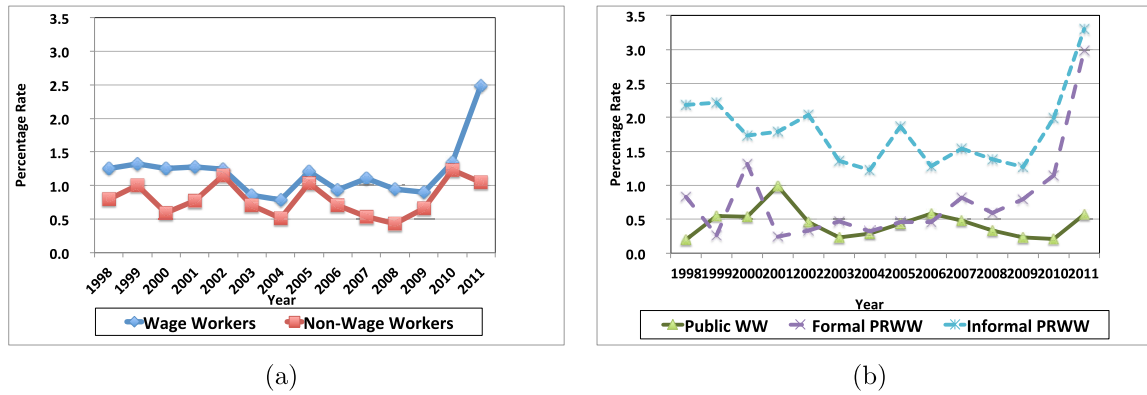


Figure 1.23: Evolution of separation rates for male workers, between 15 and 49 years of age, by type and sector of employment, in Egypt.

Source: Author's own calculations based on ELMPs 2012.



Figure 1.24: Evolution of job-to-job transition rates for male workers, between 15 and 49 years of age, by type and sector of employment, in Egypt.

Source: Author's own calculations based on ELMPs 2012.

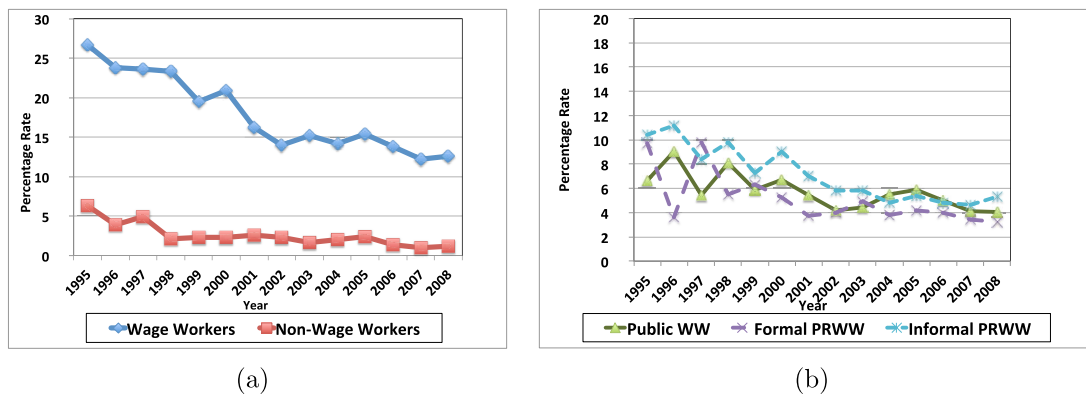


Figure 1.25: Evolution of job finding rates for male workers, between 15 and 49 years of age, by type and sector of employment, in Jordan.

Source: Author's own calculations based on JLMPS 2010.

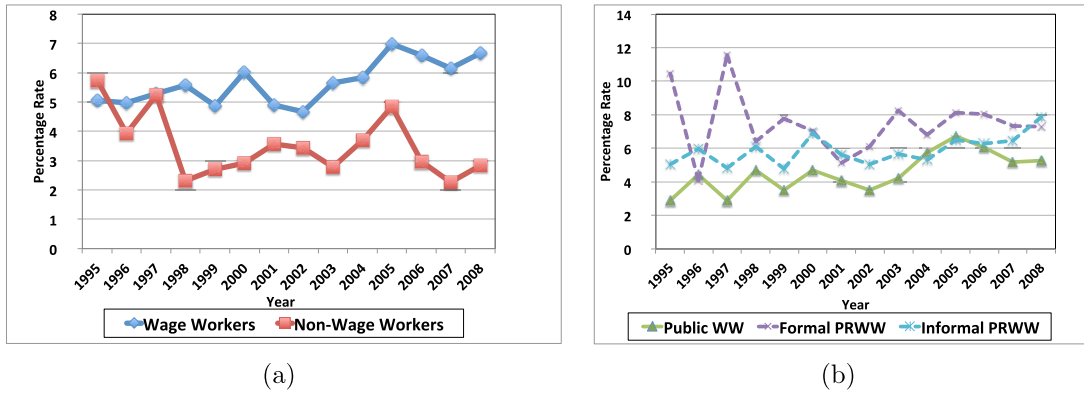


Figure 1.26: Evolution of hiring rates for male workers, between 15 and 49 years of age, by type and sector of employment, in Jordan.

Source: Author's own calculations based on JLMPS 2010.

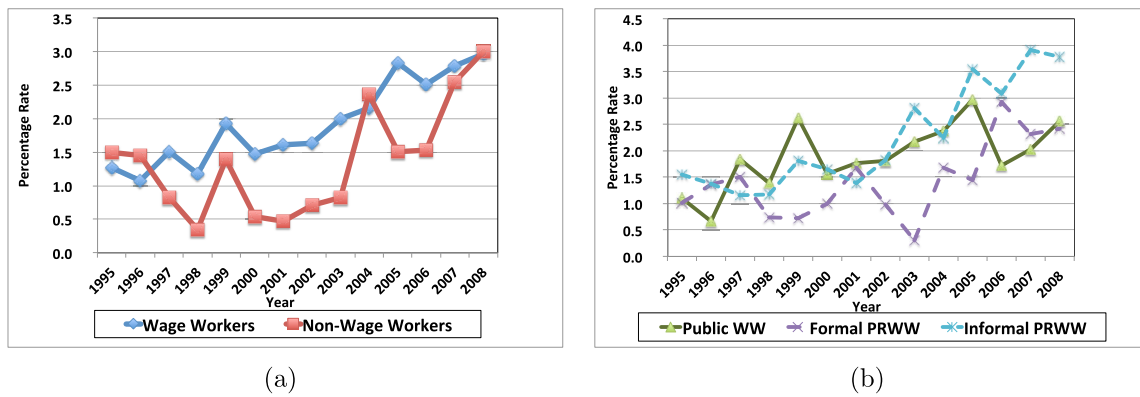


Figure 1.27: Evolution of separation rates for male workers, between 15 and 49 years of age, by type and sector of employment, in Jordan.

Source: Author's own calculations based on JLMPS 2010.



Figure 1.28: Evolution of job-to-job transition rates for male workers, between 15 and 49 years of age, by type and sector of employment, in Jordan.

Source: Author's own calculations based on JLMPS 2010.

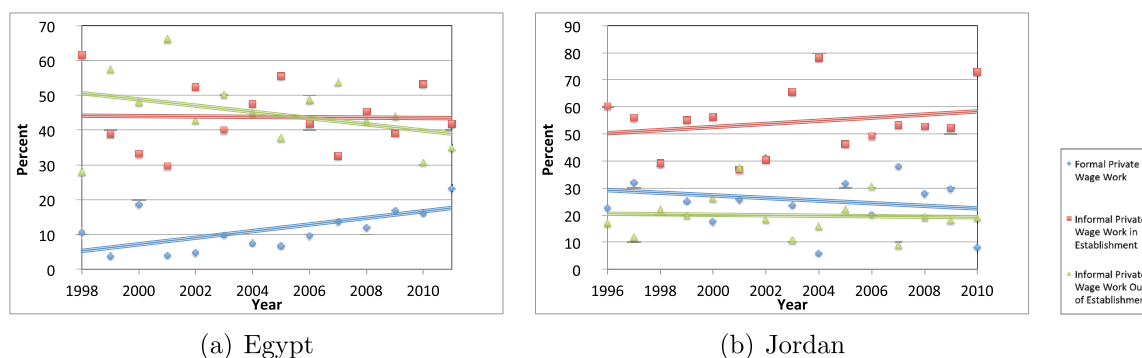


Figure 1.29: Distribution of private wage workers who quit/lose their jobs over time by formality and in/out of establishment.

Source: Author's own calculations based on ELMPS 2012 and JLMPS 2010.

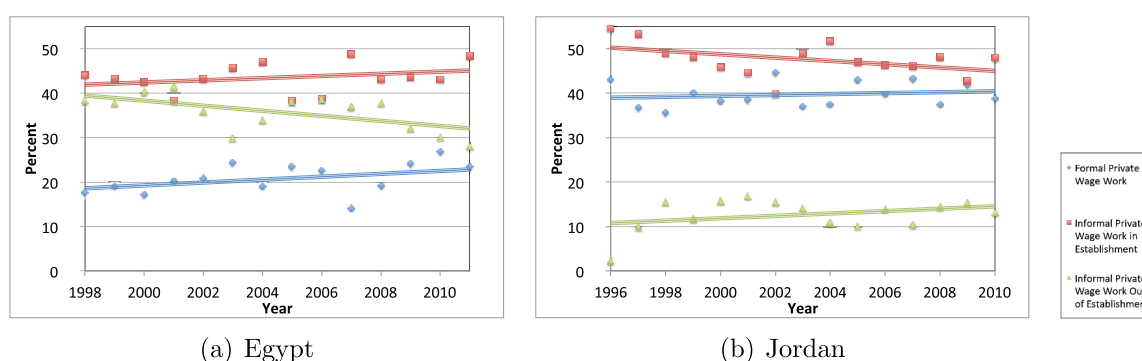


Figure 1.30: Distribution of private wage workers who move from one job to another (job-to-job transition) over time by formality and in/out of establishment of the source job.

Source: Author's own calculations based on ELMPS 2012 and JLMPS 2010.

of transitions over time is driven primarily by informal workers. The distribution of workers who switch to new jobs over the observation period by formality and in/out of establishment (for their job destination) in figure 1.31 shows that on average only about 40% of wage workers transiting from previous jobs (whether formal or informal) move to formal jobs afterwards. The trend of this share has either been stable over time (as in Egypt) or declining (as in Jordan). The remaining 60% are distributed between workers who find jobs the informal wage work sector inside and outside establishments. In Jordan, 60% of the job-to-job transitions originated from the informal sector. The share of workers who manage to move to a formal job destination declined from 45% to 40% over the period 1996-2010. This is another source of worry for both the Egyptian

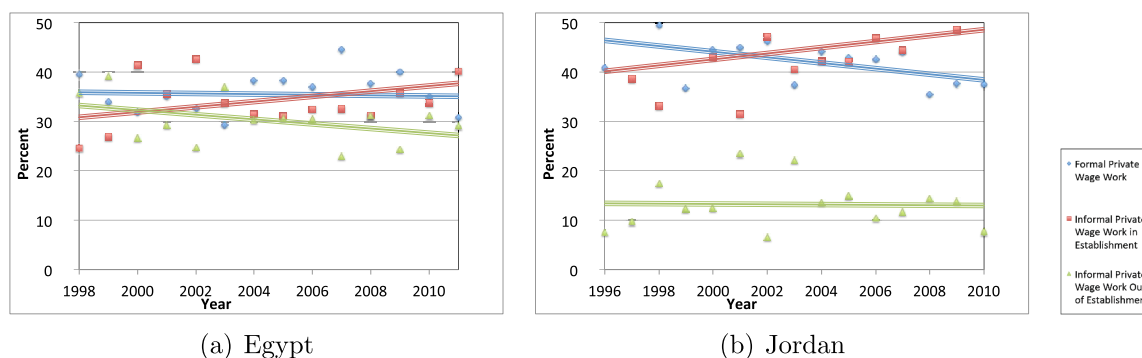


Figure 1.31: Distribution of private wage workers who move from one job to another (job-to-job transition) by formality and in/out of establishment of the destination job.

Source: Author's own calculations based on ELMPS 2012 and JLMPS 2010.

and Jordanian labor markets, which are not only characterized by relatively low job-to-job transition rates but if these transitions do take place, they occur among workers who have a low “reservation” package or low expectations ( reservation offer including the wage level, work conditions, job quality, formality, productivity, skills level required...). These workers do get affected by the downturns of the economy and the slowdown in economic growth but since they cannot afford to stay unemployed, they would rather move to and accept informal jobs. This for instance might explain the small increase noted in the unemployment rates in Egypt in recent years even though one would have expected a large increase in these rates after the financial crisis and the January 2011 Uprising.

Having discussed the age, education and sector of employment of wage workers transiting from one state or job to another, it is crucial at this point to explore the reason of transition for these workers. Unfortunately, this question was not available in the JLMPS (see section 1.3.1). The analysis is therefore only done for Egypt. In figure 1.32, the evolution of the share of voluntary and involuntary movers is plotted. An involuntary leave or job switch is one which was out of the worker's hands and where he was forced to transit to another state or job.

In general, job quits and job-to-job transitions have been mainly driven over the past decade by the worker's will and desire. In the year 2005, 90% of male workers who moved out of employment were quitting their jobs voluntarily, and 85% were willingly

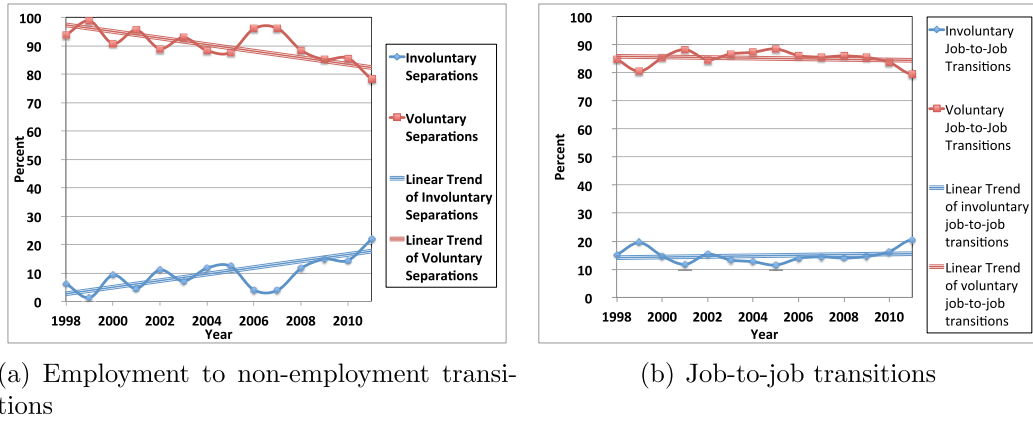


Figure 1.32: Distribution of employment to non-employment (separations) and job-to-job transitions over the period 1998-2012 in Egypt, by reason of change.

Source: Author's own calculations based on ELMPS 2012.

switching to another job. Unsurprisingly, the share of involuntary leaves increased over the period 2009-2012. These were mainly workers who reported that their contracts were ended and not renewed by the employer. This might provide additional evidence that the increase in separations observed in the previous sections was a reaction to the economic downturn, and not purely an artificial increase due to recall and misreporting problems. Trends in involuntary job switches have remained stable with a slight increase between the years 2010 and 2011. This increase was mainly due to workers who searched for other jobs because they were terminated by their employers or were working in a project that got suspended.

## 1.6 Conclusion

The objective of this paper is to set out a number of stylized facts about the Egyptian and Jordanian labor market flows over the past decade using the ELMPS and JLMPS datasets. Although it is descriptive by nature, the main contribution of this paper is to provide a summary of a wide range of information about Egyptian and Jordanian labor market dynamics from several different angles. The paper provides a survey of the different labor market institutions in Egypt and Jordan. These are markets with generally low levels of employment, higher youth unemployment rate, oversized public sectors and large informal sectors. This paper also provides a descrip-



tion of the questionnaires structures of the datasets to be used in this thesis. It also details the steps adopted to extract longitudinal retrospective datasets. This is crucial for developing countries such as Egypt and Jordan where limited budget constraints do not allow regular panel data collection needed for analysis of labor market dynamics.

The labor market dynamics stylized facts deduced in this paper are the first of this kind and may prove useful to researchers and policy-makers working on various aspects of the Egyptian and Jordanian labor markets. Knowledge of those facts is crucial to be able to monitor business cycles, detect inflection points and assess labor market tightness (how labor demand and supply are balanced within the economy). It is important to ensure a healthy dynamic labor market where productive jobs are being created, existing jobs are getting more productive and less productive jobs are being destroyed. This does not seem to be happening at all in the Egyptian and Jordanian labor markets where most of the turnover is occurring in small informal sector jobs, job-to-job transitions are extremely low and when they occur it is because people are moving within or to the informal sector. One has to note though that the Jordanian labor market, given the history and evolution of its regulatory institutional framework, it is more flexible and mobile than the Egyptian labor market. Yet, there is some evidence that suggests that the Jordanian labor market is much more segmented than the Egyptian; the informal sector serving mostly as an intermediary in Egypt, while in Jordan it appears to be a segment in the market that functions on its own attracting specific workers. The informality aspect of both markets surely requires more investigation and further research. In Egypt, the formal public and private sectors suffer from an extremely rigid environment where workers, once they access jobs in these sectors, would hardly ever leave or move to other jobs. In general, separation rates in Egypt are extremely low. The trends of flows in this paper show however that there have been better responses to the economic slowdown from the private formal sector than before, especially after January 2011 Uprising. Overall, the sluggishness of the Egyptian and Jordanian labor markets is surely hindering to a large extent the productivity levels and growth within the economy.

The main findings of this paper confirm the fact that unemployment in Egypt tends to be dominated by structural rather than cyclical. The trends obtained from the raw

data might suggest an increasing role of cyclical unemployment in the Egyptian labor market starting in 2009, as a reaction to the financial crisis as well as the January 2011 Uprising. In Jordan, the unemployment components, namely job findings and separations seem to be changing trends after 2003, i.e. after the return of Jordanians after the Iraq war and also after the slowdown of the GDP growth rates in 2007. The Egyptian and Jordanian labor markets are two arab MENA countries that suffer from low job accession, separation and mobility rates relative to stocks of employment and unemployment. The paper notes a declining trend in the Egyptian hiring rates, mirroring the falling trend in the working age population growth rate, showing that the youth bulge was successfully absorbed in the Egyptian Labor Market over the past decade. It also shows a constant trend of employment expansion in Jordan tracking the stagnant population growth rate. However, trends show that it became more difficult for a non-employed individual to find jobs. Rates of workers quitting their jobs or getting laid off remain at a low level even after an apparent increase in the most recent years of the retrospective panels i.e. the years right before the year of the survey. One has to be cautious when analysing such results given the potential biases and measurement errors in the datasets used that might result in artificial variations in levels or trends. Indeed, the results suggest that separation rates reach their highest levels in 2011 in Egypt and 2010 in Jordan, however this is only 2% of the total employment in Egypt and 4% in Jordan. The analysis shows that the share of involuntary job loss has increased over the period 2009-2011 in Egypt. This supports that these trends reflect the response of the Egyptian labor market to the financial crisis and the January 2011 Uprising rather than a more dynamic labor market. However, one cannot confirm this conclusion given potential recall errors and questionnaire design bias. The following chapters investigate these errors and offer possible solutions and corrections to be able to use the data to analyze the dynamics of the labor market in question.

The analysis also shows evidence of increasing trends of job-to-job transition rates in Egypt, especially among informal workers. In general, the formal sector remains rigid although evidence of better responses to the economic slowdown from the private formal sector, than from the public sector, has been documented. The overall picture suggests that the Egyptian and Jordanian labor markets should be a source of worry.

Future unemployment rates, particularly in Egypt, are expected to be substantially higher due to the the increasing separations and declining job finding, as well as higher demographic pressures resulting from the echo of the youth bulge.

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## 1.A Gross Flows and Transition Rates

Both the gross flows and transition rates approaches can be formalized in equations as follows;

$$\frac{E_{t+1} - E_t}{W_t} = \frac{M_t^{UE}}{W_t} + \frac{M_t^{UI}}{W_t} - \frac{S_t^{EU}}{W_t} - \frac{S_t^{EI}}{W_t} \quad (1.5)$$

where as one normalizes by the total working age population, an equation, that focuses on the total gross flows as the determinant of changes in the employment rate, is obtained. An alternative method would be to write equation 1.3 in terms of hiring rates ( $h$ ) and separation rates ( $s$ ).

$$\begin{aligned} \frac{E_{t+1}}{E_t} - 1 &= \frac{M_t^{UE}}{E_t} + \frac{M_t^{UI}}{E_t} - \frac{S_t^{EU}}{E_t} - \frac{S_t^{EI}}{E_t} \\ &= h_t^{UE} + h_t^{UI} - s_t^{EU} - s_t^{EI} \end{aligned} \quad (1.6)$$

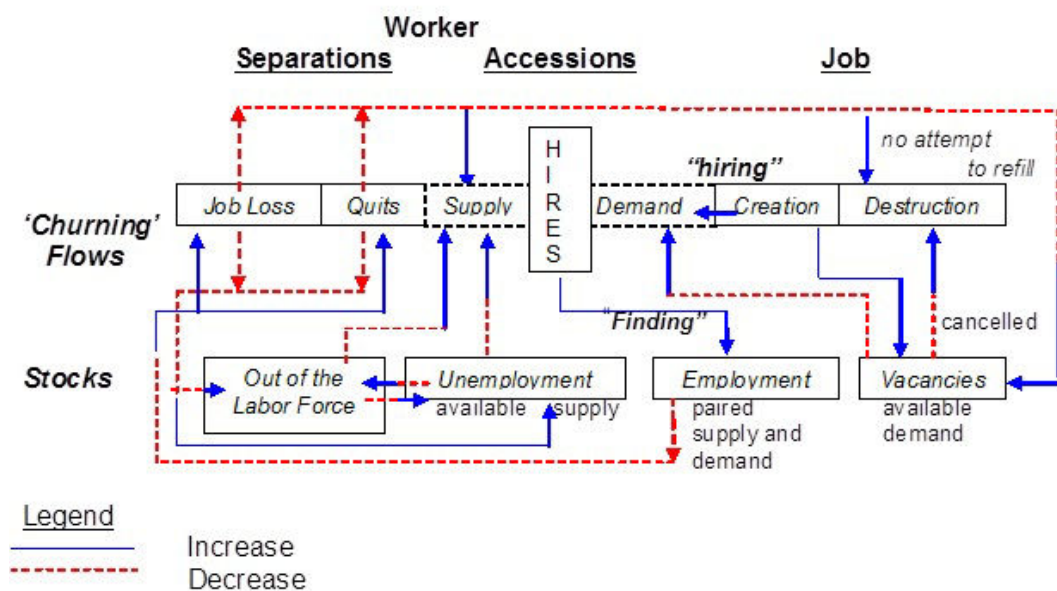
Similarly, an examination of gross flows or transition rates can be done using the decomposition of changes in unemployment; equation 1.4. Again, it is possible to normalize by the total working-age population;

$$\frac{U_{t+1} - U_t}{W_t} = -\frac{M_t^{UE}}{W_t} + \frac{S_t^{EU}}{W_t} - \frac{G_t^{UI}}{W_t} + \frac{G_t^{IU}}{W_t} \quad (1.7)$$

or write the unemployment decomposition equation in terms of job finding rate  $f$  and separation rates as follows;

$$\begin{aligned} \frac{U_{t+1}}{U_t} - 1 &= -\frac{M_t^{UE}}{U_t} + \frac{S_t^{EU}}{U_t} - \frac{G_t^{UI}}{U_t} + \frac{G_t^{IU}}{U_t} \\ &= -f_t^{UE} + s_t^{EU} \frac{E_t}{U_t} + \frac{G_t^{IU} - G_t^{UI}}{U_t} \end{aligned} \quad (1.8)$$

Figure 1.33 summarizes the above combination of labor market stocks and flows, to simplify for the reader each of the concepts used in this paper.



\***Note:** Courtesy Stevens (2002)

Figure 1.33: A simplified view of labor market stocks and flows\*

### 1.B Samples and Number of Transitions

The tables below show the unexpanded and expanded number of transitions for both males and females between 15 and 49 years of age. These are the samples obtained from the raw data and upon which the analyses, all throughout the thesis, are based on.

For Egypt, the tables report the percentage of these transitions, made by individuals who were interviewed in the ELMPS 2006.



year	Emp. → Emp.			% of transitions by individuals interviewed in 2006	% of job-to-job transitions	Emp. → Unemp.			Number of transitions	Emp. → Inactivity		
	Number of observed transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006			Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006		Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006
1998	6232	10600	73%	3%	15	28.49	60%	54	93.67	67%		
1999	6552	11100	72%	3%	23	38.71	57%	54	86.03	59%		
2000	6836	11500	71%	4%	21	28.86	71%	65	105.84	65%		
2001	7147	11900	71%	3%	16	22.66	75%	58	106.00	55%		
2002	7413	12300	70%	4%	24	49.24	54%	64	116.33	58%		
2003	7714	12700	70%	4%	19	25.75	53%	54	75.60	54%		
2004	7940	13000	69%	4%	20	27.82	40%	56	70.42	66%		
2005	8186	13300	69%	4%	24	36.70	63%	69	105.79	55%		
2006	8503	13700	68%	4%	23	34.59	57%	58	99.42	59%		
2007	8718	14000	68%	4%	23	34.94	78%	52	99.03	63%		
2008	8983	14300	68%	5%	30	45.37	70%	43	70.86	60%		
2009	9181	14600	67%	5%	36	60.27	78%	41	56.51	61%		
2010	9336	14900	67%	5%	44	71.16	75%	81	114.11	68%		
2011	9424	15000	67%	4%	55	92.14	71%	89	152.61	63%		

year	Unemp. → Emp.			% of transitions by individuals interviewed in 2006	Unemp. → Unemp.			Number of transitions	Unemp. → Inactivity		
	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006		Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006		Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006
1998	52	81.14	71%	73%	158	271.93	73%	5	6.05	60%	
1999	46	74.95	74%	71%	185	301.14	71%	6	13.83	67%	
2000	63	94.59	68%	70%	197	312.15	70%	6	11.35	100%	
2001	72	133.74	65%	70%	212	305.30	70%	4	5.36	75%	
2002	81	120.46	62%	70%	204	286.14	68%	1	1.33	100%	
2003	68	90.82	68%	67%	226	352.93	68%	5	10.03	80%	
2004	60	109.39	60%	67%	247	380.66	67%	8	10.95	38%	
2005	100	153.98	65%	63%	240	361.40	63%	7	10.29	57%	
2006	88	144.07	56%	64%	250	359.65	64%	5	6.33	40%	
2007	73	107.37	59%	67%	281	424.51	67%	6	8.49	83%	
2008	84	129.56	70%	68%	285	430.04	68%	3	5.71	100%	
2009	107	156.74	68%	73%	274	425.34	73%	1	1.56	100%	
2010	94	165.77	76%	73%	283	440.37	73%	4	5.00	75%	
2011	83	134.36	73%	74%	305	493.45	74%	1	1.12	100%	

year	Inactivity → Emp.			% of transitions by individuals interviewed in 2006	Inactivity → Unemp.			Number of transitions	Inactivity → Inactivity		
	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006		Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006		Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006
1998	302	529.88	67%	72%	60	84.58	72%	1534	2318.90	63%	
1999	304	462.85	63%	67%	51	69.49	67%	1586	2370.80	62%	
2000	322	472.18	63%	70%	67	102.81	70%	1600	2372.92	61%	
2001	301	459.71	61%	56%	54	74.72	56%	1655	2452.95	63%	
2002	317	473.69	58%	68%	69	114.96	68%	1709	2518.57	64%	
2003	297	421.94	60%	59%	68	121.39	59%	1785	2694.49	66%	
2004	335	459.73	64%	59%	80	117.75	59%	1759	2697.32	69%	
2005	357	536.58	60%	60%	75	104.12	60%	1736	2671.17	73%	
2006	297	429.82	68%	73%	77	129.13	73%	1812	2813.88	73%	
2007	326	466.30	64%	76%	63	94.83	76%	1786	2862.48	74%	
2008	272	411.43	68%	83%	66	104.67	83%	1848	2981.33	73%	
2009	279	451.19	65%	74%	66	116.37	74%	1873	3009.36	75%	
2010	237	382.78	71%	77%	56	105.50	77%	1928	3075.66	75%	
2011	195	298.46	74%	82%	44	77.17	82%	2099	3362.75	74%	

Table 1.2: Labor market transitions between employment, unemployment and inactivity states, males between 15 and 49 years of age, in Egypt, 1998-2011.

Emp.→Emp.					Emp.→Unemp.					Emp.→Inactivity				
year	Number of observed transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	% of job-to-job transitions	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	
1998	1467	2500	75%	1%	8	15.21	88%	25	42.11	80%				
1999	1517	2572	75%	1%	5	7.05	80%	26	56.91	85%				
2000	1534	2604	75%	2%	8	15.21	88%	40	80.88	83%				
2001	1588	2707	75%	2%	11	18.76	82%	28	52.86	71%				
2002	1629	2776	74%	1%	9	8.40	44%	37	80.28	86%				
2003	1697	2859	73%	1%	8	20.10	63%	32	69.56	75%				
2004	1751	2949	72%	1%	10	13.42	60%	33	65.00	73%				
2005	1804	3031	72%	2%	11	17.73	73%	44	79.65	57%				
2006	1843	3064	71%	2%	18	30.33	67%	53	87.48	66%				
2007	1894	3139	72%	1%	20	30.73	60%	53	92.78	47%				
2008	1911	3131	72%	2%	16	26.33	63%	59	97.67	61%				
2009	1929	3139	72%	2%	22	32.04	68%	56	97.70	61%				
2010	1989	3201	71%	2%	19	39.32	68%	61	98.79	52%				
2011	2031	3276	72%	2%	15	19.92	73%	52	86.54	54%				

Unemp.→Emp.					Unemp.→Unemp.					Unemp.→Inactivity				
year	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	% of transitions	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	
1998	15	28.42	87%		174	318.55	83%	0	0.00	—				
1999	16	31.23	75%		207	361.09	81%	1	1.97	100%				
2000	21	39.73	67%		238	410.56	82%	2	3.59	100%				
2001	17	31.00	82%		290	505.69	79%	0	0.00	—				
2002	22	39.45	73%		335	579.85	79%	3	5.11	67%				
2003	28	57.86	82%		386	629.78	77%	0	0.00	—				
2004	26	53.62	65%		443	725.57	76%	0	0.00	—				
2005	43	58.27	67%		479	785.57	75%	1	1.45	100%				
2006	44	72.08	66%		524	861.17	75%	1	0.10	0%				
2007	37	48.38	78%		591	972.86	72%	3	3.47	33%				
2008	34	59.78	62%		662	1061.02	70%	0	0.00	—				
2009	56	91.10	64%		720	1124.21	69%	1	2.26	100%				
2010	61	90.26	75%		759	1186.11	68%	3	3.20	67%				
2011	47	73.45	70%		803	1254.34	68%	1	1.12	100%				

Inactivity→Emp.					Inactivity→Unemp.					Inactivity→Inactivity				
year	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	% of transitions	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	Number of transitions	Expanded No. of transitions (000's)	% of transitions by individuals interviewed in 2006	
1998	66	124.01	79%		41	59.61	71%	6389	10900	74%				
1999	67	108.57	66%		46	81.83	80%	6718	11400	74%				
2000	96	168.99	75%		62	113.41	69%	6975	11800	73%				
2001	95	180.14	72%		58	98.06	76%	7242	12100	72%				
2002	90	160.13	58%		70	99.39	73%	7588	12600	71%				
2003	91	149.77	55%		72	124.78	67%	7910	13000	70%				
2004	101	156.03	75%		68	104.54	71%	8163	13300	69%				
2005	95	143.60	61%		78	127.18	68%	8454	13700	68%				
2006	102	166.00	67%		87	130.60	59%	8630	13900	67%				
2007	110	172.35	61%		85	117.22	54%	8800	14000	67%				
2008	92	137.11	71%		97	127.29	60%	8966	14300	66%				
2009	134	196.19	63%		80	122.08	64%	9104	14600	66%				
2010	110	193.37	70%		73	103.48	74%	9192	14700	66%				
2011	84	131.27	69%		79	123.41	68%	9337	14900	66%				

Table 1.3: Labor market transitions between employment, unemployment and inactivity states, females between 15 and 49 years of age, in Egypt, 1998-2011.

year	Emp.→Emp.			Emp.→Unemp.		Emp.→Inactivity	
	Number of observed transitions	Expanded No. of transitions (000's)	% of job-to-job transitions	Number of transitions	Expanded No. of transitions (000's)	Number of transitions	Expanded No. of transitions (000's)
1996	2876	691	5%	20	5.51	11	2.08
1997	2965	715	5%	20	5.47	13	2.94
1998	3036	734	6%	35	7.66	17	4.08
1999	3136	759	5%	13	3.28	6	1.46
2000	3188	769	8%	39	7.91	36	8.01
2001	3312	797	7%	26	6.68	20	3.49
2002	3421	822	5%	32	8.16	17	3.53
2003	3490	838	6%	33	7.01	26	5.77
2004	3569	853	6%	37	9.82	21	3.88
2005	3641	874	7%	48	10.80	34	6.92
2006	3713	888	8%	54	13.23	35	9.19
2007	3825	913	7%	48	12.29	35	7.16
2008	3947	942	8%	66	13.49	32	8.30
2009	4046	964	7%	64	15.85	28	6.81
2010	4032	959	9%	143	35.38	43	8.66

year	Unemp.→Emp.		Unemp.→Unemp.		Unemp.→Inactivity	
	Number of transitions	Expanded No. of transitions (000's)	Number of transitions	Expanded No. of transitions (000's)	Number of transitions	Expanded No. of transitions (000's)
1996	35	7.96	73	14.31	0	0.00
1997	32	6.61	88	19.77	1	0.14
1998	42	9.76	94	21.29	0	0.00
1999	45	8.93	117	26.77	0	0.00
2000	62	15.00	103	22.29	0	0.00
2001	49	11.60	143	30.59	0	0.00
2002	51	12.44	170	36.07	1	0.30
2003	64	12.92	194	43.53	1	0.11
2004	78	18.40	228	47.27	0	0.00
2005	86	19.24	246	53.60	1	0.14
2006	114	26.90	276	57.18	1	0.43
2007	136	29.52	263	55.70	0	0.00
2008	126	28.58	257	55.58	0	0.00
2009	115	27.25	319	65.26	0	0.00
2010	163	35.49	295	59.29	2	1.13

year	Inactivity→Emp.		Inactivity→Unemp.		Inactivity→Inactivity	
	Number of transitions	Expanded No. of transitions (000's)	Number of transitions	Expanded No. of transitions (000's)	Number of transitions	Expanded No. of transitions (000's)
1996	113	32.38	25	6.36	731	173
1997	110	28.49	22	4.45	796	185
1998	98	26.90	29	6.18	846	193
1999	99	23.32	36	7.47	931	213
2000	125	27.66	44	10.59	945	215
2001	130	31.16	52	10.97	996	226
2002	108	24.82	55	11.42	1054	237
2003	100	23.27	75	14.19	1113	251
2004	112	27.81	64	14.69	1185	265
2005	106	24.50	90	18.51	1238	284
2006	114	26.53	67	14.27	1330	306
2007	120	28.19	71	16.07	1446	334
2008	109	26.36	112	23.38	1526	349
2009	104	22.52	75	14.43	1642	380
2010	94	22.59	105	24.10	1773	407

Table 1.4: Labor market transitions between employment, unemployment and inactivity states, males between 15 and 49 years of age, in Jordan, 1996-2010.

year	Emp.→Emp.			Emp.→Unemp.		Emp.→Inactivity	
	Number of observed transitions	Expanded No. of transitions (000's)	% of job-to-job transitions	Number of transitions	Expanded No. of transitions (000's)	Number of transitions	Expanded No. of transitions (000's)
1996	468	114	5%	1	0.32	13	3.24
1997	489	118	2%	3	0.83	17	5.41
1998	519	126	3%	4	1.02	14	3.00
1999	529	128	3%	3	0.86	25	7.61
2000	541	130	5%	3	1.23	36	8.97
2001	560	135	7%	4	0.72	32	8.11
2002	585	141	5%	10	3.38	24	5.21
2003	607	144	4%	8	1.90	29	7.56
2004	627	150	5%	7	2.03	40	9.64
2005	639	151	5%	9	2.10	45	11.80
2006	677	161	5%	8	1.43	33	9.28
2007	716	168	7%	9	2.46	40	11.25
2008	737	174	4%	15	3.93	33	7.78
2009	807	189	4%	9	2.54	33	8.47
2010	814	191	5%	17	4.05	47	11.52

year	Unemp.→Emp.		Unemp.→Unemp.		Unemp.→Inactivity	
	Number of transitions	Expanded No. of transitions (000's)	Number of transitions	Expanded No. of transitions (000's)	Number of transitions	Expanded No. of transitions (000's)
1996	17	4.68	48	10.82	0	0.00
1997	15	3.06	52	11.44	1	0.15
1998	5	1.13	60	13.22	1	0.12
1999	13	2.87	64	14.26	0	0.00
2000	13	3.80	67	14.35	0	0.00
2001	18	3.73	61	13.35	0	0.00
2002	16	3.28	68	15.03	0	0.00
2003	16	3.64	74	17.64	1	0.31
2004	15	3.65	90	21.55	2	0.74
2005	24	6.72	105	23.67	0	0.00
2006	37	9.19	107	23.64	0	0.00
2007	33	8.90	126	25.46	0	0.00
2008	53	11.87	140	26.12	3	1.00
2009	39	7.79	198	36.23	1	0.11
2010	53	11.25	239	45.31	0	0.00

year	Inactivity→Emp.		Inactivity→Unemp.		Inactivity→Inactivity	
	Number of transitions	Expanded No. of transitions (000's)	Number of transitions	Expanded No. of transitions (000's)	Number of transitions	Expanded No. of transitions (000's)
1996	28	6.84	17	3.18	3500	818
1997	37	10.12	12	2.43	3618	847
1998	35	9.91	13	2.87	3710	867
1999	47	12.84	13	3.03	3825	886
2000	51	12.92	9	1.49	3946	917
2001	43	11.22	18	3.94	4087	948
2002	45	9.88	13	3.19	4241	983
2003	55	14.37	25	6.39	4357	1009
2004	56	12.70	32	6.81	4501	1045
2005	60	15.31	30	7.06	4652	1074
2006	58	13.34	42	8.66	4785	1104
2007	43	11.09	61	11.07	4926	1137
2008	67	15.92	83	14.07	5064	1176
2009	45	13.64	85	17.80	5237	1213
2010	45	10.38	104	22.27	5325	1229

Table 1.5: Labor market transitions between employment, unemployment and inactivity states, females between 15 and 49 years of age, in Jordan, 1996-2010.

## Chapter 2

# Comparing Retrospective and Panel Data Collection Methods to Assess Labor Market Dynamics in Egypt <sup>1</sup>

### 2.1 Introduction

The analysis of labor market dynamics requires the availability of data about the same individuals at multiple points in time. This kind of data allows for the examination of flows between different labor market states rather than simply assessing labor market stocks over time, which is what is usually possible with cross-sectional data. Data about the same individuals over time can either be in the form of panel data, where individuals are visited and interviewed multiple times over the course of several months or years, or retrospective data, where individuals are asked about their past labor market trajectories at one point in time. Although both methods of data collection suffer from different kinds of measurement errors, panel data are often deemed superior because they minimize recall error, which could be substantial in retrospective data. Panel data, however, are expensive and difficult to collect and are, therefore, rarely available to researchers in developing countries. If available, they are generally not collected frequently enough to observe complete labor market trajectories and transitions.

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<sup>1</sup>This chapter is mainly based on work conducted jointly with Ragui Assaad and Caroline Krafft (Assaad, Krafft, and Yassine, 2015).

It is therefore useful to examine how well retrospective data perform in assessing labor market dynamics and the extent to which analyses that depend on them conform to results obtained from panel data.

It is well known that retrospective data suffer from problems such as difficulties in recalling dates or even that certain events occurred at all (Artola and Bell (2001); Bound, Brown, and Mathiowetz (2001); Magnac and Visser (1999)). Panel data, that is data that are collected contemporaneously at different points in time for the same individual, are unlikely to suffer from recall errors but may have other problems. Because they are collected at discrete points in time, they only provide information at those points in time and not on the course of events between those points (Blossfeld, Golsch, and Rohwer, 2012). Moreover, panel data can suffer from sample attrition and misclassification errors (Artola and Bell, 2001). They can also suffer from the fact that individuals may be unwilling to accurately report their current status due to fear of taxation or other government interference. Due to potential problems with both retrospective (as has been discussed in chapter 1) and panel data, it is worthwhile to compare results on basic indicators related to labor market dynamics from retrospective and panel data on the same sample of individuals, in order to determine the conditions under which they provide similar or substantially different results. To date, no study has undertaken such a comparison in the Middle East and North Africa (MENA) region. This paper takes advantage of a unique opportunity to undertake such a comparison, where both panel and retrospective data are available for the same individuals in the Egypt Labor Market Panel Survey (ELMPS). Three waves of the ELMPS were carried out by the Economic Research Forum (ERF) in 1998, 2006 and 2012. All three waves of the ELMPS contain both contemporaneous and retrospective data, including detailed labor market histories for all individuals 15 and older who have ever worked as well as other life course variables. Not only do the reference periods of the retrospective data overlap with the dates of the previous waves of the survey, allowing for comparisons of retrospective and panel data at the same point in time, but the retrospective periods from different waves of the survey overlap with each other as well, allowing for comparison of past events in one wave with the same events as captured in another wave.

In this paper we assess the soundness of both the distribution of past statuses and transitions among them obtained from the two sources of data. Specifically, we (i) assess the consistency of reporting of time-invariant characteristics in different waves of the panel, (ii) compare the retrospective and panel data results on past labor market statuses, including the estimation of multivariate models of the determinants of alignment between the two data sources, (iv) assess the consistency of estimates of labor market transition rates across two specific dates by comparing panel and retrospective data, (v) assess the consistency of estimates of the level and trends of annual labor market transition rates across retrospective data from two different waves of the survey, and (vi) assess whether retrospective data can provide accurate trends of labor market aggregates, such as employment-to-population ratios and unemployment rates.

The rest of the paper is organized as follows. Section 2 reviews the theory and past evidence on measurement error in contemporaneous and recalled data. Section 3 includes a discussion of our data source and methods of analysis. Section 4 lays out all our findings on the various comparisons we make and section 5 concludes with recommendations as to what kinds of information can be reliably collected using retrospective questions, how to improve retrospective data collection strategies to obtain more reliable information, and potential methods for correcting measurement errors.

## **2.2 Theories and Past Evidence on Measurement Problems in Current and Recalled Data**

Whether labor market states and transitions can be accurately represented by current (contemporaneous panel) or recalled (retrospective) data is essentially an issue of measurement error. Surveys are attempting to measure a certain phenomenon such as the current labor market status, or the date of the first job but the data reported may be erroneous. The literature on measurement error suggests a wide variety of issues that might contribute to measurement errors in both current and recalled information. This section begins with a summary of the threats to research created by measurement error, then discusses some of the key issues that contribute to measurement error in current and recalled data. The section concludes with the evidence to date character-

izing these problems, with a particular focus on findings relating to labor markets in developing countries.

### 2.2.1 The Implications of Measurement Errors

The implications of measurement error depend substantially on the nature of the problems. Truly random errors in continuous variables sometimes do not present a substantial problem to research, as they will not affect estimates of key statistics such as means. In estimating linear regression models with a mis-measured continuous dependent variable,  $y$ , so long as the measurement error in  $y$  is random, results will not be biased (although standard errors will be increased) (Bound, Brown, and Mathiowetz, 2001). Random errors in an explanatory variable,  $x$ , will downward-bias or attenuate the estimated coefficient on  $x$  in a linear regression model (Bound, Brown, and Mathiowetz, 2001).

Random errors in categorical or binary variables are more problematic. For example, if a variable is binary, such as whether or not an individual is employed, an error must always be the opposite of the true value. That is, if the true value of some  $y^* = 1$ , then the measured value,  $y$ , may be 0 or 1, and it is always the case that  $y - y^* \leq 0$ . Likewise if  $y^* = 0$ , then the measured value,  $y$ , may be 0 or 1, and it is always the case that  $y - y^* \geq 0$ . Thus, the correlation between the true value and the error is always negative (Bound, Brown, and Mathiowetz, 2001). In the case of even random errors in a limited (categorical, binary) dependent variable, unlike in the continuous case, regression results will be biased downwards (attenuated). As in the continuous variable case, when the mis-measured variable is an independent, explanatory variable, this will lead to downward-biased (attenuated) estimates (Bound, Brown, and Mathiowetz, 2001).

Often, measurement errors are not random, but are instead systematic that is, related to characteristics or covariates. In this case, measurement errors will bias both basic statistics and regression coefficients in complex ways (Bound, Brown, and Mathiowetz, 2001). For instance, when studying the incomes of the self-employed, individuals with more education may keep accounting books and be able to more accurately report their incomes. If less educated individuals systematically under-report their incomes,



this will systematically bias a regression estimating the relationship between years of education and income.

### **2.2.2 Why do measurement errors occur?**

A variety of different processes can generate errors in data. Measurement problems can be either unintentional or intentional misreporting, and we discuss here a number of the processes that contribute to these different types of misreporting.

The process of respondents providing information to survey data collectors can suffer from a number of errors. The question answering process for a respondent requires, first, comprehension of the question, the recollection of the information from one's memory, comparing the retrieved information with the original question, and communicating this information to an enumerator (Bound, Brown, and Mathiowetz, 2001). A large body of literature focuses on the recall or retrieval process and the nature of errors in recall. These are particularly likely to be affected by the recall period. That is, the longer the recall period (the further back in time the event in question is), the more likely that respondents will report with error, although the extent to which this is a problem varies substantially over studies of different outcomes (Bound, Brown, and Mathiowetz, 2001).

In reporting the dates of various events, the misreporting of dates may be a function of how far back in time the event occurred. Respondents are more likely to move forward the date ("forward telescoping") an event that has a short reference period (a few weeks) while respondents are more likely to move back in time an event that occurred a year or more in the past (Bound, Brown, and Mathiowetz, 2001). Studies of panel data on dates have identified what is commonly referred to as a "seam effect", i.e. excessive numbers of changes at the "seam" between one study period and the next (Bound, Brown, and Mathiowetz, 2001).

The "salience" or importance of events may affect the accuracy with which they are reported (Bound, Brown, and Mathiowetz (2001); Judge and Schechter (2009)). For instance, unemployment spells of only a few weeks may be of lower salience than unemployment spells that last a year and therefore be more likely to be forgotten. Individuals may forget when, or even whether, certain events occurred at all. If indi-

viduals do remember events, they may not readily remember the exact timing of events. This leads to measurement errors such as “heaping”, where individuals tend to report certain numbers as responses (Roberts and Brewer, 2001). For instance, respondents often report adult ages in years in multiples of 5 or child ages in months rounded to the nearest year or half year (Heitjan and Rubin (1990); Roberts and Brewer (2001)). Question and questionnaire design can play an important role in whether respondent errors occur. Identifying the best respondent within a household, deciding on the level of aggregation for data, and asking for information in the most appropriate units and for the most appropriate reference period are important elements of design that will affect the accuracy of measurement (Grosh and Glewwe (2000); Puetz, Von Braun, and Puetz (1993)). As well as unintentional errors, primarily due to difficulties accurately recollecting information about states and events, responses in surveys may suffer from intentional respondent misreporting. Particularly for topics that relate to behaviors or states that have strong connotations of social (un)desirability, such as the intention to send children to school or the receipt of charity, respondents may misreport. Under-reporting will occur for socially undesirable phenomena, and over-reporting for desirable phenomena, generating “social desirability bias” (Bound, Brown, and Mathiowetz, 2001).

As well as respondents providing inaccurate information, interviewer practices and data processing may generate inaccurate information. Differences arise in the quality of government-collected and academic researcher-collected data (Judge and Schechter, 2009), which may be due to differences in the qualities and characteristics of interviewers and data processing. As well as subtler issues such as interviewers with poor training and weak incentives (Puetz, Von Braun, and Puetz, 1993), outright fieldworker fraud may occur. Such fraud is particularly likely to bias panel data estimates (Finn and Ranchhod, 2013). Quality control during data collection can help address such issues (Puetz, Von Braun, and Puetz, 1993).

### **2.2.3 Evidence on the extent of errors in survey data**

The Malaysian Family Life Survey (MFLS), with panel data 12 years apart and substantial retrospective elements, suggests some of the issues that may occur in devel-

oping country data. The survey focused on issues of fertility and health and therefore targeted ever-married women. The MFLS also collected life histories on issues such as employment, migration, and marriage. The findings demonstrate that substantial errors can occur, but also that reporting of retrospective events can be quite accurate. For instance, while 95% of the ever-married sample reported being currently married in the first wave of the survey in 1976, twelve years later, only 84% of panel respondents reported in 1988 that they had been married in 1976. This difference is substantial and statistically significant. However, the same rate of mortality for children born prior to 1976 results from both the 1976 and 1988 interviews (Beckett, Da Vanzo, Sastry, Panis, and Peterson, 2001). The level of detail in the question affected the accuracy of reporting as well; for instance, agreement was much higher in reporting whether a child was ever breastfed than the duration of breastfeeding. The salience of events also mattered; women reported inter-district moves (a more substantial move) more consistently in 1976 compared to 1988 than intra-district moves (only 80% of the rate of moves prior to 1976 was reported in 1988). Substantial “blurring” of dates also occurred, with mothers not reporting exact months or years for children’s births when they were relatively further back in time across the two waves. Quantities were more likely to be rounded (akin to heaping), with rounding increasing with the length of recall. Studies have found different reporting errors with the MFLS to be related to respondent characteristics (Beckett, Da Vanzo, Sastry, Panis, and Peterson, 2001).

A number of studies have also been conducted on measurement of income, assets, and consumption. A study of boat-based fisherman in India looked at self-reported income over 34 months and compared it to administrative data from the fishermen society (De Nicola and Giné, 2014). The study found that the mean of income is maintained but variance reduced when going back 24 months. Findings suggested that boat owners reverted to inference, i.e. reporting mean income, as recall periods lengthened. Asking about the date of boat purchase directly elicited responses of similar quality to asking in relation to time cues (anchoring) important to the respondent; using unimportant time cues generated substantially worse results. The timing of the question within the survey did not, however, affect results (De Nicola and Giné, 2014).

Using data from Africa, Beegle, Carletto, and Himelein (2012) look for recall bias

in agricultural data from three household surveys in African countries. Agricultural data usually refer to an agricultural season or year, and may be subject to recall bias of varying degrees depending on, for example, the time since harvest. The authors regress information on harvest sales and input use on the time elapsed between harvest and interview. They find little recall bias, although more salient events may be reported more accurately.

As well as examining income data, a number of studies have examined recall errors in expenditure and consumption data. Using household survey from Vietnam and resurveying respondents, Hiroyuki, Yasuyuki, and Mari (2010) find that questions on total rather than categorical expenditure suffer less recall bias. They also find that errors are systematically related to household size, and that errors are more serious for goods produced for own consumption than purchased goods. Errors tend to be mean-reverting, which will bias coefficients downward. Beegle, De Weerd, Friedman, and Gibson (2012) compare eight different methods for measuring household consumption, comparing to a benchmark of personal diary use other diary and retrospective approaches. Recall is lower for other approaches than diaries, with particularly acute problems for poorer, larger, and less educated households.

Using United States data including a longitudinal survey, long-term retrospective recall data, and company records, comparisons demonstrated that the means of earnings were very similar in retrospective responses and company records. However, transitory variations were under-reported, generating another case of mean-reverting errors (Gibson and Kim, 2010). In a similar vein to our work on labor market dynamics, Dercon and Shapiro (2007) examine the role of measurement problems in poverty dynamics in panel data. They review past work on poverty mobility and discuss several key errors that are also relevant in our work: (1) inaccurate measures of income or consumption (2) price deflation and (3) mismatching of households over survey waves.

One way to test for problems in survey data is using Benford's law, which describes the distribution of first significant digits that should occur in large sets of data. Comparisons of observed distributions with the distributions implied by Benford's law allows for an assessment of respondent and enumerator response problems (Finn and Ranchhod (2013); Judge and Schechter (2009)). An application of Benford's law to

multiple surveys noted that certain questions were particularly likely to suffer from response irregularities and that there were quality differences between government and academic survey data (Judge and Schechter, 2009). Applications of Benford’s law and other methods for detecting fieldworker fabrication of data in South Africa’s National Income Dynamics study found around 7% of the sample was affected. While cross-sectional estimation was not substantially affected by fabrication, panel estimators were (Finn and Ranchhod, 2013).

## 2.3 Data and Methods

### 2.3.1 Data Sources

To compare results from panel and retrospective data, it is necessary to have a survey that collects contemporaneous data at different points in time as well as retrospective data for the same individuals. The only survey that meets these criteria in the MENA region is the Egypt Labor Market Panel Survey (ELMPS). With waves in 1998, 2006, and 2012, it is possible to use the ELMPS to compare retrospective and panel data over multiple periods. The ELMPS is a nationally representative household survey with detailed modules on current and past labor market statuses. Of the original 23,997 individuals interviewed in 1998, 13,218 (55.1%) were re-interviewed in both 2006 and 2012. Of the 37,140 individuals interviewed in 2006, 18,770 (77.5%) were re-interviewed in 2012<sup>2</sup>. A retrospective panel of annual statuses is constructed from retrospective data in each wave and compared to panel and retrospective data from previous waves. Reporting of time invariant information, such as parent’s education, is also compared based on reports in different waves of the survey.

A particularly important element of our analyses relies on the labor market history section of the ELMPS surveys, which is administered to all individuals 15 and older who ever worked. In 2012, this section asks for the start and end dates (year, month) and characteristics of labor market statuses lasting six months or more from the time

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<sup>2</sup>See Assaad and Roushdy (2009) and Assaad and Krafft (2013) for a discussion of attrition from the various waves of the ELMPS.

the individual exited school <sup>3</sup>. A status is defined as any labor market state lasting six months or more, be it employment, unemployment or out of the labor force. If the individual is employed in that status, she or he is asked about the details of such employment, including employment status (wage work, self-employment, etc.), sector of employment, occupation, economic activity, incidence of a formal contract and/or social insurance coverage, location of work, and reason for changing the status. The questionnaire inquires about the first four statuses lasting six months or more. Statuses of less than six months are dropped and if four statuses are not enough to reach the current status, the fifth and later statuses are also dropped. However, the total number of employment spells and their start and end dates can be obtained from the life events calendar section of the questionnaire. In addition to the first four statuses and the current status, which is obtained elsewhere in the questionnaire, the questionnaire inquires whether the individual's current status (in early 2012) was different from their status in the month prior to the January 25th 2011 revolution. If it was, the questionnaire elicits information about the individual's status during that month.

It is important to note that in the preceding waves of the ELMPS survey (1998 and 2006), the labor market history questions were sequenced differently. Specifically, these waves of the survey used a reverse chronological order in eliciting labor market trajectories as compared to the chronological method used in 2012. In 1998 and 2006, the questionnaire first inquired about the current labor market status, then the previous status and the status previous to that, collecting information about the date of start of each of these statuses. In addition, information was collected in a separate part of the questionnaire about the first job in which the individual was engaged for a period of more than six months. Unlike the 2012 wave, the 1998 and 2006 waves did not contain a life events calendar and therefore no information on the total number of primary jobs the individual engaged over his/her lifetime. This questionnaire design implies that initial unemployment and out of labor force states could be missed, as well as employment states between the first job and the pre-previous status.

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<sup>3</sup>For individuals who never went to school, the retrospective period starts at age 6.

### 2.3.2 Methods

To compare retrospective and panel data, the retrospective data were mapped on to panel data from previous waves in such a way that retrospective and current information is available for the same individual at the same point in time. We then draw on the econometric literature on measurement error to assess and compare the data sources and suggest possible corrections to account for measurement error (Black, Berger, and Scott (2000); Bound, Brown, and Mathiowetz (2001); Carroll, Ruppert, Stefanski, and Crainiceanu (2006); Fuller (2009); Magnac and Visser (1999)).

As a first check on the accuracy of the panel data, we begin by comparing the consistency of time invariant information across different waves of the panel. We do that for own education for adults 30-54 in 1998, father's sector of work when the individual was 15 years of age, and recalled costs of marriage. We then compare labor market statuses at a given point in time (1998 and 2006) across retrospective and panel data to assess the accuracy of recall and identify statuses that are particularly prone to erroneous recall. We subsequently estimate a multivariate model of the probability of alignment in labor market status between the two kinds of data as a function of individual characteristics, whether the information was elicited from the individual him/herself or a proxy respondent, the nature of the past employment status itself, and the contemporaneous employment status in 2012.

The next step is to assess the consistency of reporting of labor market transitions in retrospective and panel data. To do this, we convert the retrospective data into an annual retrospective panel, which contains information about the main labor market variables every year since the individual exited school for the first time. Using this retrospective panel we calculate the rate of change in employment status from 1998 to 2006 using the respective waves of the panel for those dates to the rates of change over the same period as reported by the 2012 retrospective data. We then move to comparing annual transition rates derived from the retrospective data in different waves of the survey.

In examining labor market transitions, we examine two types of transitions of particular interest to the study of labor market dynamics: transitions among employment, unemployment and out-of-labor-force states, and job-to-job transitions among the em-

ployed. Within the first type, we include job-finding rates for the unemployed and those out of the labor force, and separation rates from employment to either unemployment or out of the labor force. The second type includes two-way transitions across different types of jobs, such as public and private employment and wage and non-wage work. We examine how different waves of the retrospective data generate transition rates, by type of transition. Finally, we revisit the question of whether the levels and trends in important labor market ratios of stocks, such as the employment-to-population ratio and the unemployment rate, can be accurately assessed using the retrospective data, by comparing across different waves of retrospective data and between them and contemporaneous sources of these data, such as the official labor force survey.

## **2.4 Findings**

### **2.4.1 Consistency of reporting of time-invariant information across different waves of a panel survey**

#### **Own Education for Adults**

The accuracy of the characteristics individuals report in any survey, such as their age, education, or labor market characteristics, plays an important role in researchers' ability to accurately describe economies and labor markets. Often researchers are focusing on cross-sectional, contemporaneous labor market characteristics. Comparing how individuals report static characteristics over time can help researchers understand how accurately contemporaneous characteristics are reported in cross-sectional data. Because the ELMPS is a panel, we can compare characteristics that should remain unchanged, such as education (for adults) as reported in different waves of the survey in order to assess their accuracy.

Figure 2.1 compares the reporting of education in 1998 with that in 2006<sup>4</sup> for individuals ages 30-54 in 1998. It is important to keep in mind that either the 1998 or the 2006 response could be inaccurate when they disagree, or both could be consistent

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<sup>4</sup>Comparisons are not made with 2012 because, to reduce the burden of responding to the survey, respondents who answered educational questions in 2006 and had no change in education status were not re-interviewed about education.



(but still inaccurate) over time. Education is examined categorically, in terms of eight different categories. Overall, 79% of responses are the same over time, but there is substantial variation in terms of which education categories are reported consistently. For instance, 90% of those who reported being illiterate in 1998 report being illiterate again in 2006. The remainder primarily report being able to read and write but having no education certificate (7%), which could be a genuine change in literacy, or having primary education (3%). The ability to read and write appears to be the most poorly reported, with only 34% of those reporting they could read and write but having no education certificate in 1998 reporting the same status in 2006. The most common response in 2006 for this group is being illiterate, which may represent a genuine decay in reading and writing ability. In general, when reporting is different, the reported alternative is usually a proximate level of education. For instance, 20% of those who reported general secondary in 1998 then report they attended vocational secondary in 2006<sup>5</sup>. Likewise 22% of those who reported post-secondary education in 1998 reported being vocational secondary graduates in 2006. Since the distinction is not always clear between special five-year vocational secondary programs and three-year vocational secondary plus two-year post-secondary programs, this may contribute to the lower consistency.

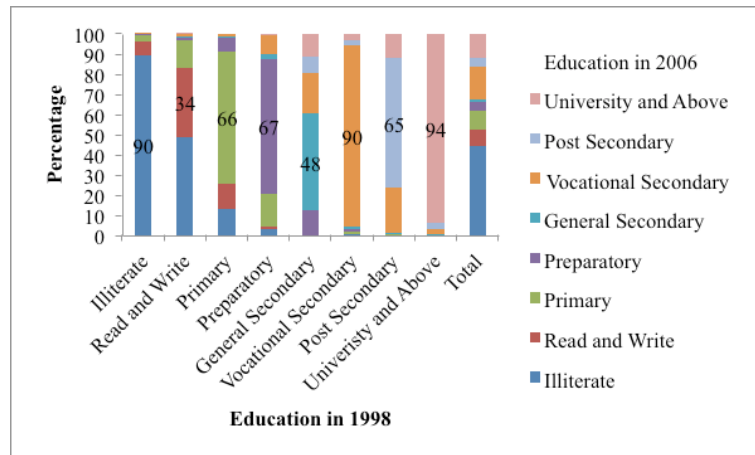


Figure 2.1: Education (8 categories) as reported in 1998 vs. 2006, Ages 30-54 in 1998

Source: Authors' calculations based on ELMPS 1998 and ELMPS 2006

Notes: See Table 2.4 for values underlying figure.

<sup>5</sup>Smaller categories, such as general secondary, may suffer from more mis-reporting due to their tiny size. For instance, if random typos are uniformly distributed across the categories, more responses in the smallest categories are likely to be errors.

Although every effort is made to collect data from the individual him or herself, one dimension of data collection that is likely to affect measurement problems is whether or not the respondent is, in fact, the individual in question. Data consistency can also be assessed along this dimension of reporting. We compare the education status in 1998 and 2006 of individuals who were consistently responding for themselves and those who were not consistently responding for themselves<sup>6</sup>. Among individuals in the panel who were 30-54 in 1998, 71.3% reported for themselves in both waves (94.9% in 1998 and 75.7% in 2006). When the individual in question is consistently the respondent, there is a slight (but not dramatic) improvement in the consistency of data. There is only a one percentage point increase in consistency of illiteracy, primary, and university reporting, but larger improvements in read and write (5 percentage points), preparatory (6 percentage points), vocational secondary (6 percentage points) and post-secondary (4 percentage points) reporting.

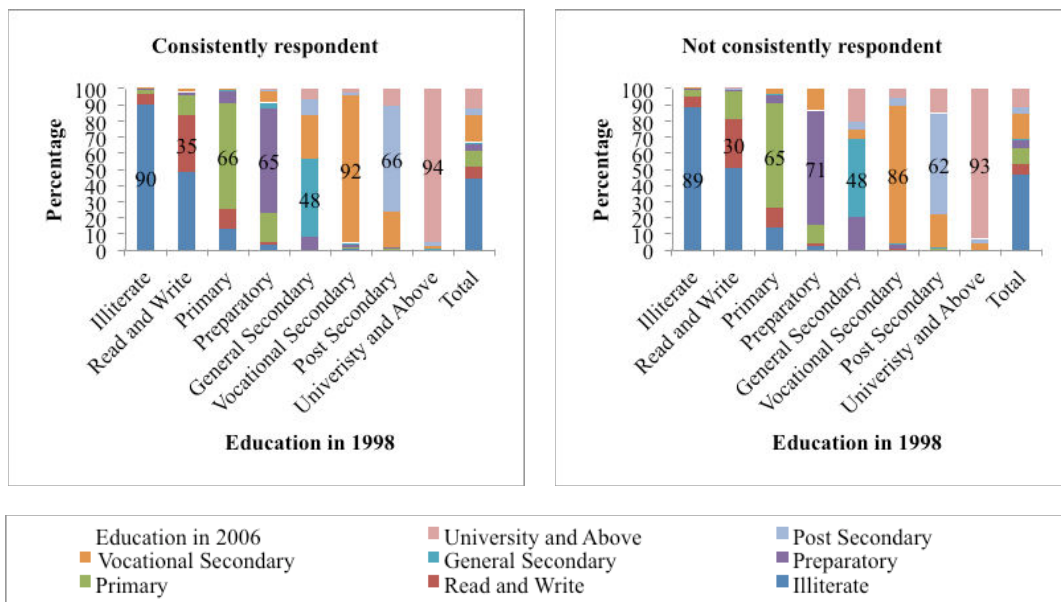


Figure 2.2: Education (8 categories) as reported in 1998 vs. 2006, by respondent, ages 30-54 in 1998

Source: Authors' calculations based on ELMPS 1998 and ELMPS 2006

Notes: See Table 2.5 for values underlying figure.

Creating less finely aggregated categories, such as only four education levels, can

<sup>6</sup>When individuals were not consistently responding for themselves, it is possible that the same individual was responding in their place in both waves (i.e. a spouse) but the data does not allow us to determine whether this is so.

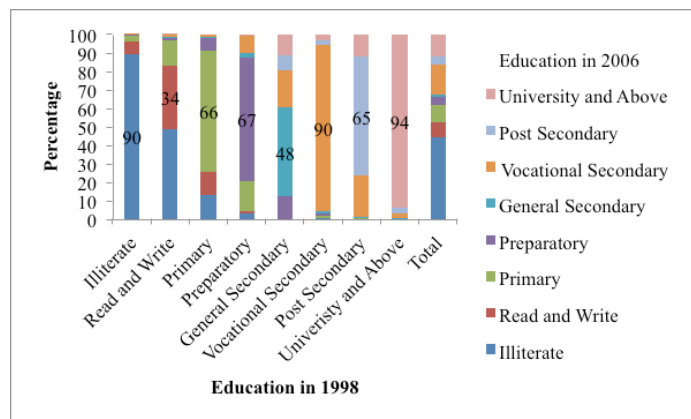


Figure 2.3: Education (4 categories) as reported in 1998 vs. 2006, Ages 30-54 in 1998

Source: Authors' calculations based on ELMPS 1998 and ELMPS 2006

Notes: See Table 2.6 for values underlying figure.

lead to more consistency in reporting (Figure 2.3). Combining illiterate and read & write leads to a category that is consistently reported 93% of the time. Combining primary and preparatory education into a single category leads to 76% of respondents reporting consistently over time. A category that combines general, vocational and post-secondary into the definition “secondary” is 91% accurately reported over time. University and above was consistently reported as 94% over the two waves. Overall, it is clear that using more aggregated categories leads to more consistent reporting; more detailed categories should be viewed with some caution (particularly read and write and general secondary).

### Father's sector of work

Particularly for analyzing patterns across generations, it is necessary to gather information on parents' characteristics, even if they are not present in the respondent's household. The ELMPS collects information on father's characteristics when the respondent was age 15 from respondents when the father is not in the household. Figure 2.4 shows the consistency of responses over time (2006 versus 2012) among respondents age 30-54 whose father was not present in 2006 or 2012. Approximately 71% of respondents who reported their father worked in government in 2006 then report that their father worked in government in 2012, while 7% said their father worked in public enterprise and 22% worked in the private sector. Private sector work is rela-

tively consistently reported (91% the same from 2006 to 2012). Consistency is most problematic in terms of identifying work in public enterprises. Only 35% of individuals who reported that their father worked in public enterprise in 2006 reported the same status in 2012. Instead, 40% reported their father worked in government and 25% reported their father worked in the private sector. As with education, certain categories are less clearly defined. The results suggest that respondents are sometimes inferring or reconstructing their father's sector of work; the results suggest that, for instance, individuals may know that their father works in a utility but not know the sector of employment and reconstruct it.

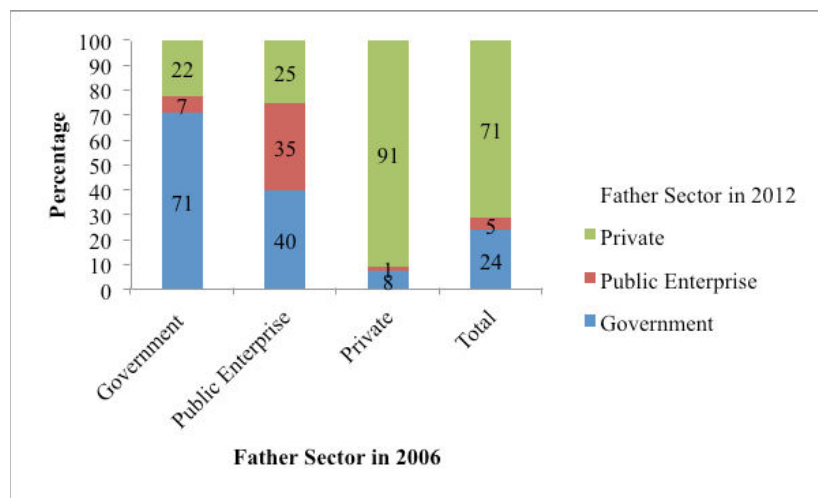


Figure 2.4: Father's sector of work when age 15, as reported in 2006 versus 2012, father not in household in 2006 or 2012, age 30-54 in 2006

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012

Notes: See Table 2.7 for values underlying figure.

One possible factor contributing to inconsistencies and mis-reporting of father's status in particular is whether or not the respondent is actually answering the questionnaire. If, for instance, an individual's spouse is responding to the questionnaire, they will often be in a very poor and uniformed position to answer questions about their spouse's parents' characteristics when their spouse was age 15. For the same sample as in figure 2.4, we examine whether father's sector is consistently reported depending on whether the respondent is (consistently) the individual in question. Responses when the individual in question answers in both 2006 and 2012 are compared to those where the individual in question does not answer in one or both of the waves. Overall, 69.4%

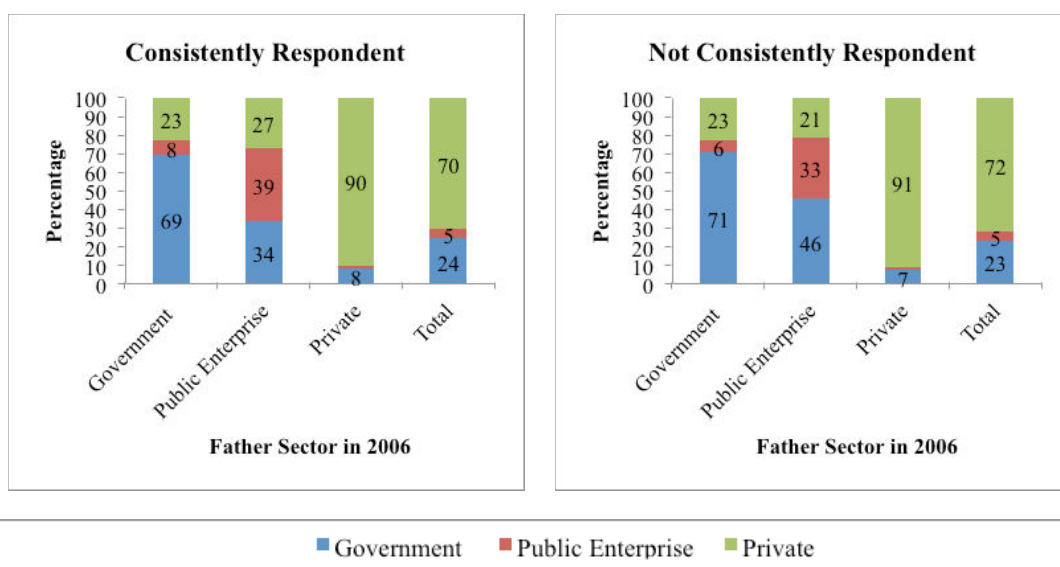


Figure 2.5: Father's sector of work when age 15, as reported in 2006 versus 2012, by respondent, father not in household in 2006 or 2012, age 30-54 in 2006

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012

Notes: See Table 2.8 and Table 2.9 for values underlying figure.

of individuals in the sample were consistently reporting for themselves. The patterns of reporting by respondent are presented in figure 2.5. Having the respondent consistently be the individual in question improves the results at most a little. Reporting of private sector work and public sector work is nearly identical. Only in regards to public enterprise work does having the respondent consistently report appreciably improve consistency, 39% reporting public enterprise in both waves when consistently reported by the respondent and 33% otherwise.

## Recalled costs of Marriage

Understanding the investments individuals have made over time often requires asking about past outlays of expenditure. Individuals are expected to provide the costs of expenditures and investments when they occurred. However, especially when individuals are inferring or reconstructing the value of an investment, for instance inferring the cost of their housing at the time of marriage based on their current cost or value of housing, this can cause problems in assessing trends over time. Essentially, individuals may (fully or partially) update past expenditures from nominal to real terms. Figure

2.6 shows the trends in the total costs of marriage over time for individuals who were married in 2012 and present in both the 2006 and 2012 waves (they may not have yet been married). Marriage is an enormous investment for young people and their families, and the cost of marriage and its trends in Egypt and the MENA region are the subject of substantial concern and discussion (Assaad and Krafft (2015a,2015b); Assaad and Ramadan (2008); Dhillon, Dyer, and Yousef (2009); Salem (no date, 2015,2012); Singerman and Ibrahim (2001); Singerman (2007)). The figure shows both the nominal (reported) costs and the real (inflated to 2012 LE) costs by year, as reported in both 2006 and 2012. Nominal marriage costs are clearly rising over time using both the 2006 and 2012 data, and the difference between those reports (when they overlap) may be due to inflation. Using the 2006 data and 2012 prices, it appears that from 2000 to 2006, marriage costs were flat or slightly declining, and averaged around 60,000 to 70,000 LE. Using the 2012 data and 2012 prices, looking at the same respondents reported marriage costs from 2000 to 2006, it appears marriage costs were flat or slightly declining, but averaged around 90,000 LE. This is clearly inconsistent with what was reported in 2006, even when updated to 2012 prices. It appears individuals are partially (but not fully) updating nominal costs into real terms, as nominal costs for 2000-2006 as reported in 2012 are too high compared to 2006 nominal costs, but real costs for 2000-2006 as reported and then inflated using 2012 data are too high compared to 2006 reports updated into 2012 prices. Additionally, further investigation suggests different elements of marriage costs are updated differentially, likely related to how easy they are to recall or reconstruct.

Continuing to examine the 2012 data out to 2012 in real terms, it appears that marriage costs have fallen substantially over time, from around 90,000 in 2000-2006 to around 60,000-70,000 by 2012. This implies the cost of marriage over the 2000-2012 period decreased almost a third. By this comparison, marriage costs are falling over time. However, looking back at marriage costs as reported in 2001-2006, and updated to 2012 terms, marriage costs have remained essentially constant, in the 60,000-70,000 range (in 2012 LE). This is evidence that, particularly when asked about events that are now a number of years in the past, individuals may be inferring their value or inflating into current terms. Thus suggests that retrospective data should not be used

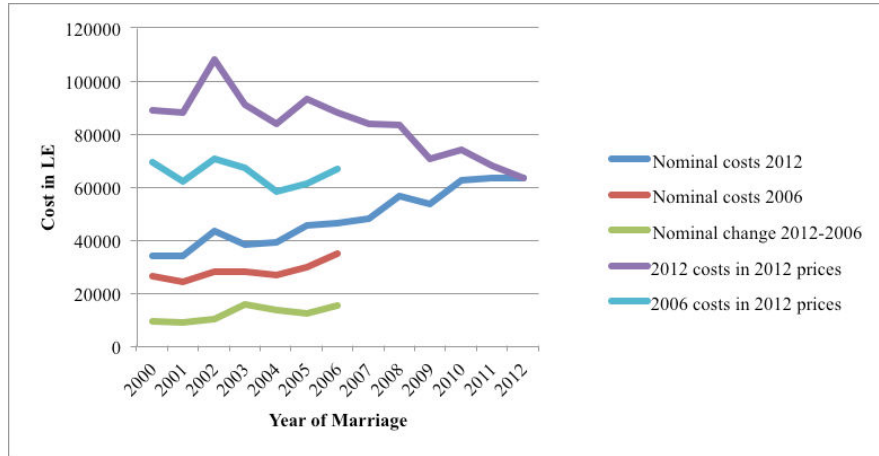


Figure 2.6: Total Marriage Costs, as reported in 2006 versus 2012, respondents in both waves, answering marriage section in 2012 (may not yet have been married in 2006)

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012.

to assess time trends for investments and financial outlays; repeated cross sections or panel data are required. Comparing investments in the few years preceding a survey wave to investments in the few years preceding different survey waves will be more accurate for such cost data.

## 2.4.2 Comparing labor market statuses across retrospective versus panel data

### Alignment of labor market statuses in general

Individuals' labor market statuses, namely whether they are out of the labor force, unemployed, or employed, and if employed, their employment status, are at the heart of labor market surveys. Both the accuracy of individuals' contemporaneous statuses and the accuracy of the labor market histories they report are of great interest. The latter are particularly important for assessing labor market dynamics. This section first assesses whether aggregate statistics vary by data source and then whether individuals report consistently across contemporaneous and retrospective data.

Figure 2.7 presents aggregate labor market statistics by gender for 1998 and 2006 using both contemporaneous statistics from the waves of the panel and retrospective reports from 2012 for those years. Notably, for males the aggregates from both the retrospective and contemporaneous data are quite similar, with a few exceptions. Re-

porting of public sector work, private formal and informal regular wage workers, and self-employment are fairly similar. Irregular wage work is differentially reported in the retrospective data, which is likely because hours of work fluctuate over time; individuals may remain at the same job over time, but report that it is irregular in 2012 and map that back onto their status in previous years. Changes in regularity within the same job are also not captured within the labor market history and are difficult to detect. Employers are more likely to be reported in the contemporaneous than retrospective data.

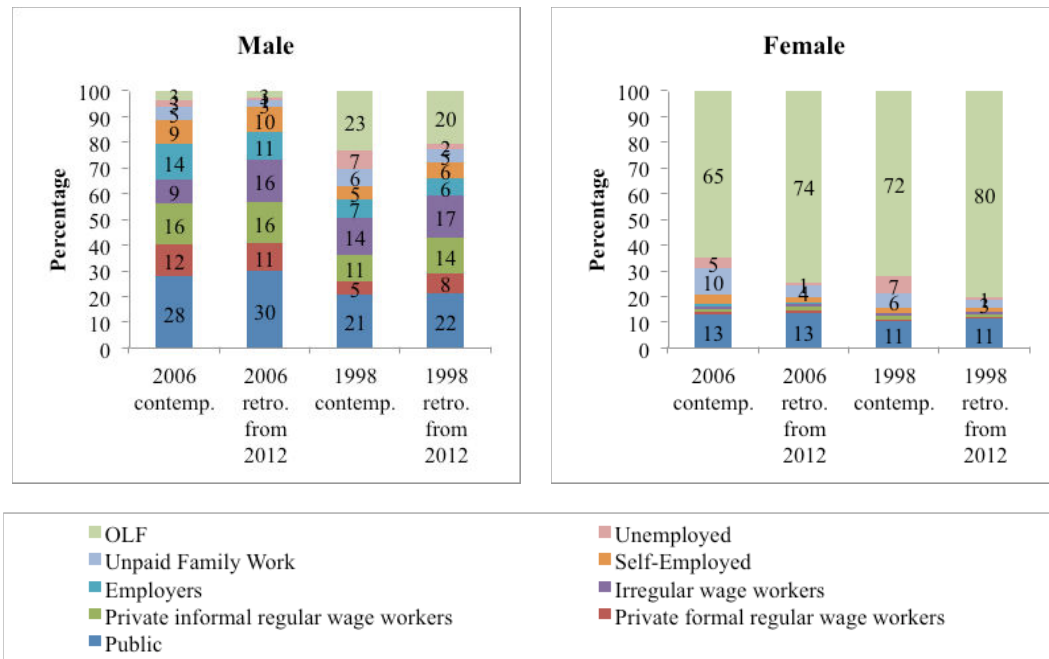


Figure 2.7: Labor market status, as reported contemporaneously for 1998 and 2006 and as reported retrospectively for those years from 2012 data, by sex, respondents ages 30-54 in 2012 present in both waves

Source: Authors' calculations based on ELMPS 1998, ELMPS 2006 and ELMPS 2012

Notes: See Table 2.10 and Table 2.11 for values underlying figure.

For individuals 30-54 in 2012, their ages would have been approximately 24-48 in 2006 and approximately 16-40 in 1998. Thus, it is only in 1998 that many would have been out of or transitioning into the labor force (unemployed). These statuses appear to be under-reported in the retrospective data comparing 1998 contemporaneous data to the retrospective data for 1998 from 2012. For instance, while 7% of males were unemployed in 1998 contemporaneously, in the retrospective data only 2% of males



report being unemployed. Likewise in the 1998 contemporaneous data, more individuals report being out of the labor force. There are so few females in a number of labor market statuses that our assessment focuses primarily on the public sector, unpaid family work, unemployed women, and women out of the labor force. Public sector work is quite consistently reported in the aggregates, which may be due in part to the stability of this employment status. Unpaid family work, which includes subsistence work, is much more frequently reported in the contemporaneous data (6-10% across years) than in retrospective data (3-4%). This may be in part because individuals are only asked the labor market history in 2012 if they report having ever worked in market work, and unpaid family workers may switch into and out of market work, sometimes producing agricultural goods for their own subsistence and sometimes selling them on the market. Unemployment is also more frequently reported in the contemporaneous data than in the retrospective data. This is likely due to the fact that many women who search for work never end up working (Assaad and Krafft, 2014) and thus are not asked the questions in the labor market history. As a result of these patterns in reporting employment, being out of the labor force is higher in the retrospective than contemporaneous data for women.

A number of labor market statuses are particularly prone to misreporting over time, comparing retrospective and contemporaneous data. Figure 2.8 presents the distribution of retrospective statuses going back from 2012 to various years by the status reported contemporaneously from 2006 or 1998 for individuals 30-54 in 2012, by sex. There also is somewhat greater inconsistency comparing 1998 statuses than 2006 statuses, which is likely due to recall deteriorating over time. While public sector employment tends to be reported quite consistently, other labor market statuses are frequently not reported consistently. Formal private sector work tends to be more consistently reported than informal work. Most reporting of wage work is consistent, but the type of wage work is not consistently reported. Distinctions between self-employment and being employers are likewise blurred. Those who were unemployed or out of the labor force show a high degree of inconsistencies. Some of this may be because the duration of these statuses is shorter, so the contemporaneous status may be off relative to the status that is measured as predominant for the year. Females have a much higher

probability than males of reporting that they are out of the labor force (which is their predominant status). Less formal forms of employment in the contemporaneous data, such as being an employer, self-employment, and unpaid family work are particularly likely to be reported as being out of the labor force. Being unemployed suffers from a similar problem, likely, as mentioned earlier, due to the large share of women who are unemployed but ultimately never find work. These patterns, as with education, suggest a number of issues for analyzing labor market statuses and dynamics. For instance, a category of private wage work, incorporating regular formal and informal and irregular workers would be more consistently reported than the disaggregated categories, and transitions between regular/irregular and formal/informal may be poorly reported over time. Self-employment and being an employer also often are mixed up, and might be better combined into a single category. For females, retrospective data should be treated with particular caution, as women may not report ever working when they have done so, or report being out of the labor force when they were in fact working in the private sector. Although it is not certain from the comparison of the contemporaneous and retrospective data which is correct, contemporaneous information on women's status shows greater differences from retrospective data than the same comparison for men.

Using more aggregated categories of employment status leads to somewhat greater consistency in responses. Figure 2.9 compares the distribution of retrospective statuses going back from 2012 to various years of by the status reported contemporaneously from 2006 or 1998, using only four categories: public, private wage, non-wage, and not working. Public sector wage work continues to be the most consistently reported category, as before. For males, private wage work is fairly consistently reported comparing 2012 retrospective statuses to 2006 (72%) and 1998 (66%). More males tended to report that they were not working retrospectively who were working in private wage work in 1998 (10%) than 2006 (3%). Only around half of those who reported being non-wage workers in 1998 or 2006 reported the same status in the retrospective data (55% for 2006 and 47% for 1998). Most of the remainder reported private sector wage work. Although half (57%) of those who reported not working in the 1998 wave also reported not working in the 2012 retrospective data for 1998. Despite the recall time

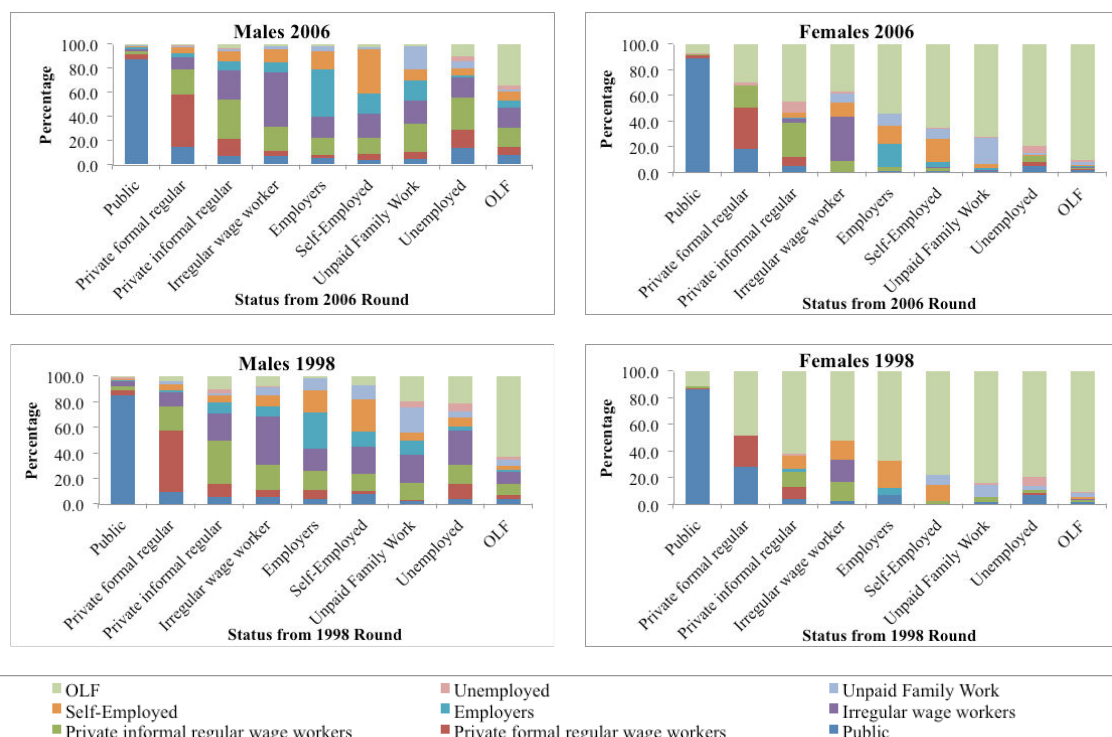


Figure 2.8: Labor market status, as reported in 1998 or 2006 versus 2012 retrospective data for 1998 or 2006, by sex, respondents ages 30-54 in 2012 present in both waves

Source: Authors' calculations based on ELMPs 1998, ELMPs 2006 and ELMPs 2012

Notes: See Table 2.12, Table 2.13, Table 2.14, and Table 2.15 for values underlying figure.

being shorter, there was less consistency between those who reported not working in 2006 and the 2012 recall data for 2006 (27% consistency). This may be because those males 30-54 in 2012 were 16-40 in 1998, and therefore were more likely to have a long-term status of not working (preceding entry into work for the first time). Those males 30-54 in 2012 were 24-48 in 2006, and so time spent not working would more likely have been short in duration. Not working, for instance short spells of unemployment, may not have even met the definition for a status lasting six months and therefore not been included in the labor history.

Although aggregating labor market statuses causes some important improvements in consistency across males' labor market histories and contemporaneous statuses, there is less improvement in consistency in females' statuses, primarily because they fail to report employment at all. Those in public sector work according to their 1998 or 2006 reporting do consistently report that in the retrospective data and those not working according to the 1998 and 2006 waves report not working in the retrospective status. However, less than half of those in private wage work in one wave reported this in their retrospective data for 2012 (43% for 2006 and 24% for 1998). Consistent reporting of non-wage work is even lower (27% for 2006 and 13% for 1998). The inconsistencies are primarily due to individuals saying they were not working at the time. Further examination of the data demonstrated that a key problem is detection of whether women ever worked at all. Among the women examined, just two-thirds (67%) of those who were identified in 2006 as engaging in market work reported that they ever worked in 2012. Likewise just 73% of females who were identified as engaged in market work in 1998 reported ever working in 2012. This was not a problem for men (<1%). The problem was driven by women who were no longer working in 2012; all of those working in 2012 were, of course, identified as having ever worked. However, among women who were not working in 2012 but were working in 2006, only 16% reported ever working in 2012. Among women who were not working in 2012 but were working in 1998, only 18% reported ever working in 2012. Only those who report ever working are asked the labor market history, and thus these women are considered to never have worked and no labor market history data is collected.

We had initially expected substantially more consistent reporting of labor market

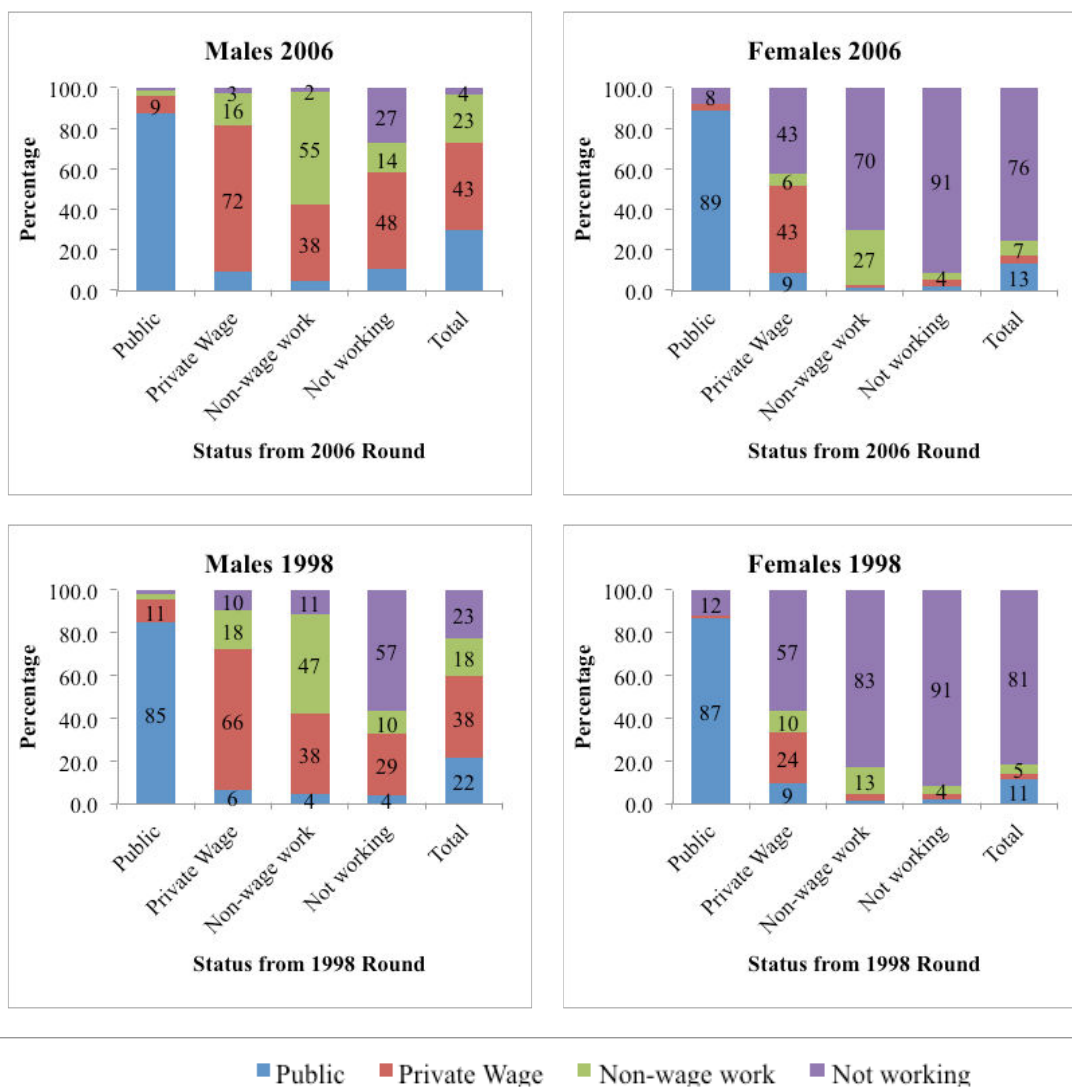


Figure 2.9: Collapsed labor market status, as reported in 1998 or 2006 versus 2012 retrospective data for 1998 or 2006, by sex, respondents ages 30-54 in 2012 present in both waves i.e. Status in 1998 or 2006 from 2012 retrospective data.

Source: Authors' calculations based on ELMPS 1998, ELMPS 2006 and ELMPS 2012

Notes: See Table 2.16, Table 2.17, Table 2.18, and Table 2.19 for values underlying figure.

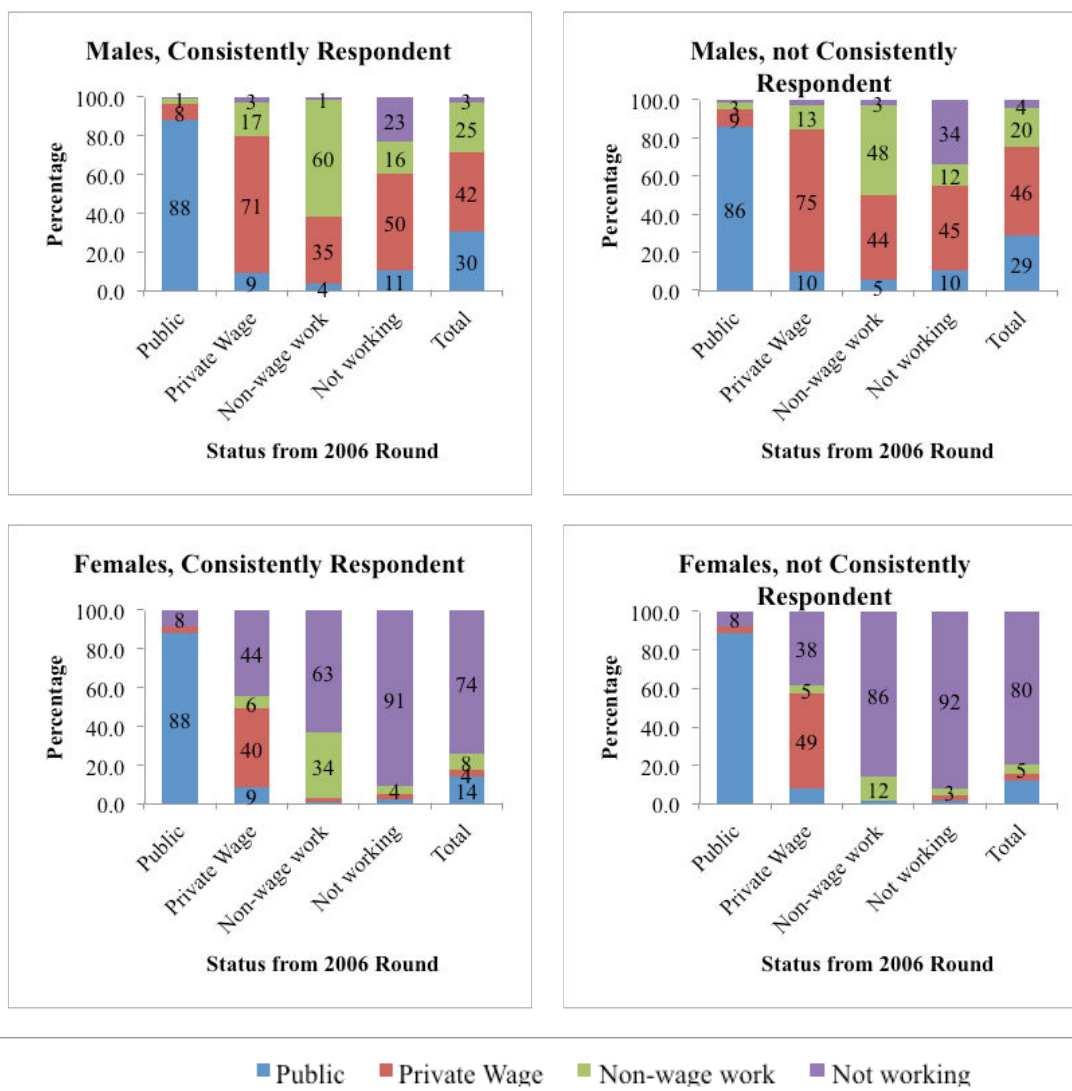


Figure 2.10: Collapsed labor market status, as reported in 2006 versus 2012 retrospective data for 2006, by sex and reported, respondents ages 30-54 in 2012 present in both waves i.e. Status in 2006 from 2012 retrospective data

Source: Authors' calculations based on ELMPS 1998, ELMPS 2006 and ELMPS 2012

Notes: See Table 2.16, Table 2.17, Table 2.18, and Table 2.19 for values underlying figure.

statuses when the respondent was the reporter. However, that does not appear to be the case. Figure 2.10 shows the collapsed labor market statuses by sex and reporter status comparing the 2006 contemporaneous data to the 2012 retrospective data for 2006. Some statuses are more consistently reported but others are not. For men, consistency in reporting public sector work is slightly higher but for women rates are similar. For both men and women private wage work is lower when the individual is consistently the respondent. When the individual reported being a non-wage worker in the 2006 wave, for both males and females this is much more consistently reported when the respondent is reporting (60% consistency for males when the individual is consistently the respondent, 48% if not and 34% consistency for females when the individual is consistently the respondent, 12% otherwise). Reporting not working tends to be more consistent for males when the individual is not consistently the respondent, but is similar for females. The lack of higher consistency when the individual is reporting for him or herself could be due to a variety of reasons. It may be that respondents are more accurate reporters, but not necessarily more consistent reporters, in that when others are reporting on behalf of an individual they provide consistent but potentially inaccurate responses, or increase consistency by simplifying the labor market history.

Further analysis of the data demonstrated that reporting whether women ever worked at all varied substantially by the respondent. Among the women examined where the respondent was not providing data, just 55% of those who were identified in 2006 as engaging in market work reported that they ever worked in 2012, compared to 71% when the respondent was consistently the individual. Among women who were not working in 2012 but were working in 2006, only 11% reported ever working in 2012 when it was not consistently the respondent reporting, and only 19% when it was the respondent reporting. While both illustrate extremely low rates of reporting work, having the respondent as the reporter did lead to increased accuracy in regards to ever working.

### **Recalling past unemployment spells**

While in the aggregate labor market statistics are not substantially different, the inconsistency of individuals' responses over time is troubling. This section attempts to

analyze some of the patterns and sources of disagreement in the data sources, focusing on the case of unemployment, the occurrence and duration of which is of particular interest within the Egyptian and MENA labor markets (Assaad and Krafft (2014); Kherfi (2015)). The inconsistencies between contemporaneous unemployment and retrospective unemployment reporting could be occurring for a variety of reasons. Because only individuals who ever worked are asked the retrospective questions, excluding women who sought for but never began work, this section focuses solely on the unemployment dynamics of individuals who ever worked and examines several different questions essentially revolving around the issue of why there are inconsistencies across the data sources. Do individuals report unemployment in their retrospective histories, but just during a different year? Are shorter spells of unemployment more likely to be forgotten over time? Are certain characteristics related to misreporting unemployment?

Since the primary concern is that unemployment is under-reported in the retrospective data, in Table 2.1, for those who reported unemployment in the 2006 or 1998 waves<sup>7</sup>, we examine the reports of unemployment in the retrospective data and a number of characteristics, including the mean current unemployment duration at the time of survey, and the percentage of individuals who experienced short (less than six month) current unemployment durations as of the time when they were surveyed. Notably, for those unemployed in the contemporaneous data for 1998, just 9% of unemployment statuses in the 2012 retrospective data for 1998 included a report of unemployment. The alignment was slightly better in 2006, when 13% were aligned. Individuals who were unemployed in 2006 were more likely to report unemployment within one year (5%) or two-five years (12%) than those unemployed in 1998 (1% reported unemployment within one year and 7% within two to five years). More individuals reported being unemployed at some point more than five years out in 1998 (11%) than in 2006 (7%). Reporting of unemployment is less accurate, both in terms of reporting at all and the timing of unemployment, going further back in time. Notably, 71% of individuals who were contemporaneously unemployed in 1998 did not ever report being unemployed in the labor market histories. Because the labor market histories in 2012 go forward in time, it is possible that unemployment occurred after the fourth status (the last status

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<sup>7</sup>Data is not separated by gender or restricted by age so as to ensure an adequate sample size.



asked in the labor market history). Therefore, those with a fourth status are separated out, and comprise a small share of the distributions (6% for those unemployed contemporaneously in 1998 and 4% of those in 2006).

The characteristics of unemployment, specifically its duration to date as of the contemporaneous status reported in 1998 or 2006, are related to the probability of accurately reporting. Those whose reporting aligned had, on average, long durations of unemployment to date, 23 months in 1998 and 16 months in 2006. Those who reported their unemployment but with imprecise timing tended to have shorter durations of unemployment than the average, a year or less. Those who never reported being unemployed in the retrospective data had slightly longer than average unemployment durations. Those unemployed contemporaneously in 1998 they were more likely to have short durations than average, but for the 2006 group they were actually slightly less likely. Overall, it appears that gathering data on historical patterns of unemployment, even among those who ever worked, is likely to produce substantially different results than using contemporaneous data. It seems likely that retrospective data will both under-report past unemployment and distort its characteristics.

Comparison to retrospective data	Dist. 1998	Mean current unemp. dur. mos. 1998	% less than six months 1998	Dist. 2006	Mean current unemp. dur. mos. 2006	% less than six months 2006
Aligned	9	23	26	13	16	31
Unemployed within one year +/-	1	0	22	5	5	24
Unemployed within two-five years +/-	7	12	33	12	9	38
Unemployed more than five years +/-	11	8	31	7	7	46
Never unemployed but have a fourth status	6	15	35	4	27	31
Never unemployed no fourth status	65	22	41	59	22	29
Total	100	19	37	100	18	32
N	261	261	261	443	443	443

Table 2.1: Patterns of unemployment reporting as reported in 1998 or 2006 versus 2012 retrospective data for 1998 or 2006, respondents reporting contemporaneous unemployment in 2006 or 1998 and present in 2012

Source: Authors' calculations based on ELMPS 1998, ELMPS 2006 and ELMPS 2012

Having the respondent reporting for his or her self does not substantially improve the reporting of unemployment. Table 2.2 presents the patterns of unemployment reporting by gender and whether or not an individual was consistently the respondent.

Males are less likely to report their unemployment as aligned overall (8% for males, 26% for females) with similar rates for those reporting consistently for themselves and otherwise. Overall, males are slightly less likely to report never being unemployed and have no fourth status if responding for themselves consistently (63%) than if otherwise (67%), but the opposite is true for women, among whom 48% of those responding for themselves report never being unemployed and have no fourth status, compared to 40% of those not consistently responding for themselves.

	Not consist. resp.	Male consist. resp.	Total	Not consist. resp.	Female consist. resp.	Total	Not consist. resp.	Total consist. resp.	Total
Aligned	8	7	8	29	25	26	13	13	13
Unemployed within one year +/-	4	5	4	4	6	6	4	5	5
Unemployed within two-five years +/-	10	14	13	4	12	10	9	13	12
Unemployed more than five years +/-	7	7	7	20	5	9	10	6	7
Never unemployed but have a fourth status	4	4	4	3	4	4	3	4	4
Never unemployed no fourth status	67	63	65	40	48	46	61	59	59
Total	100	100	100	100	100	100	100	100	100
N (Obs.)	120	194	314	35	94	129	155	288	443

Table 2.2: Patterns of unemployment reporting as reported in 2006 versus 2012 retrospective data for 2006, by gender and whether consistently respondent, respondents reporting contemporaneous unemployment in 2006 and present in 2012

Source: Authors' calculations based on ELMPS 1998, ELMPS 2006 and ELMPS 2012

## Multivariate models of alignment between retrospective and panel data

Particularly concerning in assessing measurement error is whether errors are systematic (related to covariates). Such relationships will bias any attempts to examine the relationship between covariates and mis-measured outcomes. To assess whether there are systematic patterns of misreporting, in Table 2.3 we run probit models for whether individuals' responses about their contemporaneous (panel) data in 1998 and 2006 were consistent with their (2012) retrospective data for those years. Models are restricted to those 30-54 in 2012 and run separately for males and females and therefore allow for a comparison of how characteristics are related to reporting both by gender and over varying retrospective spans from 2012. The probability of alignment in reporting is high for the reference case, a 30-34 year-old university educated individual living in Greater Cairo, who did not consistently respond for him or her self, was a public wage worker in the 1998/2006 contemporaneous (panel) data, was employed in

2012, was a regular worker in 2012, and was a formal worker in 2012. For retrospective data referring to 1998, the reference case has a probability of alignment between retrospective and panel data of more than 0.9. This is actually lower, around 0.8, for retrospective data referring to 2006. Those 30-54 in 2012 would have been 24-48 in 2006 and 16-40 in 1998. Individuals may have an easier probability with retrospective recall about first statuses than subsequent non-current statuses that causes the 1998 data, with more first statuses, to be more consistent. Compared to the university educated, for males recalling distant (1998) statuses, all other education levels perform significantly worse, but this pattern does not hold for females or males recalling less distant (2006) statuses.

For males, compared to those 30-34 in 2012, those 35-44 in 2012, but not those 45-50 had significantly less alignment. For women there was at most a small increase in consistency in reporting among older females (45-50) for more recent (2006) statuses. Few regional differences occurred, with only slightly better alignment in Upper Egypt for male's more recent (2006) statuses. After controlling for other characteristics, there were not significant differences in consistency dependent on whether or not the respondent was consistently the individual in question. Where large differences did occur was by both the retrospective status and 2012 employment characteristics. Compared to public wage workers in the contemporaneous data (1998/2006), private wage workers were significantly less likely to have consistent reports, non-wage workers even more so. For men, those not working in the contemporaneous data were also significantly less likely to report consistently, but there were no such differences for women. The magnitude of the differences is substantial; non-wage males had around a 30 percentage point higher probability of disagreement, and non-wage women 66-72 percentage points. For males, there are mixed differences comparing the effect sizes back to 2006 versus 2012. For females, more recent reporting is consistently more aligned, although not by large margins. In terms of 2012 employment characteristics, females not employed in 2012 are significantly more likely to consistently report their 1998 status, but not their 2006 status, while for males those not employed in 2012 are significantly less likely to report their 2006 status but not their 1998 status. Both males and females who were irregular in 2012 were significantly less likely to report their 2006 statuses consistently

	1998 Male	1998 Female	2006 Male	2006 Female
Reference Case Probability:	0.927	0.918	0.811	0.796
Own Education (Univ. omitted)				
Illit. or R&W	-0.185***	0.017	-0.011	0.051*
	-0.042	-0.028	-0.028	-0.022
Basic	-0.225***	0.021	-0.021	0.049
	-0.04	-0.032	-0.028	-0.027
Secondary	-0.196***	-0.047	-0.026	0.028
	-0.03	-0.026	-0.023	-0.021
Age group in 2012 (30-34 omit.)				
35-39	-0.132***	-0.042*	-0.012	-0.002
	-0.033	-0.018	-0.021	-0.017
40-44	-0.136***	-0.067**	-0.008	0.017
	-0.041	-0.022	-0.024	-0.017
45-49	-0.049	-0.041	0	0.033*
	-0.042	-0.022	-0.026	-0.016
50	-0.021	-0.037	0.031	0.042*
	-0.044	-0.021	-0.027	-0.018
Region (Gr. Cairo omitted)				
Alex. and Suez Canal	0.027	0.032	-0.003	0.022
	-0.043	-0.027	-0.032	-0.024
Urban Lower	0.067	0.052	0.046	0.037
	-0.04	-0.027	-0.029	-0.022
Urban Upper	0.057	0.03	0.071*	0.028
	-0.038	-0.024	-0.029	-0.021
Rural Lower	0.008	0.03	0.025	0.007
	-0.039	-0.026	-0.026	-0.02
Rural Upper	0.066	0.038	0.058*	0.012
	-0.041	-0.025	-0.028	-0.021
Consist. Respondent (Not consist. omit.)				
Consist. resp.	-0.011	0.001	0.005	0.018
	-0.027	-0.018	-0.016	-0.012
Panel (1998 or 2006) employment status (public wage omit.)				
Private wage	-0.105**	-0.604***	-0.137***	-0.459***
	-0.037	-0.088	-0.025	-0.052
Non-wage	-0.305***	-0.718***	-0.290***	-0.663***
	-0.042	-0.052	-0.025	-0.033
Not working	-0.276***	0.005	-0.547***	-0.017
	-0.041	-0.036	-0.037	-0.026
2012 Employment chars.				
Not employed in 2012	-0.054	0.224***	-0.202***	0.005
	-0.061	-0.041	-0.044	-0.024
Irregular in 2012	-0.07	-0.127	-0.082***	-0.269**
	-0.036	-0.1	-0.021	-0.084
Informal in 2012	-0.01	-0.111***	0.008	0.052
	-0.029	-0.03	-0.021	-0.043
N(Obs.)	2408	2465	4540	4656

Table 2.3: Probit model marginal effects for the probability of alignment of reporting between contemporaneous 1998 or 2006 and 2012 retrospective data by sex, respondents in 2006 or 1998 and present in 2012, ages 30-54 in 2012

Source: Authors' calculations based on ELMPs 1998, ELMPs 2006 and ELMPs 2012

but not their 1998 ones, possibly due to the rising volatility of their employment being relatively recent (Assaad and Krafft, 2015c). Those males who were informal in 2012 were significantly less likely to report their 1998 status consistently. Overall, there are mixed relationships between 2012 status and recall of past statuses, but definite disagreements related to the contemporaneous (panel) employment type in the preceding 1998 or 2006 wave.

### **2.4.3 4.3 Comparing labor market transition rates across retrospective versus panel data**

An important application of retrospective and panel data on labor market statuses is measuring transition rates between different labor market statuses in order to assess labor market dynamics. We have demonstrated that there could be substantial misalignment between contemporaneously measured statuses and ones measured by means of retrospective questions, but also that the overall distribution of statuses is fairly similar (Figure 2.7). If the measurement errors are primarily an issue of random errors in the reporting of the timing of statuses, measures of labor market transition rates could still be fairly sound. However, if entire statuses are lost (as appears to be the case for unemployment), then measures of labor market dynamics will be understated and will point to a more rigid labor market than is actually the case. Because the ELMPS contains three panel waves, it is actually possible to assess labor market transition rates by using either purely retrospective or purely panel data. This section specifically compares transition rates, by status, from 1998 to 2006, based at first on the 1998 and 2006 panel data, and second, on the retrospective data collected in 2012 for 1998 and 2006. This analysis is performed only for individuals who appear in all three waves and who were 30-54 in 2012. The status used for classification purposes comes from either the retrospective or the panel data, depending on which data are being used to calculate the transition rates.

There are some key points to keep in mind when considering this comparison. The contemporaneous status is (as is the case throughout this paper) the “usual” status in the 3-month period preceding the survey, if an individual is employed. In the retrospec-

tive data coming from the labor market history module of the survey, statuses have to be at least six months long to be reported. It is therefore likely that in the panel data some of the transitions that are detected relate to statuses that lasted less than six months and that would not be observed by definition in the retrospective data. This would tend to inflate panel data transition rates upward, but probably not by much. We know from the 2012 contemporaneous data that only 1.6% of employed individuals have a different primary job in the reference week than in the reference three months, suggesting that short-term transitions are rare. Transition rates in the panel data are therefore only likely to be inflated by a few percentage points at most. Although the probability of reporting statuses across panel and retrospective data is fairly similar (Figure 2.7), the differences that do exist are going to affect the measurement of transition rates as well.

In Figure 2.11, the rates of change in the various labor market statuses are assessed using panel and retrospective data sources, according to the 1998 status. Notably, transition rates for males are under-stated by about half in the retrospective data relative to the panel data (35% versus 59%) and by about two-thirds for females (9% versus 33%). Looking across statuses, every employment status in 1998 suffers from under-reporting problems, but to varying degrees. For males, transitions out of unemployment and OLF statuses are fairly comparable, but this is not the case for females.

As well as differential rates of change, there are differential patterns of change in terms of which transitions are detected or not detected (not shown). More subtle transitions, such as transitions from informal to formal private wage work or from employer to self-employed and vice versa, are more likely to be missed in the retrospective data. More distinctive transitions-such as those between public and private sector jobs and between wage and non-wage work are also somewhat under-reported in the retrospective data, but to a lesser extent. Particularly for women, the retrospective data is less able to detect transitions into and out of the out of the labor force. The problems associated with detecting employment even contemporaneously among marginally employed women in agriculture and animal husbandry in Egypt are well known (Anker (1995); Assaad (1997); Langsten and Salen (2008)). These problems are compounded when the question refers to a reference period well in the past. Women in the public

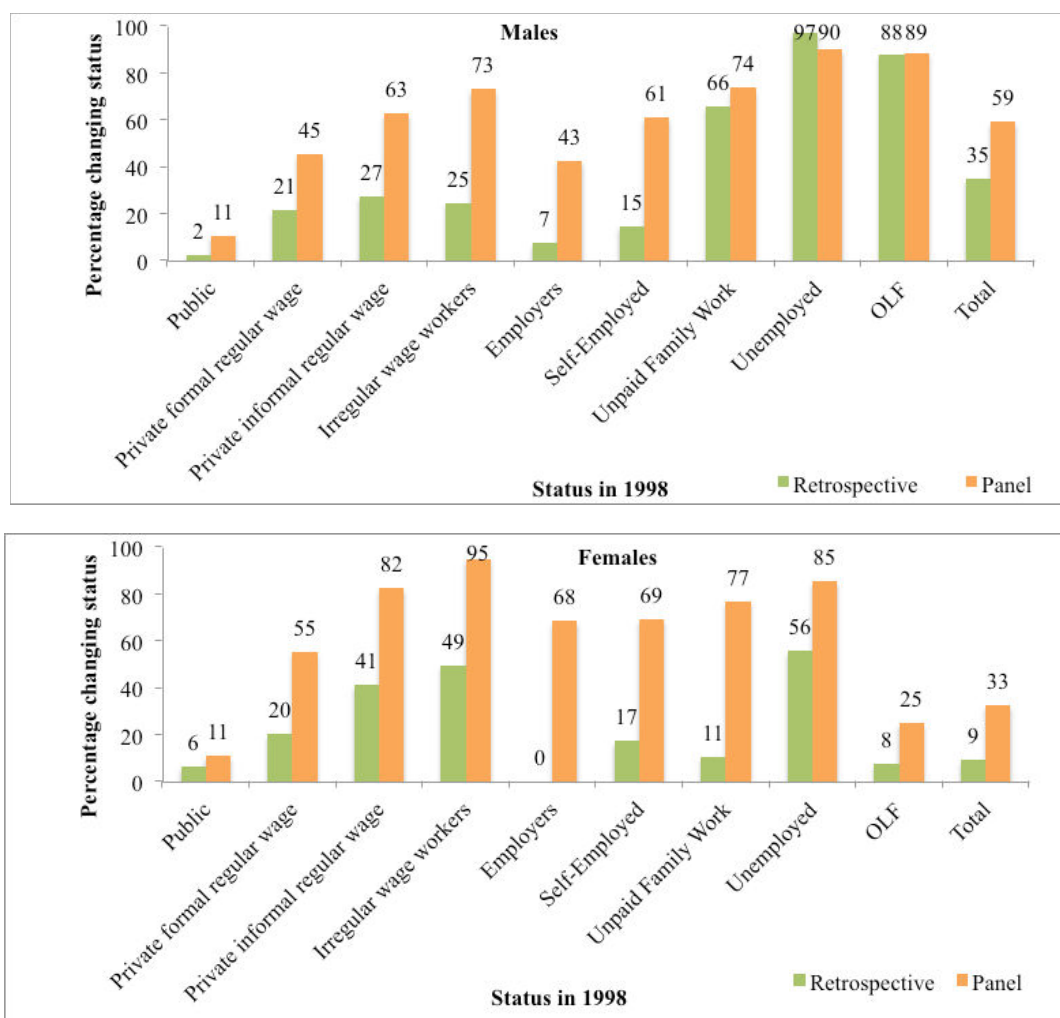


Figure 2.11: Rates of status change in panel data for 1998 to 2006 versus rates of status change in retrospective data from 2012 for changes from 1998 to 2006 by sex and status in 1998

Source: Authors' calculations based on ELMPS 1998, ELMPS 2006 and ELMPS 2012 // Notes: Based only on individuals in all three waves. Status in 1998 is from either retrospective or panel data depending on whether transition rates are being examined for retrospective or panel data. See Table 2.20 for values underlying figure.

sector are much more likely to report being employed in the past. Since they typically have low transition rates, this tends to understate overall transition rates for women.

#### **2.4.4 Comparing the levels and trends of annualized labor market transitions rates across two sets of retrospective data from different waves of the survey**

##### **Measuring annualized transition rates from retrospective data**

In order to further investigate the extent to which the ELMPS retrospective data suffers from measurement problems, we compare the transition probabilities obtained from the retrospective data for the same time period as assessed by different waves of the survey. This analysis could serve as a guide for researchers wishing to use similar surveys to generate annualized data from retrospective questions. Our overall conclusion is that retrospective data tends to greatly understate the degree of dynamism of the labor market and the longer the recall period, the greater the information loss.

The retrospective data from the ELMPS suffers from two major problems, the first being the typical recall bias that attenuates the number of past transitions and the second being the tendency of respondents to only recall past employment spells and overlook non-employment spells. The latter problem may be an artifact of the confusion on the part of interviewers and respondents between past labor market statuses and past jobs. Accordingly, this section aims to deliver two key messages about the retrospective data obtained from the ELMPS surveys. First, transition rates tend to be underestimated when calculated using the annualized retrospective data. Second, the time trends of these transitions are relatively reliable when analysing job-to-job flows, especially if the time-series curves are smoothed. However, the trends for job/non-employment flows are not well identified; these trends are distorted not only because of recall errors but also due to the way the labor market history questions are interpreted in the field. Throughout the retrospective accounts, non-employment spells are often skipped, whether they are initial spells preceding first employment or interim spells between two employment statuses.

To illustrate some of the challenges in working with retrospective data, we demon-



strate three different approaches to constructing retrospective data on the labor market. Firstly, a naive basic panel of annualized labor market statuses is constructed using only the retrospective chapter of the questionnaire. Respondents are therefore limited to individuals who have ever worked and who report their past labor market statuses. Second we augment this labor market history data with information about recent unemployment spells from the current unemployment section of the questionnaire. We also incorporate information from the life events calendar on the timing of non-employment spells of those who are currently out of the labor force. We refer to this type of retrospective panel data as the “augmented panel”. Finally, we incorporate information from those who have never worked, which should be considered in all analyses of dynamics. By means of this analysis, we show that it would be quite misleading to rely only on the labor market history information for those who have ever worked to assess labor market dynamics. For these retrospective data to be useful, they must be combined with the information on current unemployment for new entrants as well as those who ever worked and with the longer employment history obtained from the life events calendar. The dynamics we focus on are primarily the job finding ( $f$ ) and separation rates ( $s$ ), which can be defined as the share of employed,  $E$ , and non-employed,  $NE$ , changing states over time,  $t$ ;

$$f = \frac{NE_{t-1} - E_t}{NE_{t-1}} \quad (2.1)$$

$$s = \frac{E_{t-1} - NE_t}{E_{t-1}} \quad (2.2)$$

### Separation rates

Turning first to the dynamics of separation rates, Figure 2.12 compares the differences across the three different annualized retrospective data construction approaches using the 2012 retrospective data. The ELMPS 2012 questionnaire was redesigned to ask about the past labor market statuses in a chronological order. Consequently, the

fourth status does not necessarily coincide with the current status for certain individuals and moving from the labor market history data to the current state information detects additional separations. Since separation rates are calculated relative to the employed, adding in the never worked is irrelevant. The addition of the life events calendar in the ELMPS 2012 might have also played a role, given that now individuals who have gone recently out of the labor force have been captured, using the start date of their inactivity status.

Although some dynamics are still missing in the new ELMPS 2012 design, as we show below, the new structure of the retrospective questionnaire has generated smaller bias in the dynamics obtained using the ELMPS 2012 than those obtained using the ELMPS 2006 and the ELMPS 1998, especially when going back further in time. Yet a substantial amount of information about states individuals have occupied between the fourth status of the labor market history and the current status is lost. According to calculations from ELMPS 2012, about 34% of individuals who ever worked and had a fourth status have exited that status. These two points indicate that while the new design represents an improvement in the retrospective chapter in the questionnaire, the addition of a fifth and sixth status to the labor market history section of the survey might be valuable.

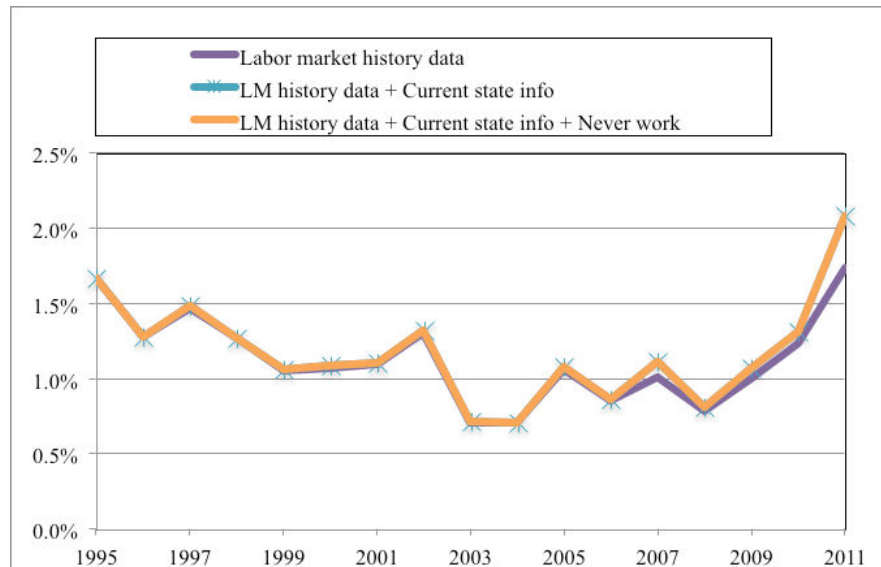


Figure 2.12: Comparing retrospective panels for employment to non-employment separation rates, males 15-54 years of age, 1995-2011

Source: Authors' calculations based on ELMPS 2012

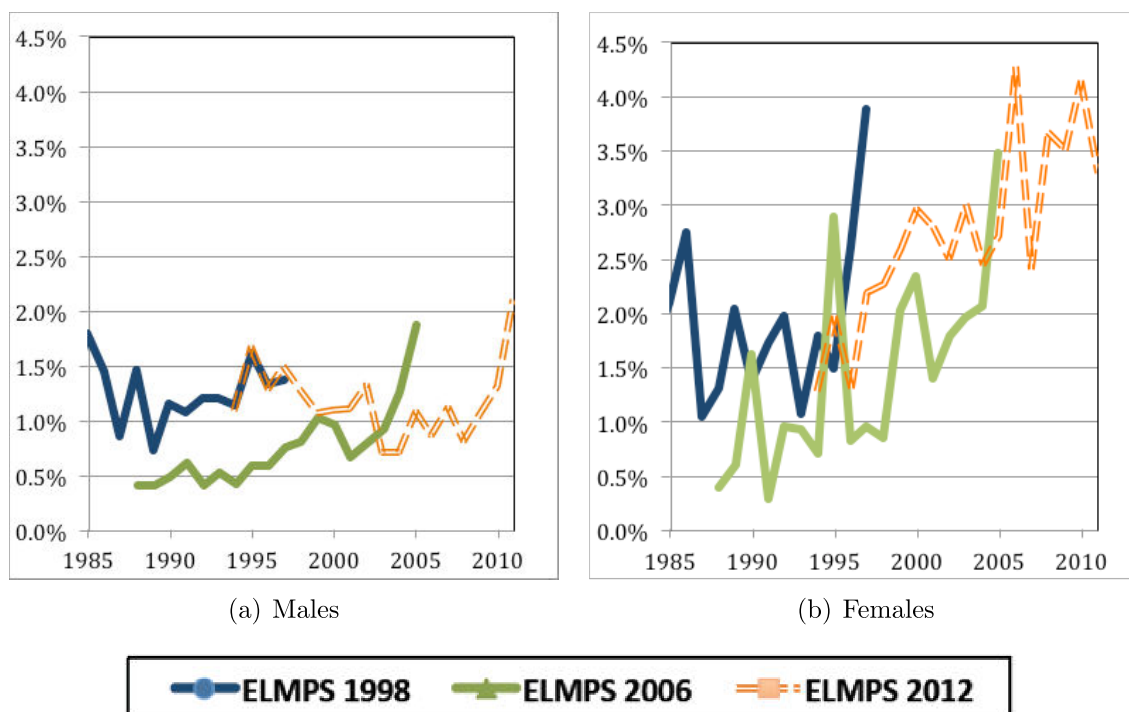


Figure 2.13: Employment to non-employment separation rates by sex and wave, augmented panel, 15-54 years of age, 1985-2011

Source: Authors' calculations based on ELMPS 2012

Using the augmented panels of the three waves of the survey, in figure 2.13 we overlap the separation rates calculated over the years. This is done for both male and female workers between 15 and 54 years of age in year  $t$ . A remarkable jump in the separation rates in the most recent year of each survey is observed. This tends to be true for both men and women but is much more pronounced in the male workers' trends.

It may be the case that individuals lose accuracy as we ask them to recall labor market states further in the past. At this stage we can not confirm if this bias is attributed to a recall error measurement or to a questionnaire design issue. One additional possibility is that the jump in these separation rates is because people declare having lost their jobs right before the year of the survey out of fear that enumerators are tax collectors. The latter argument is unlikely given all the evidence about the underestimation of unemployment as retrospective data are overlapped with previous waves of the panel in the previous section. Overall, non-employment spells and therefore separation rates of workers are underestimated through the individuals' retrospective accounts.

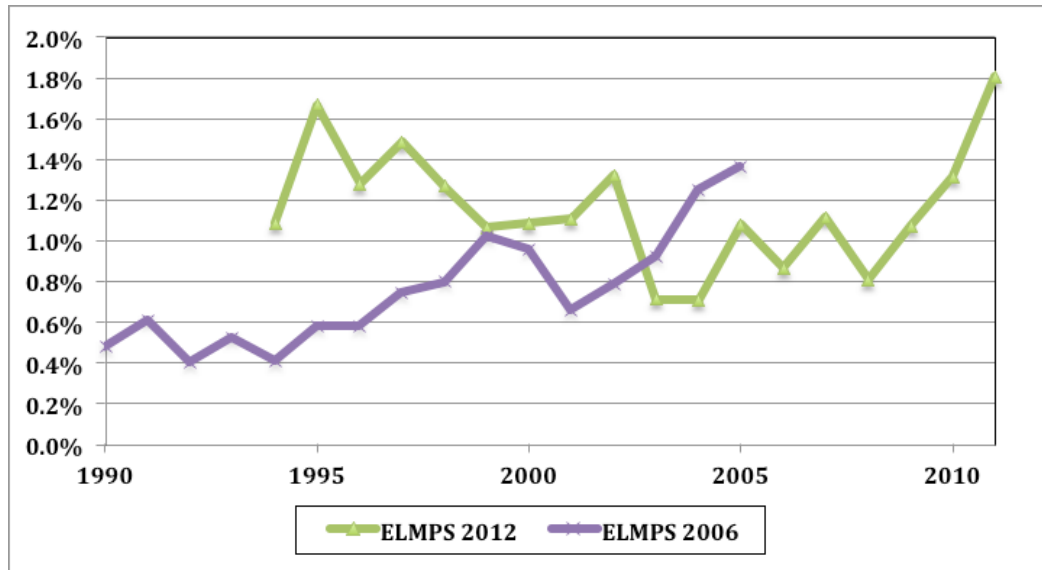


Figure 2.14: Employment to non-employment separation rates by wave, males ages 15-54, using augmented panels with unemployment spells greater than or equal to six months

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012

Given that the survey was designed to capture only retrospective labor market statuses that last for more than 6 months, we modify the way our retrospective panels are augmented. By including all currently unemployed individuals, we might have captured current unemployment spells that would have lasted less than 6 months. Although this might actually be giving us a more accurate picture of dynamics in the labor market, we reclassify, for comparability, those short unemployment spells as employment lags. In the ELMPS 2012 and ELMPS 2006, those would be the unemployment spells that started during the second half of the years 2005 (for the ELMPS 2006) and 2011 (for the ELMPS 2012). This might actually bring up how crucial it is to analyze short-term unemployment spells in a separate chapter in future surveys.

In Figure 2.14, we replot the employment to non-employment separation rates for males using the reclassified augmented data. The separation rate increase in the year preceding the survey is of a smaller magnitude. Yet, we still note the increasing trend in the separation time series. We again note that the ELMPS 2012, most likely to the chronological design of the retrospective accounts, is doing a better job than the ELMPS 2006 in capturing the transitions of individuals that are further back in time. Still, if we take more recent rates as true, both are underestimating the employment

to non-employment transitions.

As a further investigation into how employment to non-employment transitions are under-estimated using retrospective panels, we repeat the above exercise making a distinction between unemployment and inactivity states. We replot the three separation rate time series, first using employment to unemployment transitions then second using employment to inactivity transitions. Figure 2.15 and Figure 2.16 show that the jump in the separation rates continues to appear for both types of separations, although this may be due, in part, to including statuses lasting less than six months. The increase in the employment-to-inactivity separations seem to increase gradually over the most recent two years while the jump occurs suddenly for the unemployment separations.

If we examine the age distributions of these separations by year, throughout our observation period separations are concentrated around the age of 20 for employment to inactivity transitions and late twenties for the employment-to-unemployment transitions. This age distribution helps explain the under-reporting of these transitions in the retrospective section. These are interim non-employment spells that occur at early stages of an individual's labor market trajectory. Only the most recent non-employment spells are reported, while past job statuses are merged or over-reported.

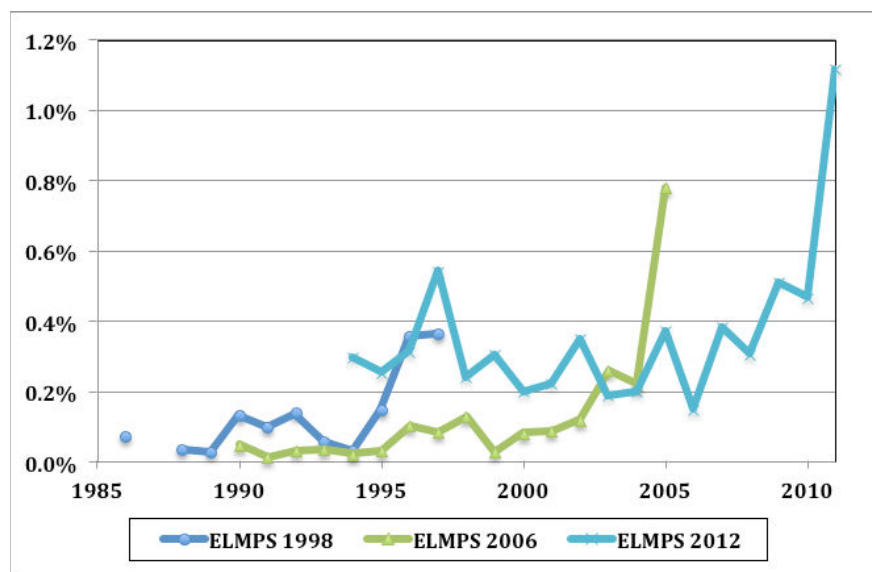


Figure 2.15: Employment to unemployment separation rates by wave, males ages 15-54, using augmented panel data

Source: Authors' calculations based on ELMS 1998, ELMPS 2006, and ELMPS 2012

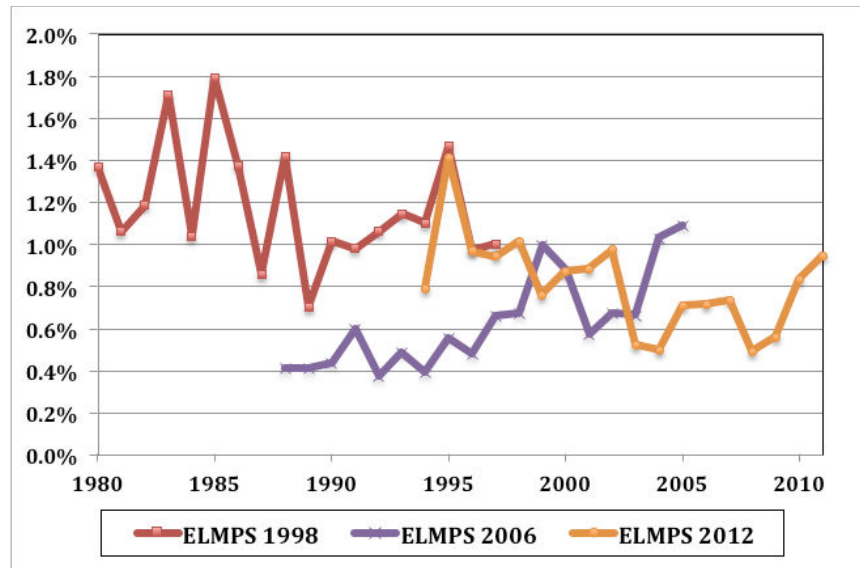


Figure 2.16: Employment to inactivity separation rates for male workers between 15 and 54 years of age

Source: Authors' calculations based on ELMS 1998, ELMPS 2006, and ELMPS 2012

Apart from measurement error issues, the observed dynamics confirm the static nature of the Egyptian labor market once an individual gets stabilized in a job. A lot of churning occurs among the young, either between employment and unemployment until they find what is probably a “suitable” job from their perspective, or either between employment and inactivity, most likely for their military service. This explanation does not mean however that if we exclude the young age group from our sample, we avoid this separation uptick.

### Job-finding rates

Moving now to the dynamics of the job finding process, recall that these rates are the flow of workers from non-employment to employment relative to the stock of non-employed. In this case, augmenting our retrospective panels, first with the currently unemployed and then with the never worked does make a difference. Figure 2.17 shows that adding information about current unemployment and inactivity spells is not trivial; it gives a higher estimate of the stock of non-employed especially during the last two to three years before the survey. These are most likely initial unemployment spells, i.e people who have never had a job and consequently are not captured in the retrospective

part of the survey. Including everybody (ever and never work) in the analysis gives the conceptually correct estimate of the stock of non-employed. Yet, it is only through the current unemployment information that we can differentiate between unemployed and inactive individuals with more than four statuses.

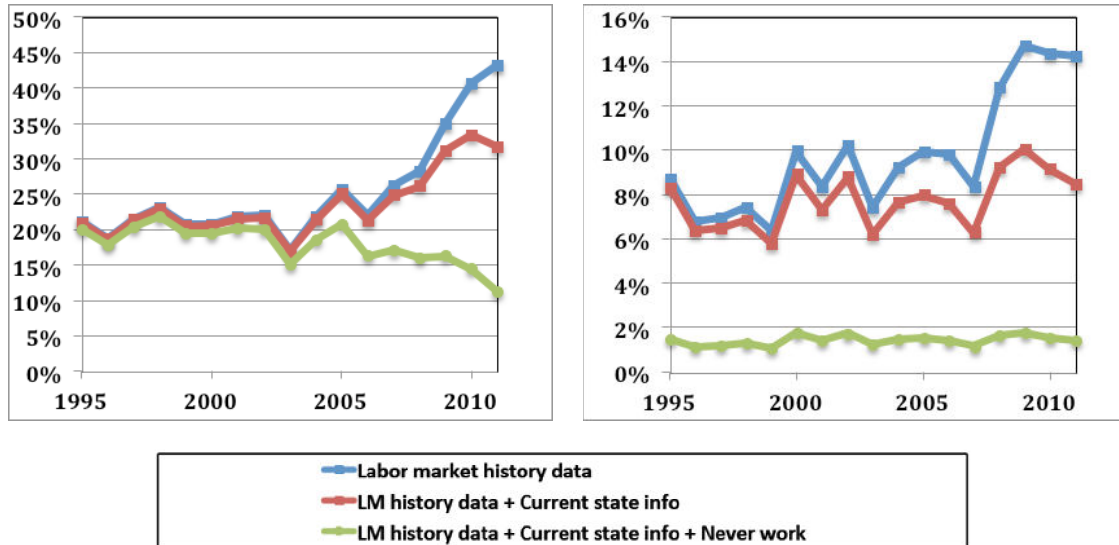


Figure 2.17: Comparing retrospective panels for non-employment to employment job finding rates by sex, ages 15-54, 1995-2011

Source: Authors' calculations based on ELMS 1998, ELMPS 2006, and ELMPS 2012

As was true for the job finding rates time series, we again suspect an underestimation of the non-employed as we go back in time. This time, the job-finding rates calculated from our retrospective panels are over-estimated. The most reliable point, in terms of the level of the job-finding rate, is likely to be the most recent point. Figure 2.18 shows the overlap of the the three finding rates time series calculated from the three retrospective panels using augmented data and incorporating those who never worked. We note likely over-estimation in the job finding rates mirroring the likely under-estimation we noted above in the separation rates. If we set aside the levels issue, and focus of the trend of both finding and separation rates over time, we note that there has been a very slight increase in the job finding rates over time for males and almost no substantial chnge for the females. A relatively higher increase in the separation rates over time is observed for both male and female workers.

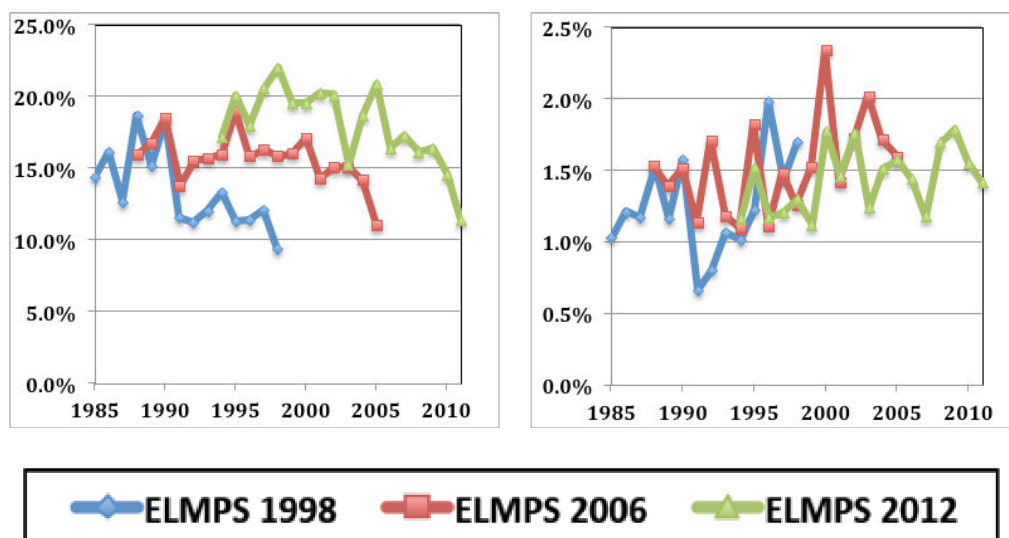


Figure 2.18: Non-employment to employment job finding rates by sex and wave, ages 15-54, using augmented panel data and incorporating those who never worked

Source: Authors' calculations based on ELMS 1998, ELMPS 2006, and ELMPS 2012

### Job-to-job transitions

Having examined states and transitions between employment and non-employment, we now examine job-to-job transitions among the employed. The comparisons of retrospective and panel data showed that more aggregated employment statuses are likely to be more consistently reported. For instance, it appears that respondents have difficulty distinguishing between informal and formal employment states as well as regular and irregular work. Therefore, we limit the analysis of the retrospective transitions rates to three broad employment sectors, namely public wage work, private wage work and non-wage work.

In Figure 2.19, we overlap the job-to-job transition rates calculated using the ELMPS 2006 and ELMPS 2012 retrospective panels. These rates are obtained by dividing the number of workers transitioning from one sector to another between years  $t$  and  $t+1$  by the number of workers employed in the origin sector in year  $t$ . Generally, we observe a close overlap of the job-to-job transition rates obtained using the two different retrospective panel data sets. This finding suggests that using retrospective accounts give consistent conclusions about the trends of job-to-job transition rates over time, especially when these trends are smoothed. However, it's crucial to note that the



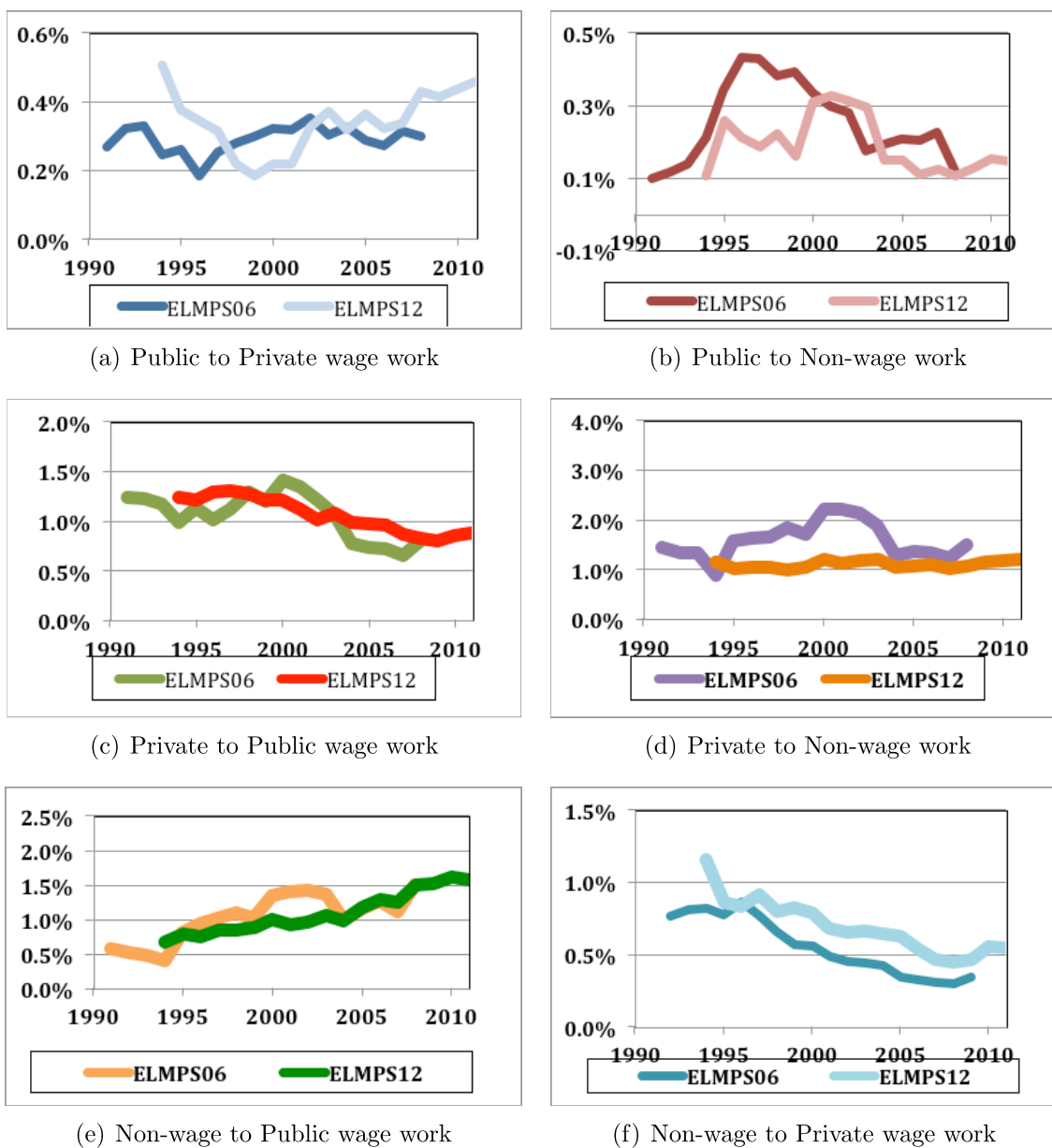


Figure 2.19: Job-to-job transitions by wave, male workers, ages 15-54 calculated from retrospective panels

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012

levels of these transition rates are under-estimated given what we saw earlier in Figure 2.11.

## 2.4.5 Do retrospective data provide accurate trends of past labor market aggregates?

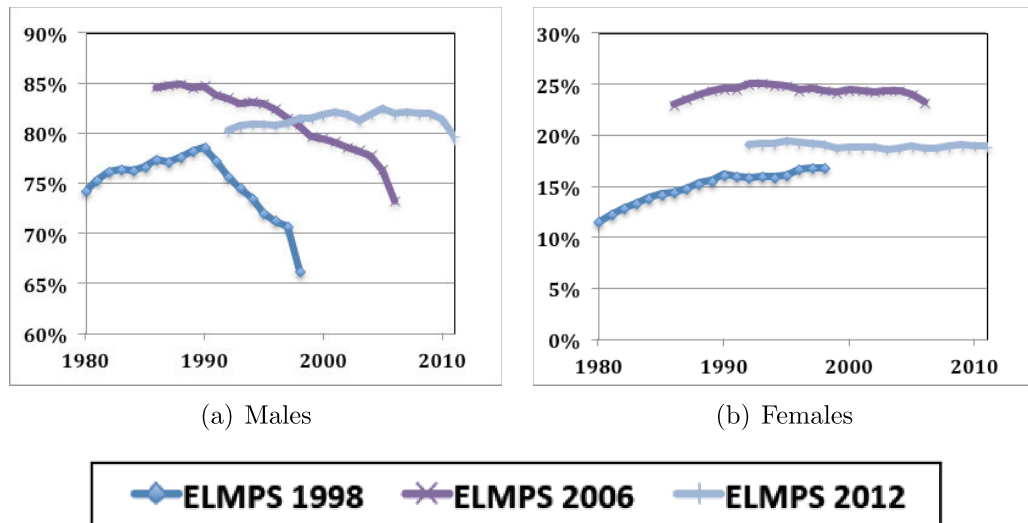


Figure 2.20: Employment-to-population ratios by sex and wave, ages 15-54, calculated from augmented panels including the never worked

Source: Authors' calculations based on ELMS 1998, ELMPS 2006, and ELMPS 2012

The problems we observe in assessing labor market dynamics using retrospective data also present challenges to assessing stocks over time. This section examines the stocks derived from the retrospective data for two specific statistics: the unemployment rate and the employment to population ratio (employment rate). Figure 2.20 illustrates the evolution of employment to population ratio from the augmented retrospective panels, including the never worked over our observation period. The pattern suggests that as we go back in time, we only retain the employment states of our sample and lose track of their non-employment history. We obtain as a result a decreasing employment-to-population ratio, which is not consistent with patterns observed contemporaneously in the panel (Assaad and Krafft, 2015c). The magnitude of the decrease differs from one survey to the other. The ELMPS 2012 seems to have less of a decreasing trend than the ELMPS 2006. The most likely explanation for this observation is the different structure

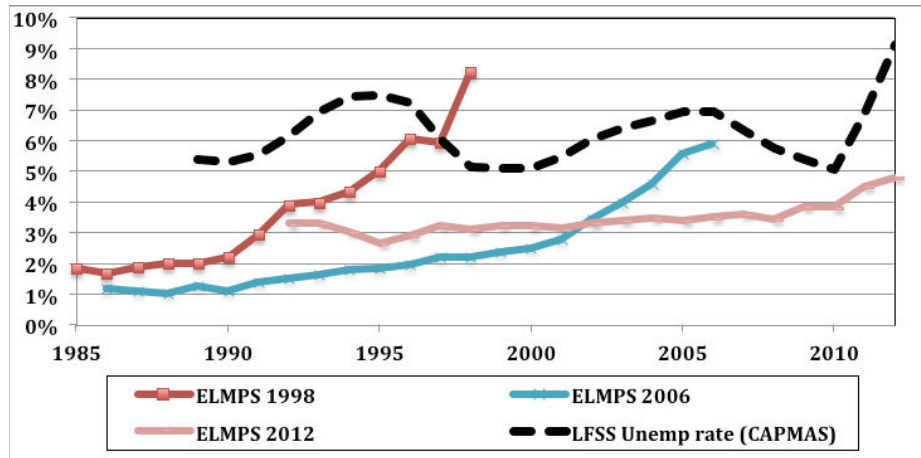


Figure 2.21: Unemployment rates, males, ages 15-64, calculated from augmented retrospective panels including the never worked compared to those reported in the LFSS

Source: Authors' calculations based on ELMS 1998, ELMPS 2006, ELMPS 2012, and LFSS data (based on CAPMAS's bulletin of the Labor Force Sample Survey for 1989-2011)

of the ELMPS 2012 questionnaire. Asking individuals about their past statuses in a chronological order, starting with the first status, rather than backward in time as was the case in 1998 and 2006, may have increased consistency of employment trends. However, none of these approaches recovers the pattern of employment observed in the panel contemporaneous statuses, which is an increase in employment rates over time for men and a rise and fall in employment rates for women.

Superimposing the retrospective data and the unemployment rates from the official Labor Force Sample Survey (LFSS) further illustrates how the proportions of different labor market states and consequently labor market transitions get distorted if one uses retrospective data. Figure 2.21 shows that the retrospective data does not align with the evolution of Egypt's unemployment rate over the past two decades as reported in official statistics.

## 2.5 Conclusion

The primary objective of this paper is to assess whether it is possible to collect information about labor market dynamics using retrospective data or if recall error is so great as to make panel data the only viable option. As expected, we conclude that it is possible to garner useful information on labor market dynamics from retrospective data,

but one must be cautious about which information to trust and at what level of detail. One of our most basic conclusions is that information on past employment collected using retrospective data can be fairly reliable, so long as fine distinctions between employment states are not made. For instance, the distinctions between employer and self-employed, between formal and informal wage work, or regular and irregular wage work are not easily made using retrospective data. The regularity of work is something that can change frequently depending on the state of labor demand in the economy and should therefore not be a subject of retrospective questions. Even the distinction between self-employment and irregular wage work is sometimes difficult to make especially for men engaged in small-scale agriculture. Smallholders often do not have enough land to keep them fully occupied on their small farms and must often engage in multiple livelihood strategies that may either involve non-agricultural self-employment or irregular wage work.

In the case of women engaged in self-employment, whether in agriculture or outside agriculture, the distinction between being employed and not employed is hard enough to make in contemporaneous data, let alone in retrospective data. In Egypt, women in this kind of employment typically do not consider themselves to be employed and may move frequently between employment and non-employment states, as defined by international labor statisticians. To assess their current status accurately, researchers must use complex keyword-based questions that inquire about a large number of activities, and even this detailed approach often fails to elicit reliable estimates of female participation in home-based self-employment and unpaid family labor (Anker (1995); Assaad and El-Hamidi (2009); Assaad (1997); Langsten and Salen (2008)). It is impossible to ask questions at this level of detail about a retrospective period, casting doubt on the employment transitions obtained from retrospective data for women in self-employment. Conversely, transitions across well-defined employment states, such as between public and private wage work, or between public wage work and non-wage work can be captured fairly reliably using retrospective data. Spells of non-employment interspersed between employment spells are usually hard to recall, whether they are unemployment spells or spells outside the labor force altogether. For instance, 71% of those observed as unemployed in the 1998 wave and 64% of the unemployed in 2006

wave of the survey never reported any unemployment at any time in the past in the retrospective data obtained from them in the 2012 wave. Thus transitions from non-employment to employment and vice-versa will be understated in retrospective data, with important implications for the accurate reporting of separation rates for the employed and job-finding rates for either the unemployed or those outside the labor force, and the stock of unemployed in past dates. Generally, these rates will be understated, and possibly increasingly so as we go back in time, confounding any measurement of trends. In contrast, trends describing job-to-job transitions can be captured more reliably using retrospective data.

Another conclusion we derived from analyzing the reporting of recalled marriage costs is that retrospective questions eliciting monetary amounts are unreliable at best. Even when asked to report the nominal amount paid at the time, at least some respondents tend to inflate the amount to their equivalent value at the time of the survey. It thus becomes impossible to ascertain monetary trends over time when some of the data is inflated and some of it is not.

This research has also produced valuable lessons about how to use existing retrospective data from the ELMPs or other similar surveys. It is tempting to create annualized retrospective panel data from the labor market history module of the questionnaire and use those to calculate various transition rates. However, the labor market history module of the questionnaire is only applicable to people who have ever worked, excluding people at risk of transitioning to employment who may not have ever worked. Moreover, because of the limitations on the number of states that the questionnaire inquires about (up to four), the retrospective data may not reach up to the current state. To correct for the possible biases that can result from this, the labor market history data must be augmented by information from the current employment or unemployment sections of the questionnaire and from the life events calendar, which can potentially include more transitions to and from employment. Finally, it needs to be augmented by adding individuals who have never worked but who are currently either unemployed or out of the labor force. In adding data from the current section of the survey, it is important to correct for the fact that current spells may last for less than six months and may therefore not be comparable to spells captured in the retrospective

data. Individuals currently unemployed for less than six months should potentially be reclassified to their previous status to ensure compatibility of definitions.

Finally, this experience has allowed us to derive some important lessons on how to improve questionnaire design to collect more accurate retrospective data. First, in comparing the retrospective data from 2012 to the data from previous rounds, we determined it is preferable to ask questions about the individual's labor market trajectory in chronological rather than in reverse chronological order. It elicits better information about labor market insertion and in particular about any initial unemployment spells prior to first employment. Second, we suspect that many respondents (and possibly interviewers) interpreted status to mean job, contributing to the underreporting of non-employment spells. It is probably a good idea to explicitly ask about whether there was an initial non-employment or unemployment spell prior to the first job and to explicitly ask whether the end of each job was followed by a period of non-employment that exceeded a six-month duration. Third, it is necessary to ask those who have never worked and are currently inactive about whether they have ever sought employment and about the timing and length of the spell in which they were seeking employment, at least for the first time. Fourth, although the addition of a life events calendar that elicits information about the start and end dates of all employment states helps fill some of the gaps, it may still be valuable to elicit information in the labor market history module about a fifth and possibly sixth labor market state to capture the transitions of individuals with more numerous transitions.

Given budgetary and availability constraints, the retrospective panels are currently the only available panels in the MENA region that allow researchers study labor market dynamics, particularly short-term transitions or flows. Having discussed the errors encountered in retrospective data, it is important to note however that it is possible to use some remedies that attenuate these measurement errors and eventually produce unbiased (or possibly less biased) results. A possible solution would be to match biased moments obtained from retrospective data with reliable accurate moments obtained from auxiliary contemporaneous cross-sectional data. Of course, this could be obtained from the same dataset or an external data source, so long comparability between the data sets is verified. In this case, one assumes that the information obtained

from the contemporaneous data is the most accurate. Assumptions about the (functional) form of the “forgetting rate” or information loss in the retrospective data would also be required. Langot and Yassine (2015) (chapter 3) correct the ELMPS aggregate labor market transition rates between employment, unemployment and inactivity states, obtained from the retrospective panels, using this methodology. They assume that the most recent year of the latter panels are the most accurate and that people report more distant events less accurately. The measurement error has a functional form that increases exponentially as one goes back in time. This methodology can allow the re-construction of corrected separation and job finding time series that can be used in the analysis of the macroeconomic trends of the labor market. This can even be extended to make use of the micro-level information available about the labor market transitions. Using the aggregate measurement errors estimated for the different types of transitions, one could distribute these errors in the form of weights to the individuals in the survey (Yassine (no date), chapter 5). Again, assumptions need to be made on how to attribute weights to the individuals. Yassine (no date) (chapter 5) discusses two ways of doing so: (1) a naive method: where all individuals are assumed to be corrected similarly i.e. proportional weights and (2) a differentiated method: where weights are predicted based on the probability an individual would make a certain type of transition. All the above assumed that the information in retrospective panels is correct, just a little bit over reported or under-reported with respect to the true contemporaneous points (i.e. true moments). Another possible solution, with a different assumption, would be to estimate the alignment rate, possibly the rate of telling the truth, and eventually creating a weight such that individuals who report the truth have higher weights. This requires however the availability of both micro-level contemporaneous and retrospective information for the same individuals. In our case, it could be applied to the ELMPS but not to other datasets, for instance the Jordan Labor Market Panel Survey (JLMPS) and the Tunisia Labor Market Panel Survey, where only one wave is available. Drawbacks of how representative the sample becomes after the creation of such weights need to be also discussed.

One possible solution to the missing non-employment states problem would be stressing on the targeted meaning of retrospective statuses in the training of the enu-

merators. Additionally, we suggest adding questions about the end dates of each status throughout the retrospective section rather than relying on the start date of the next status. Even if people interpret the retrospective state as a job status, this additional information could help to capture the interim non-employment state, which starts at the end date of the prior job and ends at the start date of the next job.

To conclude, we believe that panel data with short retrospective modules to fill in the gaps between waves of the panel are the best data we can hope for, short of continuous administrative data, to study labor market dynamics. However, in the absence of such panel data, useful information can be obtained from retrospective questions, so long as some of the lessons we draw here are kept in mind.



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## 2.A Appendix Tables

Response in 1998	Illiterate	Read and Write	Primary	Preparatory	Response in 2006 General Secondary	Vocational Secondary	Post Secondary	University and Above
Illiterate	89.6	6.7	3	0.4	0	0.3	0	0
Read and Write	49.1	33.7	13.9	1.6	0.2	1.4	0.1	0.1
Primary	13.6	12.2	65.7	6.5	0.5	1.6	0	0
Preparatory	3.1	1.7	16.1	66.8	2.1	9.2	0.7	0.4
General Secondary	0	0	0	12.4	48.1	20	8.3	11.2
Vocational Secondary	0.9	0.2	0.7	1.7	0.8	90.1	2.6	3
Post Secondary	0	0.2	0.7	0.3	0.2	22.2	64.5	12
University and Above	0	0	0	0	0.7	2.7	2.7	93.9
Total	44.7	7.8	9.5	4.4	0.9	16.5	4.1	12.1

Table 2.4: Education (8 categories) as reported in 1998 vs. 2006, Ages 30-54 in 1998

Source: Authors’ calculations based on ELMPS 1998 and ELMPS 2006

Consistently respondent								
Response in 1998	Illiterate	Read and Write	Primary	Preparatory	Response in 2006 General Secondary	Vocational Secondary	Post Secondary	University and Above
Illiterate	90	7	2.4	0.3	0	0.4	0	0
Read and Write	48.5	35.2	12.5	1.9	0.2	1.8	0	0
Primary	13.4	12.2	65.9	7.2	0.5	0.8	0	0
Preparatory	3.2	1.9	17.9	65.1	3	7.4	1	0.6
General Secondary	0	0	0	8.4	48	26.9	10.1	6.6
Vocational Secondary	1	0.2	0.9	1.4	0.9	91.8	1.9	1.9
Post Secondary	0	0.3	0.6	0.4	0	22.6	65.5	10.7
University and Above	0	0	0	0	0.9	2	2.7	94.3
Total	44	8.1	9.5	4.2	0.9	16.9	4.1	12.3
Not consistently respondent								
Response in 1998	Illiterate	Read and Write	Primary	Preparatory	Response in 2006 General Secondary	Vocational Secondary	Post Secondary	University and Above
Illiterate	88.6	6.2	4.4	0.6	0	0.2	0	0
Read and Write	50.8	30	17.7	0.8	0	0.2	0.4	0.2
Primary	14.1	12.1	65.1	4.5	0.4	3.8	0	0
Preparatory	2.8	1.2	11.6	70.9	0	13.5	0	0
General Secondary	0	0	0	20.3	48.4	6.1	4.7	20.5
Vocational Secondary	0.5	0.2	0.3	2.5	0.7	85.7	4.4	5.7
Post Secondary	0	0	0.8	0	0.8	21.1	62.1	15.2
University and Above	0	0	0	0	0	4.8	2.6	92.7
Total	46.6	7.1	9.7	4.7	0.8	15.7	4.2	11.4

Table 2.5: Education (8 categories) as reported in 1998 vs. 2006, by respondent, ages 30-54 in 1998

Source: Authors’ calculations based on ELMPS 1998 and ELMPS 2006

Response in 1998	Response in 2006			
	Illit. Or R&W	Basic	Secondary	University and Above
Illit. Or R&W	93.5	5.9	0.6	0
Basic	18.7	75.8	5.4	0.1
Secondary	0.8	2.5	91.2	5.5
University and Above	0	0	6.1	93.9
Total	52.6	13.9	21.5	12.1

Table 2.6: Education (4 categories) as reported in 1998 vs. 2006, Ages 30-54 in 1998

Authors' calculations based on ELMPS 1998 and ELMPS 2006

Father's Sector in 2006	Father's Sector in 2012		
	Government	Public Enterprise	Private
Government	70.8	6.7	22.5
Public Enterprise	39.6	35.2	25.2
Private	7.8	1.5	90.8
Total	23.9	4.7	71.4

Table 2.7: Father's sector of work when age 15, as reported in 2006 vs. 2012, father not in household in 2006 or 2012, ages 30-54 in 2006

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012

Father's Sector in 2006	Father's Sector in 2012		
	Government	Public Enterprise	Private
Government	69.2	8.2	22.6
Public Enterprise	33.7	39.1	27.3
Private	8.3	1.5	90.2
Total	24.2	5.4	70.4

Table 2.8: Father's sector of work when age 15, as reported in 2006 vs. 2012, father not in household in 2006 or 2012, consistently respondent, ages 30-54 in 2006

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012

Father's Sector in 2006	Father's Sector in 2012		
	Government	Public Enterprise	Private
Government	70.8	6.4	22.8
Public Enterprise	45.6	33.2	21.2
Private	7.1	1.5	91.4
Total	23.3	4.8	72

Table 2.9: Father's sector of work when age 15, as reported in 2006 vs. 2012, father not in household in 2006 or 2012, not consistently respondent, ages 30-54 in 2006

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012

	2006 contemp.	2006 retro. from 2012	1998 contemp.	1998 retro. from 2012
Public	27.9	29.9	20.7	21.5
Private formal regular wage workers	12.3	11	5.3	7.5
Private informal regular wage workers	16.3	16	10.5	13.6
Irregular wage workers	8.9	16.3	14.2	16.8
Employers	14.1	11.1	7.3	6.4
Self-Employed	9.5	9.7	5.2	6.4
Unpaid Family Work	5	2.6	6.5	5.1
Unemployed	2.8	0.9	7.3	2.3
OLF	3.4	2.7	23.1	20.3
Total	100	100	100	100

Table 2.10: Labor Market Status, as reported contemporaneously for 1998 and 2006 and as reported retrospectively for those years from 2012 data, male respondents ages 30-54 in 2012 present in both waves

Source: Authors' calculations based on ELMS 1998, ELMPS 2006 and ELMPS 2012

	2006 contemp.	2006 retro. from 2012	1998 contemp.	1998 retro. from 2012
Public	12.9	13.4	10.6	11.3
Private formal regular wage workers	1.1	1.2	0.7	0.5
Private informal regular wage workers	1.3	1.7	1.3	1.4
Irregular wage workers	0.6	0.9	0.8	0.8
Employers	1	0.7	0.3	0.3
Self-Employed	4	1.9	1.9	1.5
Unpaid Family Work	10	4.4	5.5	2.8
Unemployed	4.5	1.5	6.6	1.4
OLF	64.5	74.3	72.3	80
Total	100	100	100	100

Table 2.11: Labor Market Status, as reported contemporaneously for 1998 and 2006 and as reported retrospectively for those years from 2012 data, female respondents ages 30-54 in 2012 present in both waves

Source: Authors' calculations based on ELMS 1998, ELMPS 2006 and ELMPS 2012

	Public	Private formal regular wage	Private informal regular wage	Irregular wage worker	Employers	Self-Employed	Unpaid Family Work	Unemployed	OLF
Public	87.6	4.3	2.6	1.6	1.3	1.3	0.2	0.3	0.8
Private formal regular wage	14.8	43.6	20.4	10.8	3.2	4.9	0.6	1.2	0.5
Private informal regular wage	7	14	32.8	24.6	7.7	8.1	1.9	1.2	2.7
Irregular wage worker	6.6	4.6	19.8	45.7	8.3	10.8	2.3	1	1.1
Employers	5	2.9	13.8	17.7	39.8	15.3	4.2	0.2	1.2
Self-Employed	3.6	4.9	13.2	20.4	16.9	36.7	1.7	0.4	2.1
Unpaid Family Work	4.6	5.3	23.6	19.7	16.8	8.7	19.4	0.9	1
Unemployed	13.7	14.9	27.1	16.8	1.8	5.4	5.7	5.1	9.5
OLF	7.9	6.9	15.2	16.8	6.6	7.2	1.7	3.4	34.3
Total	29.9	11	16	16.3	11.1	9.7	2.6	0.9	2.7

Table 2.12: Labor Market Status, as reported in 2006 versus 2012 retrospective data for 2006, male respondents ages 30-54 in 2012 present in both waves

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012

	Public	Private formal regular wage	Private informal regular wage	Irregular wage worker	Employers	Self-Employed	Unpaid Family Work	Unemployed	OLF
Public	85	4.2	2.6	4	1.4	0.4	0.4	1.1	1
Private formal regular wage	9.7	47.8	19	10.8	1.2	4.8	2.5	0.2	3.9
Private informal regular wage	5.6	10.2	34	21.1	8.6	6	1.1	3.5	10
Irregular wage worker	5.5	5.4	19.4	38.1	8.2	8.7	5.7	1.2	7.8
Employers	3.6	7.3	15	17.4	28.3	17.3	9.3	0.4	1.4
Self-Employed	7.8	2.2	13.5	21.4	11.8	25	10.9	0.2	7.1
Unpaid Family Work	2.2	0.9	13.4	21.9	10.8	6.4	19.6	5.1	19.6
Unemployed	3.9	12	15.1	26.4	3.5	6.5	4.9	6.3	21.5
OLF	4.2	3.1	8.7	9.1	1.4	3.2	4.5	3.1	62.7
Total	21.5	7.5	13.6	16.8	6.4	6.4	5.1	2.3	20.3

Table 2.13: Labor Market Status, as reported in 1998 versus 2012 retrospective data for 1998, male respondents ages 30-54 in 2012 present in both waves

Source: Authors' calculations based on ELMPS 1998 and ELMPS 2012

	Public	Private formal regular wage	Private informal regular wage	Irregular wage worker	Employers	Self-Employed	Unpaid Family Work	Unemployed	OLF
Public	88.7	2.6	0.6	0	0	0.3	0	1.1	6.8
Private formal regular wage	18.1	32.7	17.3	0	0	0	0	2.1	29.9
Private informal regular wage	4.4	7.8	26.5	3	1.2	4	0	8.2	45
Irregular wage worker	0	0	8.5	34.5	0	11.2	7.1	1.9	36.8
Employers	0.9	0	3.3	0	17.7	14	9.7	0	54.4
Self-Employed	0.9	0	2.2	1.3	3.9	17.7	8.1	0.3	65.7
Unpaid Family Work	1.2	0	0	0.5	1.6	3.3	20.2	1.2	72
Unemployed	4.9	3.1	4.8	0	0	0.7	1.8	5.5	79.2
OLF	2	0.4	1.1	0.8	0.2	0.9	2.9	1.3	90.4
Total	13.4	1.2	1.7	0.9	0.7	1.9	4.4	1.5	74.3

Table 2.14: Labor Market Status, as reported in or 2006 versus 2012 retrospective data for 2006, female respondents ages 30-54 in 2012 present in both waves

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012



	Public	Private formal regular wage	Private informal regular wage	Irregular wage worker	Employers	Self-Employed	Unpaid Family Work	Unemployed	OLF
Public	88.7	2.6	0.6	0	0	0.3	0	1.1	6.8
Private formal regular wage	18.1	32.7	17.3	0	0	0	0	2.1	29.9
Private informal regular wage	4.4	7.8	26.5	3	1.2	4	0	8.2	45
Irregular wage worker	0	0	8.5	34.5	0	11.2	7.1	1.9	36.8
Employers	0.9	0	3.3	0	17.7	14	9.7	0	54.4
Self-Employed	0.9	0	2.2	1.3	3.9	17.7	8.1	0.3	65.7
Unpaid Family Work	1.2	0	0	0.5	1.6	3.3	20.2	1.2	72
Unemployed	4.9	3.1	4.8	0	0	0.7	1.8	5.5	79.2
OLF	2	0.4	1.1	0.8	0.2	0.9	2.9	1.3	90.4
Total	13.4	1.2	1.7	0.9	0.7	1.9	4.4	1.5	74.3

Table 2.15: Labor Market Status, as reported in 1998 versus 2012 retrospective data for 1998, female respondents ages 30-54 in 2012 present in both waves

Source: Authors' calculations based on ELMPS 1998 and ELMPS 2012

	Public	Private Wage	Non-wage work	Not working
Public	87.6	8.5	2.8	1.1
Private Wage	9.4	72.2	15.7	2.7
Non-wage work	4.5	38.2	55.5	1.9
Not working	10.5	47.9	14.3	27.4
Total	29.9	43.3	23.3	3.6

Table 2.16: Collapsed labor market status, as reported in 2006 versus 2012 retrospective data for 2006, male respondents ages 30-54 in 2012 present in both waves

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012

	Public	Private Wage	Non-wage work	Not working
Public	88.7	3.1	0.3	7.9
Private Wage	8.6	43	5.8	42.6
Non-wage work	1.1	1.5	27.4	70
Not working	2.2	2.7	3.9	91.3
Total	13.4	3.8	7	75.8

Table 2.17: Collapsed labor market status, as reported in 1998 versus 2012 retrospective data for 1998, male respondents ages 30-54 in 2012 present in both waves

Source: Authors' calculations based on ELMPS 1998 and ELMPS 2012

	Public	Private Wage	Non-wage work	Not working
Public	85	10.7	2.3	2
Private Wage	6.3	66.3	17.7	9.7
Non-wage work	4.3	37.8	46.8	11.2
Not working	4.1	28.8	10.5	56.7
Total	21.5	38	17.8	22.6

Table 2.18: Collapsed labor market status, as reported in 2006 versus 2012 retrospective data for 2006, female respondents ages 30-54 in 2012 present in both waves

Source: Authors' calculations based on ELMPS 2006 and ELMPS 2012

	Public	Private Wage	Non-wage work	Not working
Public	86.7	1.6	0	11.7
Private Wage	9.4	24.2	9.9	56.6
Non-wage work	1.2	3.2	12.8	82.9
Not working	2.2	2	4.3	91.5
Total	11.3	2.7	4.6	81.4

Table 2.19: Collapsed labor market status, as reported in 1998 versus 2012 retrospective data for 1998, female respondents ages 30-54 in 2012 present in both wave

Source: Authors' calculations based on ELMPS 1998 and ELMPS 2012

	Male		Female	
	Retrospective	Panel	Retrospective	Panel
Public	2	11	6	11
Private formal regular wage workers	21	45	20	55
Private informal regular wage workers	27	63	41	82
Irregular wage workers	25	73	49	95
Employers	7	43	0	68
Self-Employed	15	61	17	69
Unpaid Family Work	66	74	11	77
Unemployed	97	90	56	85
OLF	88	89	8	25
Total	35	59	9	33

Table 2.20: Rates of status change in panel data for 1998 to 2006 versus rates of status change in retrospective data from 2012 for changes from 1998 to 2006 by sex and status in 1998

Authors' calculations based on ELMPS 1998, ELMPS 2006 and ELMPS 2012

## Part II

# The Impact of Labor Market Policies and Institutions on Labor Market Outcomes

## Chapter 3

# Reforming Employment Protection in Egypt: An Evaluation Based on Transition Models with Measurement Errors <sup>1</sup>

### 3.1 Introduction

The history of institutions in most developing countries led their labor markets to be very rigid, where private sector contractual opportunities approached the rules of public sector appointments. Major international organizations have therefore encouraged reforms, to introduce more flexibility in these labor markets. The importance of ensuring a healthy dynamic labor market lies in creating more productive jobs and destroying less productive ones (see Veganzones-Varoudakis and Pissarides (2007)). Increased dynamics also scales down the difference between formal employment and informal work, which is very flexible by definition. By attracting more workers to formal jobs, the

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<sup>1</sup>This chapter is based on work conducted jointly with François Langot. This work has benefited from a financial grant from the Economic Research Forum. The contents and recommendations do not necessarily reflect the views of the Economic Research Forum. We thank R. Assaad, D. Margolis, F. Fontaine and J. Wahba for helpful comments as well as seminar participants at University of Paris 1 Pantheon-Sorbonne, Paris School of Economics (SIMA-Maison des Sciences Economique) and University of Maine (GAINS-TEPP). Participants at the Economic Research Forum workshop “Impact of Labor Market Regulations and Institutions on Labor Market Performance and Outcomes” and World Bank conference on “Markets, Labor and Regulations” also provided valuable remarks and suggestions.

shift of employment into the formal sector allows an increase in the fiscal revenues of governments and hence reduces their budgetary deficits.

The importance of a more flexible labor market was recognized by the Egyptian Government in 2003, as they introduced the new labor law (No.12). The new Egypt labor law came to action in 2004 aiming at increasing the flexibility of the hiring and firing processes in Egypt. The law provides comprehensive guidelines for recruitment, hiring, compensation and termination of employees. It directly addresses the right of the employer to terminate an employee's contract and the conditions in which it performs under.

Although flexible employment protection strategies have been recommended, economic theory predicts ambiguous effects of increased flexibility on the performance of labor markets. Indeed, when the policy change is perfectly anticipated, the conventional model of Mortensen and Pissarides (1994) shows that facilitating the termination of employees leads to increased job finding rates, but also has a direct positive effect on transitions from employment to unemployment. Since the employment rate is an increasing function of job finding rates but a decreasing function of separations, evaluating a policy that increases labor market flexibility necessitates the analysis of the different elasticities of these two rates of transitions to the reform in question. Even if the policy change is unexpected, given that the hirings and separations are jump variables, the same reasoning applies. Even if the effects on unemployment are ambiguous, the liberalization of the labor market promotes new job and hence high productivity.

It hence becomes crucial to assess the adjustment of the Egyptian overall separation and job finding rates (the two main components of Egypt's unemployment rate) to such a more flexible employment protection strategy, introduced by the new 2003 labor law. In general, only one earlier study by Wahba (2009) investigated the short term impact (i.e after two years) of the law but on the formalization process in Egypt. Our paper is able to reply to the following research questions:

1. Investigate the evolution of worker flows trend over the period 1998-2012, and link changes in the job finding and separation rates to the New Egyptian Labor Law implemented in 2004.

2. Build up a model in a way that enables us to simulate labor market policies and examine their implications on dynamics of the Egyptian labor market.<sup>2</sup>

From a methodological point of view, the construction of the observed labor market transitions from microeconomic data, as developed by Shimer (2005, 2012), seems to be a perfect fit to assess this type of labor market reforms. It's a methodology that allows to exploit rich labor market surveys, to disentangle the changes in all transitions and to deduce using a simple balance of flows, the impact on aggregates, such as the rate of unemployment. In this paper, we try to use this construction methodology, to create aggregate flows from microeconomic surveys in the spirit of the work of Shimer. From an econometric point of view, the reform will be analyzed as a break in the series of job finding and separation rates. The aggregated effect on unemployment will be deduced from the composition of the differentiated effects of transition rates.

The originality of our work lies in the construction of the flow dynamics time series of the Egyptian labor market. As in most countries in the project development process, micro surveys which trace the history of each individual every month are unavailable. Only a labor market panel survey where individuals report their retrospective and current accounts of their labor market states is repeated almost every 6 years. Even with high quality collection methods and accurate cross-validated questions, such surveys and retrospective information are subject to a memory bias (recall error).<sup>3</sup> De Nicola and Giné (2014) have shown that the magnitude of the recall error increases over time, in part because respondents resort to inference rather than memory. Their findings are based on a comparison between administrative records and retrospective survey data from a developing country, more precisely a sample of self-employed households engaged in fishing in coastal India. Using data of a developed country (USA), Poterba and Summers (1986) find through audits of employment surveys that correcting employment self-reports can change the estimated duration of unemployment by a factor of two. Thus, the methodological contribution of our paper is to propose an original

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<sup>2</sup>This can be made without any problem concerning the Lucas (1976) criticism because separation and job finding rates are jump variables, and given that the policy change is unexpected.

<sup>3</sup>Given the long time interval between the waves of the survey, we can not use simple methods of memory bias correction used in annual surveys to reconstruct monthly data from retrospective calendars. See e.g. Hairault, Le Barbanchon, and Sopraseuth (2013) for such methods applied on French data.

method correcting this recall error, using the markovian structure of the labor market transitions. We structurally estimate using Simulated Method of Moments (SMM) a function representing the "forgetting rate" conditional on the individual's state in the labor market. Our model is close to the one developed by Magnac and Visser (1999). Given the importance of taking into consideration the entry and exit of the labor force, in an attempt to portray the Egyptian labor market as fully as possible, and to test the robustness of our method, we extend our analysis to a three-state model of the labor market (employment, unemployment and inactivity) and check if the results on unemployment rates, reconstructed from a series of corrected labor market flows, are consistent. We show that estimates of corrections then yield similar results, suggesting that our statistical correction method produces robust series. Consequently, we can conclude that our method can be applied to multiple surveys only available between two relatively spaced dates (points in time), which is often the case in developing countries.

The paper uses the Egypt labor market panel surveys (ELMPS 2006 and ELMPS 2012) to extract annual and semi-annual synthetic retrospective panel data sets over the period 1999-2012. As mentioned above, given the nature of our data (with a wave repeated almost every 6 years), we were concerned with recall error. We were also concerned by a potential design bias in our data due to the very rich information obtained about the most recent employment/non-employment vector versus relatively limited information about past trajectories. We hence develop our novel methodology to correct for the "recall and design" error in the labor market transitions time series.

In his 2012 article, Shimer shows that reconstructing workers flows from microeconomic surveys gives the advantage to job finding rates in explaining fluctuations of the US unemployment. His results therefore contrast with those obtained by Blanchard and Diamond (1990) and Davis and Haltiwanger (1990, 1992): these authors showed that, based on statistics of job creations and destructions (job flows), the majority of fluctuations in the US unemployment rate arise from the job destruction rate. In our article, despite the use of a methodology similar to that proposed by Shimer (2012), we show that the new 2003 labor law had significant positive effects on the separation rates, but barely any on the job finding rates. The increase in separation rates therefore outweighs the no significant change in job finding rates leading to an increase in the

unemployment rates after the reform. These results are valid whether we include or exclude the inactivity state from our analysis. By performing counterfactuals analysis, we show evidence of the increasing dominant role of the separation rates in accounting for Egyptian unemployment fluctuations. It's important to note however that the separation and job finding rates remain at extremely low levels reflecting a very rigid nature of the Egyptian labor market.

These empirical results can be viewed as inconsistent with the usual Mortensen and Pissarides (1994) model, where an increase in the labor market flexibility (modeled as a downward shift of the firing costs) would definitely increase the separation and the finding rates. Indeed, such a policy which reduces tax distortions should lead as well to increasing the match surplus (even if the job duration will be reduced), and consequently the job finding rate. At this point, it becomes therefore difficult to explain the no change in job finding rates even though there has been a decrease in the firing costs using the conventional Mortensen and Pissarides (1994) model. It's true one can explain this by the time lag between the employers reaction to the reform between separating more workers directly after the implementation of the policy and hiring more workers only when they feel confident enough about the market. However, among the possible explanations behind such an observed unusual phenomenon could be the fact that Egypt is a developing country where corruption is one of the main barriers to business encountered by the entrepreneurs. We show theoretically how the Mortensen and Pissarides (1994) can account for this phenomenon and hence to match our data.<sup>4</sup>

The rest of the paper is divided as follows. The second section surveys the literature and exposes the value added by our paper. Section 3 briefly presents the data used in our analysis, the creation of the synthetic retrospective panel data sets and the potential error treatments. Section 4 discusses the presence of recall and design bias

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<sup>4</sup>Another way to explain this puzzle is to extend the Mortensen and Pissarides (1994) to account for the informal and public sectors, which represent big shares of employment. Even though the policy is directed to the formal private sector, it surely affects the interaction and the flow of workers between the different employment sectors. The conventional aggregate Mortensen and Pissarides (1994) model fails to explain the inside story of these inter-sectoral transitions. Langot and Yassine (2015) (chapter 4) attempt to extend the Mortensen and Pissarides (1994) to model the different transitions between the formal, informal and public sectors and hence try to explain the possible reasons behind only separations increasing in response to a more flexible labor market.



in our transition matrices and hence a model is built and estimated to correct for the bias. Section 5 explores the econometric methodology adopted. Section 6 presents our estimation methodology and results. Section 7 provides counterfactual experiments and policy implications. Section 8 surveys the (Mortensen and Pissarides, 1994) theoretical model and shows how it fails to explain our empirical results, except if we introduce corruption. We then finally conclude.

## 3.2 Value Added and Literature Survey

Egypt has long been ranked as a country with very rigid labor laws (see WorldBank (2014)). This has stemmed from the time when virtually all industrial employment was public sector and heavily unionized. In 1990, the private sector accounted at most for 23 percent of Egypt's manufacturing sector output, and 25 percent of its employees. Very bureaucratic rules were established. Fear of social costs of privatization may have kept these rules rigid, especially the costs of paying off fired workers.<sup>5</sup> Different labor regulations indices have unsurprisingly shown that Egypt, was ranked one of the most rigid among the MENA region countries, which are themselves the most restrictive developing countries, after the Latin American region (see (Veganzones-Varoudakis and Pissarides, 2007) and (Campos and Nugent, 2012))<sup>6</sup>. This index decreases substantially to reach a level lower than 1.5 during the period 2000-2004 after a long period of stagnation around a level of 1.8 for about three decades since 1970. Indeed, the Law 12 of the New 2003 Labor Code seems to have relatively reduced the state's role, giving greater leeway to employers to hire and fire.<sup>7</sup> With such a reform, should an employer need to go out of business, he gets the right to lay off all workers. In case of economic necessity, an employer has the right to lay off workers or modify contracts given that he

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<sup>5</sup>The crisis of the beginning of the 90's, compelled the government to look to the International Monetary Fund (IMF), World Bank and the Paris Club for support, where Egypt was required to undergo a structural adjustment package as a counterpart to receiving a stand-by credit. The result was an increase in economic activity, and strong growth in private-sector manufacturing. By 2003, the share of the Egyptian total industrial value added reached 70 percent and employment increased substantially to 60 percent.

<sup>6</sup>Veganzones-Varoudakis and Pissarides (2007) underline the ranking of the different developing country regions from the least to the most rigid as follows: South Asia (1.25), Sub-Saharan Africa (1.45), East Asia (1.6), MENA (1.65), Latin America (2.05), with the index of labor market regulation between parenthesis.

<sup>7</sup>The new 2003 law also gives greater leeway to employers to set wages and benefits.

provides a notice period of 2 months for an employee of less than 10 years seniority, and 3 months if seniority is over 10 years. Severance payments of an amount of 1 month per year for workers with less than 5 years experience and of an amount of 1.5 months per year after that are implemented (see WorldBank (2014) for more details).

Unfortunately, the impact of the new 2003 labor market reform has been rarely assessed. It's extremely important to measure whether the policy has achieved its direct objective on the labor market's flexibility in general, the separation and finding rates in particular, as well as its consequent effect on the national unemployment. Policy evaluation techniques necessitate the availability of time series labor market flows to detect structural changes in a given labor market. In a country like Egypt where available data and analyses are hinged on static, cross-sectional and aggregate approaches, our mission becomes difficult. The limitations and potential errors synthetic panel data, constructed from retrospective accounts, are subject to, prevents research from confirming trends and results obtained by simple descriptive statistics<sup>8</sup>. Previous research as a result hardly satisfied the urge to explore the true story of the dynamics of the Egyptian Labor market and the effect of reforms on the labor market outcomes. This paper therefore aims at enriching the existing literature and exploring the effect of the new labor law implemented in 2004 on separation and job finding rates, about which we know very little from the official aggregate data and statistics (as has been explained in chapters 1 and 2).

The paper also overcomes the budget constraints limiting annual data collection to follow workers through their careers by benefiting from the existing two waves of the Egypt Labor Market Panel Survey (2006 and 2012) as well as by the improved techniques we adopt to construct trajectory panels for individuals within these surveys from the retrospective accounts to provide us with annual panel data sets. Our techniques don't limit to only capturing these trajectories and labor market dynamics but

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<sup>8</sup>See Assaad, Krafft, and Yassine (2015) (chapter 2) for detailed evidence on how different labor market statuses, especially unemployment, are prone to misreporting over time, comparing retrospective and contemporaneous data for the same individuals over time using the Egypt Labor Market Panel Surveys 1998, 2006 and 2012.

also to correcting the recall and design<sup>9</sup> bias from which our retrospective data tend to suffer.<sup>10</sup> Like previous research, as for example De Nicola and Giné (2014), we were concerned by the recall bias observed in our retrospective calendars. Uncorrected preliminary descriptives might give false impressions about the dynamics of worker flows and unemployment in Egypt. In the literature on measurement error in transition models, two approaches are used. The first approach, in the tradition of the seminal papers of Poterba and Summers (1986, 1995), uses either validation or reinterview data (assuming that these data is error free) to estimate the measurement error. While Poterba and Summers (1986) use the reinterview data from the Current Population Survey to study the impact of measurement error on the estimated number of labor market transitions, Magnac and Visser (1999) use prospective and retrospective data for the same time period to study labor mobility of French workers with the Labor Force Survey, where the prospective data was being treated as error-free. The second approach, used for example by Rendtel, Langeheine, and Berntsen (1998), is applied when no auxiliary (error-free) information is available. Based on the assumption of the Independent Classification Errors<sup>11</sup>, these methods use latent Markov model with measurement error. In Magnac and Visser (1999) and Bassi, Hagenaars, Croon, and Vermunt (2000), this method is extended to the case where correlation between errors are possible, also by using retrospective data.

Nevertheless, these methods are designed for short term analysis of the labor market (the impact of the business cycle on labor market transitions). They use surveys where annual waves are available, and which include intra-annual information. In this perspective, the measurement error can be approximated as a small noise, with an update

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<sup>9</sup>Recall bias is defined as respondents mis-reporting their retrospective trajectory because they tend to forget some events or spells, especially the short ones. The design bias arises from the fact that different types of questions are being asked for current versus recall/retrospective statuses. There is therefore a question of salience/cognitive recognition by the respondents where by asking the questions differently, respondents, or even sometimes the enumerators themselves, can interpret them differently. Yassine (2014) (chapter 1) and Assaad, Krafft, and Yassine (2015) (chapter 2) show for instance that due to the questionnaire design of the ELMPS, statuses in the retrospective sections are being interpreted more of job statuses rather than labor market states.

<sup>10</sup>In an investigation of the effect of measurement error on poverty transitions in the German Socio-Economic Panel (GSOEP), Rendtel, Langeheine, and Berntsen (1998) conclude that approximately half of the observed transitions are due to measurement error. Lollivier and Daniel (2002) corroborate this result for the European Community Household Panel (ECHP).

<sup>11</sup>This assumption means that the errors made at two subsequent time periods are conditionally independent given the true states

each year at the time of the interview. In our case, the delay between the two interviews is much longer, requiring a new method to correct for long-term memory recall bias. In addition to the recall bias, we also suspect a potential design bias in our constructed synthetic panel data sets, due to differences in the nature of questions asked about the current or most recent labor market status and those asked about the individuals' histories. We therefore add to the existing literature by applying a new theoretical model to correct for the bias observed in our data, for both a two-state and a multiple state labor market. Empirically, the technique we use to extract a retrospective panel and correct for "recall and design" bias using the Egyptian Labor market data sets would definitely allow researchers and policy-makers (who use the same or similar data sets) to use these data sets for further research and needed investigations about labor market dynamics. We also use the cross-sectional information obtained from a third wave of the Egypt Labor Market Panel Survey in 1998, to verify the results we obtain using our corrected transition rates time series. We explain in the data section the limitations of this data set and why we choose not to use it in our econometric estimations.

### 3.3 Data and Sample Selection

Our paper relies on the Egypt Labor Market Panel Surveys 1998, 2006 and 2012, the first, second and third rounds of a periodic longitudinal survey that tracks the labor market and demographic characteristics of households and individuals interviewed in 1998. The households selected in the longitudinal data are national-representative and randomly selected. The final sample interviewed in 2012 consists of 12060 households, which includes 6752 original households (out of 8371 interviewed in 2006, which followed itself 4816 households interviewed in 1998), 3308 split households and a refresher sample of 2000 households. The attrition cross-sectional and panel weights attributed in these data sets by Assaad and Krafft (2013) allow to expand sample figures to a macro population level.

We make use in this paper of the rich retrospective information available in both questionnaires as well as current state information and the newly added chapter (in ELMPS12) of life events' calendar. Unfortunately, the ELMPS 1998 round did not

contain what we require as “full” (compared to ELMPS06 and ELMPS12) retrospective accounts about the interviewed individuals. The type and different characteristics of an individual’s first state in the labor market have not been collected. We therefore choose to only use the cross-section stocks from this round in our analysis, for identification and comparability reasons in the correction model, given that it does not contain the minimal information required to extract the longitudinal retrospective panel data.

Following the methodology adopted by Yassine (2014) (chapter 1), we extract two retrospective panel datasets for the periods 1999-2006 (from ELMPS06) and 1999-2012 (from ELMPS12). ELMPS06 records only the year of start of an individuals’ state allowing us to just extract an annual panel data set between 1999-2006. The availability of the month and year of the date of start of a state in ELMPS12, on the other hand, enables the extraction of both semi-annual and annual transitions. Since missing values about the month and year of start of a state are problematic when creating such synthetic panels, we adopted the same assumptions made in Yassine (2014) (chapter 1) to create the ELMPS12 panel datasets. Consequently, the cross-state transitions do not get evenly distributed over the 2 semesters of the year. Semi-annual transitions are not representative for a 6 months period. However as they are lumped into an annual trajectory, this allows us to capture the maximum range of transitions an individual went through during the year  $t$ . Cross-state labor market transitions such as job finding and job separations are therefore derived from the semi-annual constructed panel, but then lumped into annual transitions in order to be representative as well as comparable with the 1999-2006 panel extracted from the ELMPS06<sup>12</sup>.

The general sample of the retrospective panel datasets includes individuals who answered the retrospective question i.e those who ever worked in the Egyptian labor market, the young unexperienced new entrants and the individuals who are permanently out of the labor force.

In this paper, we focus on employed, unemployed and inactive male individuals between 15 and 49 years of age. Our analysis exclude female workers since their movement in and out of the labor market most of the time follow personal motives such as marriage and child birth. Moreover, going back in time, our sample should have

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<sup>12</sup>See Yassine (2014) (chapter 1) for a detailed discussion of this procedure.

included people who were alive back then but passed away by the year of the survey i.e. 2006 and 2012 and hence did not respond to the ELMPS questionnaire. Due to this backward attrition, we were obliged to limit the age of our analysis group to what we refer to as the prime age group (i.e. between 15 and 49 years old). Another reason why one would want to avoid including old people within our analysis group is to limit recall error which is intuitively likely to increase with advanced age.

A potential type of error that our data is susceptible to face is the response error including the “present” mis-report bias and recall bias (Yassine, 2014). We cannot deal with the bias resulting from people deliberately mis-reporting their present employment status and information to avoid taxes and government registers. We therefore assume the non-existence of this bias. The extent of recall bias is examined and corrected by our constructed model in the next section.

In addition to the recall error, we also suspect the presence of what we call the “design” bias that leads to a systematic inaccuracy (in the same direction of the recall bias) in our constructed synthetic panels. The ELMPS survey contains very detailed (almost complete) questions about an individual’s current employment/unemployment/inactivity state. Questions about retrospective accounts are however minimal and very broad, where people mostly end up recording their jobs history ignoring histories about their unemployment spells. It’s also worth noting that individuals responding to the retrospective chapter in the survey are required to have at least one work experience. Consequently, using the available collected data, we obtain correct estimate for current labor market state and increasingly biased estimates as we move backwards, especially among the unemployed and inactive who have never worked before. We examine in the next section the nature of the bias observed in the data and suggest a methodology to correct for it.

Finally, it’s important to note that in this paper we have two stages of analysis; one where an individual can occupy one of two states, namely employment (E) or unemployment (U). The transition from employment to unemployment is referred to as job separation and the transition from unemployment to employment is referred to as job finding. A three-state (Employment [E] - Unemployment [U] - Inactivity [I]) model is also developed where all inter- and intra- state transitions are illustrated and

are used to calculate the job finding and separation rates of the three-state economy following Shimer (2012).

## 3.4 Recall and Design Bias

We first describe the link between worker flows and stocks data. Secondly, we present our method that corrects the data from the "recall and design bias". In the last part of this section, we present our "corrected" data.

### 3.4.1 Descriptive Statistics

Following Diamond-Mortensen-Pissarides (DMP) matching model of unemployment, in steady-state equilibrium, flows into unemployment ("separations") equal flows from unemployment ("finds"). Using the flow balance equation, we therefore have

$$\underbrace{fU}_{\text{Probability to find a job} \times \text{no. of unemployed}} = \underbrace{sE}_{\text{Probability to quit/lose a job} \times \text{no. of employed}} \quad (3.1)$$

We can therefore show that in equilibrium, unemployment rate is

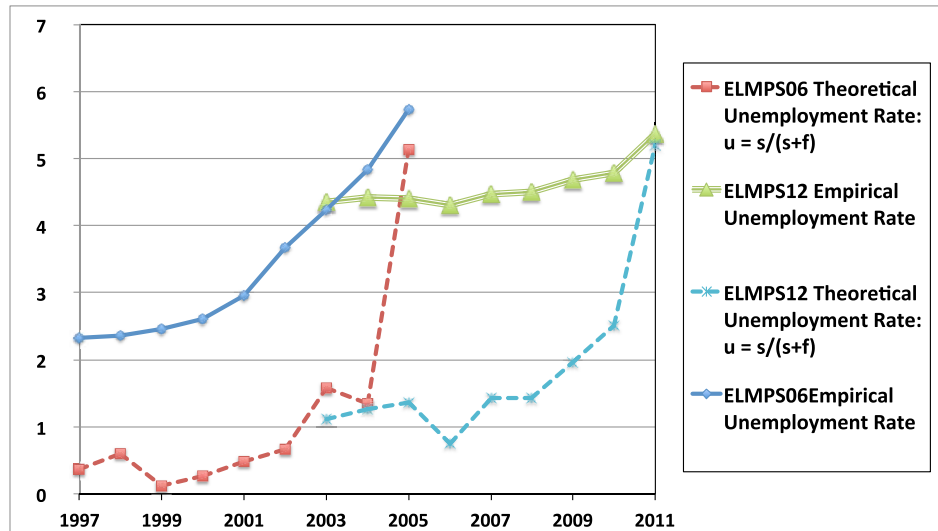
$$\underbrace{\frac{U}{L}}_{\text{Unemployment Rate}} = \frac{s}{s + f} \quad (3.2)$$

This represents the rate of unemployment to which the economy naturally gravitates in the long run. The natural rate of unemployment is determined by looking at the rate people are finding jobs, compared with the rate of job separation (i.e. People quitting either voluntarily or involuntarily in our case), and not the size of the population or the economy. In any given period, people are either employed or unemployed. As a result, the sum of structural and frictional unemployment <sup>13</sup> is referred to as the natural rate of unemployment also called "full employment" unemployment rate. This is the

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<sup>13</sup>Frictional unemployment occurs naturally in any economy. People have to search to find an employer who needs their specific skills. Finding the right employee-employer match takes time and energy. Individuals have to look for the right job, and firms have to screen individuals for the right qualifications. This takes some time. Therefore, there will always be some level of unemployment in the healthiest of economies.

average level of unemployment that is expected to prevail in an economy and in the absence of cyclical unemployment. A healthy dynamic economy is therefore one with high separation and finding rates, keeping natural unemployment rate at its minimum.



Source: LFSS surveys by CAPMAS and Authors' own calculations using ELMPS12.

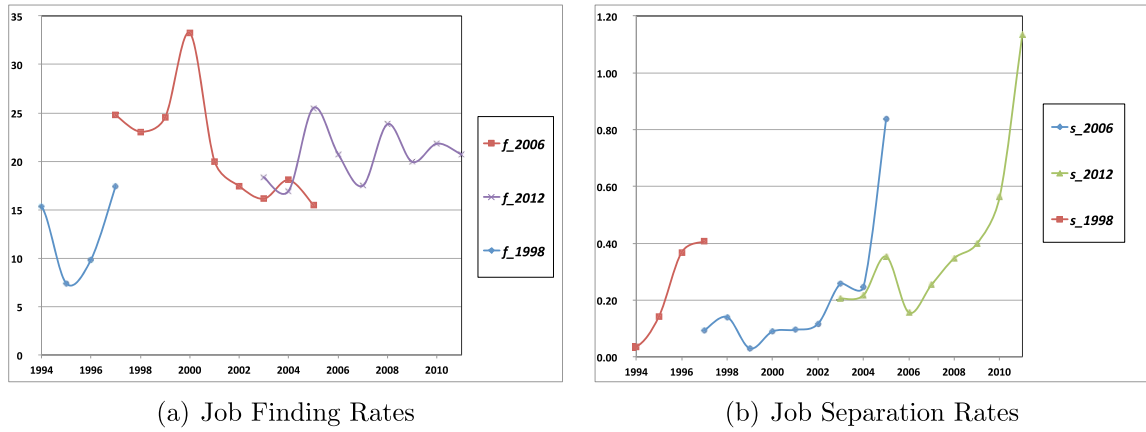
Figure 3.1: Empirical Versus Theoretical Unemployment Rate, Male Workers between 15 and 49 years of age

Using the job finding and job separation rates obtained from our constructed synthetic panel data sets, we plot in figure 3.1 the theoretical steady state versus the empirical unemployment (the rate of unemployed in the labor force). It is very obvious that the theoretical unemployment rate is correctly estimated and hence a good proxy for the prevailing unemployment rate in the economy only for the year 2011 i.e. the most recent year. The gap between the empirical and theoretical unemployment rate increases as we go back in time. As we examine the data thoroughly, we note that this gap can be mainly attributed to two factors acting in the same direction, namely to the recall error and the design nature of the ELMPS survey.

On the one hand, it's intuitive and very likely that when reporting their labor market histories, individuals would not recall their unemployment spells especially the short ones. On the other hand, as previously mentioned the design of our survey tends to under-record the unemployment and inactivity spells through the retrospective accounts. Consequently our estimations for the job separation rates over previous years are likely to be underestimated. On the other hand, people are more likely subject to



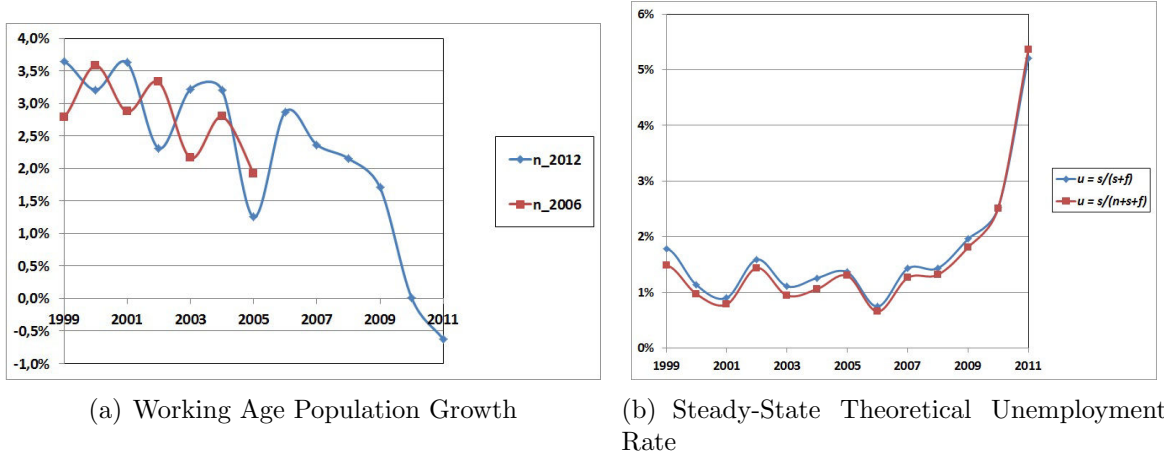
over-recall and over-record their job finding transitions. This becomes clearly obvious as we overlap in figure 3.2 the job finding and separation rates from both panels, ELMPS06 and ELMPS12. Estimations for the job separation rates are increasingly being underestimated as we move backwards from the year of the survey, whilst job finding rates tend to be over-estimated. Even by adding the separation and job finding rates in 1998 obtained from the ELMPS98 synthetic panel which contains incomplete information, we still note the same trend in the bias.



Source: Authors' own calculations using ELMPS12 and ELMPS06.

Figure 3.2: Evolution of job finding and separation rates for workers between 15 and 49 years of age over the period 1999-2011 in Egypt, using ELMPS 2006 and ELMPS2012.

A potential argument behind the reason of the backward increasing gap between the theoretical and empirical unemployment rates is the declining growth rate of the working age population in Egypt. The Steady State theoretical unemployment rate assumes a population that increases at a constant growth rate. We therefore replot in figure 3.3 the steady state theoretical unemployment rate with a declining population growth rate  $n$ . Even after correcting for the population dynamics, the theoretical unemployment rate curve keeps the same form confirming the backward increasing trend of the “recall and design” bias suggested above. For brevity and simplicity, we use throughout the rest of the paper the term recall error to refer to this combined bias.



Source: Authors' own calculations using ELMPS12 and ELMPS06.

Figure 3.3: Steady-State unemployment rates, with a constant versus decreasing population growth rate, male workers between 15 and 49 years of age.

### 3.4.2 A Model Correcting Recall Error

We present two models: the first one is a simple two-state model (here employment and unemployment), and the second is a three-state model (employment, unemployment and inactivity)<sup>14</sup>.

#### A two-state model

We suppose that the true labor market histories are generated by a discrete-time Markov chain. The vector of the true labor market state occupied at year  $t$  is

$$X(t) = \begin{bmatrix} E(t) \\ U(t) \end{bmatrix} \quad (3.3)$$

where  $E(t)$  and  $U(t)$  represent the true proportion of employed and unemployed respectively in the labor force in year  $t$ . These are therefore the unbiased true moments

<sup>14</sup>The model can be easily extended to multiple state to be able to correct detailed labor market transitions, for instance among the different employment sectors and non-employment. However, given the nature of the data used and the available samples' sizes, as has been shown in chapter 1, it is not possible to estimate a multiple-state model using the longitudinal retrospective panels extracted from the ELMPS surveys.

of the population stocks obtained from the data. The vector

$$x(t) = \begin{bmatrix} e(t) \\ u(t) \end{bmatrix} \quad (3.4)$$

denotes the observed empirical labor market state proportions at time  $t$ , with  $e(t)$  and  $u(t)$  being the observed proportion of employed and unemployed in the labor force in year  $t$ . These are the observed moments that decay, i.e. get biased due to the recall and design measurement errors as one goes back in time from the year of the survey. With  $\lambda_{lk}(t-1, t)$  being the transition rates from state  $l$  occupied in  $t-1$  to the state  $k$  occupied in  $t$ , the matrix

$$M(t-1, t) = \begin{bmatrix} \lambda_{EE}(t-1, t) & \lambda_{EU}(t-1, t) \\ \lambda_{UE}(t-1, t) & \lambda_{UU}(t-1, t) \end{bmatrix}_{15} \quad (3.5)$$

gives the observed transition probabilities between the year  $t-1$  and the year  $t$ . These are obtained by aggregating the expanded number of individuals making the transition  $lk$  from the year  $t-1$  to year  $t$  in the constructed retrospective panels and dividing by the stock of  $l$  in the year  $t-1$ . There exists a restriction on these transition rates: the sum of the elements of each column must be equal to one,

$$\lambda_{EU}(t-1, t) = 1 - \lambda_{EE}(t-1, t) \quad (3.6)$$

$$\lambda_{UE}(t-1, t) = 1 - \lambda_{UU}(t-1, t) \quad (3.7)$$

The transition matrix in equation 5.14 leads to

$$x(t) = M'(t-1, t)x(t-1) \quad (3.8)$$

where  $M'(t-1, t)$  is the transposed matrix of  $M(t-1, t)$ . The observed transition probabilities, as have been explained above, are biased due to recall and design measurement errors. To be able to correct this bias, an error term  $\varphi_z(t-1, t)$ , for  $z = E, U$ , is defined and associated to the  $z$ -type agents. These error terms vary in time and increase as one goes back in history, showing the loss of accuracy and memory as older

events are being reported, as observed in the descriptive statistics in the previous section. The true matrix of transition probabilities between years  $t - 1$  and  $t$  can therefore be written as follows;

$$\begin{aligned}\Pi(t - 1, t) &= \begin{bmatrix} \lambda_{EE}(t - 1, t) - \varphi_E(t - 1, t) & \lambda_{EU}(t - 1, t) + \varphi_E(t - 1, t) \\ \lambda_{UE}(t - 1, t) + \varphi_U(t - 1, t) & \lambda_{UU}(t - 1, t) - \varphi_U(t - 1, t) \end{bmatrix} \\ &= \begin{bmatrix} \lambda_{EE}(t - 1, t) - \varphi_E(t - 1, t) & 1 - [\lambda_{EE}(t - 1, t) - \varphi_E(t - 1, t)] \\ 1 - [\lambda_{UU}(t - 1, t) - \varphi_U(t - 1, t)] & \lambda_{UU}(t - 1, t) - \varphi_U(t - 1, t) \end{bmatrix}\end{aligned}\tag{3.9}$$

By correcting the observed transition matrix  $M(t - 1, t)$ , in equation 5.14 and obtaining a true corrected one  $\Pi(t - 1, t)$ , in equation 5.18, we obtain

$$X(t) = \Pi'(t - 1, t)X(t - 1)\tag{3.10}$$

where  $\Pi'(t - 1, t)$  is the transposed matrix of  $\Pi(t - 1, t)$ . Given the shape of the recall bias observed and discussed in the previous section in figures 3.1 and 3.2, we assume that the error terms  $\varphi_z(t - 1, t)$ , for  $z = E, U$  :

$$\varphi_z(t - 1, t) = \nu_z(1 - \exp(-\theta_z(T - t)))\tag{3.11}$$

implying  $\varphi_z(T - 1, T) = 0$ . As suggested by the descriptive statistics in the previous section, the worker flows are correctly estimated for the most recent year  $T$ , we therefore assume that  $\Pi(T - 1, T) = M(T - 1, T)$  for a given retrospective panel data set. For the 2012 round of the ELMPS, for instance, the assumption  $\Pi(2010, 2011) = M(2010, 2011)$  is made and for the ELMPS06  $\Pi(2004, 2005) = M(2004, 2005)$ , reflecting that the most recent year of the retrospective panel extracted from a survey is the most accurate one. It's also important to note here that we exclude, from our analysis, transitions between the years 2011-2012 and 2005-2006, since these transitions are only observed for part of the year and not the entire years 2006 and 2012. The data collection process for both surveys was conducted early 2006 and 2012. Given the above setting and the availability of three waves from the ELMPS, we are able to estimate the parameters

$\Theta = \{\theta_E, \theta_U, \nu_E, \nu_U\}$ , using a Simulated Method of Moments (SMM). We solve the following system

$$\begin{aligned} g(x_T, \Theta) &= \left\{ \begin{bmatrix} X(2011)_{ELMPS12} \\ X(2005)_{ELMPS06} \\ \lambda_{EE}(2004, 2005)|_{2006} \\ \lambda_{UU}(2004, 2005)|_{2006} \end{bmatrix} - \begin{bmatrix} \tilde{\Pi}_1(\Theta) \\ \tilde{\Pi}_2(\Theta) \\ \tilde{\Pi}_3(\Theta) \\ \tilde{\Pi}_4(\Theta) \end{bmatrix} \right\} \\ &= [\psi_T - \psi(\Theta)] \end{aligned} \quad (3.12)$$

where

$$\begin{aligned} \tilde{\Pi}_1(\Theta) &= \left( \prod_{t=2006}^{2011} \Pi'(t-1, t) \right) X(2005)_{ELMPS06} \\ \tilde{\Pi}_2(\Theta) &= \left( \prod_{t=1998}^{2011} \Pi'(t-1, t) \right) X(1997)_{ELMPS98} \\ \tilde{\Pi}_3(\Theta) &= \lambda_{EE}(2004, 2005)|_{2012} - \nu_E(1 - \exp(-\theta_E(2011 - 2005))) \\ \tilde{\Pi}_4(\Theta) &= \lambda_{UU}(2004, 2005)|_{2012} - \nu_U(1 - \exp(-\theta_U(2011 - 2005))) \end{aligned}$$

This set of restrictions lead to 4 identifying equations. The first two lines of  $g(x_T, \Theta)$  are a  $2 \times 2$  system with only one independent equation<sup>16</sup>,

$$\begin{aligned} E(2011) &= \pi_{1,EE}E(2005) + (1 - \pi_{1,UU})(1 - E(2005)) \\ E(2005) &= \pi_{2,EE}E(1997) + (1 - \pi_{2,UU})(1 - E(1997)) \end{aligned}$$

The two additional identifying restrictions are given by the  $2 \times 2$  system leading to two

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<sup>16</sup>These two first lines of  $g(x_T, \Theta)$  are

$$\begin{aligned} E(2011) &= \pi_{1,EE}E(2005) + (1 - \pi_{1,UU})(1 - E(2005)) \\ 1 - E(2011) &= (1 - \pi_{1,EE})E(2005) + \pi_{1,UU}(1 - E(2005)) \\ E(2005) &= \pi_{2,EE}E(1997) + (1 - \pi_{2,UU})(1 - E(1997)) \\ 1 - E(2005) &= (1 - \pi_{2,EE})E(1997) + \pi_{2,UU}(1 - E(1997)) \end{aligned}$$

where the two first lines lead to the same restriction, as the two last lines.

independent restrictions:

$$\begin{aligned}
& \begin{bmatrix} \lambda_{EE}(2004, 2005) - \varphi_E(2004, 2005) & \lambda_{EU}(2004, 2005) + \varphi_E(2004, 2005) \\ \lambda_{UE}(2004, 2005) + \varphi_U(2004, 2005) & \lambda_{UU}(2004, 2005) - \varphi_U(2004, 2005) \end{bmatrix}_{2012} \\
&= \begin{bmatrix} \lambda_{EE}(2004, 2005) & \lambda_{EU}(2004, 2005) \\ \lambda_{UE}(2004, 2005) & \lambda_{UU}(2004, 2005) \end{bmatrix}_{2006} \\
&\Leftrightarrow \begin{cases} \tilde{\lambda}_{EE}(2004, 2005) &= \lambda_{EE}(2004, 2005) \\ \tilde{\lambda}_{UU}(2004, 2005) &= \lambda_{UU}(2004, 2005) \end{cases}
\end{aligned}$$

with

$$\begin{aligned}
\varphi_E(2004, 2005)|_{2012} &= \nu_E(1 - \exp(-\theta_E(2011 - 2005))) \\
\varphi_U(2004, 2005)|_{2012} &= \nu_U(1 - \exp(-\theta_U(2011 - 2005))) \\
\varphi_E(2004, 2005)|_{2006} &= 0 \\
\varphi_U(2004, 2005)|_{2006} &= 0
\end{aligned}$$

This gives only two restrictions because

$$\begin{aligned}
& \begin{bmatrix} \tilde{\lambda}_{EE}(2004, 2005) & 1 - \tilde{\lambda}_{EE}(2004, 2005) \\ 1 - \tilde{\lambda}_{UU}(2004, 2005) & \tilde{\lambda}_{UU}(2004, 2005) \end{bmatrix}_{2012} \\
&= \begin{bmatrix} \lambda_{EE}(2004, 2005) & 1 - \lambda_{EE}(2004, 2005) \\ 1 - \lambda_{UU}(2004, 2005) & \lambda_{UU}(2004, 2005) \end{bmatrix}_{2006}
\end{aligned}$$

where  $\tilde{\lambda}_{EE}(2004, 2005) = \lambda_{EE}(2004, 2005)|_{2012} - \varphi_E(2004, 2005)|_{2012}$   
and  $\tilde{\lambda}_{UU}(2004, 2005) = \lambda_{UU}(2004, 2005)|_{2012} - \varphi_U(2004, 2005)|_{2012}$ .

This model is therefore just identified with 4 free parameters and 4 restrictions. In order to be able to estimate  $\Theta = \{\theta_E, \theta_U, \nu_E, \nu_U\}$ , we solve  $J$ , where  $J$  is

$$J = \min_{\Theta} [\psi_T - \psi(\Theta)]' W [\psi_T - \psi(\Theta)] = g(x_T, \Theta)' W g(x_T, \Theta) \quad (3.13)$$

Estimating the parameters  $\theta_E$ ,  $\theta_U$ ,  $\nu_E$  and  $\nu_U$  allows us to reproduce the true transition probabilities  $\Pi(t-1, t)$  between the years 1999 and 2005 using the retrospective

lingitudinal panel extracted from the ELMPS 2006 survey. Appendix 3.C show the steps adopted to obtain the standard errors of the estimated parameters allowing us to construct confidence intervals around the corrected transition rates and steady state unemployment rate as well as test for their statistical significance.

### Accounting for a large set of labor market transitions ( $N$ states)

The vector of the true labor market state occupied at year  $t$  becomes now

$$Y(t) = \begin{bmatrix} E(t) \\ U(t) \\ I(t) \end{bmatrix} \quad (3.14)$$

where  $E(t)$ ,  $U(t)$  and  $I(t)$  represent the true unbiased moments of the proportion of employed, unemployed and inactive individuals respectively in year  $t$ . The vector

$$y(t) = \begin{bmatrix} e(t) \\ u(t) \\ i(t) \end{bmatrix} \quad (3.15)$$

denotes the observed labor market state histories at time  $t$ , with  $e(t)$ ,  $u(t)$  and  $i(t)$  being the observed proportion of employed, unemployed and inactive in year  $t$ . With  $\lambda_{lk}(t-1, t)$  being the transition rates from state  $l$  occupied in  $t-1$  to the state  $k$  occupied in  $t$ , the matrix

$$N(t-1, t) = \begin{bmatrix} \lambda_{EE}(t-1, t) & \lambda_{EU}(t-1, t) & \lambda_{EI}(t-1, t) \\ \lambda_{UE}(t-1, t) & \lambda_{UU}(t-1, t) & \lambda_{UI}(t-1, t) \\ \lambda_{IE}(t-1, t) & \lambda_{IU}(t-1, t) & \lambda_{II}(t-1, t) \end{bmatrix} \quad (3.16)$$

gives the observed biased transition probabilities between the year  $t-1$  and the year  $t$ . There exists a restriction on these transition rates: the sum of the elements of each column must be equal to one. Thus, we have:

$$\lambda_{EI}(t-1, t) = 1 - \lambda_{EU}(t-1, t) - \lambda_{EE}(t-1, t) \quad (3.17)$$

$$\lambda_{UI}(t-1, t) = 1 - \lambda_{UE}(t-1, t) - \lambda_{UU}(t-1, t) \quad (3.18)$$

$$\lambda_{IU}(t-1, t) = 1 - \lambda_{IE}(t-1, t) - \lambda_{II}(t-1, t) \quad (3.19)$$

This transition matrix leads to

$$y(t) = N'(t-1, t)y(t-1) \quad (3.20)$$

As previously, the observation of the transition probabilities can be biased due to the recall error. To correct this bias, we propose to estimate, in this case, three functions, one for each subgroup. We define  $\varphi_z(t-1, t)$ , for  $z = E, U, I$ , as the associated error terms to the  $z$ -type agents (the subgroup). These errors also vary in time and increase as we go back in history. Again, these simply reflect that people tend to lose accuracy and memory as they report older events. This allows us to write the true matrix of transition probabilities between years  $t-1$  and  $t$  as follows;

$$\Omega(t-1, t) = \begin{bmatrix} \lambda_{EE} - \varphi_E & \lambda_{EU} + a_1\varphi_E & \lambda_{EI} + (1 - a_1)\varphi_E \\ \lambda_{UE} + b_1\varphi_U & \lambda_{UU} - \varphi_U & \lambda_{UI} + (1 - b_1)\varphi_U \\ \lambda_{IE} + c_1\varphi_I & \lambda_{IU} + (1 - c_1)\varphi_I & \lambda_{II} - \varphi_I \end{bmatrix} \quad (3.21)$$

With the correction, we obtain

$$Y(t) = \Omega'(t-1, t)Y(t) \quad (3.22)$$

As in the two state model, the error terms  $\varphi_z(t-1, t)$  are assumed to have the following functional forms:

$$\varphi_z(t-1, t) = \nu_z(1 - \exp(-\theta_z(T - t)))$$



implying  $\varphi_z(T-1, T) = 0$ . Since as we show in the previous section, our worker flows are correctly estimated for the most recent year  $T$ , we therefore assume that  $\Omega(T-1, T) = N(T-1, T)$  for a given synthetic panel data set. This implies that for the ELMPS12 constructed panel  $\Omega(2010, 2011) = N(2010, 2011)$  and for the ELMPS06  $\Omega(2004, 2005) = N(2004, 2005)$ . Given this new three-state setting, we are now able to estimate the parameters

$$\Theta_3 = \{\theta_E, \theta_U, \theta_I, \nu_E, \nu_U, \nu_I, a_1, b_1, c_1\}$$

where  $\dim(\Theta_3) = 9$ , by solving the following system

$$\begin{aligned} g(x_T, \Theta_3) &= \left\{ \begin{bmatrix} Y(2011)_{ELMPS12} \\ Y(2005)_{ELMPS06} \\ \lambda_{EE}(2004, 2005)|_{2006} \\ \lambda_{UU}(2004, 2005)|_{2006} \\ \lambda_{II}(2004, 2005)|_{2006} \\ \lambda_{EU}(2004, 2005)|_{2006} \\ \lambda_{UE}(2004, 2005)|_{2006} \\ \lambda_{IE}(2004, 2005)|_{2006} \end{bmatrix} - \begin{bmatrix} \tilde{\Omega}_1(\Theta_3) \\ \tilde{\Omega}_2(\Theta_3) \\ \tilde{\Omega}_3(\Theta_3) \\ \tilde{\Omega}_4(\Theta_3) \\ \tilde{\Omega}_5(\Theta_3) \\ \tilde{\Omega}_6(\Theta_3) \\ \tilde{\Omega}_7(\Theta_3) \\ \tilde{\Omega}_8(\Theta_3) \end{bmatrix} \right\} \\ &= [\psi_T - \psi(\Theta_3)] \end{aligned} \tag{3.23}$$

where

$$\begin{aligned}
\tilde{\Omega}_1(\Theta_3) &= \left( \prod_{t=2006}^{2011} \Omega'(t-1, t) \right) Y(2005)_{ELMPS06} \\
\tilde{\Omega}_2(\Theta_3) &= \left( \prod_{t=1998}^{2011} \Omega'(t-1, t) \right) Y(1997)_{ELMPS98} \\
\tilde{\Omega}_3(\Theta_3) &= \lambda_{EE}(2004, 2005)|_{2012} - \nu_E(1 - \exp(-\theta_E(2011 - 2005))) \\
\tilde{\Omega}_4(\Theta_3) &= \lambda_{UU}(2004, 2005)|_{2012} - \nu_U(1 - \exp(-\theta_U(2011 - 2005))) \\
\tilde{\Omega}_5(\Theta_3) &= \lambda_{II}(2004, 2005)|_{2012} - \nu_I(1 - \exp(-\theta_I(2011 - 2005))) \\
\tilde{\Omega}_6(\Theta_3) &= \lambda_{EU}(2004, 2005)|_{2012} - \nu_E(1 - \exp(-\theta_E(2011 - 2005))) \\
\tilde{\Omega}_7(\Theta_3) &= \lambda_{UE}(2004, 2005)|_{2012} - \nu_U(1 - \exp(-\theta_U(2011 - 2005))) \\
\tilde{\Omega}_8(\Theta_3) &= \lambda_{IE}(2004, 2005)|_{2012} - \nu_I(1 - \exp(-\theta_I(2011 - 2005)))
\end{aligned}$$

Similar to the derivation done for the two state model, we therefore find out that the identification of  $\Omega$  relies on restrictions laid out by equations that serve to guarantee the consistency of  $\Omega$  with the evolution of stocks between 2005 and 2011 as well as 1997 and 2005. Since  $1 = E + U + I$ , these would yield 4 restrictions only allowing us to identify only four free parameters. We therefore add six more restrictions identified by

$$\Omega(2004, 2005)_{ELMPS06} = \Omega(2004, 2005)_{ELMPS12}$$

The relations between the transition rates in equations 3.17, 3.18 and 3.19 is the reason that we only yield six restrictions. Given the structure imposed by the three states model, we have ten restrictions and nine free parameters: the model is therefore over-identified. Further tests after estimation can therefore be developed in this case to test for its goodness of fit.

The same estimation methodology, as for the two-state model, is adopted where to estimate  $\Theta = \{\theta_E, \theta_U, \theta_I, \nu_E, \nu_U, \nu_I\}$ , we solve  $J$ , where  $J$  is

$$J = \min_{\Theta_3} [\psi_T - \psi(\Theta_3)] W [\psi_T - \psi(\Theta_3)]' = g(x_T, \Theta_3) W g(x_T, \Theta_3)' \quad (3.24)$$

We use our estimated  $\hat{\theta}_z$ ,  $\hat{\nu}_z$ ,  $\hat{a}_1$ ,  $\hat{b}_1$  and  $\hat{c}_1$ , for  $z = E, U, I$ , to reproduce the

true transition probabilities  $\Omega(t-1, t)$  between the years 1999 and 2005 using the retrospective panel extracted from the ELMPS 2006.

### 3.4.3 Empirical results: the "corrected" Data

Our estimations of the recall error terms allow us to obtain in table 3.1 the estimated results for  $\hat{\phi}$ ,  $\hat{\psi}$ ,  $\hat{\psi}_E$ ,  $\hat{\psi}_U$  and  $\hat{\psi}_I$  for both models, namely E-U and E-U-I.

	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Model 1: E-U							
$\hat{\phi}$	0.006	0.0059	0.0058	0.0056	0.005	0.0036	0
$\hat{\psi}$	-0.1002	-0.0874	-0.0732	-0.0576	-0.0403	-0.0212	0
Model 2: E-U-I							
$\hat{\psi}_E$	0.0096	0.0096	0.0095	0.0093	0.0086	0.0065	0
$\hat{\psi}_U$	-0.071	-0.0602	-0.0489	-0.0373	-0.0253	-0.0129	0
$\hat{\psi}_I$	-0.0682	-0.0589	-0.0489	-0.0380	-0.0263	-0.0136	0

Table 3.1: Estimation of recall error terms

The corrected trends of the separation, job finding and three-state transition rates are hence obtained as follows in figures 3.4, 3.5 and 3.6. Indeed, as we have already shown in the descriptive time series obtained from overlapping the two surveys (ELMPS 2006 and ELMPS 2012), the separation is under-estimated and this bias is larger when the individual must appeal to distant memory. For the job finding rate, the transition rates are slightly over-estimated. The setting of our correction model succeeds in adjusting these trends to reflect as close as possible the prevailing labor market flows of the economy using the available data. These figures also show that the correction of the separation rates is more important than the one of the job finding rates. This was expected given the nature and extent of the recall as well as the design bias earlier discussed in the data section. As we compare our corrected separation and job finding rates in 1999 in figure 3.4, to the empirical rates we obtain from ELMPS98 in 1998 in figure 3.1, we find that our methodology allows us to obtain a very good proxy to the true level of these rates as we go backwards in time. Appendix 3.A show the confidence intervals computed for the corrected separation and job finding rates in the two state model.

As we replot the steady-state unemployment rates using the corrected separation

and job finding rates <sup>17</sup> for each of the two models, we obtain much more reasonable curves (figures 3.4c and 3.5c)<sup>18</sup>: our corrected theoretical unemployment rate share approximatively the same average of the aggregate empirical unemployment rate (obtained from stocks). Nevertheless, it seems more cyclical than the prevailing empirical unemployment rate, suggesting that it contains more information.

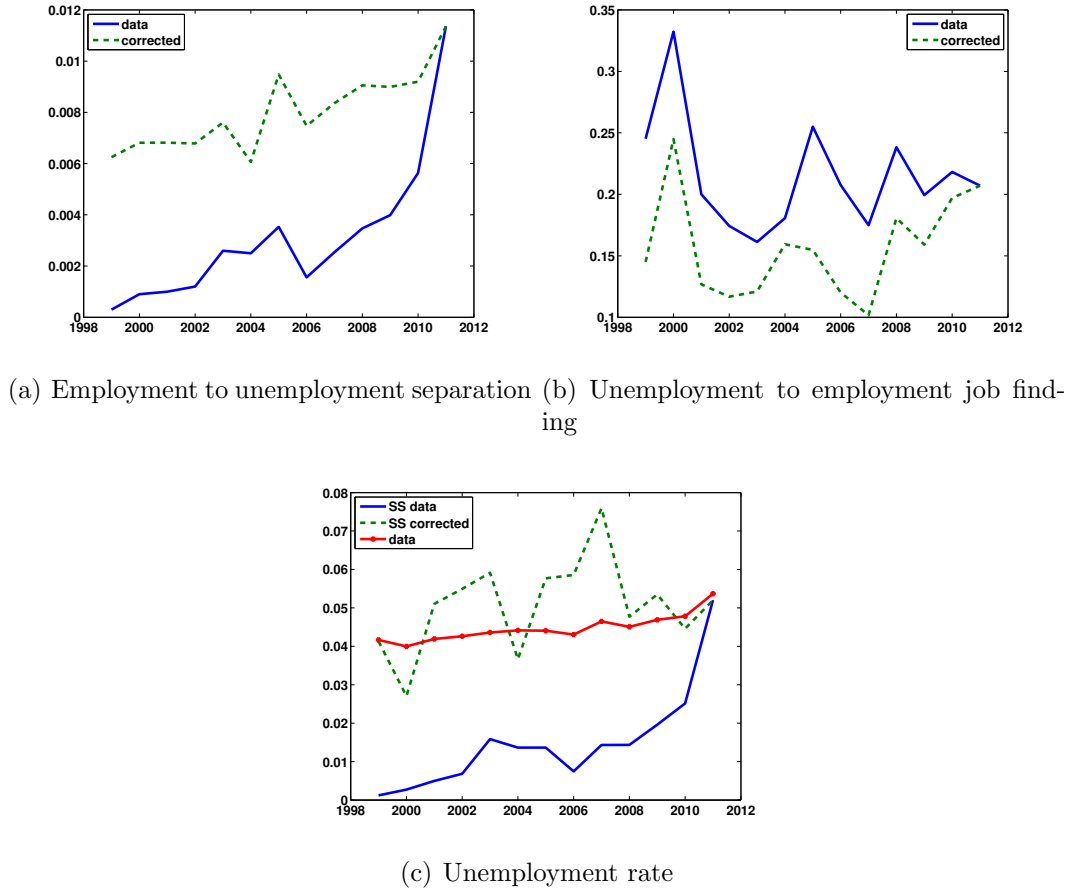
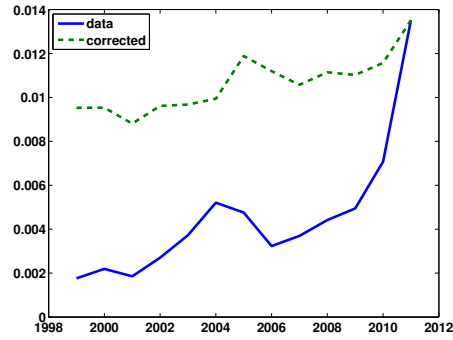


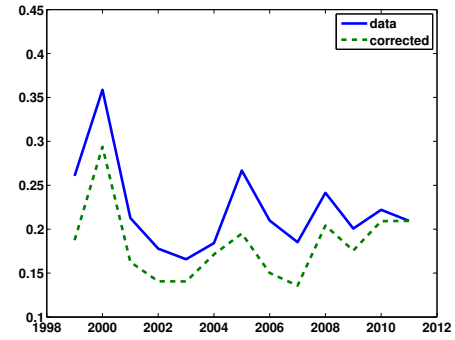
Figure 3.4: Job finding, separation and unemployment Rates in Egypt for male workers between 15 and 49 years of age, corrected for recall bias, two-state employment/unemployment model

<sup>17</sup>Finding and Separation rates obtained in the three-state model are not of the same level as the rates in the two-state. This is pretty intuitive and normal since in the first model, an individual can only occupy one of two states (E or U), the transitions involved are therefore only EU and UE. In the three-state E,U,I model, the finding and separation rate take into consideration any other type of transition or state, an individual could have gone through before entering employment or exiting to unemployment. The probabilities calculated are therefore conditional on the existence of a third state in the labor market, namely inactivity and all related potential transitions.

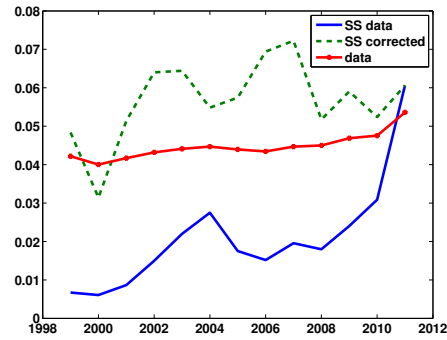
<sup>18</sup>See appendix 3.A for the confidence intervals of the steady state unemployment compared to the empirical stocks



(a) Separation



(b) Job finding



(c) Unemployment Rate

Figure 3.5: Job finding, separation, unemployment rates in Egypt for male workers between 15 and 49 years of age, corrected for recall bias, three-state employment/unemployment/inactivity model

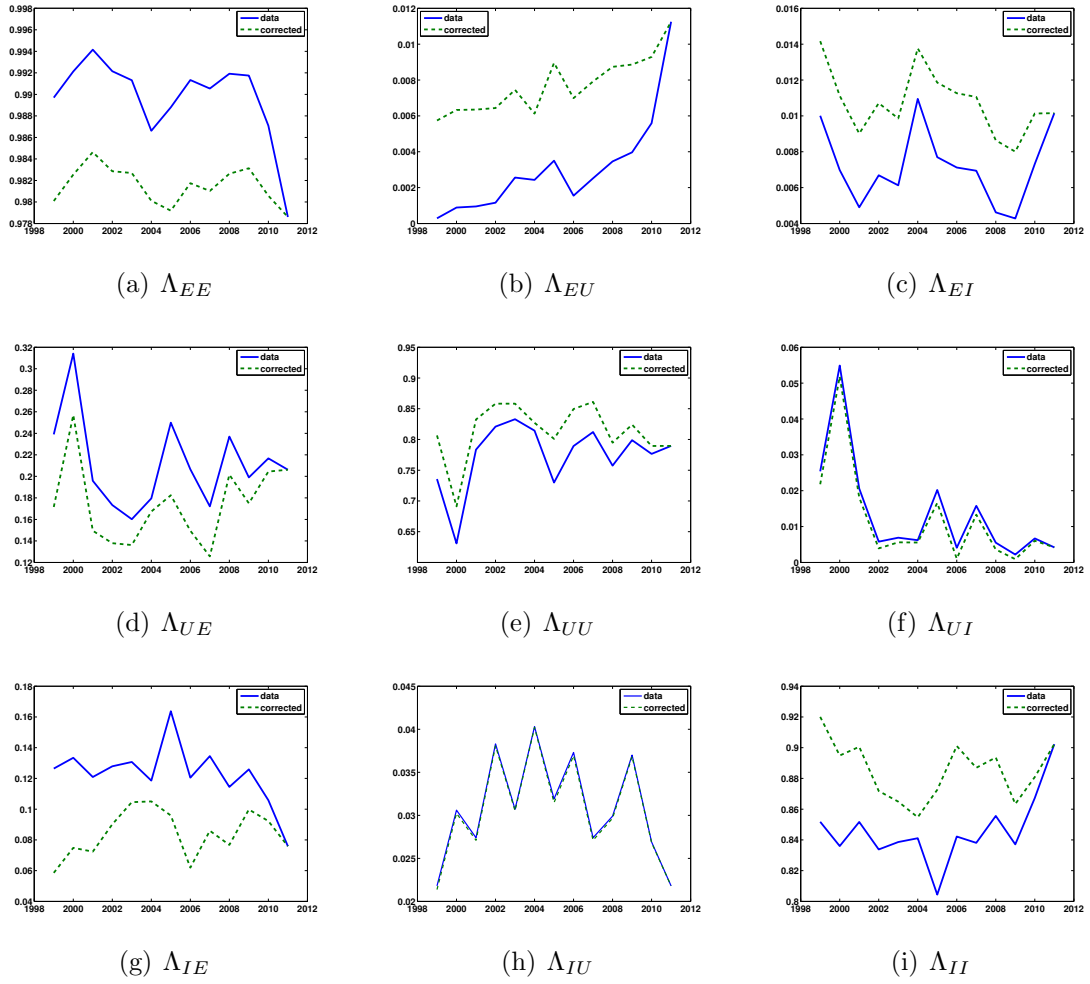


Figure 3.6: All transition rates in Egypt for male workers between 15 and 49 years of age, corrected for recall bias, three-state employment/unemployment/inactivity model

## 3.5 Policy Evaluation of the reform

In this section, our objective is to detect a structural break, linked to a permanent and unexpected change in the labor market policy. We first present our simple econometric methodology allowing us to identify a permanent change linked to the reform, and then, we present and comment our empirical findings.

### 3.5.1 Econometric Methodology

**A two-state labor market.** In our time series, there are two components. The first one accounts for the business cycle, whereas the second accounts for long run component. Only this last part matters for our analysis. It is therefore necessary to purge the time series from their cyclical components. We extract the high frequency component of each series using the first difference of the observed output (in log): our final data are then the trend of the original time obtained after a projection on aggregate business cycle measures: we obtain a measure of the long run components of the worker flows. We test the robustness of your statistical approach by using the cyclical component of the output (in log) extracted by the Hodrick-Prescott (HP) filter instead to use the first difference of the output.

Any policy, that changes the natural rate of the worker flows ( $x^*$ ), introduces an instability on the relation

$$\hat{x}_t = \hat{b} + \mathbb{I}_a \hat{\gamma} + \hat{\epsilon}_t \quad \text{for } x = f, s.$$

This allows us to test the impact of the 2003 reform in the Egyptian labor market. Without any observed policy change ( $\hat{\gamma} = 0$ ), the variations in  $\hat{x}_t$  are driven by unobservable changes in the matching and the separation processes. Remark that the time series  $\hat{x}_t^s$ , built under the assumption of a stable relationship over time, can be interpreted as the counterfactual of an economy without any policy changes (this time series is build with  $\hat{\gamma} = 0$ ). If the policy change the natural rate of the worker flows, then the “true” series of the natural worker flows are given by  $\hat{x}_t$ . The gap between  $\hat{x}_t$  and  $\hat{x}_t^s$  measures the impact of the reform.

Given that the unemployment rate is well approximated by its stationary value at the flow equilibrium, we can use our estimations of the natural flows to construct the implied natural unemployment. More formally, we have  $u = \frac{s}{s+f}$ . Thus, if we only focus on the component of the worker flows purged from the cyclical component linked to the GDP, we have  $\hat{u}_t = \frac{\hat{s}_t}{\hat{s}_t + \hat{f}_t}$  and  $\hat{u}_t^s = \frac{\hat{s}_t^s}{\hat{s}_t^s + \hat{f}_t^s}$ .

Finally, in order to measure the relative contribution of the worker flows in the unemployment dynamics, one can compute  $\hat{u}_t^f = \frac{\hat{s}_t}{\hat{s}_t + \hat{f}_t^s}$ : this time series gives the unemployment dynamics if only the job finding rate is affected by the reform, or in other words, the contribution of the change in the job finding rate to the natural unemployment variation.

**Extension: Entry and exit from the labor force.** In a developing rigid labor market such as Egypt, flows to and from inactivity play an important role as a determinant of final labor market outcomes. Examining the gross flows of workers, between the three labor market states, employment (E), unemployment (U) and inactivity, becomes essential to portray as fully as possible the real story and the particular nature of the market.

In such case we adopt the same econometric methodology described above to measure the impact of the 2003 new labor law on the three-state labor market transitions. However, as mentioned previously, we now have a  $3 \times 3$  matrix of the corrected transition probabilities,  $\Omega(t-1, t)$ . With  $\Lambda_{ji}(t-1, t)$  being the corrected transition rates from state  $j$  occupied in  $t-1$  to the state  $i$  occupied in  $t$ , we re-write  $\Omega(t-1, t)$  as follows;

$$\Omega(t-1, t) = \begin{bmatrix} \Lambda_{EE} & \Lambda_{EU} & \Lambda_{EI} \\ \Lambda_{UE} & \Lambda_{UU} & \Lambda_{UI} \\ \Lambda_{IE} & \Lambda_{IU} & \Lambda_{II} \end{bmatrix}$$

This therefore extract the cyclical component of the workers flows using the first difference of the observed output (in log)<sup>19</sup>, and we analyze the behavior of the "natural"

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<sup>19</sup>As previously, a robustness check is provided by the use of the HP filter instead of the first difference of the output.



rate of worker flows using the model

$$\hat{x}_t = \hat{b} + \mathbb{I}_a \hat{\gamma} + \hat{\epsilon}_t \quad \text{for } x = \Lambda_{EE}, \Lambda_{EU}, \Lambda_{EI}, \Lambda_{UE}, \Lambda_{UU}, \Lambda_{UI}, \Lambda_{IE}, \Lambda_{IU}, \Lambda_{II}.$$

This allows us to test if the policy changes the natural rate of the worker flows or not.

We then use our estimations of the natural flows to construct the implied natural unemployment. Following Shimer (2012), in a three-state E-U-I model, the number of employed, unemployed and inactive individuals are determined by the following equations;

$$E = k(\Lambda_{UI}\Lambda_{IE} + \Lambda_{IU}\Lambda_{UE} + \Lambda_{IE}\Lambda_{UE})$$

$$U = k(\Lambda_{EI}\Lambda_{IU} + \Lambda_{IE}\Lambda_{EU} + \Lambda_{IU}\Lambda_{EU})$$

$$I = k(\Lambda_{EU}\Lambda_{UI} + \Lambda_{UE}\Lambda_{EI} + \Lambda_{UI}\Lambda_{EI})$$

where  $k$  is a constant set so that  $E$ ,  $U$  and  $I$  sum to the relevant population. The steady-state unemployment rate ( $u = \frac{s}{s+f}$ ) in a three-state labor market can therefore be written as

$$u = \frac{\Lambda_{EI}\Lambda_{IU} + \Lambda_{IE}\Lambda_{EU} + \Lambda_{IU}\Lambda_{EU}}{(\Lambda_{EI}\Lambda_{IU} + \Lambda_{IE}\Lambda_{EU} + \Lambda_{IU}\Lambda_{EU}) + (\Lambda_{UI}\Lambda_{IE} + \Lambda_{IU}\Lambda_{UE} + \Lambda_{IE}\Lambda_{UE})}$$

The relative contribution of the worker flows in the unemployment dynamics is then calculated. One can compute  $\hat{u}_t^f = \frac{\hat{s}_t}{\hat{s}_t + \hat{f}_t^s}$ , a time series that gives the unemployment dynamics if only job finding rate is affected by the reform given no change in the separation rates. In the three-state model (where individuals can also be inactive), the separation and job finding rates take into account all intermediate states/transitions, an individual could have gone through before exiting into unemployment or entering into employment. The hypothetical separation and job finding rates are therefore calculated as follows;

$$\hat{s}_t = \bar{\Lambda}_{EI}\bar{\Lambda}_{IU} + \bar{\Lambda}_{IE}\bar{\Lambda}_{EU} + \bar{\Lambda}_{IU}\bar{\Lambda}_{EU}$$

$$\hat{f}_t^s = \Lambda_{UI}\bar{\Lambda}_{IE} + \bar{\Lambda}_{IU}\Lambda_{UE} + \bar{\Lambda}_{IE}\Lambda_{UE}.$$

In other words, we show the unemployment dynamics if the three-state model separa-

tion rate followed the same dynamics as before the 2003 reform.

### 3.5.2 Estimation and Results

In this section, we show that correcting for the recall bias enables us, to investigate the "true" evolution of worker flows trends over the period 1998-2012 in our both models; E-U and E-U-I. To illustrate the interest of our approach, we propose, in a first "naive" estimation, the impact of the reform using non-corrected data. In a second step, using the corrected data, we provide a more robust analysis. We are then able to link changes in the job finding and separation rates to the 2003 New Labor Law implemented in Egypt in 2004.

#### A Naive Econometric Model

In a naive econometric scenario, the above recall error would be neglected: the data used in this "naive" approach are the non-corrected data. The job finding and separation rates are purged from their business cycle component. In order to account for the increase of the recall bias, we also introduce a linear and a quadratic trend: this is the "naive" method which allows this simple econometric model to have stationary residuals, given the shape of the non-corrected time series of separation and job finding rates. We hence use the following econometric model:

$$\hat{x}_t = \beta_1 t + \beta_2 t^2 + b + \mathbb{I}_a \gamma + \hat{\epsilon}_t \quad \text{for } x = f, s$$

where  $f_t$  and  $s_t$  are respectively the observed job finding and job separation rates.  $\beta_1$  and  $\beta_2$  are two constants representing the linear and quadratic trends (in our case the increasing slope) of the time series.  $b$  is a constant term that encompasses the "true" constant and the structural rate of worker flows (hiring or separation). We also introduce a dummy  $\mathbb{I}_a = 1$  after the reform and 0 before. By running such a regression, one obtains the following results reported in table 3.2.

By neglecting the recall error, or more precisely, by using a reduced form analysis which does not use the restrictions provided by the data and the stock-flow models, the law seems to have reduced the unemployment rate. There has been a significant

	$f$	$f$	$s$	$s$
$\beta_1$	-0.0360**	-0.0348	-0.000028	0.000214
$\beta_2$	0.0025*	0.0035	0.000042**	0.00044***
$b$	0.2534***	0.2253*	0.0017**	-0.0004
$\gamma$		-0.0310		-0.002337***

Table 3.2: OLS regression results, a naive econometric model

decrease in the separation rates and non-significant effect on the job finding rates. In such a case, the law seems inefficient in terms of flexibilizing the labor market, i.e. facilitating the hiring and firing process. Yet, the policy makers would be relieved seeing the unemployment rates reduced (see the section 3.6 for a figure of this unsatisfying correction of the unemployment rate). Unfortunately, the above naive scenario does not reflect not even part of the reality. By neglecting the structural interaction between the job finding and separation rates, and detrending each time series apart, one obtains misleading results: some data restrictions are not used in order to constraint the estimation. We show in the rest of the paper the impact of the reform after correcting for this recall bias given the underlying interaction between the structural stock-flow approach of the labor market model and the data.

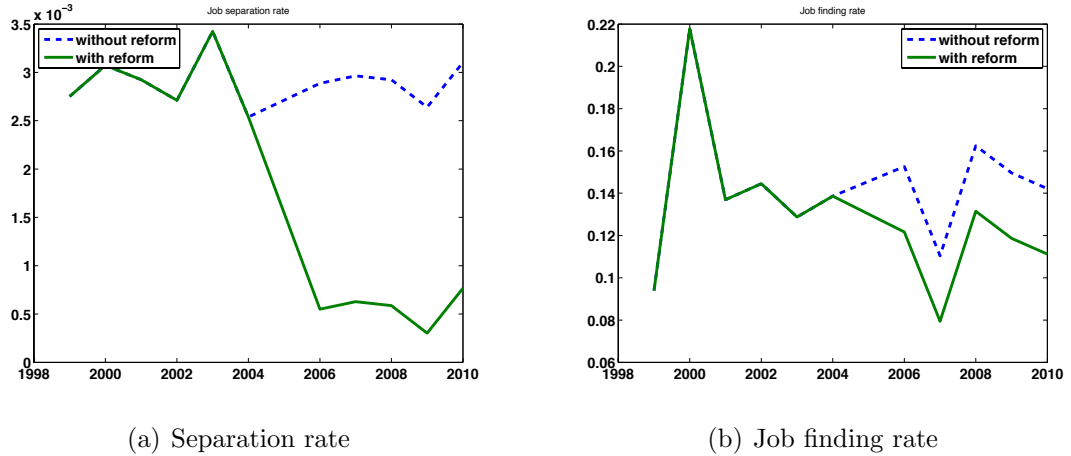


Figure 3.7: Job Finding and Separation Rates with and without the new labor market reform in 2004, a naive econometric model

### The evaluation of the reform with corrected data

After correcting the labor market flows from the recall error, we compute the steady-state unemployment rate ( $u = \frac{s}{s+f}$ ), our proxy to the prevailing unemployment rate

in the economy. Figure 3.8 shows the relationship between the GDP growth rate and the corrected steady-state unemployment rate in Egypt over the period 1999-2011. We note that before the year 2004, the year of implication of the new labor law, there has been a classical negative relationship between the unemployment rate and the GDP growth, which portrays an Okun's law relation between the unemployment and economic growth. However, after the reform this negative relationship gets distorted. We note a substantial increase in the unemployment rate accompanied by a rapid growth of GDP levels. In order to be able to explain such a paradox and because the reform can have different effects on job finding and separation rates, we decompose its impact by analyzing these two components of the unemployment rate.

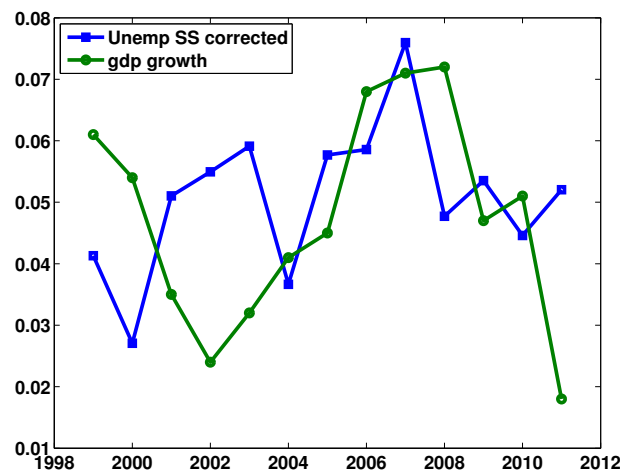


Figure 3.8: GDP growth rate and corrected steady-state unemployment rate in Egypt for male workers between 15 and 49 years of age

Our econometric methodology extracts the cyclical component from the trends of the labor market flows making it possible to detect a structural break observed in our time series showing the impact of the new labor law implemented in 2004. We first limit our analysis to individuals being either employed or unemployed. At first glance, figure 3.9 shows that the new labor law has lead to positive effects on both separation and job finding rates. Our regression results in 3.B, however, reveal that only the increase in separation rates was significant at the 1% level. With a very significant rise in the separations and a no significant change in the job findings, it becomes intuitive that the normal net effect of the reform explains the rise in the unemployment rates after

2004.

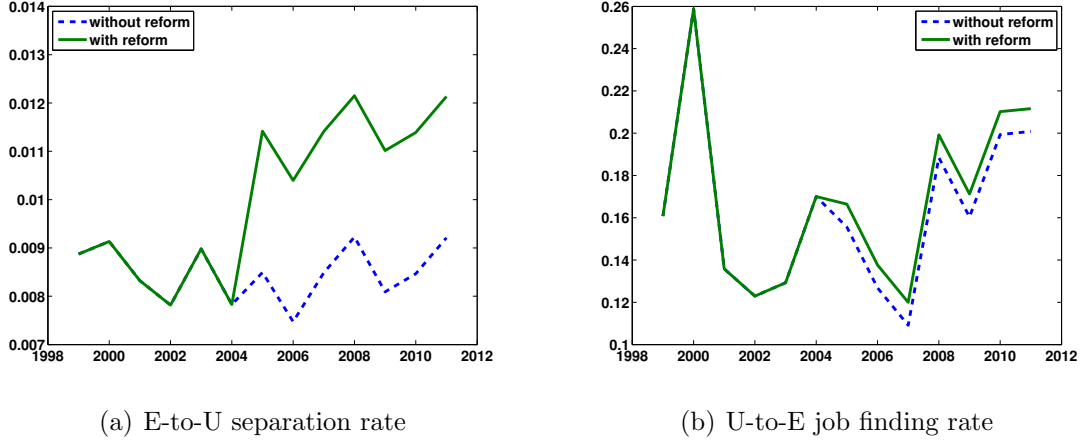


Figure 3.9: Trends of Job Finding and Separation Rates with and without the new labor market reform in 2004, a two-state E/U model

The full story of the Egyptian labor market is never however complete as one excludes flows entering and exiting the labor force. According to Yassine (2014), the new entrants (inactivity to employment) constitute a substantial flow of workers, that one can not ignore when analyzing the Egyptian labor market. As a matter of fact it has been argued that, being a developing country, looking at participation rates might portray a better picture of the health of the labor market. Consequently, the detrended job finding and separation rates are reconstructed but this time for a three-state model where individuals can either be employed, unemployed or inactive. By modeling all possible labor market flows, we calculate separation and job finding rates, but this time accounting for the existence of the inactivity state. Our results are robust and coherent with the two-state E/U system. The 2003 reform lead to a significant increase in the separation rates and barely any impact on the job finding rates. Looking at the more detailed labor market transitions, we show that even though the structural break, observed in 2004, favored the unemployment-to-employment ( $\Lambda_{UE}$ ) flows, as well as inactivity-to-employment ( $\Lambda_{IE}$ ) labor market flows, the impact has been insignificant for both (The coefficients when ( $\hat{\gamma} \neq 0$ ) were insignificant for these flows.). The introduction of the dummy at the time of the reform neither improved the fit of the regressions for ( $\Lambda_{IE}$ ) nor ( $\Lambda_{UE}$ ). On the other hand, the coefficients of the dummy  $\gamma$  for the regressions of ( $\Lambda_{EI}$ ) and ( $\Lambda_{EU}$ ) were statistically significant (Table 3.5). It's im-

portant to note at this point that the E-to-I has been slightly affected negatively after the 2003 law. This impact was only significant at the 10% level and was mainly dominated by the very significant increment of the E-to-U flows. All regressions' estimations used in this section are illustrated in appendix 3.B. We also redo our regressions, by detrending our flows using the Hodrick and Prescott (1997) filter, in the appendix 3.B, showing that we obtain the same robust results.

In general, we note that the residuals of the regressions that omit the 2003 reform are non-stationary. For the significant cases (especially separations), the residuals become centered around zero when the reform is taken into account. This supports the significant impact of the dummy variable reported in the tables 3.3, 3.4 and 3.5.

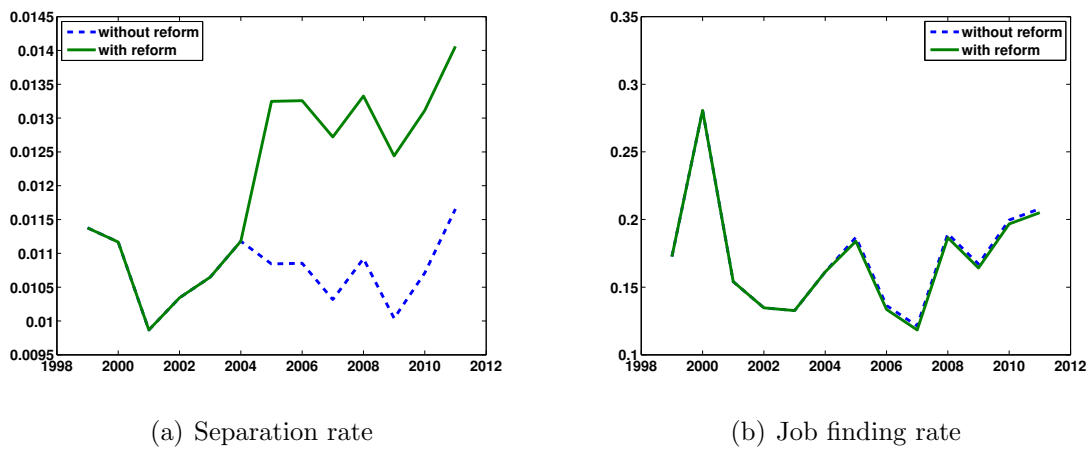


Figure 3.10: Job Finding and Separation Rates with and without the new labor market reform in 2004, a three-state E-U-I model

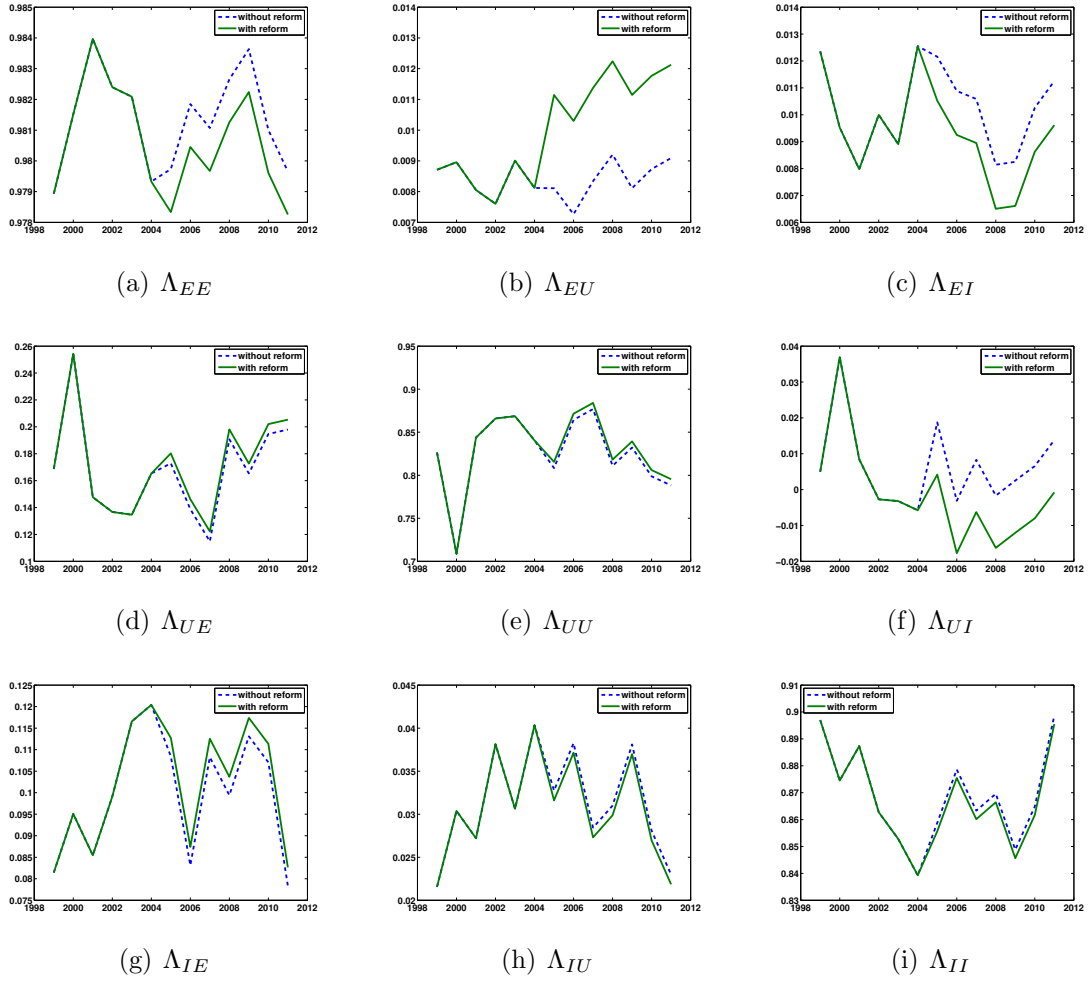


Figure 3.11: Trends of labor market transition rates with and without the new labor market reform in 2004, a three-state E-U-I model

### 3.6 Counterfactuals and Implications

Having shown the effects of the reform on labor market flows (the components of unemployment), we were able to deduce that the dynamics of the separation rates has a much more dominant impact, especially after the new 2003 labor law, on the variability of the unemployment rate than the job finding rates. Given that the policy reform is unexpected and that the labor market flows are jump variables, one can use our estimation results to decompose the unemployment dynamics between each of its components.

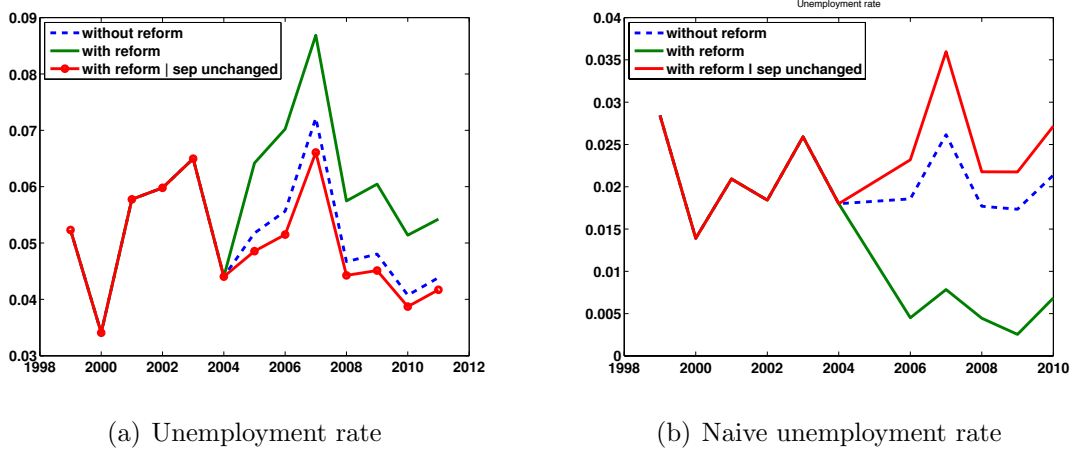


Figure 3.12: Counterfactual evolution of unemployment rate if separation rates followed the same dynamics before the labor market reform in 2004, a two-state E-U model

To be able to verify this observation and using the estimates of equations 3.38, 3.39, 3.42 and 3.43, we construct counterfactual experiments. After extracting the cyclical component of the worker flows driven by the output gap, and then focussing only on the structural changes on the labor market, we can construct two time series: the first where it is assumed that the reform has no impact on the structural worker flows ( $\hat{\gamma} = 0$ ) and the other where the estimates of the 2003 reform are take into account ( $\hat{\gamma} \neq 0$ ). We therefore plot the evolution of unemployment rate after the reform assuming the separation rates have followed the same dynamics before the law. In other words, these time series assume that the separation rates remain unaffected by the reform. This scenario captures the impact of the reform on the variability of the unemployment rate if and only if the law had an impact on the Egyptian labor market's job finding rates.



We reproduce the same exercise with the "naive" econometric model presented in the section 3.5.2.<sup>20</sup> The two panels of figure 3.12 show that the use of the corrected data, that take into account the restrictions of the markovian processes of the workers flows, does not lead to the same predictions of a reduced form estimation. Our correction clearly matters, even for a policy evaluation.

Figures 3.12 and 3.13 show that, whether we take into consideration the existence of a third state of inactivity in the market or not, the relative contribution of the separation rates to the Egyptian unemployment dynamics is substantial and significant. The structural increase in the unemployment rates after the reform is mainly due to the increase in separation rates. The positive responses (decrease in unemployment) due to the insignificant increase in the job finding rates were definitely outweighed by the significant impact of the augmented separations (figure 3.12). Adding inactivity as a third state in the economy, the positive impact of the job findings on the unemployment is no more observed (since job findings hardly changed in this model) and all the unemployment variations are attributed to the separations increase in this case. The Egyptian unemployment rate was therefore more responsive and had a larger elasticity vis-a-vis the variation in the level of the separation rate. It is true that it's important for an economy, in order to promote higher productivity levels associated with economic growth, to increase job destruction (i.e separations). This phenomenon should however be accompanied by new productive jobs being created in a much greater magnitude; in other words a more proportional increase in the job findings. This assures a healthy dynamic labor market with natural unemployment rates maintained at low levels. Generally, the law achieved only part of its double-sided mission, where the firing process was to some extent facilitated. Yet it has not been offset by a sufficiently increased and facilitated hiring. As a matter of fact, the law did not affect by any means the hiring process in the Egyptian labor market. In simple words, more jobs were being destructed, than before the law, while the same number of jobs were being created. A normal consequence would be a rise in the unemployment even if the economy has been experiencing rising rates of economic growth.

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<sup>20</sup>Given the non-stationarity of the uncorrected job flows data, the average of the job finding and separation rates are  $x = \frac{1}{T} \sum_t (\beta_1 t + \beta_2 t^2) + b$ .

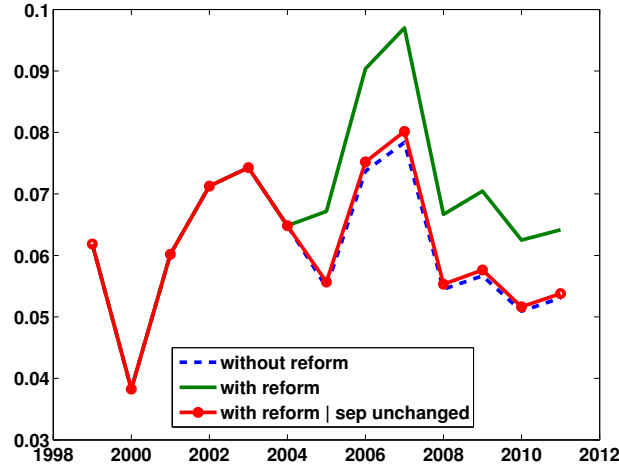


Figure 3.13: Counterfactual evolution of unemployment rate if separation rates followed the same dynamics before the labor market reform in 2004, a three-state E-U-I model

## 3.7 A theoretical attempt to evaluate the partial failure of the reform

In this section, we survey the conventional Mortensen and Pissarides (1994) theoretical model, showing the impact of a reduction of firing costs on the labor market's equilibrium. According to the model, the introduction of such reform, modelled as a decrease in the firing taxes, would lead to the increase of both separation and job finding rates. These theoretical predictions supports the liberalization of the labor market. Nevertheless, according to our empirical results, following the introduction of a more flexible employment protection policy in the market, only the job separations in Egypt increased while the job findings remain unchanged. We therefore try to explain this phenomenon using the theoretical model. We show that an increase in corruption can explain the partial failure of the reform.

### 3.7.1 Setting the Model

We set an equilibrium search model with a matching function  $m(v, u)$  that characterizes the search and recruiting process by which new job-worker matches are created. The recruiting intensities across employers and workers are the same. The matching function is characterized by constant returns where  $m(v, u) = m(1, \frac{u}{v})v \equiv q(\theta)v$  with

$\theta = \frac{v}{u}$  being the market tightness. A vacant job is filled at a rate  $q(\theta)$ ; this rate decreases in  $\theta$  since  $q(\theta) = m(1, \frac{1}{\theta})$ . Consequently with increasing market tightness, the vacancy takes longer to be filled (duration of the vacancy  $= \frac{1}{q(\theta)}$ ). A worker finds a job at a rate  $\theta q(\theta)$ , which increases with  $\theta$ . It follows that with increased labor market tightness, a worker takes a shorter duration to find a job (duration of being unemployed  $= \frac{1}{\theta q(\theta)}$ ).

An existing match is destroyed if the idiosyncratic productivity falls below a reservation threshold, an endogenous variable  $R$ . It therefore follows that the unemployment incidence (E→U) is given by  $\lambda F(R)$ . If  $R$  increases, extra jobs will fall below the productivity threshold and  $\lambda F(R)$  increases. The expected duration of a job is  $\frac{1}{\lambda F(R)}$ .

At steady-state, we have  $\dot{u} = \lambda F(R)(1 - u) - \theta q(\theta)u = 0$ . Steady-state unemployment rate can therefore be expressed as follows:  $u = \frac{\lambda F(R)}{\lambda F(R) + \theta q(\theta)} = \frac{s}{s+f}$ . As  $\theta$  increases, the steady state unemployment decreases. As the reservation product  $pR$  increases ( $p$  being a worker's skill), more separations take place and the steady state unemployment increases.

A firm incurs two types of costs and they both increase as the skill sophistication/level becomes higher: (i) a set-up cost:  $pC$  (these are sunk up costs once the match is formed), and (ii) a recruiting cost  $cp$ .

An employer and a worker meet, they bargain and agree on an initial wage  $w_0(p)$ . The job is created, production occurs until they get a shock and that's when they renegotiate a wage  $w(x, p)$ . If  $x$  ever falls below the reservation product, that's when the job is destructed. The firm pays a firing cost  $pT$  (imposed by the employment protection regulation). This increases with the skill of the worker because it costs more to get rid of a skilled worker than a less skilled one.

### ***Firm Values***

The value of a continuing match to the employer

$$rJ(x) = px - w(x) + \lambda \int_R^1 [J(z) - J(x)] dF(z) + \lambda F(R)[V - pT - J(x)] \quad (3.25)$$

The asset pricing equation of the present value of an unfilled vacancy is :

$$rV = q(\theta)[J_0 - V - pC] - pc \quad (3.26)$$

Initial value of the match to the employer:

$$rJ_0 = p - w_0 + \lambda \int_R^1 [J(z) - J_0] dF(z) + \lambda F(R)[V - pT - J_0] \quad (3.27)$$

New vacancies are posted until the capital value of holding a vacancy is equal to zero.  
i.e. replace  $V = 0$  in equation 3.26

$$J_0 = \frac{pc}{q(\theta)} + pC \quad (3.28)$$

This represents that , at the free-entry condition, the cost of recruiting and hiring a worker should be equal to the anticipated discounted profit the employer gets from the job.

### ***Worker Values***

The value of the worker for the initial and the continuing matches are:

$$rW_0 = w_0 + \lambda \int_R^1 [(W(z) - W_0)] dF(z) + \lambda F(R)[U - W_0] \quad (3.29)$$

$$rW(x) = w(x) + \lambda \int_R^1 [(W(z) - W(x))] dF(z) + \lambda F(R)[U - W(x)] \quad (3.30)$$

Value of being unemployed:

$$rU = b + \theta q(\theta)[W_0 - U] \quad (3.31)$$

### ***Wage Determination and Nash Bargaining***

The threatpoint is looking for an alternative match partner.  $\beta$  is the worker's bargaining power and consequently  $1 - \beta$  is the employer's. For the initial and the

continuing wages, we have:

$$w_0 = \operatorname{argmax}\{[W_0 - U]^\beta [J_0 - pC - V]^{1-\beta}\} \quad w(x) = \operatorname{argmax}\{[W(x) - U]^\beta [J(x) - V + pT]^{1-\beta}\}$$

Differentiating with respect to the wage ( $w_0$  or  $w(x)$ ) and equating the derivative to zero, for a surplus  $S_0 = J_0 - V - pC + W_0 - U$  or  $S(x) = J(x) - V + pT + W(x) - U$ , we obtain:

$$\begin{aligned} W_0 - U &= \beta S_0 & \text{and} & & J_0 - V + pT &= (1 - \beta) S_0 \\ W(x) - U &= \beta S(x) & \text{and} & & J(x) - V + pT &= (1 - \beta) S(x) \end{aligned}$$

For the continuing wage, we will neither have the set-up costs nor the job creation subsidy, but we will have the firing tax (not in the initial value since this is a cost that does not exist if the match is not formed initially). Hence, the wage rules are<sup>21</sup>

$$\begin{aligned} w_0 &= (1 - \beta)b + \beta p(1 + c\theta - (r + \lambda)C - \lambda T) \\ w(x) &= (1 - \beta)b + \beta p(\theta c + x + rT) \end{aligned}$$

### 3.7.2 Equilibrium

#### *The job creation condition*

Substituting the wage equations into the initial and continuing match value equations, we obtain:<sup>22</sup>

$$(1 - \beta) \left[ \frac{(1 - R)}{r + \lambda} - T - C \right] = \frac{c}{q(\theta)} \quad (3.32)$$

#### *The job destruction condition*

A firm destroys a job if it becomes more profitable to keep the job vacant i.e.  $V > J(z) + pT$  and a worker prefers to stay unemployed if  $U > W(z)$ . The reservation

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<sup>21</sup>See the appendix 3.C for the complete derivation of the wage equations.

<sup>22</sup>See the appendix 3.C for the complete derivation of the job creation curve.

productivity is therefore  $R = \max\{R_e, R_w\}$ , with  $R_e$  being the reservation productivity of the employer and  $R_w$  being the reservation productivity of the worker. It therefore follows that the necessary and sufficient condition is  $R = R_e = R_w \Rightarrow J(R) + W(R) = V - pT + U$ . The separation rule should be jointly optimal that it maximizes the “total wealth” (Employer + worker).

Again, substituting the wage equation  $w(x)$  into the asset value equation, then evaluating  $((r + \lambda)J(x))$  at  $z$  and  $R$ , we are able to calculate  $J(z) - J(R) = \frac{1-\beta}{r+\lambda}p(z - R)$ . This enables us to obtain the job destruction curve as follows:

$$\frac{b}{p} - rT + \frac{\beta}{1-\beta}c\theta = R + \frac{\lambda}{r+\lambda} \int_R^1 (z - R)dF(z) = R + \frac{\lambda}{r+\lambda} \int_R^1 (1 - F(z))dz \quad (3.33)$$

### 3.7.3 The impact of the New Labor Law 2004

Employment protection laws are translated in the theoretical model via the firing tax  $T$ . Since we are dealing with a developing country where corruption is a common phenomenon, we can also think of the set up costs  $C$  as a corruption fixed cost. With a probability  $\mu$  the employer is forced to pay at the start of a job an amount  $\kappa$  to a corrupt agent and with a probability  $1 - \mu$  he pays nothing. To be able to measure the impact of the new Egypt labor law 2004 on the equilibrium pair  $(R^*, \theta^*)$ , the effect on  $R^*$  and  $\theta^*$  is obtained by differentiating the equilibrium conditions.

For the job creation condition, we obtain

$$\frac{c}{1-\beta}d\theta = \frac{1}{r+\lambda} \frac{q^2(\theta)}{q'(\theta)}dR + \frac{q^2(\theta)}{q'(\theta)}(dT + dC) \quad (3.34)$$

and differentiating the job destruction condition, we get

$$\frac{db}{p} - rdT + \frac{\beta}{1-\beta}cd\theta = \frac{r + \lambda F(R)}{r + \lambda}dR \quad (3.35)$$

Rewriting equation 3.34 as follows, and introducing it in equation 3.35, we obtain

$$\begin{aligned}
d\theta &= \frac{1-\beta}{c} \frac{1}{r+\lambda} \frac{q^2(\theta)}{q'(\theta)} dR + \frac{1-\beta}{c} \frac{q^2(\theta)}{q'(\theta)} (dT + dC) \\
\Rightarrow \underbrace{\frac{db}{p} + \beta \frac{q^2(\theta)}{q'(\theta)} dC}_{-} + \underbrace{\left[ \beta \frac{q^2(\theta)}{q'(\theta)} - r \right] dT}_{-} &= \underbrace{\left[ r + \lambda F(R) - \beta \frac{q^2(\theta)}{q'(\theta)} \right] \frac{dR}{r+\lambda}}_{+}
\end{aligned}$$

This implies that the variation of  $\theta$  at the equilibrium is given by

$$d\theta = \frac{1-\beta}{c} \frac{q^2(\theta)}{q'(\theta)} \left[ \frac{\frac{1}{p}}{r + \lambda F(R) - \beta \frac{q^2(\theta)}{q'(\theta)}} db + \frac{r + \lambda F(R)}{r + \lambda F(R) - \beta \frac{q^2(\theta)}{q'(\theta)}} dC + \frac{\lambda F(R)}{r + \lambda F(R) - \beta \frac{q^2(\theta)}{q'(\theta)}} dT \right]$$

If  $db = 0$ , then the model reveals that  $C$  and  $T$  must change at the same time in order to observe a constant job finding rate, as in the data. Indeed, we have  $d\theta = 0$ , iff

$$dC = -\frac{\lambda F(R)}{r + \lambda F(R)} dT \quad (3.36)$$

In this case, the equation 3.35 is reduced to

$$-r dT = \frac{r + \lambda F(R)}{r + \lambda} dR$$

which shows that when  $dT < 0$ , we have  $dR > 0$ . Hence, the joint evolution of  $T$  and  $C$  can explain why we observe more separations but not more creations when liberalization reforms are introduced in the labor market, as it is always the case in the usual Mortensen and Pissarides model.<sup>23</sup> Remark that if  $dC = 0$ , whereas  $db > 0$ , it is not immediate, without parameter restrictions to obtain a increase in separations without any changes in the job finding rate.

The empirical results, discussed above, show that in response to the new Egypt labor law, there has been a substantial increase in separations and almost no change (or a very trivial increase) in the job creation. A simple way to explain this via the

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<sup>23</sup>If  $db = dC = 0$ , we have  $\left[ \beta \frac{q^2(\theta)}{q'(\theta)} - r \right] dT = \left[ r + \lambda F(R) - \beta \frac{q^2(\theta)}{q'(\theta)} \right] \frac{dR}{r+\lambda}$  implying that  $dT < 0$  leads to  $dR > 0$ , whereas the evolution of the job finding rate is driven by the evolution of  $\theta$ , given by  $d\theta = \frac{1-\beta}{c} \frac{q^2(\theta)}{q'(\theta)} \frac{\lambda F(R)}{r + \lambda F(R) - \beta \frac{q^2(\theta)}{q'(\theta)}} dT > 0$ . Hence, in the classical Mortensen and Pissarides model, we have  $d\theta > 0$  and  $dR > 0$  when  $dT < 0$ . A more flexible employment protection reform, modelled as reduced firing taxes, would increase in this case, both job creations and destructions.

theoretical model is therefore by setting  $dC \neq 0$ , as in equation 3.36.

Even if the firing taxes are reduced ( $dF < 0$ ), but the corruption costs increase ( $dC > 0$ ), the positive effect on job creation can be attenuated or even totally nullified. Explaining this in real world terms, it is possible to say that employers might perceive this reform as a potential increase for their surplus. Nevertheless, at the same time, it is possible for the corrupt agent to capture this new surplus by increasing the set-up costs: separations then rise instantaneously but hiring decisions do not change.

Is this explanation possible? It is not possible to measure corruption directly. Hence, our theoretical analysis can reveal the impact of the phenomenon on the labor market equilibrium. Corruption may be thought of as a form of rent seeking which adds a cost to transactions, in particular for new entrants or for the job creation. Do we observe an increase of corruption in Egypt at the time of the reform, or a change in the trend of perceived corruption at the time the new labor law came to action? If it is the case, then one can not reject our interpretation of our empirical results, based on the Mortensen and Pissarides model perturbed by changes in firing taxes (the labor market reform) and changes in corruption ( installation/set-up costs). The Transparency International<sup>24</sup> provides a Corruption Perceptions Index (CPI) that allows to rank countries and territories based on how corrupt their public sector is perceived to be. It is a composite index constructed from a combination of polls and opinion surveys drawing on corruption-related data collected by a variety of reputable institutions. The CPI reflects the views of observers from around the world and residents of the surveyed countries. Using this index, countries are ranked according to a scale ranging from 0 to 10; 0 indicating high levels of perceived corruption and 10 indicating perceived corruption being very low. Figure 3.14 shows that according to the CPI, Egypt has known a significant increase in the perceived corruption after 2004. Before 2004, the corruption trend was perceived as declining (where the index has been increasing over time), this phenomenon was reversed after 2004 (CPI has declined significantly between

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<sup>24</sup>Transparency International (TI) is a German INGO whose main purpose is to fight against corruption of governments and international governmental institutions. It was founded by Peter Eigen in 1993 and today has an international reputation, having autonomous sections in 80 countries all over the world (North as well as South).



2004 and 2010)<sup>25</sup>. The figure 3.14 also shows that this phenomenon was not shared similarly by all the MENA region countries. In Tunisia, the perceived corruption increases significantly after 2004, however in Jordan, the levels of perceived of corruption have declined over that period.

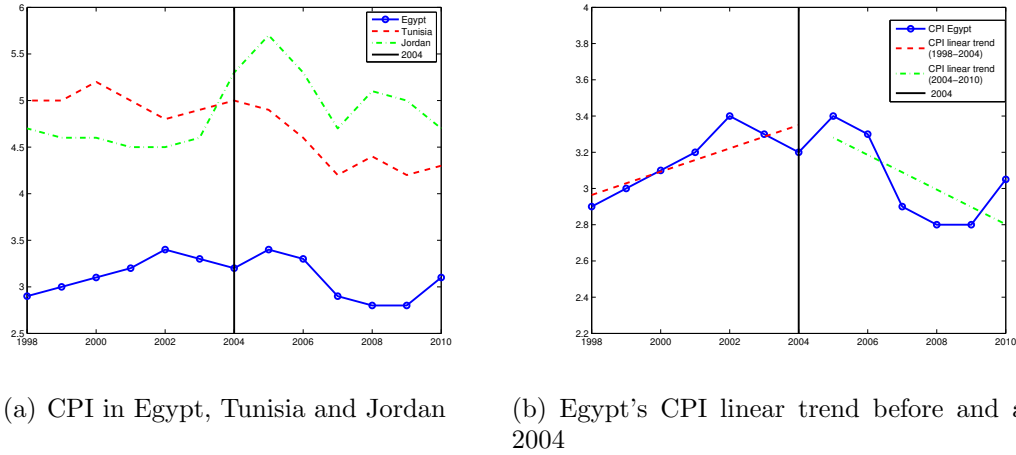


Figure 3.14: Corruption Perceptions Index (CPI) as per Transparency International (TI) in Egypt, Tunisia and Jordan, over the period 1998-2010

Another possible explanation to this might be the existence of informal and public employment sectors in addition to the private formal employer. The interaction and the flow of workers between these different employment sectors are not being considered by the aggregate Mortensen and Pissarides (1994) model. This expresses the need to extend the model to portray such developing countries' labor markets' nature where possible interactions and inter-sectoral transitions might take place with other employment sectors such as the private informal and public employers. Langot and Yassine (2015) describes such an extended theoretical model.

## 3.8 Conclusion

This paper addresses an important question namely the impact of labor market reforms that introduce flexibility in developing countries. We use the experiment of the implementation of the 2003 Egypt labor law on the dynamics of the Egyptian labor

<sup>25</sup>Testing the linear time trend of Egypt's CPI before and after 2004 ( $CPI = \beta * Time + \alpha$ ) yielded significant estimations of the coefficient  $\beta$ . Before the reform,  $\hat{\beta} = 0.0643$  is significant at the 1% level and after 2004,  $\hat{\beta} = -1.9322$  is significant at the 5% level

market, one of the most rigid markets at the end of the nineties. This reform came to action in 2004, with the aim of enhancing the flexibility of the hiring and the firing processes. Given the two components of unemployment, separation and job finding rates, we measure the impact of the reform on each. Using constructed synthetic retrospective panel datasets from the Egypt labor market panel surveys 2006 and 2012, we are able to build a model to control for the recall and design bias such retrospective data sets are likely to encounter. We therefore obtain the corrected trends of separation and job finding rates over the period 1999-2011. These time series of workers' flows, that even official statistics fail to reproduce, are extremely important to be able to understand the behavior of the dynamics of the Egyptian labor market necessary for policy evaluation.

Our findings suggest that the new labor market reform increased significantly the separation rates and had no significant impact on the job finding rates. Having decomposed the impact of the new law on both components and also by using counterfactual experiments, we were able to conclude that the dynamics of the separation rates have had an increasing dominant role in accounting for the changes in the unemployment rate in Egypt especially after 2004. With increased separations and unchanged job findings, the unemployment rates in the Egyptian labor market were shifted upwards after 2004.

In the traditional Mortensen and Pissarides (1994) model, these empirical findings can be explained only if the liberalization of the labor market is accompanied by a capture of the new potential surpluses by corrupt agents. Indeed, in the Mortensen and Pissarides (1994) model, the decrease in the firing costs allows the entrepreneurs to take advantage of the facility to fire employees occupying obsolete jobs. But this decline of taxes also gives incentive to create new jobs: this last phenomenon is not observed in the data. Hence, we deduce that, expecting these increases in job surpluses, the corrupt agents capture the value of these new opportunities: the costs due to corruption will rise, and hence no hirings are encouraged. Knowing that the firms benefit from a larger job surplus, a corrupt agent is more likely to charge extra costs (corruption costs) from the firm than before the application of the reform. In addition to introducing hiring subsidies to commit himself, the policymaker needs to make sure that corruption and

other set-up costs do not increase following such a reform. On the contrary, rules should be set to fight against corruption to decrease such costs for the firms.

From a policy evaluation point of view, the law achieved only part of its mission, where the firing (particularly to unemployment) process was largely facilitated. Yet it has not been offset by a sufficiently increased and facilitated hiring process.

**Extensions:** The correction methodology proposed in this paper assumes a specific parametric functional form of the estimated error terms. Further work is needed to expand on the role of this functional form and to test to what extent the obtained results depend on it. Moreover, since the three-state correction model is over-identified, given nine free parameters and ten identifying restrictions, we shall be able to develop tests of fit for the estimated error terms and hence the corrected transition matrices. Computing the standard errors of the estimated parameters in the three state model, would also enable us to test for their significance and construct confidence intervals for the corrected flows and theoretical steady state stocks as has already been done for the two state correction model. Calculating boot-strapped standard errors of both the two-state and three-state models is also considered for future work.

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## Appendix

### 3.A Statistical Inference of the Correcting Parameters

#### 3.A.1 Computing the Variance of $\Theta$

In order to be able to test for the statistical significance of our correction methodology, we adopt the following steps to be able to calculate the standard deviations of the estimated matrix of the unknown parameters  $\hat{\Theta}$ . We have

$$\begin{aligned} g(x_T, \hat{\Theta}) &= g(x_T, \Theta_0) + Dg(x_T, \Theta_0)(\hat{\Theta} - \Theta_0) \\ \underbrace{Dg(x_T, \hat{\Theta})' W g(x_T, \hat{\Theta})}_{=0 \quad FOC} &= Dg(x_T, \hat{\Theta})' W g(x_T, \Theta_0) + Dg(x_T, \hat{\Theta})' W Dg(x_T, \Theta_0)(\hat{\Theta} - \Theta_0) \end{aligned}$$

where the left hand side of this last equation is equal to zero because it corresponds the the FOC of the problem  $\min_{\Theta} J$ :

$$Dg(x_T, \hat{\Theta})' W g(x_T, \hat{\Theta}) = 0 \tag{3.37}$$

Hence, we deduce that

$$\sqrt{T}(\hat{\Theta} - \Theta_0) = \left[ Dg(x_T, \hat{\Theta})' W Dg(x_T, \Theta_0)' \right]^{-1} Dg(x_T, \hat{\Theta})' W \sqrt{T} g(x_T, \Theta_0)$$

Given that  $Dg(x_T, \hat{\Theta}) = -D\psi(\Theta_T)$ , we have

$$\sqrt{T}(\hat{\Theta} - \Theta_0) = \left[ D\psi(\hat{\Theta})' W D\psi(\Theta_0)' \right]^{-1} D\psi(\hat{\Theta})' W \sqrt{T} [\psi_T - \psi(\Theta_T)]$$

If, asymptotically,  $\sqrt{T}[\psi_T - \psi(\Theta_T)] \rightarrow \mathcal{N}(0, W^{-1})$ , then

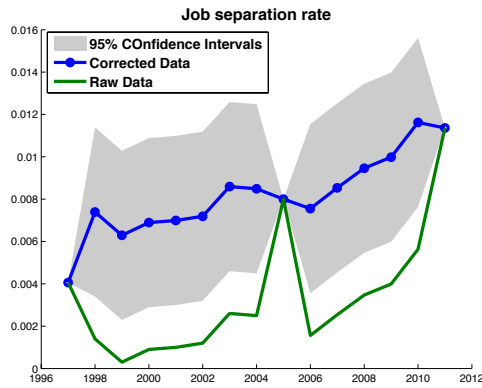
$$\sqrt{T}(\hat{\Theta} - \Theta_0) \rightarrow \mathcal{N}(0, \Sigma_{\Theta})$$

with

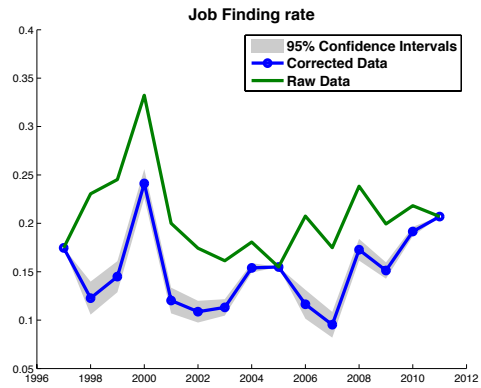
$$\begin{aligned} \Sigma_{\Theta} &= \left[ D\psi(\hat{\Theta})' W D\psi(\Theta_0)' \right]^{-1} D\psi(\hat{\Theta})' W W^{-1} W D\psi(\hat{\Theta}) \left[ D\psi(\hat{\Theta})' W D\psi(\Theta_0)' \right]^{-1} \\ &= \left[ D\psi(\hat{\Theta})' W D\psi(\Theta_0)' \right]^{-1} \end{aligned}$$

### 3.A.2 Corrected Flows and Steady-state Unemployment with Confidence Intervals

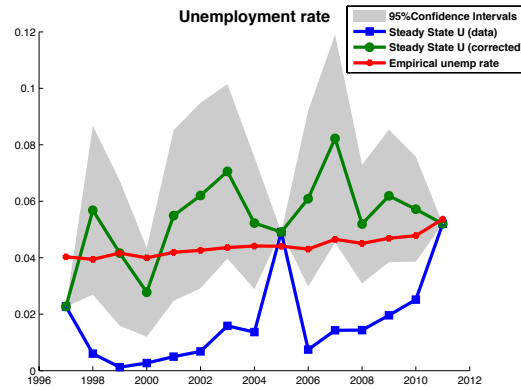
The proposed correction methodology produces significant estimated parameters. In figure 3.15, we show the confidence intervals computed around the corrected time series of the separation and job finding rates, as well as the theoretical steady state unemployment. The corrected flows are significantly different from the biased raw data flows and the corrected steady state unemployment rate is significantly not different from the empirical unemployment rate and can therefore be used as a proxy for the unemployment rate in Egypt over the period 1999-2011 in our analysis.



(a) Employment to unemployment separation



(b) Unemployment to employment job finding



(c) Unemployment rate

Figure 3.15: Job finding, separation and unemployment Rates in Egypt for male workers between 15 and 49 years of age, corrected for recall bias, two-state employment/unemployment model



### 3.B OLS Regression Estimations

We report in the table 3.3 and 3.4 the ols regression estimations, of the two-state E-U model, for the equations 3.38 and 3.39 (where  $\Delta y_t$  is used as an approximation for the difference between the observed and the potential output), as well as the equations 3.40 and 3.41 (where  $y_t^{HP}$  is the detrended output series using the (Hodrick and Prescott, 1997) filter).

$$x_t = \alpha \Delta y_t + b + \epsilon_t \quad \text{for } x = f, s \quad (3.38)$$

$$x_t = \alpha \Delta y_t + b + \mathbb{I}_a \gamma + \epsilon_t \quad \text{for } x = f, s \quad (3.39)$$

$$x_t = \alpha y_t^{HP} + b + \epsilon_t \quad \text{for } x = f, s \quad (3.40)$$

$$x_t = \alpha y_t^{HP} + b + \mathbb{I}_a \gamma + \epsilon_t \quad \text{for } x = f, s \quad (3.41)$$

	$f$	$f$	$s$	$s$
$\alpha$	-0.1436	-0.2577	-0.0122	-0.0430***
$b$	0.1633***	0.1629***	0.0086***	0.0085***
$\gamma$		0.0108		0.0029***

Table 3.3: OLS regression results, a two-state E-U model

	$f$	$f$	$s$	$s$
$\alpha$	0.6980	0.6880	-0.0033	-0.0072
$b$	0.1564***	0.1532***	0.0080***	0.0067***
$\gamma$		0.0062		0.0024***

Table 3.4: OLS regression results, a two-state E-U model (with HP filter)

In table 3.5, the three-state E-U-I ols regression estimations for the following equations 3.42, 3.43, 3.44 and 3.45 are illustrated.

$$x_t = \alpha \Delta y_t + b + \epsilon_t \quad \text{for } x = s, f, \Lambda_{EE}, \Lambda_{EU}, \Lambda_{EI}, \Lambda_{UE}, \Lambda_{UU}, \Lambda_{UI}, \Lambda_{IE}, \Lambda_{IU}, \Lambda_{II} \quad (3.42)$$

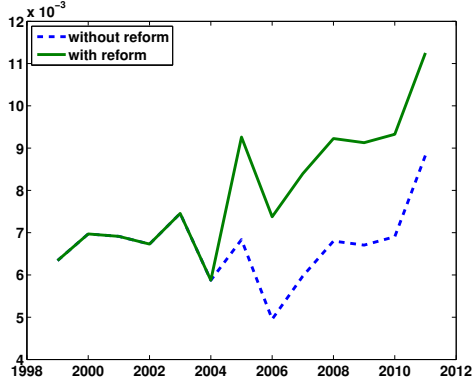
$$x_t = \alpha \Delta y_t + b + \mathbb{I}_a \gamma + \epsilon_t \quad \text{for } x = s, f, \Lambda_{EE}, \Lambda_{EU}, \Lambda_{EI}, \Lambda_{UE}, \Lambda_{UU}, \Lambda_{UI}, \Lambda_{IE}, \Lambda_{IU}, \Lambda_{II} \quad (3.43)$$

$$x_t = \alpha y_t^{HP} + b + \epsilon_t \quad \text{for } x = s, f, \Lambda_{EE}, \Lambda_{EU}, \Lambda_{EI}, \Lambda_{UE}, \Lambda_{UU}, \Lambda_{UI}, \Lambda_{IE}, \Lambda_{IU}, \Lambda_{II} \quad (3.44)$$

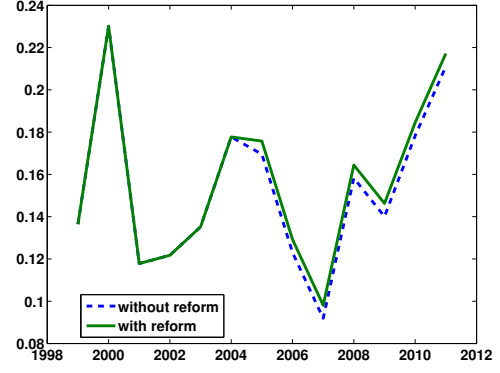
$$x_t = \alpha y_t^{HP} + b + \mathbb{I}_a \gamma + \epsilon_t \quad \text{for } x = s, f, \Lambda_{EE}, \Lambda_{EU}, \Lambda_{EI}, \Lambda_{UE}, \Lambda_{UU}, \Lambda_{UI}, \Lambda_{IE}, \Lambda_{IU}, \Lambda_{II} \quad (3.45)$$

	$f$	$f$	$s$	$s$		
$\alpha$	-0.0570	0.2447	0.0020	-0.0302***		
$b$	0.1748***	0.1727***	0.0107***	0.0107***		
$\gamma$		-0.0029		0.0024***		
	$\Lambda_{UE}$	$\Lambda_{UE}$	$\Lambda_{UU}$	$\Lambda_{UU}$	$\Lambda_{UI}$	$\Lambda_{UI}$
$\alpha$	0.1259	0.0485	-0.2484	-0.3243	0.1224	0.2758
$b$	0.1682***	0.1679***	0.8259***	0.8257***	0.0059	0.0064
$\gamma$		0.0074		0.0072		-0.0146*
	$\Lambda_{EE}$	$\Lambda_{EE}$	$\Lambda_{EU}$	$\Lambda_{EU}$	$\Lambda_{EI}$	$\Lambda_{EI}$
$\alpha$	0.0043	0.0190	-0.0167	-0.0487***	0.0124	0.0296
$b$	0.9813***	0.9814***	0.0085***	0.0084***	0.0102***	0.0102***
$\gamma$		-0.0014		0.0030***		-0.0016*
	$\Lambda_{IE}$	$\Lambda_{IE}$	$\Lambda_{IU}$	$\Lambda_{IU}$	$\Lambda_{II}$	$\Lambda_{II}$
$\alpha$	-0.3293	-0.3744	-0.0148	-0.0029	0.3441	0.3774
$b$	0.0998***	0.0997***	0.0313***	0.0314***	0.8688***	0.8690***
$\gamma$		0.0043		-0.0011		-0.0032
With HP filter	$f$	$f$	$s$	$s$		
$\alpha$	0.8679	0.8712	-0.0149	-0.0183*		
$b$	0.1828***	0.1838***	0.0106***	0.0095***		
$\gamma$		-0.0020		0.0021***		

Table 3.5: OLS regression results, a three-state E-U-I model

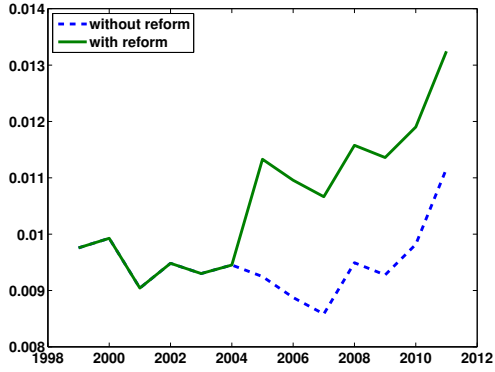


(a) Separation rate

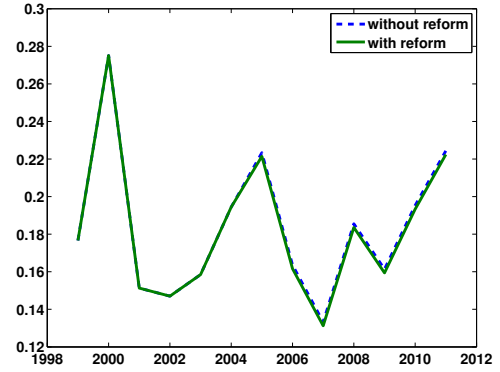


(b) Job finding rate

Figure 3.16: Trends of Job Finding and Separation Rates with and without the new labor market reform in 2004, a two-state E/U model, HP filter used to detrend the labor market flows



(a) Separation rate



(b) Job finding rate

Figure 3.17: Trends of Job Finding and Separation Rates with and without the new labor market reform in 2004, a three-state E/U/I model, HP filter used to detrend the labor market flows

### 3.C Model

Adding equations 3.25 and 3.30, we obtain the following expression for the surplus  $S(x)$ :

$$S(x) = \frac{px + \lambda \int_R^1 S(z) dF(z) - r(V - pT + U)}{r + \lambda} \quad (3.46)$$

Since  $S(R) = 0$ , we have  $\lambda \int_R^1 S(z) dF(z) = r(V - pT + U) - pR$ . This implies that

$$S(x) = \frac{p(x - R)}{r + \lambda} \quad (3.47)$$

Now we go back to the  $S(R)$ :

$$\begin{aligned} \frac{pR + \lambda \int_R^1 S(z) dF(z) - r(V - pT + U)}{r + \lambda} &= 0 \\ \Leftrightarrow pR + \frac{\lambda p}{r + \lambda} \int_R^1 (z - R) dF(z) &= r(V - pT + U) \end{aligned}$$

The reservation product,  $pR$ , plus the option value of continuing the match attributable to the possibility that match product will increase in the future, the left-hand side, equals the flow value of continuation to the pair, the right-hand side of the equation.

Using the sharing rule, we obtain the following :

$$(1 - \beta) \left( \frac{W(x) - U}{r + \lambda} \right) = \beta \left( \frac{J(x) - V + pT}{r + \lambda} \right) \quad (3.48)$$

The option value cancels out, and so we are left with:

$$w(x) = (1 - \beta)rU + \beta(px - r(V - pT))$$

For the initial surplus, we add equations 3.27 and 3.29, and we use  $\lambda \int_R^1 S(z) dF(z) = r(V - pT + U) - pR$  to obtain:

$$(r + \lambda)S_0 = p(1 - R) - (r + \lambda)p(C + T) \quad (3.49)$$

We also know that  $S(x) = \frac{p(x - R)}{r + \lambda}$  and for  $S_0$ ,  $x = 1$ , we can therefore write:

$$(r + \lambda)S_0 = (r + \lambda)(S(x) - p(C + T))$$

To obtain  $w_0$ , we use the sharing rule:

$$\beta(J_0 - pC - V) = (1 - \beta)(W_0 - U)$$

The option value cancels and we finally obtain

$$w_0 = (1 - \beta)rU + \beta(p - r(V + U) - (r + \lambda)pC - \lambda pT) \quad (3.50)$$

The free entry condition as mentioned previously is  $J_0 = \frac{pc}{q(\theta)} + pC$  and so we can re-write it as  $J_0 - pC = \frac{pc}{q(\theta)}$ . With  $V = 0$ , the sharing rule is  $J_0 - pC = (1 - \beta)S_0 \Rightarrow \frac{pc}{1 - \beta} = q(\theta)S_0$ .

The value of an unemployed worker is therefore re-written as linear in  $\theta$  as follows:

$$rU = b + \beta\theta \frac{pc}{1 - \beta} \quad (3.51)$$

We substitute in the equations  $w_0$  and  $w(x)$ , with  $V = 0$ :

$$\begin{aligned} w_0 &= (1 - \beta)b + \beta p(1 + c\theta - (r + \lambda)C - \lambda T) \\ w(x) &= (1 - \beta)b + \beta p(\theta c + x + rT) \end{aligned}$$

Substituting the wage equations into the initial and continuing match value equations, we obtain:

$$(r + \lambda)J_0 = (1 - \beta)p(1 - x) + \beta p(r + \lambda)C + \beta(r + \lambda)pT - (r + \lambda)pT + (r + \lambda)(J(x) + pT)$$

Knowing that a job is destroyed when it's no more profitable to the employer, we can write  $J(R) + pT = 0$ . By evaluating equation 3.52 at  $R$  and since at free entry  $J_0 = \frac{pc}{q(\theta)} + pC$ , the job creation curve becomes:

$$(1 - \beta)\left[\frac{(1 - R)}{r + \lambda} - T - C\right] = \frac{c}{q(\theta)} \quad (3.52)$$

## Chapter 4

# Informality, Public Employment and Employment Protection: Theory Using Evidence from Egypt<sup>1</sup>

### 4.1 Introduction

In chapter 1, it has been shown that the arab MENA countries in general, Egypt in particular, are developing countries with rigid labor markets (low job finding and separation rates). The public sector occupies a sizeable share of the jobs' market and has always been the main employer for workers in the region. With the democratic transition as well as fiscal realities, the role of the public sector as the main employer retreats allowing the development of the private sector and boosting the competitiveness of the labor market. However, the structure of the labor markets in developing countries in general and in the MENA region in particular is much more complex. The segmentation of these labor markets and the existence of an informal sector, due to the lack of flexibility in the private formal sector <sup>2</sup>, is almost a fact, where informality in Egypt for instance counts up to approximately 40% of employment.

To date, very little is known about the internal dynamics of these labor markets. The special features of the region's labor markets make an understanding of the in-

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<sup>1</sup>This chapter is based on work conducted jointly with François Langot

<sup>2</sup>For descriptive statistics and a more detailed discussion of the labor market institutions in the MENA region, particularly Egypt and Jordan, see Chapter 1.

teraction between its different sectors crucial. The limited evidence to date indicates that MENA labor markets suffer from high levels of inertia and rigidity, with rates of job creation and destruction well below the levels observed in Europe and the United States (Yassine (2014) (chapter 1, Langot and Yassine (2015) (chapter 3).

Since the flow approach to labor markets has become the basic toolbox to modern labor macroeconomics replacing the usual paradigm of supply and demand in a frictionless environment, this paper proposes a dynamic job search model, that fits developing countries in general and MENA region countries in particular, where we take into account the interaction between the public, formal private and informal private sectors. A worker's employment/non-employment choices are therefore based on the comparisons between his/her expected job values in the current or all prospective jobs i.e in any of the three employment sectors. If the theory omits any of these sectors, the measures of the job turnovers, as well as transitions between sectors, can be biased.

This approach has as its central insight the assesement of the interactions between the the three employment sectors namely public, private formal and private informal, being crucial to explain the main labor market outcomes, one observes overtime. Limiting the analysis, as previous traditional literature, to only an unsegmented or segmented Private labor market might be insufficient or might fail to explain the inside story of the underlying different transitions and the particular nature of the MENA region labor markets. There have been recent attempts to include within the job search model an informal sector (such as Albrecht, Navarro, and Vroman (2009), Meghir, Narita, and Robin (2012), Bosch and Esteban-Pretel (2012), Charlot, Malherbet, and Ulus (2013, 2014) and Charlot, Malherbet, and Terra (2015)) or a public sector and an unsegmented private sector (Burdett (2012) , Bradley, Postel-Vinay, and Turon (2013)). In this paper, we aim to add both an informal and a public sector to the conventional Mortensen and Pissarides (1994) model.

In the previous chapter (Langot and Yassine, 2015), we adapted the aggregate Mortensen and Pissarides (1994) to try to explain the impact of the implementation of the 2003 Egypt labor law on the dynamics of the Egyptian labor market, one of the most rigid markets at the end of the nineties. This reform came to action in 2004, with the aim of enhancing the flexibility of the hiring and the firing processes. The empirical

findings suggest that the new labor market reform increased significantly the separation rates and had no significant impact on the job finding rates. Theoretically, the introduction of reduced firing taxes in a conventional Mortensen and Pissarides (1994), both job creation and job destruction increase. The aggregate model can be adapted due to the nature of a developing country where corruption exists and hence even if reducing the firing tax, increases the surplus of the employer allowing him to create more jobs, the corrupted agents knowing this can from their side increase the corruption set-up cost they impose on the employers and hence nullify the positive effect of the new law on job creation. However, another possible explanation to this might be the existence of informal and public employment sectors in addition to the private formal employer. Even though the policy is directed to the formal private sector, it surely affects the interaction and the flow of workers between the different employment sectors. It is not possible to explain using the conventional aggregate Mortensen and Pissarides (1994) model the hidden inside story of these inter-sectoral flows underlying these outcomes. In this paper, we therefore aim at testing for the robustness of these results by modelling such developing countries' labor markets' nature where possible interactions and inter-sectoral transitions might take place with other employment sectors such as the private informal and public employers.

This paper therefore aims at the following main objectives:

1. Extend a theoretical job search equilibrium model a la Mortensen and Pissarides (1994) showing the interaction between the 3 employment sectors namely (public, formal and informal) and non-employment state.
2. Using qualitative analytics, calibrate the model and provide simulations for the impact of the structural reforms following the democratic transitions of the MENA region countries, particularly the Egypt Labor Law implemented in 2004.
3. Show supporting evidence from available data on flows in Egypt between the employment sectors (private formal wage work, private informal wage work and public sector wage work) and unemployment, before and after the 2004 reform.

In this paper, we choose to focus on exploring the effects of firing taxes and public sector wage policies on job creation, job destruction, on-the-job search and employ-



ment. It is worth noting however that the model developed in this paper can be used to explore the effect of changes of many other parameters such as subsidies, cost of maintaining jobs, productivity shocks on labor market outcomes. For the purpose of this chapter, we limit the analysis to firing taxes and public sector wage policies. The model can therefore provide results and simulations that can provide main guidelines to how the MENA region future employment policies, whether public or private, should be directed in order to obtain the most efficient labor market outcomes during and after the democratic transition period.

This paper should also be viewed as an attempt to explain to what extent the Mortensen and Pissarides model is applicable to developing countries, such as Egypt, where big shares of their employment lies in the informal <sup>3</sup> and public sectors. It confirms the limitations of how the inside story of inter-sectoral transitions are not displayed by the aggregate model. How can these interactions between sectors be illuminating? First, the workers' mobilities between sectors imply that their outside options depend on opportunities in all sectors: when they bargain their wages in a particular sector, they integrate their potential opportunities in other sectors. Hence, if the formal sector becomes more profitable, the threat point of the employees in each sector goes up, leading to wage pressures in the informal sector. If this last one does not observe changes in its profitability, workers move to the formal sector, the most able to support these high wages. The interaction between private (formal and informal) sector and public sector is also interesting. Indeed, if the public sector provides high wages, it is profitable for the employees to search on-the-job, in order to move to these types of jobs. Hence, the public sector can act as an additional tax for the firms: they pay an opening cost in order to hire workers, but during the duration of the contract, some of these workers would choose to move for a better opportunity, in the public sector. The model built in this paper also takes into consideration fiscal realities faced by the public sector. It's true that the public sector can increase its wages but given its budgetary constraint, it is likely to decrease the rate at which it hires employees. This could be done, as in Egypt for instance, by rationing public sector vacancies.

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<sup>3</sup>The informal sector in this chapter, as throughout the entire thesis, is defined as employment that is not taxed or controlled by any form of government. The lack of a contract and social insurance identify informal wage workers in our dataset. See Chapter 1.

Our main findings suggest that introducing flexible employment protection rules, modelled as reduced firing taxes, favors job creation and job destruction in the private formal sector which is the main aim of the policy. It increases job separations in the informal sector and decreases workers finding informal jobs. In general, introducing flexibility into developing countries' labor markets is important not only to promote productivity growth along with economic growth, but also to scale down the difference between formal and informal jobs. Such a reform causes a shift of employment from informal jobs, which are very flexible by definition given that they are not controlled by any institutional regulations, to formal work. The model developed in this paper supports this. Indeed, it is shown that the liberalization of the labor market plays against the informal employment by increasing the profitability of the formal jobs. But, if at the same time, the wages offered by the public sector are increased, this would create a crowding out effect: the new surpluses created by the labor market reform are more than compensated by the new costs of worker mobility induced by the increase in the attractiveness of the public sector. We show that this result is robust, even if the introduction of reduced firing taxes decreases the proportion of on-the-job search towards the public sector of both workers in the formal and informal sectors. This paper supports the view that since reducing firing taxes has been accompanied simultaneously by a trending increase in the real wages of public sector workers <sup>4</sup>, relatively higher than the increase in the wages of private sector workers, formal and informal workers are encouraged to search more on-the-job in the public sector: this tends to nullify the positive effect on the private formal sector's job creation, it even reduces it. The net effect of the reform would therefore be an increase in the unemployment rates since job separations in all cases are enhanced, but job findings remain unchanged or even dampened. This therefore explains the empirical paradox of the Egyptian case discussed in (Langot and Yassine, 2015), showing that following the liberalization of the labor market, only job separations increase and job findings remain unchanged.

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<sup>4</sup>Said (2015) shows that over the period 1998-2006, i.e. from a point in time before the reform to a point in time after, there has been a 40% increase in the median real monthly wages of government employees, a 26% increase in the median real monthly wages of public enterprises' employees and only a 9% increase in the median real wage of the private sector.

## 4.2 A Model with Formal, Informal and Public Sectors

### 4.2.1 Setting the Model

In this section, we propose an extension to the Mortensen and Pissarides (1994) model to include the 3 sectors of the developing countries' labor market; private formal wage work (F), private informal wage work (I) and public sector (G). Our model is founded, as the conventional Mortensen and Pissarides model, on the following concepts for each of the private sectors, namely the formal ( $F$ ) and the informal ( $I$ ):

1. A matching function that characterizes the search and recruiting process by which a new job-worker match is created in sector.
2. An idiosyncratic productivity shock capturing the reason for resource reallocation across alternative activities in that specific sector.
3. An on-the-job search option allowing for an option that the job-worker match can get destroyed as a worker transits to the public sector.

Given the above concepts, decisions about creation of new jobs, about recruiting and search effort, and about the conditions that induce job-worker separations within each sector can be formalized. Since our main focus is to study the job creation and destruction processes in the market, transitions between the formal and informal sectors are not allowed in this model. These transitions are important to study the formalization process of jobs and the way the quality of one's job is improving, which is beyond the study of this paper.

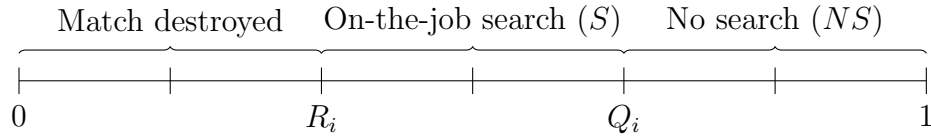
Job and worker matching in the private sector is viewed as a production process. The function  $m_i(v_i, u)$  represents the matching rate in sector  $i = F, I$  associated with every possible vacancy in that sector and unemployment pair. Following Mortensen and Pissarides (1994) and based on evidence from Petrongolo and Pissarides (2001), constant returns is considered a convenient assumption, such that for  $i = F, I$

$$m_i(v_i, u) = m_i(1, \frac{u}{v_i}) \equiv q_i(\theta_i) \quad (4.1)$$

where  $\theta_i = \frac{v_i}{u}$ , is the labor market tightness in sector  $i$  i.e. the ratio of vacancies in that specific sector to the overall unemployment. These are endogenous variables and are determined by the model.

In either the formal or the informal private sector, a vacant job is taken by a worker at the rate  $q_i(\theta_i)$ . The rate at which workers find jobs is  $\theta_i q_i(\theta_i)$ . Given that the matching functions are assumed to be concave, homogenous and linear,  $q_i(\theta_i)$  decreases in  $\theta_i$ , while  $\theta_i q_i(\theta_i)$  increases in  $\theta_i$ .

Following the conventional model, the source of job-worker separations is job destruction attributable to an idiosyncratic shock to match productivity (Mortensen and Pissarides, 2001). Modelling this idea, the output of a job in sector  $i$  is the product of two components  $p_i$ , a common productivity of all jobs in a particular skill group in sector  $i$ , and  $x$ , the idiosyncratic component taking values on the unit interval and arriving from time to time at the Poisson rate  $\lambda_i$ . Given an arrival of an idiosyncratic shock,  $x$  is distributed according to the c.d.f.  $F(x)$ . The sequence of shocks are iid. In a specific sector, an existing match is destroyed if the idiosyncratic productivity shock falls below an endogenous reservation threshold  $R_i$  specific to each sector. The average rate of transition from employment in sector  $i$  to unemployment is therefore  $\lambda_i F(R_i)$ , which increases with the reservation threshold. Since certain workers, as has been discussed in chapter 1, take the private sector (whether formal or informal) as an intermediary till they get their appointment in the public sector, we allow for these types of transitions among a productivity level ( $x$ ) below a certain qualification threshold ( $Q_i$ ). Offers from the public sector arrive at an exogenous poisson rate  $\lambda_{iG}$ , with  $i = F, I$  depending on where the worker receiving the offer is hired. In simple words, when it's a good/high productivity job, there is no interest to search for another and when it's a bad/low productivity job, it's only an intermediate step till the public sector's appointment arrives. In each of the private sectors, formal (F) and informal (I), there are therefore 3 values: the initial value (0), when  $x$  is at its highest i.e.  $x = 1$ , the no-search value ( $NS$ ) when  $Q_i < x \leq 1$  and the on-the-job search value ( $S$ ), when  $R_i \leq x \leq Q_i$ .



The Public sector is added as an exogenous player. Wages, as well as the employment strategy are determined by the policy maker and should not be determined by the Nash bargaining rule. The exogenous wages and number of individuals hired in the public sector are however constrained by a government budget  $D$ . Workers within the public sector are neither hit by productivity reallocation shocks nor get laid off. In all sectors, workers retire at an exogenous rate  $\delta$ .

The notations used in the model are close to the notations used in the conventional literature on job search theory, just with the difference of being specific to the type of private sector studied in our model. In general a firm with a profit opportunity in the private sector, whether formal or informal open a job vacancy for a worker with skill indexed  $p_i$  with  $i = F, I$ . The flow cost of recruiting in each sector is  $c_i p_i$ . Applications in each sector begin arriving at a hazard rate  $q_i(\theta_i(p_i))$ , and one is received on average  $\frac{1}{q_i(\theta_i(p_i))}$  after the posting of the vacancy. As they meet, the worker and employer in whichever sector start to bargain till they agree on an initial wage  $w_i^0(p_i)$ . Note that the initial wage differs from one sector to the other and is dependent on the worker's skill. Job creation therefore takes place. Only in the formal sector, the firm is required to pay a set-up cost  $p_F C$ . This includes the cost of hiring in terms of legal formalities, training and other forms of match specific investments. The informal sector being not controlled by any form of government is assumed not incur any of these costs. Wage renegotiation occurs with wage outcome  $w_i(x, p_i)$  prevailing on any continuing job, one that generally reflects the new information  $x$ . As discussed above, if  $x$  falls below some qualification level  $Q_i(p_i)$ , on-the-job search towards the public sector becomes an outside option for the workers. If  $x$  falls below some reservation level  $R_i(p_i)$ , job destruction takes place. Only formal firms in that case pay a firing cost  $p_F T$ . This is an implicit firing tax imposed by employment protection regulations. Other policy parameters are also considered in our model and only appear in the formal sector's equations. These include job creation or hiring subsidies denoted as  $p_F H$  and payroll taxes  $\tau$ . Hiring subsidies are payments made to the employer when a worker is hired.

Finally, unemployed workers in the model enjoy imputed income during unemployment  $b > 0$ . This income is independent of skill and represents the imputed value of leisure to the worker, as well as all other forms of income that must be given up as the worker moves from unemployment to employment. We formalize below the firm' and workers' behaviour in each sector.

## 4.2.2 Firms

### Formal Firms

The initial value of an occupied job in the formal sector is given by the equation :

$$\begin{aligned} (r + \delta)J_F^0(1) &= p_F - w_F^0 + \tau + \lambda_F \int_{R_F}^1 [\max\{J_F^{NS}(z), J_F^S(z)\} - J_F^0(1)] dF(z) \\ &+ \lambda_F F_F(R_F)[V_F - p_F T - J_F^0(1)] \end{aligned} \quad (4.2)$$

$r$  represents the risk free interest rate.  $V_F$  is the value of a vacancy in the formal private sector. Since the idiosyncratic component of a new job is  $x = 1$  and due to the existence of job creation costs  $p_F C$  and policy parameters  $p_F H$  and  $p_F T$ , we define  $J_F^0(1)$  as the expected profit of a new match to the employer, given an initial formal sector wage  $w_F^0$ .

A continuing match has a specific productivity  $x$ . However, as explained in the previous section, we define two intervals: (i) no search and (ii) on-the-job search.

$Q_F$  is the skill threshold that determines whether workers are on the job-search or not. If it's a good (high productivity) job i.e  $x > Q_F$ , the workers will not be looking for a job in the public sector i.e. no on-the-job search ( $NS$ ). In that case, the worker is paid a wage  $w_F^{NS}(x)$ . The match can end in the future if a new match specific shock  $z$  arrives and is less than some reservation threshold  $R_F$ . The capital value of the job to the employer  $J_F^{NS}(x)$  therefore solves the following asset pricing equation for each  $p$ :

$$\begin{aligned} (r + \delta)J_F^{NS}(x) &= p_F x - w_F^{NS}(x) + \tau + \lambda_F \int_{R_F}^1 [\max\{J_F^{NS}(z), J_F^S(z)\} - J_F^{NS}(x)] dF(z) \\ &+ \lambda_F F_F(R_F)[V_F - p_F T - J_F^{NS}(x)] \end{aligned} \quad (4.3)$$

If it's a bad (low-productivity) job  $x \leq Q_F$ , the workers are looking for better

options in the public sector (on-the-job search  $S$ ). This decreases the capital value of the job to the employer. In the asset pricing equation, an outside option being the transition of the worker from the formal sector to the public sector is added. This becomes an additional possibility to why the match can end in the future. The worker is paid a wage  $w_F^S(x)$  in that case.

$$\begin{aligned} (r + \delta)J_F^S(x) &= p_F x - w_F^S(x) + \tau + \lambda_F \int_{R_F}^1 [\max\{J_F^{NS}(z), J_F^S(z)\} - J_F^S(x)] dF_F(z) \\ &+ \lambda_F F_F(R_F)[V_F - p_F T - J_F^S(x)] + \lambda_{FG}(V_F - J_F^S) \end{aligned} \quad (4.4)$$

Given the definitions of the policy parameters described in the setting of the model, the present value of an unfilled vacancy for a formal firm,  $V_F$ , is:

$$rV_F = -p_F C_F + q_F(\theta_F)(J_F^0(1) - p_F(C - H) - V_F) \quad (4.5)$$

Free entry requires that new vacancies are created until the capital value of holding one is driven to zero i.e.  $V_F = 0$ . The free entry condition for formal jobs can therefore be formalized using the equation:

$$\frac{p_F C}{q_F(\theta_F)} + p_F(C - H) = J_F^0(1) \quad (4.6)$$

The free entry condition therefore equates the cost of recruiting and hiring a worker to the expected discounted future profit stream.

## Informal Firms

The logic behind the behaviour of the informal firms is similar to that of the formal firms except that any form of government regulation or policy parameter is being excluded. It follows that, in the informal sector, there will neither be firing costs nor setting up costs. The initial job value with an idiosyncratic productivity  $x = 1$  in that case would be exactly equal to the capital value of a job in a continuing match over the no search interval i.e. if  $Q_I < x \leq 1$ , formally  $J_I^0(1) = J_I^{NS}(1)$ .  $Q_I$  is the skill threshold that determines whether workers are on the job-search or not.

In the case of a high-productivity job i.e.  $x > Q_I$ , the only way the match can end

is in the future is if a new match with a specific shock  $z$  arrives and this shock being less than the reservation threshold  $R_i$ . With a wage  $w_I^{NS}(x)$ , the expected profit of the job to the employer is:

$$\begin{aligned} (r + \delta)J_I^{NS}(x) &= p_I x - w_I^{NS}(x) + \lambda_I \int_{R_I}^1 [\max\{J_I^{NS}(z), J_I^S(z)\} - J_I^{NS}(x)] dF_I(z) \\ &+ \lambda_I F_I(R_I)[V_I - J_I^{NS}(x)] \end{aligned} \quad (4.7)$$

When it's a bad low-productivity job, i.e.  $x \leq Q_I$ , on-the-job search towards the public sector becomes an outside option and threatens the match to end in the future. The capital value to an employer  $J_I^S(x)$  is therefore the solution of the asset-pricing equation:

$$\begin{aligned} (r + \delta)J_I^S(x) &= p_I x - w_I^S(x) + \int_{R_I}^1 \max\{J_I^{NS}(z), J_I^S(z)\} - J_I^S(x) dF_I(z) \\ &+ \lambda_I F_I(R_I)(V_I - J_I^S(x)) + \lambda_{IG}(V_I - J_I^S(x)) \end{aligned} \quad (4.8)$$

In the informal sector there are no policy parameters, the value of a vacant job is therefore:

$$rV_I = -p_I c + q_I(\theta_I)J_I^{NS}(1) \quad (4.9)$$

The free entry condition for informal firms therefore equates the cost of recruiting and the anticipated profit of the match to the employer:

$$\frac{p_I c}{q_I(\theta_I)} = J_I^{NS}(1) \quad (4.10)$$

### 4.2.3 Workers

An analogous reasoning to that described in the behavior of the firms, is used to analyse the workers' behaviour. In general, an employed worker can be either employed in the formal or the informal sector  $i = F, I$  respectively. According to the level of productivity  $x$ , the worker decides whether to search on-the-job for better options in the public sector or not.



The initial job value of a worker,  $W_i^0(1)$ , in sector  $i = F, I$  is when the idiosyncratic component is at its highest value i.e.  $x = 1$ . This is expressed by the equation:

$$\begin{aligned} (r + \delta)W_i^0(1) &= w_i^0(1) + \lambda_i \int_{R_i}^1 [\max\{W_i^{NS}(z), W_i^S(z)\} - W_i^0] dF_i(z) \\ &+ \lambda_i F(R_i)(U - W_i^0(1)) \end{aligned} \quad (4.11)$$

For a continuing match, as the specific productivity  $x$  is below the the on-the-job search threshold of the sector,  $Q_i$ , the worker will be searching for better options in the public sector with an exogenous poisson rate of arrival of public sector offers  $\lambda_{iG}$ . The rate at which the public sector hires workers is therefore specific to the sector  $i$  where the worker is employed as he/she receives the offer. The worker's value  $W_i^S(x)$  in that case would solve the following asset pricing equation:

$$\begin{aligned} (r + \delta)W_i^S(x) &= w_i^S(x) + \lambda_i \int_{R_i}^1 [\max\{W_i^{NS}(z), W_i^S(z)\} - W_i^S(x)] dF_i(z) \\ &+ \lambda_i F_i(R_i)(U - W_i^S(x)) + \lambda_{iG}(W_G - W_i^S(x)) \end{aligned} \quad (4.12)$$

If the specific productivity  $x$  exceeds the threshold  $Q_i$ , the only outside option for the worker becomes being unemployed. No on-the-job search takes place in that case. The worker's value over the no search interval is expressed by:

$$\begin{aligned} (r + \delta)W_i^{NS}(x) &= w_i^{NS}(x) + \lambda_i \int_{R_i}^1 [\max\{W_i^{NS}(z), W_i^S(z)\} - W_i^{NS}] dF_i(z) \\ &+ \lambda_i F_i(R_i)(U - W_i^{NS}(x)) \end{aligned} \quad (4.13)$$

Being unemployed in this economy, the individual receives an imputed income  $b > 0$ . In the future, the unemployed can get hired by either of the three sectors, private formal, private informal or public. The following bellman equation therefore solves for the value of being unemployed,  $U$ :

$$(r + \delta)U = b + \theta_F q_F (W_F^0(1) - U) + \theta_I q_I (W_I^0(1) - U) + \lambda_{UG}(W_G - U) \quad (4.14)$$

By arriving to the public sector, the workers in our model are content with their jobs. Evidence from the Egypt Labor Market Panel Survey in chapter 2 has shown that

transitions from the public sector to other sectors including the private sector (whether formal or informal) and non-wage work are very few, sometimes nil. In the model, the government employees are therefore assumed not to be searching for jobs in the private sector. Moreover, transitions from employment to unemployment are very rare among public sector workers and are therefore set to zero. The value of an employed worker in the public sector is therefore,  $W_G$ :

$$(r + \delta)W_G = w_g \quad (4.15)$$

In the formal sector, given a match product shock  $z$ , a firm decides to destroy a job, whether on the on-the-job search or no search interval, if and only if the value of holding it as a vacancy exceeds its value as a continuing job plus the firing costs  $p_F T$ . In other words,  $V_F^j > J_F^j(z) + p_F T$  where  $j = NS, S$ . Similarly, a worker in the formal sector prefers to stay unemployed if and only if  $U > W_i(z)$ . Since, under the wage rule, and as we will show below,  $J_F^j(z)$  and  $W_F^j(z)$  are increasing, separation occurs when a new value of the shock arrives and falls below a reservation threshold  $R_F$ . This reservation productivity  $R_F$  is defined as  $\max\{R_{eF}, R_{wF}\}$ , where  $W_F^j(R_{wF}) = U$  and  $J_F^j(R_{eF}) = V_F - p_F T$ . The separation rule in our case, a bilateral bargain, should be jointly optimal in the sense that it maximizes the total wealth. The necessary and sufficient condition for this joint optimization is therefore  $R_F = R_{eF} = R_{wF}$  implying that  $J(R_F) + W(R_F) = V_F - p_F T + U$ .

Similarly, the same reasoning applies to come up with the reservation threshold and the necessary and sufficient condition for the joint optimization in the informal sector. The only difference is that no firing costs should be paid by the employer as jobs are destroyed. It therefore follows that  $R_I$  is defined as  $\max\{R_{eI}, R_{wI}\}$ , where  $W_I^j(R_{wI}) = U$  and  $J_I^j(R_{eI}) = V_I$ , with  $j = S, NS$ . The necessary and sufficient condition for the joint optimization would be  $R_I = R_{eI} = R_{wI}$  leading to  $J(R_I) + W(R_I) = V_I + U$ .

#### 4.2.4 On-the-job Search

After deriving the value of the surplus in every sector, as shown in appendix 4.A, it becomes possible to determine the threshold at which workers would decide to search

on-the-job or not.

### Formal Sector

In the formal sector, the productivity threshold  $Q_F$  is defined when the surplus obtained from a job with on-the-job search is equal to the surplus obtained from one with no search, such that  $S_F^{NS}(Q_F) = S_F^S(Q_F)$ . By doing so, one obtains

$$\lambda_{FG}S_F^S(Q_F) = \lambda_{FG}[p_FT + (W_G - U)] \quad (4.16)$$

which allows us to derive a unique value for  $Q_F$ , only if  $\lambda_{FG} > 0$ . If  $\lambda_{FG} = 0$ , the threshold  $Q_F$  can not be defined.

Using equations 4.16 and 4.46, the expression for  $Q_F$ , the on-the-job threshold in the formal sector, when  $\lambda_{FG} > 0$  is :

$$Q_F = R_F + (r + \delta + \lambda_F + \lambda_{FG})(T + \frac{W_G - U}{p_F}) \quad (4.17)$$

### Informal Sector

Similarly in the informal sector, the productivity threshold  $Q_I$  is defined when the surplus obtained from an informal job with on-the-job search is equal to the surplus obtained from one with no search, such that  $S_I^{NS}(Q_I) = S_I^S(Q_I)$ . By doing so, one obtains

$$\lambda_{IG}S_I^S(Q_I) = \lambda_{IG}(W_G - U) \quad (4.18)$$

As in the formal sector, the  $Q_I$  threshold is only defined if  $\lambda_{IG} > 0$  and is consequently expressed as follows:

$$Q_I = R_I + (r + \delta + \lambda_I + \lambda_{IG})(\frac{W_G - U}{p_I}) \quad (4.19)$$

### 4.2.5 Nash Bargaining and Wage Determination

As has been well established in the search equilibrium literature such as Diamond (1981, 1982), Mortensen (1978, 1982), Pissarides, Layard, and Hellwig (1986), and Pissarides (1990), the generalized axiomatic Nash bilateral bargaining outcome with threat point being the option to look for an alternative match partner is the baseline for the wage determination. The wages are therefore bargained, with  $\beta$  being the worker's bargaining power and  $1 - \beta$  the employer's, and setting  $V_i = 0$  ( $i = F, I$ ) according to the free-entry condition. By using the definitions and expressions of surpluses derived in appendix 4.A, we are able to build up the first order conditions of the standard wage optimization problem for each sector  $i = F, I$ , during the absence and presence of on-the-job search.

For the initial wage of a job in the formal sector:

$$\beta(J_F^0(1) - V_F - p_F(C - H)) = 1 - \beta(W_F^0(1) - U) \quad (4.20)$$

For a continuing job in the formal sector with  $x \leq Q_F$

$$\beta(J_F^S(x) - V_F - p_F T) = 1 - \beta(W_F^S(x) - U) \quad (4.21)$$

For a continuing job in the formal sector with  $x > Q_F$

$$\beta(J_F^{NS}(x) - V_F - p_F T) = 1 - \beta(W_F^{NS}(x) - U) \quad (4.22)$$

Recalling that the initial wage in the informal sector is the same as the wage of a no-search job when  $x = 1$ , i.e.  $w_I^0(1) = w_I^{NS}(1)$ , the first order condition for a job in the informal sector with  $x > Q_I$

$$\beta(J_I^{NS}(x) - V_I) = 1 - \beta(W_I^{NS}(x) - U) \quad (4.23)$$

For a job in the informal sector with  $x \leq Q_I$

$$\beta(J_I^S(x) - V_I) = 1 - \beta(W_I^S(x) - U) \quad (4.24)$$

Using the free entry conditions for the formal and informal sectors  $\frac{p_F c}{q_F(\theta_F)} + p_F(C - H) = J_F^0(1)$  and  $\frac{p_I c}{q_I(\theta_I)} = J_I^{NS}(1)$  respectively, we can re-write  $(W_F^0(1) - U) = \frac{\beta}{1-\beta} \frac{p_F c}{q_F(\theta_F)}$  and  $(W_I^{NS}(1) - U) = \frac{\beta}{1-\beta} \frac{p_I c}{q_I(\theta_I)}$ . This implies :

$$(r + \delta)U = b + \frac{\beta}{1-\beta}(c_F \theta_F p_F + c_I \theta_I p_I) + \lambda_{UG}(W_G - U) \quad (4.25)$$

Using the public sector worker's value function  $(r + \delta)W_G = w_g$ :

$$W_G - U = \frac{w_G - b - \frac{\beta c}{1-\beta}(\theta_F p_F + \theta_I p_I)}{r + \delta + \lambda_{UG}} \quad (4.26)$$

Plugging  $W_G - U$  into the value equation of the unemployed, we obtain:

$$(r + \delta)U = \frac{r + \delta}{r + \delta + \lambda_{UG}}(b + \frac{\beta c}{1-\beta}(\theta_F p_F + \theta_I p_I)) + \frac{\lambda_{UG}}{r + \delta + \lambda_{UG}}w_G \quad (4.27)$$

Introducing these results in the wage equations, we obtain the expressions for the initial wages and wages in continuing jobs in both the formal and informal sectors.

- **Formal Sector:** The initial wage expression in the formal sector therefore becomes:

$$\begin{aligned} w_F^0(1) &= \beta(p_F + \tau - (r + \delta + \lambda_F)p_F(C - H) - \lambda_F p_F T + \frac{r + \delta}{r + \delta + \lambda_{UG}}c(\theta_F p_F + \theta_I p_I)) \\ &+ (1 - \beta)[\frac{r + \delta}{r + \delta + \lambda_{UG}}b + \frac{\lambda_{UG}}{r + \delta + \lambda_{UG}}w_G] \end{aligned}$$

For the wages of jobs occupied by workers who are looking out for outside options in the public sector, i.e.  $x \leq Q_F$

$$\begin{aligned} w_F^S(x) &= \beta[p_F x + \tau - (r + \delta + \lambda_{FG})p_F T + \frac{r + \delta + \lambda_{FG}}{r + \delta + \lambda_{UG}}c(\theta_F p_F + \theta_I p_I)] \\ &+ (1 - \beta)[\frac{r + \delta + \lambda_{FG}}{r + \delta + \lambda_{UG}}b + \frac{\lambda_{UG} - \lambda_{FG}}{r + \delta + \lambda_{UG}}w_G] \end{aligned}$$

For a continuing match, when workers are not searching on the job,  $x > Q_F$ , we

have:

$$w_F^{NS}(x) = \beta(p_F x + \tau - (r + \delta)p_F T + \frac{r + \delta}{r + \delta + \lambda_{UG}}c(\theta_F p_F + \theta_I p_I)) \\ + (1 - \beta)[\frac{r + \delta}{r + \delta + \lambda_{UG}}b + \frac{\lambda_{UG}}{r + \delta + \lambda_{UG}}w_G]$$

As in the conventional Mortensen and Pissarides model, the wages of the formal sector depend on the policy parameters. By introducing the informal sector in the model, these wages not only depend on the labor market tightness in the formal segment of the market, but also on the labor market tightness in the informal sector. As the tightness  $\theta_i$  increases in any of the sectors, the net share of match product obtained by the employer increases. Adding the public sector increases the bargained share by the worker, whether at the start of the job since now the outside option is not only being unemployed and receiving an imputed income  $b$ . It is now possible for an unemployed worker to get hired by the public sector and this therefore adds to the his net share of the bargained wage. Moreover, the on-the-job search possibility acts as a liability to the employer. It therefore strengthens the worker's hand in the wage bargain.

- **Informal Sector:** Similarly in the informal sector, the wages depend on the labor market tightness in both segments of the private sector,  $\theta_I$  and  $\theta_F$ . Since the informal sector is any form of employment that is not regulated by the government, the wages in this sector do not depend by any means of the policy parameters. The outside option of getting hired by the public sector, however, strengthens the worker's bargain and acts as a tax or liability to the employer. The informal wage in a continuing match in the informal sector, when workers are searching on-the-job, i.e.  $x \leq Q_I$ , becomes:

$$w_I^{NS}(x) = \beta[p_I x + \frac{r + \delta}{r + \delta + \lambda_{UG}}c(\theta_F p_F + \theta_I p_I)] \\ + (1 - \beta)[\frac{r + \delta}{r + \delta + \lambda_{UG}}b + \frac{\lambda_{UG}}{r + \delta + \lambda_{UG}}w_G] \quad (4.28)$$

When, there is no on-the-job search,  $x > Q_I$ , the wage equation is defined as:

$$\begin{aligned} w_I^S(x) &= \beta[p_I x + \frac{r + \delta + \lambda_{iG}}{r + \delta + \lambda_{UG}} c(\theta_F p_F + \theta_I p_I)] \\ &+ (1 - \beta)[\frac{r + \delta + \lambda_{iG}}{r + \delta + \lambda_{UG}} b + \frac{\lambda_{UG} - \lambda_{iG}}{r + \delta + \lambda_{UG}} w_G] \end{aligned}$$

## 4.2.6 Equilibrium

It remains to substitute the wage equations we derived in the previous section into the asset value equations, the job creation, job destruction and on-the-job search conditions, in order to derive the overall market equilibrium. This equilibrium would be characterized by the labor market tightness in each segment of the private sector,  $\theta_F$  and  $\theta_I$ , the reservation productivity threshold for each sector,  $R_F$  and  $R_I$ , and the on-the-job search threshold in each sector  $Q_F$  and  $Q_I$ .

### Job Creation Condition

Recalling the free-entry condition in the formal sector, presented in equation 4.6 and by using  $S_F^0(1) = S_F^{NS}(1) - p_F(C - H + T)$ , the job creation condition for the formal sector is can be deduced as follows:

$$\frac{p_F c_F}{q_F(\theta_F)} = (1 - \beta) \left[ \frac{p_F(1 - R_F) - \lambda_{FG} p_F T - \lambda_{FG}(W_G - U)}{r + \delta + \lambda_F} - p_F(C - H + T) \right] \quad (4.29)$$

For the informal sector, the free-entry condition in equation 4.10 allows us to write the informal sector's job creation condition as follows:

$$\frac{p_I c_I}{q_I(\theta_I)} = (1 - \beta) \left[ \frac{p_I(1 - R_I) - \lambda_{IG}(W_G - U)}{r + \delta + \lambda_I} \right] \quad (4.30)$$

### Job Destruction Condition

In the formal sector, we derive the job destruction condition by the equation:

$$p_F R_F = (r + \delta)U - \tau - \lambda_F \int_{R_F}^1 S_F(z) dF_F(z) - (r + \delta + \lambda_{FG})p_F T - \lambda_{FG}(W_G - U) \quad (4.31)$$

while for the informal sector, we obtain

$$p_I R_I = (r + \delta)U - \lambda_I \int_{R_I}^1 S_I(z) dF_I(z) - \lambda_{IG}(W_G - U)$$

The job destruction conditions suggest that the at the worst possible surplus, whether for the formal or informal sector, the reservation productivity does not only depend on the possible gains from the match in the sector itself. It depends as well on the potential gains one could have from passing on eventually to a job in the public sector after being for a while in the formal or the informal sector. A worker might prefer having a low salary in the private sector i.e. a low reservation productivity  $R_i$ , whether formal or informal  $i = F, I$ , knowing that eventually he/she can access the public sector via this job.

### On-the-job search Condition

As have been previously derived, the on-the job search condition in the formal sector is re-written as:

$$p_F Q_F = p_F R_F + (r + \delta + \lambda_F + \lambda_{FG})(p_F T + W_G - U) \quad (4.32)$$

and for the informal sector as:

$$p_I Q_I = p_I R_I + (r + \delta + \lambda_I + \lambda_{IG})(W_G - U) \quad (4.33)$$

All the above labor market conditions use the following expressions which are functions of the endogenous  $\theta_i$ ,  $R_i$  and  $Q_i$ ,  $i = F, I$ , to be determined by solving the model:

$$\begin{aligned} \int_{R_F}^1 S_F(z) dF_F(z) = & \frac{p_F}{r + \delta + \lambda_F + \lambda_{FG}} \left\{ -(Q_F - R_F)(1 - F_F(Q_F)) + \int_{R_F}^{Q_F} [1 - F_F(x)] dx \right\} \\ & \frac{p_F}{r + \delta + \lambda_F} \left\{ (Q_F - R_F)(1 - F_F(Q_F)) + \int_{Q_F}^1 [1 - F_F(x)] dx \right\} \\ & + \frac{\lambda_{FG} p_F T - \lambda_{FG}(W_G - U)}{r + \delta + \lambda_F} (1 - F_F(Q_F)) \end{aligned}$$



$$\begin{aligned}
\int_{R_I}^1 S_I(z) dF_I(z) &= \frac{p_I}{r + \delta + \lambda_I + \lambda_{IG}} \left\{ -(Q_I - R_I)(1 - F_I(Q_I)) + \int_{R_I}^{Q_I} [1 - F_I(x)] dx \right\} \\
&\quad - \frac{p_I}{r + \delta + \lambda_I} \left\{ (Q_I - R_I)(1 - F_I(Q_I)) + \int_{Q_I}^1 [1 - F_I(x)] dx \right\} \\
&\quad + \frac{\lambda_{IG}(1 - F_I(Q_I))}{r + \delta + \lambda_I} (W_G - U)
\end{aligned}$$

$$(r + \delta)U = \frac{r + \delta}{r + \delta + \lambda_{UG}} \left( b + \frac{\beta c}{1 - \beta} (\theta_F p_F + \theta_I p_I) \right) + \frac{\lambda_{UG}}{r + \delta + \lambda_{UG}} w_G$$

$$W_G - U = \frac{w_G - b - \frac{\beta c}{1 - \beta} (\theta_F p_F + \theta_I p_I)}{r + \delta + \lambda_{UG}}$$

### 4.3 Steady-state Stocks

The entire Population of the economy,  $Pop$ , is sub-divided into four sub-populations: the unemployed  $u$ , public sector employees  $n_G$ , formal private sector wage workers  $n_F$  and informal private sector wage workers  $n_I$ .

$$1 = n_F + n_I + n_G + u \quad (Pop) \quad (4.34)$$

Since the model is assumed to be in steady-state, for each sub-population, inflows are equal to the outflows. This can be formalized by the equations

$$\delta n_G = \lambda_{UG} u + \lambda_{FG} n_F + \lambda_{IG} n_I \quad (NG) \quad (4.35)$$

$$f_F u = \lambda_F F_F(R_F) n_F + \lambda_{FG} n_F \quad (NF) \quad (4.36)$$

$$f_I u = \lambda_I F_I(R_I) n_I + \lambda_{IG} n_I \quad (NI) \quad (4.37)$$

Given the above relationship, the number of workers hired in the public sector is given

by the equation:

$$n_G = \frac{\lambda_{UG}}{\delta + \lambda_{UG}} + \frac{\lambda_{FG} - \lambda_{UG}}{\delta + \lambda_{UG}} \frac{f_F}{\lambda_F F_F(R_F) + \lambda_{FG}} u + \frac{\lambda_{IG} - \lambda_{UG}}{\delta + \lambda_{UG}} \frac{f_I}{\lambda_I F_I(R_I) + \lambda_{IG}} u \quad (4.38)$$

It's important to note at this point that due to fiscal realities, even though the hiring and wage policies in the public sector, they are constrained by the government's budget. This is defined as  $D$  such that

$$D = n_G(\lambda_{UG}, \lambda_{FG}, \lambda_{IG}) \times w_G \quad (4.39)$$

Finally the steady-state unemployment rate is obtained.

$$u = \frac{\delta(\lambda_I F_I(R_I) + \lambda_{IG})(\lambda_F F_F(R_F) + \lambda_{FG})}{\left[ \begin{aligned} &(\lambda_I F_I(R_I) + \lambda_{IG})(\lambda_{FG} + \delta)f_F + (\lambda_F F_F(R_F) + \lambda_{FG})(\lambda_{IG} + \delta)f_I \\ &+ (\lambda_I F_I(R_I) + \lambda_{IG})(\lambda_F F_F(R_F) + \lambda_{FG})(\lambda_{UG} + \delta) \end{aligned} \right]} \quad (4.40)$$

## 4.4 A Numerical Analysis of the Model

One of the main aims of this paper is to explain how the labor market equilibrium, particularly job creations and job destructions, in developing countries, such as Egypt, react as flexible employment protection is introduced in their markets. Liberalizing the labor market is modelled theoretically by reduced firing taxes  $T$ . Although the model developed in this paper can be used to analyse the impact of changing many parameters such as hiring subsidies, cost of maintaining jobs, productivity shocks on labor market outcomes. We choose to focus on the Egyptian case and the introduction of the 2004 Labor Law, to try to explain the paradoxal empirical result obtained in Langot and Yassine (2015) (chapter 3). In the latter chapter, identifying the reform as a structural break in the job findings and separations time series, it has been shown that as the firing taxes were reduced, only separations increased significantly. Job creations remain unchanged. Moreover, evidence from Said (2015), pointed out, during the period 1998-2006, i.e. during the time period where the reform came into action, a relatively higher increase in the median real wages of public sector employees. Since

the public sector can not continue hiring employees at increased salaries due to budget constraints, there has been a decline in the public sector hiring over the same period. In this section, we therefore focus on exploring the effects of firing taxes and public sector wage policies on job creation, job destruction, on-the-job search and employment.

We present computed solutions to the model that provide some numerical feel for its policy implications. Parsimonious functional forms are assumed. The parameters are set at reasonable values and are chosen to match unemployment spell durations and incidences typically experienced by the Egyptian workers in the different sectors. The next section provide empirical evidence on the labor market transition probabilities in the Egyptian labor market over the period 1999-2011 (i.e before and after the reform). Chapters 1 and 2 also provide detailed descriptive statistics in the labor market transition probabilities, sectors' shares and unemployment rates obtained from the Egypt Labor Market Panel Survey, fielded in 2012. Some of these descriptive statistics provide guidelines in our numerical analysis to choose the baseline parameters.

Following (Mortensen and Pissarides, 2001), the matching function of sector  $i = F, I$  is log-linear. Formally,

$$q_i(\theta_i) = \theta_i^{-\eta_i}$$

where without loss of generality the scale parameter is normalized to one (this assumption simply determines the units in which  $v_i$ , and so  $\theta_i$ , are measured) and  $\eta_i$  is the constant elasticity of each sector's matching function with respect to unemployment. The distribution of the idiosyncratic shock to match productivity is uniform over the interval  $[\gamma_i, 1]$ . We therefore have:

$$F_i(x) = \frac{x - \gamma_i}{1 - \gamma_i}$$

The baseline parameter used for the policy cases under study are presented in Table 4.1. This table also justifies the choice of the value of the baseline parameters. This could be chosen following previous search equilibrium literature, inspired by the data or modified to fit results that match the economy in question. The normalized skill parameter value  $p_F = 1$  is interpreted as the initial match product of a worker of

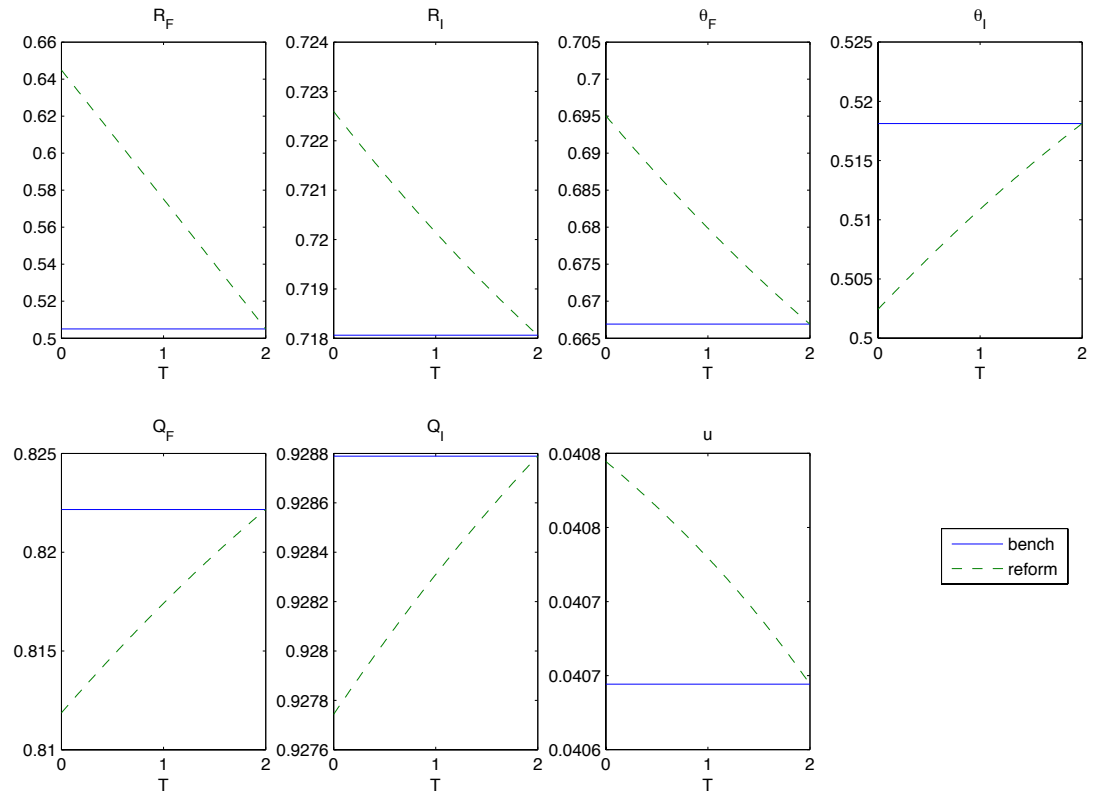
average ability in the formal sector. The skill parameter of a worker in the informal sector is assumed to be lower,  $p_I = .9$ . The analysis considers only the case of an efficient equilibrium solution to the model, where  $\beta = \eta$

The Egypt Labor Law, implemented in 2004, introduced lower levels of employment protection in the Egyptian Labor market. Theoretically, this is modelled as a reduction in the firing tax  $T$ . In Figure 4.1, we show the impact of decreasing the firing taxes on the steady-state labor market outcomes, assuming that all other baseline parameters have remained unchanged after the reform. The blue line in the steady state outcomes subpanel (a) represent the reference economy obtained using the baseline parameters and  $T = 2$ . We note that both separations in the formal and informal sectors increase, since both  $R_F$  and  $R_I$  (the reservation productivity levels) shift upwards after the reform. The increase in separations is proportional in magnitude to the decrease in the firing taxes, i.e the larger the reduction in Taxes, the larger the increase in job destruction. For the job creations, the story is different. As suggested by the conventional Mortensen and Pissarides (1994) model, the decrease in the firing tax leads to an increase in the job creations of the formal sector. This is the direct effect, corresponding to the shift of the job creation curve in the plane (labor market tightness, reservation productivity) which always dominates the reduction of the employment duration implied by the increase in the separation (the shift of the job destruction curve in the plane (labor market tightness, reservation productivity)). Extending the model to include the informal sector, shows that such a reform decreases the job creations in the informal sector: the new opportunities in the formal sector push up the real wages in all sectors, and hence reduce the hiring in the sector where this increase of labor costs is not over-compensated by a reduction of tax (the firing taxes in the formal sector). The reform, therefore scales down the difference between the formal and informal sector by shifting employment favoring the formal sector. Moreover, our simulations show that decreasing firing taxes reduces substantially the on-the-job search of private formal workers towards the public sector jobs. It is shown that if the decrease in  $T$  is huge, the share of workers on-the-job search in the formal sector, described by the difference between  $Q_F$  and  $R_F$ , might be very small. This is mainly driven by combined effect of the small decrease in the on-the-job search threshold  $Q_F$  along with a substantial increase in the

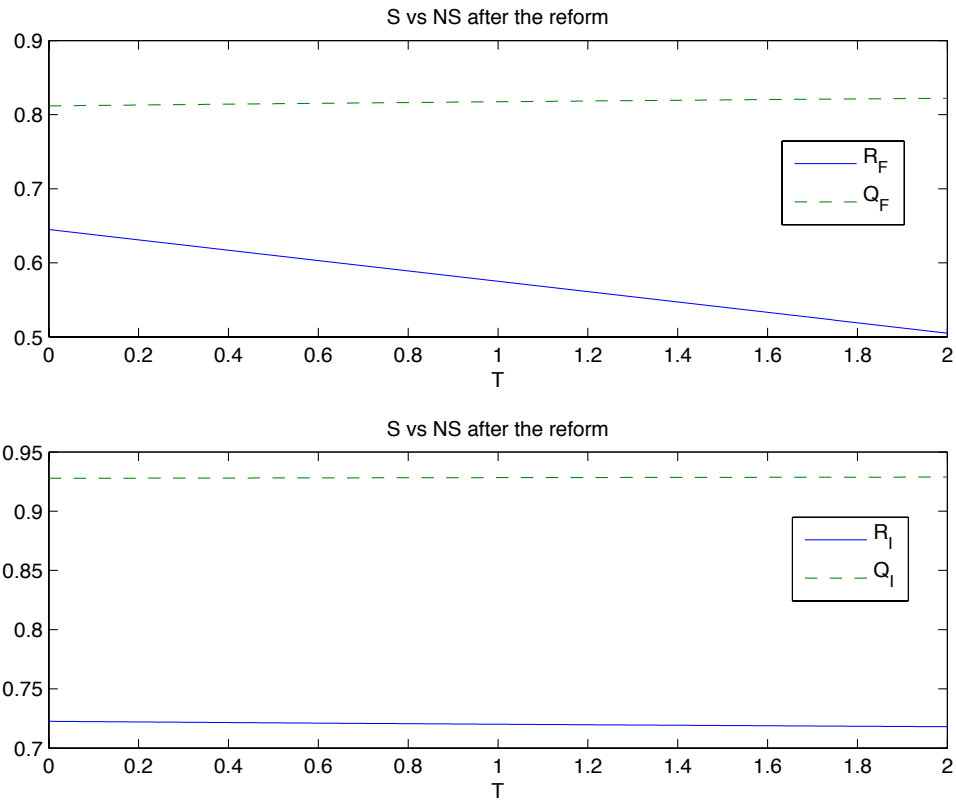
reservation productivity  $R_F$  for a given  $dT$ . In the informal sector, on-the job search towards the public sector almost remains unchanged or slightly decreases, following a relatively small increase in the reservation productivity  $R_I$  and almost no change in the on-the-job search threshold  $Q_I$ . Figure 4.1 also shows following the reduction in firing taxes, overall steady-state unemployment shifts upwards.

Parameters	Benchmark	Reason for setting this value
Output per worker in Formal $p_F$	1	Previous Literature
Output per worker in Informal $p_I$	0.9	Lower than the Formal Sector
Worker Bargaining power $\beta$	0.5	Previous Literature
Interest rate $r$	0.09	Average interest rate in Egypt
Reallocation Shock (Formal) $\lambda_F$	0.01	very low to reflect low separations
Reallocation Shock (Informal) $\lambda_I$	0.02	Separations are more frequent than in the Formal Sector
Transition from Formal to Public $\lambda_{FG}$	0.012	Transition rate from ELMPS 2012 Data
Transition from Formal to Public $\lambda_{IG}$	0.009	Transition rate from ELMPS 2012 Data
Transition from unemployment to Public $\lambda_{UG}$	0.015	Transition rate from ELMPS 2012 Data
Fixed cost of maintaining a formal job $c_F$	0.3	Previous Literature
Fixed cost of maintaining an informal job $c_I$	0.3	Previous Literature
Cost of Setting up a cost $C$	0.3	Previous Literature
Hiring Subsidy $H$	0	Does not exist
Duration Elasticity (Formal Sector) $\eta_F$	0.5	To obtain an efficient equilibrium solution
Duration Elasticity (Informal Sector) $\eta_I$	0.5	To obtain an efficient equilibrium solution
Lower productivity shock support (Formal) $\gamma_F$	0.1	Adjusted to obtain reasonable results and typically lower than developed countries in previous literature
Lower productivity shock support (Informal) $\gamma_I$	0.08	Lower than the Formal sector
Value of Leisure $b$	0.3	Previous Literature
Matching Efficiency (Formal) $q_F$	0.07	differentiated from the informal sector
Matching Efficiency (Informal) $q_I$	0.1	Assumed to be easier to match worker-job
Public Sector Wage $w_G$	0.8	Adjusted to obtain reasonable results
payroll tax $\tau$	0.2	Typical payroll tax
Firing Tax $T$	2	Adjusted to obtain reasonable results
Retirement rate $\delta$	0.007	Public Sector separations in the data

Table 4.1: Baseline parameters



(a) Steady State Outcomes (Before and After Reform)



(b) On-the-Job Search Vs. No Search (Before and After Reform)

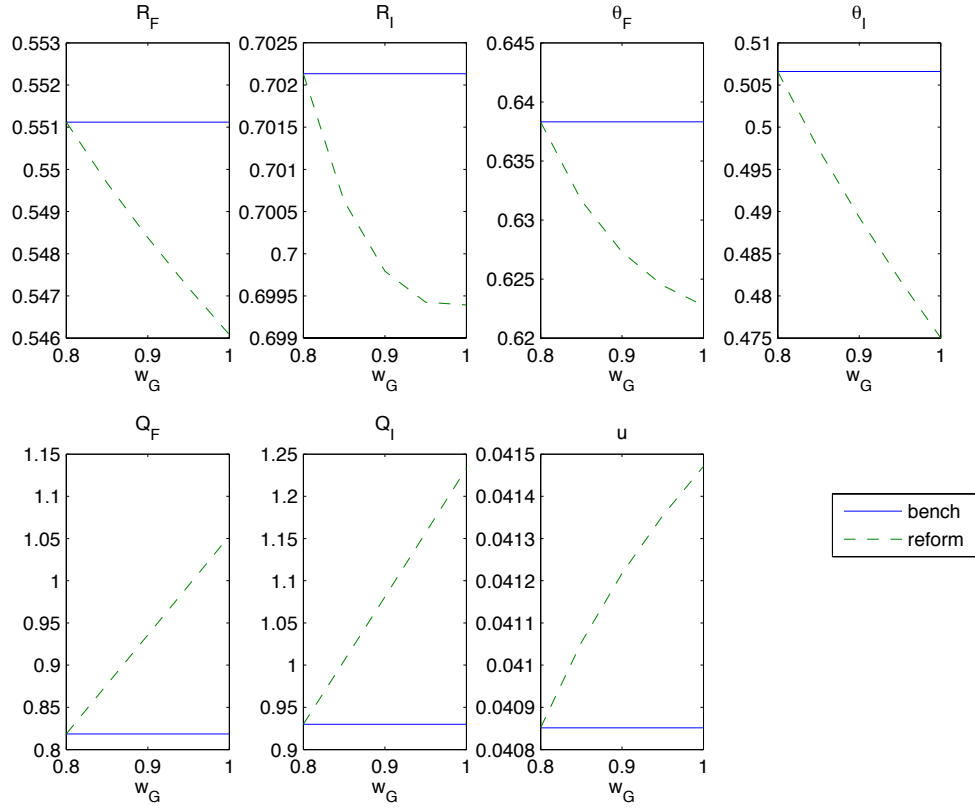
Figure 4.1: Impact of reducing firing Taxes, keeping all other baseline parameters constant

Evidence from Said (2015) has shown, however, that during the period 1998-2006, i.e. during the time period where the reform came into action, there has been a relatively higher increase in the median real wages of public sector employees. Said (2015) shows that there has been a 40% increase in the median real monthly wages of government employees and a 26% increase in the median real monthly wages of public firms' employees, as opposed to only a 9% increase in the median real wage of the private sector. The government is faced however by fiscal realities, in other words it is constrained by a budget, denoted by  $D$  in the model. Even if the wages increase, the government will have to decrease its hiring rate. In reality, this could be done via rationing public sector jobs, as in Egypt. To be able to calibrate this theoretically, we fix a budget constraint, given the initial public sector wage  $w_G^0$  and the initial share of public sector employees  $n_G^0$ ,  $D^0 = n_G^0(\lambda_{FG}^0, \lambda_{IG}^0, \lambda_{UG}^0) \times w_G^0$ . As the public sector wage increases and the budget remains unchanged, the resulting  $\hat{n}_G(\hat{\lambda}_{FG}, \hat{\lambda}_{IG}, \hat{\lambda}_{UG})$  is deduced assuming the functional form :

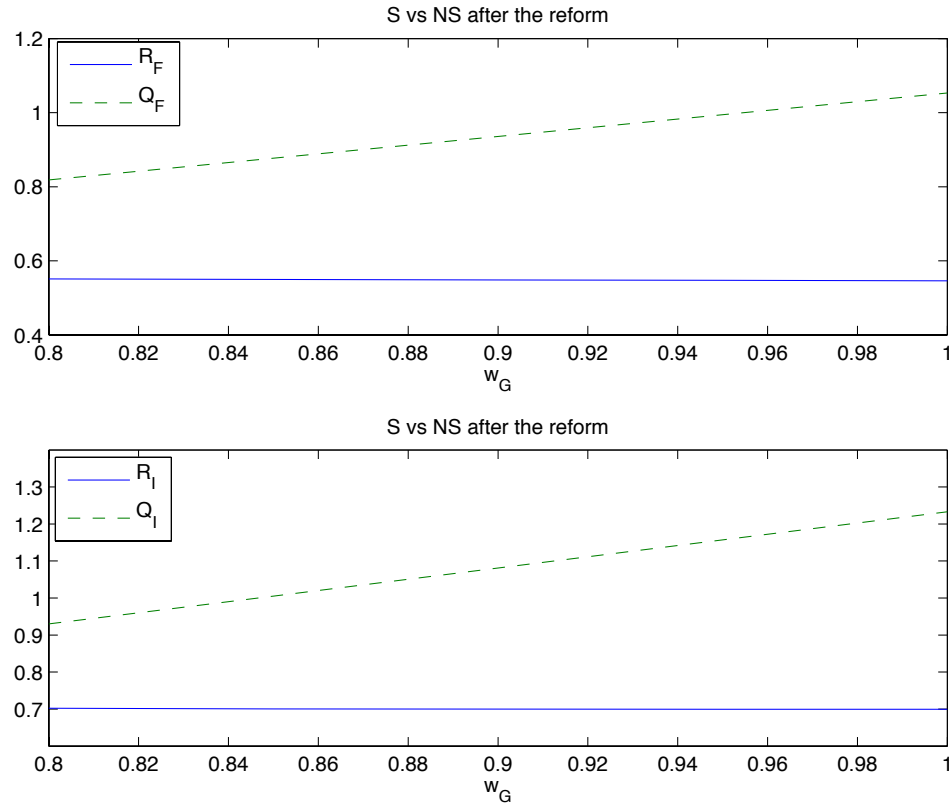
$$\lambda_{iG} = \frac{\lambda_{iG}^0}{(1 + \exp(a \times w_G) - \exp(a \times w_G^0))} \quad (4.41)$$

where  $\lambda_{iG}$  is the new public sector hiring rate from  $i = F, I, U$ ,  $w_G$  is the public sector wage after the increase and  $a$  is a parameter that is determined endogenously as the model is solved given  $D^0$  and the new  $n_G$ .

In figure 4.2, we show how the steady-state labor market outcomes vary in response to only a variation in the public sector wages. The blue line in subpanel (a) therefore represents the reference economy obtained using the baseline parameters. We choose however a lower level of firing tax  $T = 1$ , reflecting that the market has already been liberalized by the reform. Interestingly, the increase in public sector wages show opposite effects to the decrease in firing costs on the reservation productivity levels of both sectors  $R_F$  and  $R_I$ . These effects are non-linear given that the increase in wages is accompanied by a non-linear decrease in the public sector hiring rate from all sectors. As has been explained in the theoretical model, as the public sector jobs become more attractive, the reservation productivities  $R_F$  and  $R_I$  are pushed downwards. Consequently, increasing the public sector's wages while keeping all other parameters



(a) Steady State Outcomes (Before and After Reform)



(b) On-the-Job Search Vs. No Search (Before and After Reform)

Figure 4.2: Impact of an increase in public sector wages, after the market has been liberalized ( $T = 1$ ), keeping all other baseline parameters constant



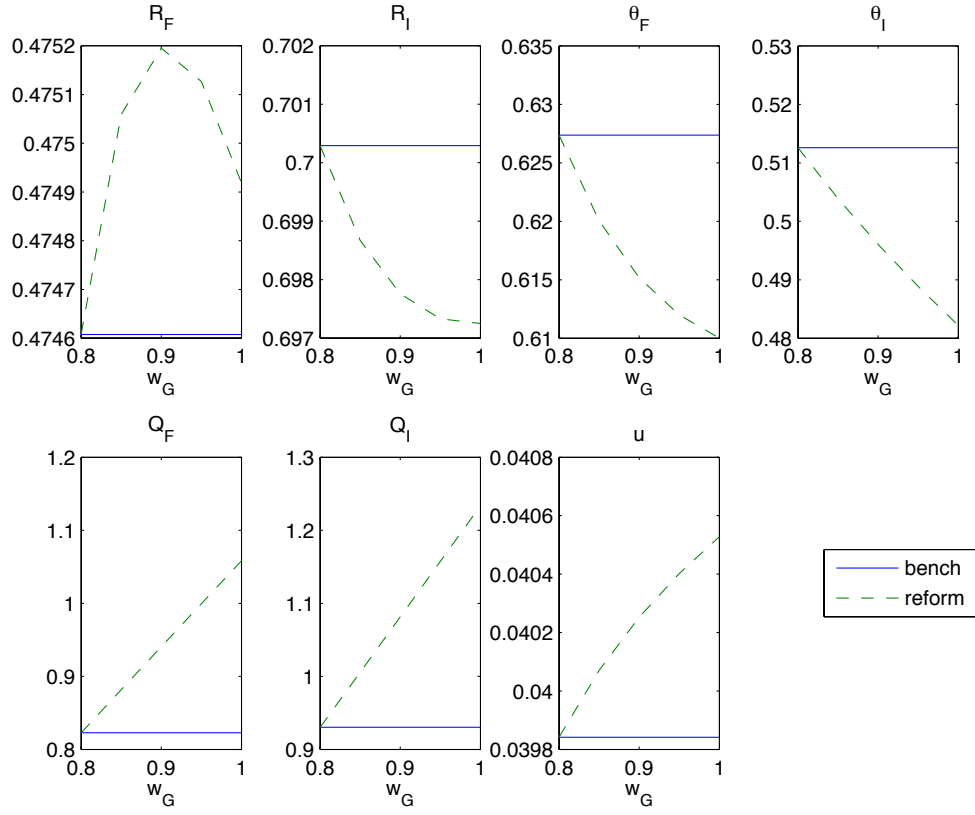
constant, separations are dampened in both sectors. It is interesting for workers to stay temporarily in these private sector jobs knowing that eventually there are potentials to move to the public sector. It is worth noting that it might be possible however, that even if the public sector wages increase, in case the hiring rate encounters a substantial relative decrease, in other words  $\lambda_{iG}$  is very elastic, there exists less potential to move to public sector jobs. In that case the reservation productivities might on the contrary increase or remain unchanged. Figure 4.3 shows an example to this possible phenomenon. This shows the response of the steady-state labor market outcomes in response to only a variation in the public sector wages at a higher level of firing tax  $T = 2$  i.e. a more rigid formal sector.

Moreover, following the rise of  $w_G$ , it becomes more attractive for all workers to search for better options and potential jobs in the Public sector. Job creations in both private formal and informal sectors are discouraged. Again this decrease is non-linear depending on the way job finding rate in the public sector decreases. Generally, by raising its attractiveness, the public sector reduces the expected employment duration of each job, and hence the expected surplus. This implies that  $\theta_F$  and  $\theta_I$  decrease. On-the-job search in both sectors also increases, given that workers can now gain more with higher wages in the public sector.

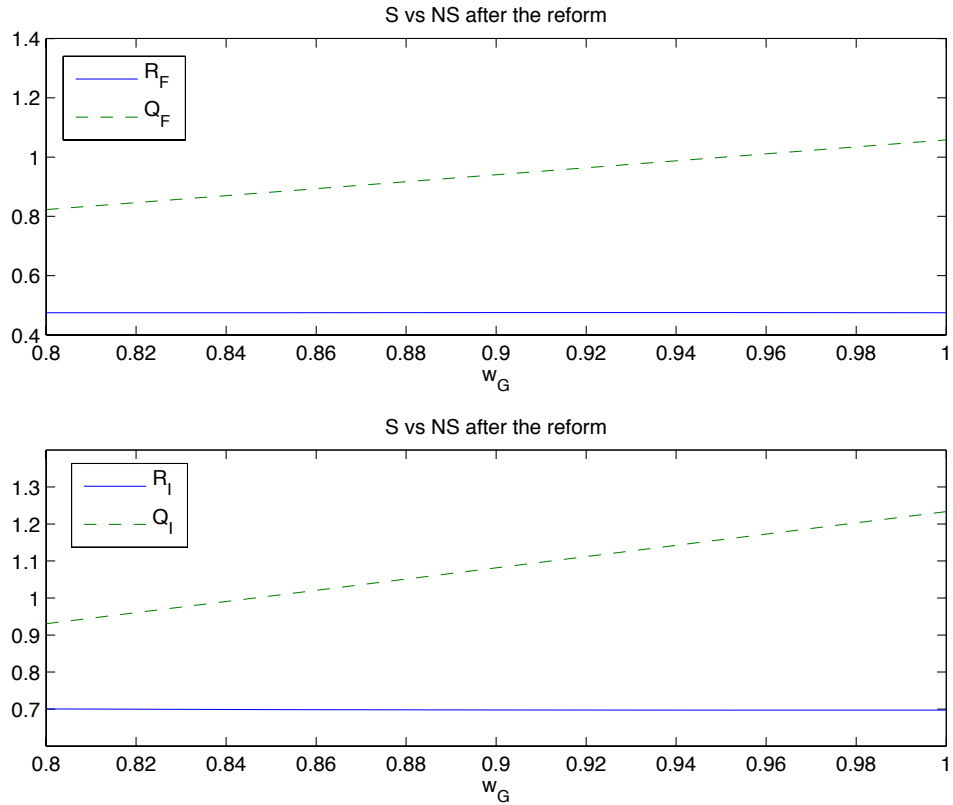
That being said, we can conclude our analysis by studying the simultaneous changes of firing taxes and public wages, and precisely by a decrease in the firing taxes, accompanied by an increase in the public sector wages. In table 4.4, we detail the impact of the change in each of these parameters on the model's equilibrium, trying to sum up the expected combined net effect on the labor market outcomes. Figures 4.4 and 4.5 show the analytical results using a three-dimensional display of the impact of variations in both firing taxes and public sector wages simultaneously on steady-state outcomes.

On-the job search towards the public sector is encouraged in both sectors the formal and informal, thanks to the rise in  $w_G$ . This is obvious in figure 4.4. The positive effects on job creations resulting from the liberalization of the labor market, following the reform, becomes nullified or sometimes worsened (where creations are dampened) by an increase in the public sector wage.

Overall for the formal sector's separations, i.e.  $R_F$  (Figure 4.5), there has been



(a) Steady State Outcomes (Before and After Reform)



(b) On-the-Job Search Vs. No Search (Before and After Reform)

Figure 4.3: Impact of an increase in public sector wages, after the market has been liberalized ( $T = 1$ ), keeping all other baseline parameters constant

	↓↓ Firing Taxes	↑↑ Public Sector Wages	<b>Combined Effect</b>
<b>Separations</b>			
Formal Sector	↑↑	↓↓	??
Informal Sector	↑↑	↓↓	??
<b>Job Findings</b>			
Formal Sector	↑↑	↓↓	??
Informal Sector	↓↓	↓↓	↓↓
<b>On-the-Job Search</b>			
Formal Sector	↓↓	↑↑	??
Informal Sector	No Effect	↑↑	↑↑
<b>Impact on SS Unemp.</b>	↑↑	↑↑	↑↑

Table 4.2: Summing up the two effects

a substantial increase following the simultaneous decrease in the firing tax and the increase in public sector wages. This is however mainly driven by the increase in separations following the introduction of flexible regulations. The increase in the public sector wages, accompanied by a decrease in the public sector hiring had almost no effect, possibly a very slight decrease, on the reservation productivity in the formal sector. overall, separations in the informal sector almost remain unchanged. They might first increase following the liberalization of the market but then dampened as the public sector wages increase. Job creations in the informal sector are reduced.

The most important observation though that job creations in the formal sector are discouraged after they have been encouraged by the new law. This possibly provides an explanation to the empirical results obtained on the aggregate level in (Langot and Yassine, 2015) showing that although the new labor law came into action in 2004, job findings remain unchanged afterwards. In all cases, steady-state unemployment increases after the change in both parameters.

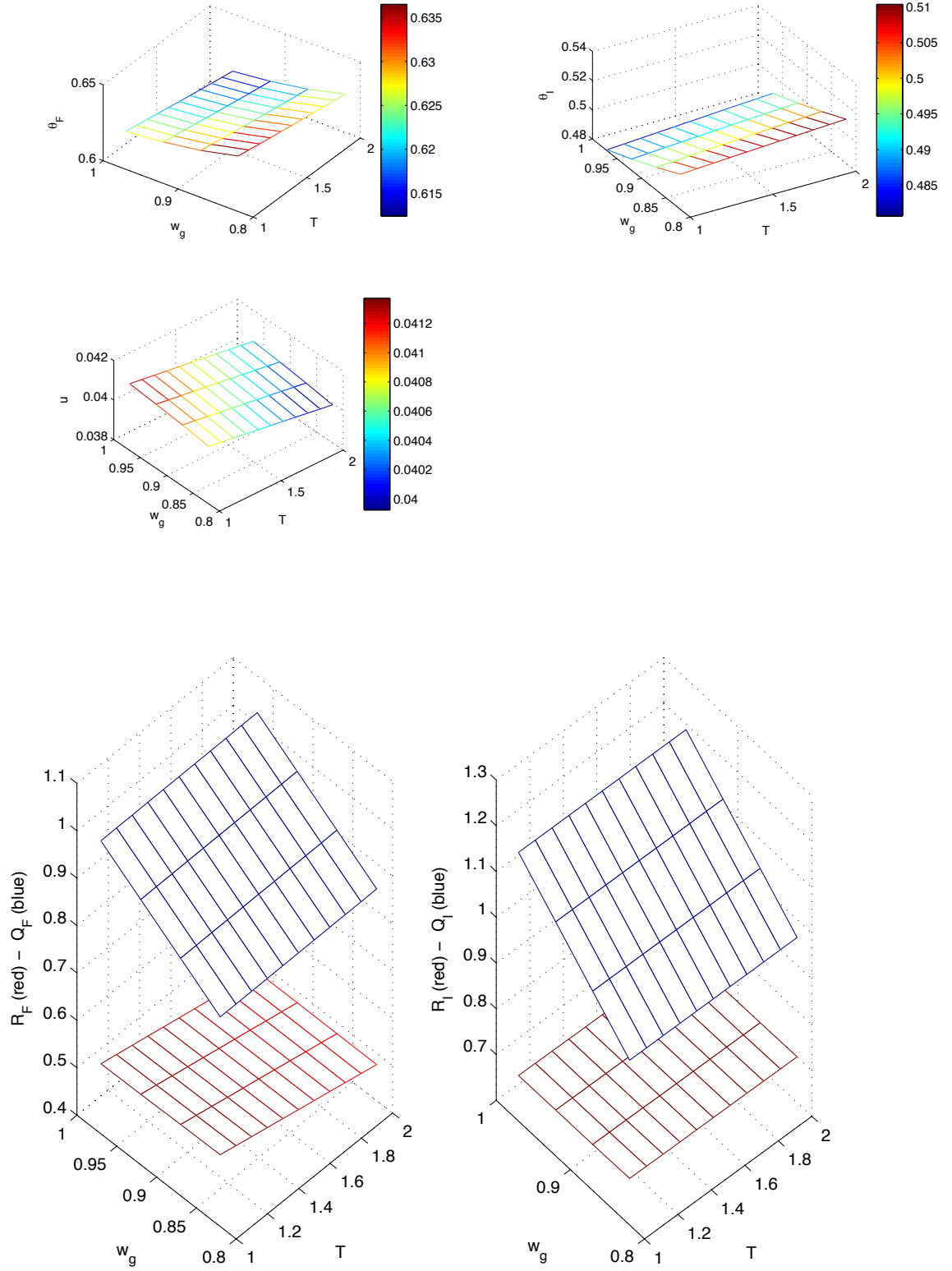


Figure 4.4: Impact of chnaging  $T$  and  $w_G$  on Steady-state outcomes

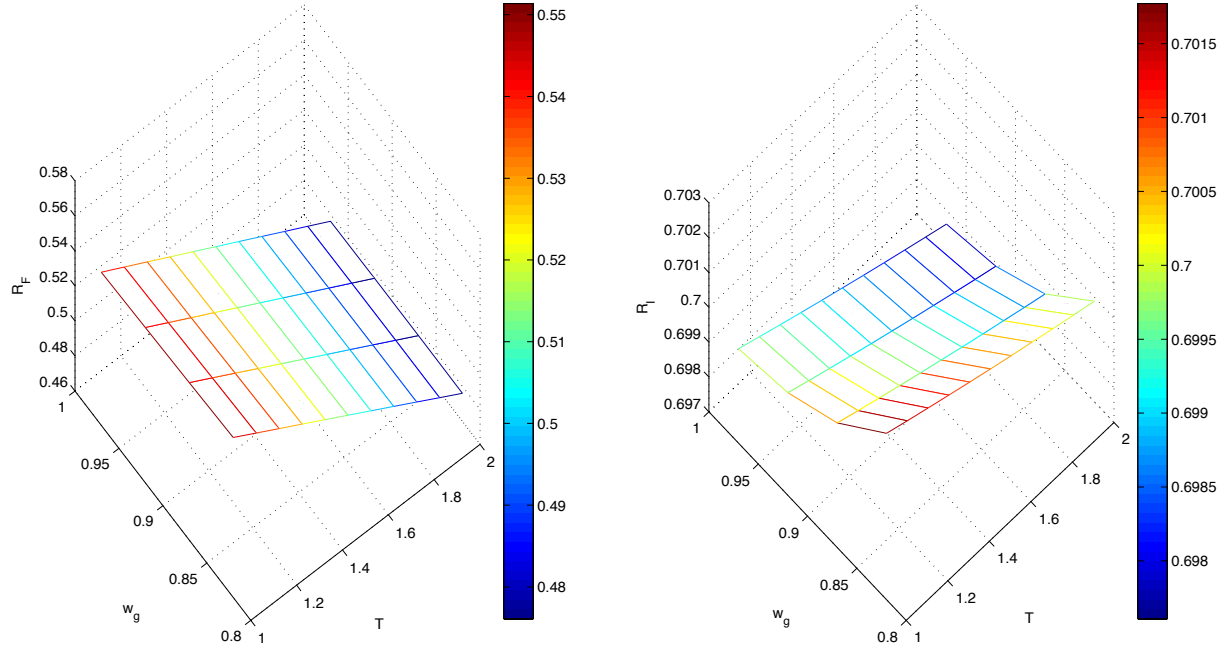


Figure 4.5: Impact of changing  $T$  and  $w_G$  on  $R_F$  and  $R_I$

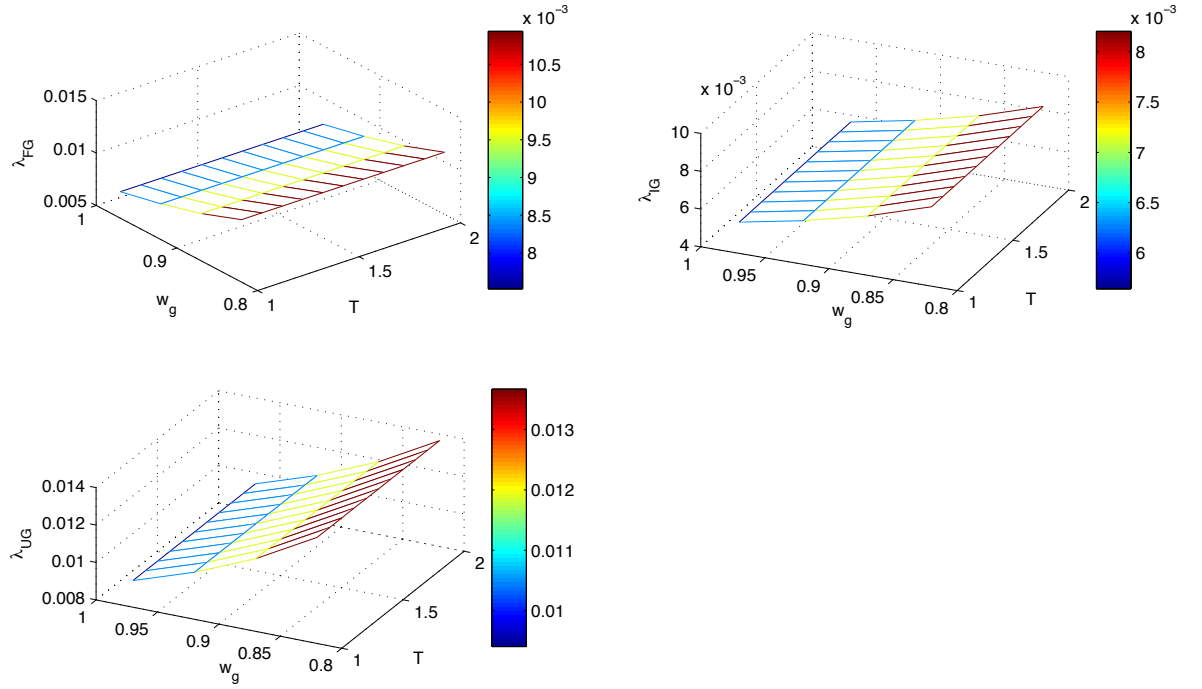


Figure 4.6: Evolution of  $\lambda_{iG}$ ,  $i = F, I, U$  as  $w_G$  increases and  $T$  decreases

## 4.5 Empirical Evidence from ELMPS 2012

In this section, we use the Egypt Labor Market Panel Survey, fielded in 2012 to extract, as has been done in chapter 1, a longitudinal retrospective panel for the period 1998-2011. This allows us to construct time series for the job findings and separations before and after the reform. The data also allows us to categorize employed workers by sector of employment namely, public, formal and informal wage work. It has been shown in chapters 2 and 3 that the retrospective panel extracted from the ELMPS 2012 suffer from a recall and design bias. Moreover, chapters 2 and 5 shows that the characteristics of the sample are not kept random as we go back in time. Following the correction methodology based on matching population moments and creating differentiated weights, we are able to reconstruct corrected flows between the employment sectors as well as unemployment<sup>5</sup>

Given these flows, we use the econometric methodology adopted in chapter 3 to purge the time series of each type of transition, namely separations from formal and informal sectors, job findings to the formal and informal sectors as well as transitions from formal and informal sectors to the public sector, from the the macroeconomic trend. The reform is then detected as a structural break in the series allowing us to construct the counterfactual time series if the reform has not been implemented in 2004. To be able to estimate the impact of the reform on each type of flow, we model the first approximation of the labor market flows as follows:

$$x_t - x_t^* = \alpha(y_t - y_t^*) + \beta + \epsilon_t \quad \text{for } x = s_F, s_I, f_F, f_I, \lambda_{FG}, \lambda_{IG} \quad (4.42)$$

For  $i = F, I$ ,  $s_i$  and  $f_i$  are respectively the observed job finding and job separation rates.  $\lambda_{iG}$  is the transition rate from a job in sector  $i$  to a job in the public sector.  $x_t^*$  represents the natural rate of the labor market flows (whether job finding, separation or transitions towards the public sector).  $y_t$  is the log of the observed output and  $y_t^*$  is the log of the potential output. The left-hand side term represents the flow gap,

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<sup>5</sup>See chapters 1 and 2 for the raw labor market flows obtained from the ELMPS12 dataset. The regressions in this section use the corrected flows.

whereas  $y_t - y_t^*$  captures the output gap. In other words, the difference between the observed and potential real GDP captures the cyclical level of output. Likewise, the difference between the observed and natural rate of job finding and the job separation represent the cyclical rate of worker flows. As adopted in chapter 3, we approximate  $y_t - y_t^*$  by the first difference of the observed output  $\Delta y_t$  and we assume that the natural rates of the different labor market transitions are constant over time. The estimations reported in tables 4.5, 4.5 and 4.5 show the results running the regressions of equation 4.43 allows us to test for the impact of the policy change in 2004 on the natural rate of worker flows.

$$\hat{x}_t = \hat{b} + \mathbb{I}_a \hat{\gamma} + \hat{\epsilon}_t \quad \text{for } x = s_F, s_I, f_F, f_I, \lambda_{FG}, \lambda_{IG} \quad (4.43)$$

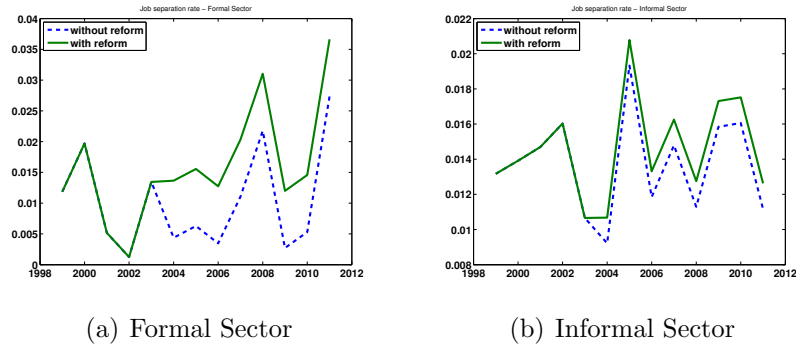


Figure 4.7: Impact of Egypt 2004 New Labor Law on Separations of the Formal and Informal Sector

	$s_F$	$s_F$	$s_I$	$s_I$
$\alpha$	0.116	-0.250	0.065	0.022
$b$	0.016***	0.010**	0.024***	0.014***
$\gamma$		0.009*		0.002

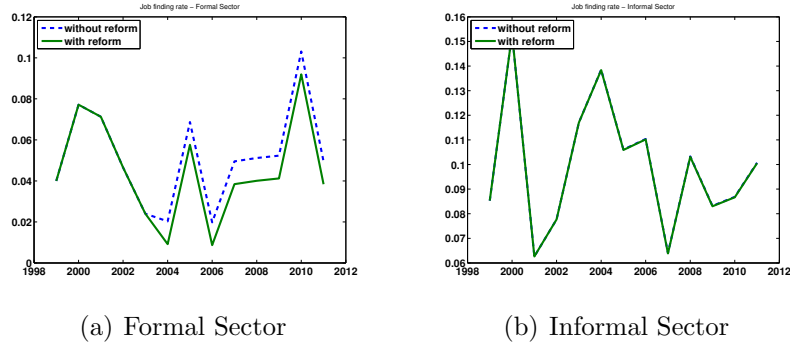


Figure 4.8: Impact of Egypt 2004 New Labor Law on Job Findings of the Formal and Informal Sector

	$f_F$	$f_F$	$f_I$	$f_I$
$\alpha$	0.628	0.307	-0.363	0.143
$b$	0.044***	0.052***	0.010***	0.010***
$\gamma$		-0.011		-0.000174

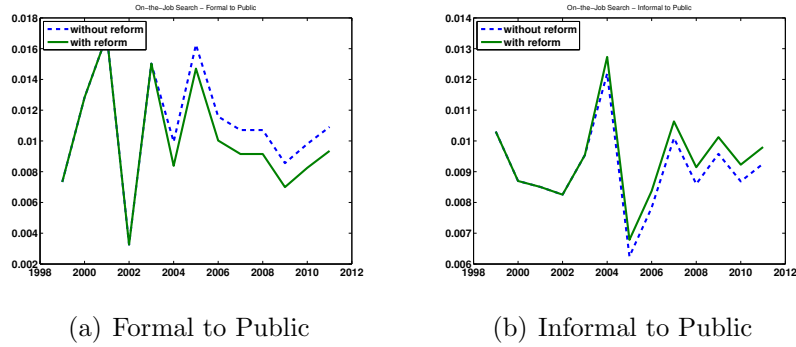


Figure 4.9: Impact of Egypt 2004 New Labor Law on the On-the-Job Search towards the Public Sector

	$\lambda_{FG}$	$\lambda_{FG}$	$\lambda_{IG}$	$\lambda_{IG}$
$\alpha$	-0.064	-0.082	-0.025	-0.041
$b$	0.010***	0.011***	0.009***	0.009***
$\gamma$		-0.002		0.001

The results of these regressions using the ELMPS 2012 show that only the separations in the formal sector increased significantly after the reform. The impact on all other flows was insignificant. This however maybe due to the fact that we're over exploiting the data by detailing the transitions between the different employment sectors, given the structure of the data set and the samples' sizes discussed in chapter 1.



What is interesting however is that the direction of change in the natural rates of these flows is coherent with the theoretical model presented in the previous section. Separations in both sectors increased showing that the effect of the reduced firing taxes has dominated in that case. Findings in both sectors retreated slightly. For the informal sector, this is due to both the decrease in the firing taxes as well as the increase in the public sector wages. For the formal sector, it shows that the job creations were still taxed by the increase in the public sector wages even though the hiring has declined. Workers considering on-the-job search are now more than before. Interestingly however, this was not followed by more people really moving to the public sector. On the contrary, actual transitions occurring to the public sector from the formal sector decreased. This comes however from the two contradicting forces acting in two different directions; where decreasing firing taxes discouraged transitions to the public sector while increasing public sector wages encouraged them. Since the firing taxes do not have any effect on the on-the-job search towards the public sector in the informal jobs, these increased following the rise in the public sector wages.

## 4.6 Conclusion

According to Assaad (2014), the dualism and segmented nature of MENA labor markets plays an important role in their lack of dynamism. High levels of public sector employment were used as part of the authoritarian bargain, where public employment was exchanged for political acquiescence under authoritarian regimes. Labor was therefore allocated in line with political goals, which undermined the primary function of labor markets, which is to distribute human capital to its most productive uses. With an aim to portray the nature of labor markets in developing countries, we extend in this paper a Mortensen-Pissarides model to add to the conventional private formal sector, public and informal wage employment sectors. The public sector is added as an exogenous player where wage and employment policies are decided exogenously. However these policies are constrained by the government's budget. The model shows the different interactions between the sectors, and particularly endogenizes job creations, job destructions as well as on-the job search towards the public sector, in both the

formal and the informal sector.

One example of a reform attempting but struggling to encourage dynamism in MENA labor markets is observed in the case of Egypt. In Egypt, a new labor law (Law 12 of 2003) was enacted with the goal of increasing the dynamism of the private sector by making hiring and firing workers easier. Langot and Yassine (2015) (chapter 3) show using empirical evidence, that following the reform, modelled as a decrease in the firing taxes imposed on employers, only separations increased significantly while job findings hardly change. Trying to explain this partial failure of the reform, in Langot and Yassine (2015) (chapter 3), we tried to adapt the Mortensen-Pissarides model by adding corruption set up costs to explain such an empirical paradox. Yet, another possible explanation might lie in the nature of the labor market of a developing country such as Egypt, due to the existence of informal sectors and a sizeable public employer. In the absence of a clear understanding of the inside story of the inter-sectoral transitions, such policy reforms are unlikely to be effective and are unlikely to achieve their objectives.

Using our model and numerical analysis, we show that the reduction in the firing taxes increase job separations in both sectors formal and informal sectors. The reform also discourages on-the-job search towards the public sector. Following the conventional Mortensen-Pissarides mode, it is shown that job creations in the formal sector is increased after a decrease in the firing taxes while job findings in the informal sector is dampened. This is consistent with the fact that such reform aim at scaling down the difference between formal and informal sectors by shifting employment towards the formal sector by liberalizing it. An increase in formal job creations accompanied by a decrease in informal job creations would result in ambiguous impact on the aggregate job creations depending on the magnitude of each variation.

The new Labor law introduced in 2004 has however been accompanied simultaneously by a trending increase in the real wages of public sector workers, as proposed by Said (2015). However, due to fiscal realities, this has been accompanied by less hiring in the public sector. Both qualitative numerical analysis of the model and empirical evidence from the data show that both formal and informal workers are encouraged to search more on-the-job in the public sector. Moreover, simulating these variations,

the model reveals that the increase in public sector wages tends to nullify the positive effect on the private formal sector's job creation, it even reduces it. The increase in public sector wages in this case acts as an extra taxation to the job creations in the formal and informal sector. The net effect of observed after the 2004 Egypt labor law is therefore an increase in the unemployment rates since job separations in all cases are enhanced, but job creations remain unchanged or even dampened. This explains the empirical paradox of the Egyptian case discussed in (Langot and Yassine, 2015), showing that following the liberalization of the labor market, only job separations increase and job findings remain unchanged. From a political evaluation point of view, the 2004 reform achieves its mission in liberalizing the market by favoring the formal sector to the informal sector, boosting both its job creations and separations. These positive effects, and particularly the increase in job creations, have been dampened and even nullified by raising the levels of public sector wages at the same time. It becomes more attractive to search for jobs in the public sector which becomes more remunerating.

**Extensions:** As has been explained in the paper, the model does not limit to explaining the impact of firing taxes  $T$  and public sector wages  $w_G$ . The aim is to take this work further by testing for the impact of changes in other policy parameters on the labor market equilibrium and generalizing the study to other developing labor markets. Hiring subsidies, paryoll taxes and productivity shocks surely play important roles in determining the different labor market outcomes. Another process that has been neglected in this model and is worth exploring in a future research agenda is the jobs formalization. Adding transitions from the informal to the formal sector to the model might be interesting in terms of how the structure and segmentation of these labor markets can get affected by the different policy parameters. For instance, liberalizing the labor market not only that it favors creations from unemployment to the formal sector but it surely favors transitions from informal jobs to formal ones. Endogenizing productivities and when would jobs be formal or informal is also an interesting question that can be used to extend the model.

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## 4.A Deriving the Market's Surplus

### Formal Sector

The initial surplus in the formal sector is defined as  $S_F^0 = J_F^0 - V_F - p_F(C - H) + W_F^0(1) - U$ , while the continuing job surplus is  $S_F(x) = \max\{J_F^{NS}(x) + p_FT - V_F + W_F^{NS}(x) - U, J_F^S(x) + p_FT - V_F + W_F^S(x) - U\}$ .

At the time of hiring, when the idiosyncratic component is at its highest value  $x = 1$ , the initial match surplus in the formal sector is therefore :

$$\begin{aligned} (r + \delta + \lambda_F)S_F^0(1) &= p_F + \tau + \lambda_F \int_{R_F}^1 S_F(z) dF_F(z) - (r + \delta)(U + V_F) \\ &- (r + \delta + \lambda_F)p_F(C - H) - \lambda_F p_F T \end{aligned} \quad (4.44)$$

For a continuing match, and in case on-the-job search takes place i.e. if  $x \leq Q_F$ , the surplus of the job,  $S_F^S(x)$  solves the following equation:

$$\begin{aligned} (r + \delta + \lambda_F + \lambda_{FG})S_F^S(x) &= p_F x + \tau + \lambda_F \int_{R_F}^1 S_F(z) dF_F(z) + (r + \delta + \lambda_{FG})p_F T \\ &- (r + \delta)(V_F + U) + \lambda_{FG}(W_G - U) \end{aligned} \quad (4.45)$$

If  $x > Q_F$ , the workers do not search on-the-job for better options in the public sector. The only outside option in this case is the destruction of the job and the worker becoming unemployed. The surplus,  $S_F^{NS}(x)$ , in this case solves the following equation:

$$(r + \delta + \lambda_F)S_F^{NS}(x) = p_F x + \tau + \lambda_F \int_{R_F}^1 S_F(z) dF_F(z) - (r + \delta)(V_F - p_F T + U)$$

Since the separation rule has to maximize the total wealth in a bilateral agreement, we know that  $J(R_F) + W(R_F) = V_F - p_F T + U$ , where  $j = S, NS$ . It follows that  $S_F^j(R_F) = 0$ . This allows us to derive  $S_F^S(x)$  as

$$S_F^S(x) = \frac{p_F(x - R_F)}{r + \delta + \lambda_F + \lambda_{FG}} \quad (4.46)$$

and  $S_F^{NS}(x)$  as

$$S_F^{NS}(x) = \frac{p_F(x - R_F) - \lambda_{FG}p_FT - \lambda_{FG}(W_G - U)}{r + \delta + \lambda_F} \quad (4.47)$$

Using all the above we can therefore conclude that the total surplus of the formal sector is:

$$\begin{aligned} \int_{R_F}^1 S_F(z) dF_F(z) &= \int_{R_F}^{Q_F} S_F^S(z) dF_F(z) + \int_{Q_F}^1 S_F^{NS}(z) dF_F(z) \\ &= \frac{p_F}{r + \delta + \lambda_F + \lambda_{FG}} \left\{ -(Q_F - R_F)(1 - F_F(Q_F)) + \int_{R_F}^{Q_F} [1 - F_F(x)] dx \right\} \\ &+ \frac{p_F}{r + \delta + \lambda_F} \left\{ (Q_F - R_F)(1 - F_F(Q_F)) + \int_{Q_F}^1 [1 - F_F(x)] dx \right\} \\ &+ \frac{\lambda_{FG}p_FT - \lambda_{FG}(W_G - U)}{r + \delta + \lambda_F} (1 - F_F(Q_F)) \end{aligned} \quad (4.48)$$

### Informal Sector

The expressions for the surplus in the informal sector are derived in a similar way to that adopted for the formal sector. However, due to the absence of policy parameters in the informal sector, the initial surplus is the same as the surplus of a continuing match, when there is no on-the-job search and when the productivity is at its highest level,  $x = 1$ , i.e.  $S_I^0(1) = S_I^{NS}(1)$ . When there is no on-the-job search, i.e.  $x > Q_I$ , the value of the surplus,  $S_I^{NS}(x)$ , is given by the equation:

$$(r + \delta + \lambda_I)S_I^{NS}(x) = p_I x + \lambda_I \int_{R_I}^1 S_I(z) dF_I(z) - (r + \delta)(V_I + U) \quad (4.49)$$

whereas for  $x \leq Q_I$ , when workers are searching on-the-job for positions in the public sector, we have

$$\begin{aligned} (r + \delta + \lambda_I + \lambda_{IG})S_I^S(x) &= p_I x + \lambda_I \int_{R_I}^1 S_I(z) dF_I(z) - (r + \delta)(V_I + U) \\ &+ \lambda_{IG}(W_G - U) \end{aligned} \quad (4.50)$$

Since  $S_I^S(R_I) = 0$ , subtracting  $S_I^S(R_I)$  from  $S_I^S(x)$  allows us to obtain:

$$S_I^S(x) = \frac{p_I(x - R_I)}{r + \delta + \lambda_I + \lambda_{IG}} \quad (4.51)$$

and subtracting  $S_I^S(R_I)$  from  $S_I^{NS}(x)$  gives:

$$S_I^{NS}(x) = \frac{p_I(x - R_I) - \lambda_{IG}(W_G - U)}{r + \delta + \lambda_I} \quad (4.52)$$

Using all the above we can therefore conclude that the total surplus in the informal sector is derived as follows:

$$\begin{aligned} \int_{R_I}^1 S_I(z) dF_I(z) &= \int_{R_I}^{Q_I} S_I^S(z) dF_I(z) + \int_{Q_I}^1 S_I^{NS}(z) dF_I(z) \\ &= \frac{p_I}{r + \delta + \lambda_I + \lambda_{IG}} \left\{ -(Q_I - R_I)(1 - F_I(Q_I)) + \int_{R_I}^{Q_I} [1 - F_I(x)] dx \right\} \\ &+ \frac{p_I}{r + \delta + \lambda_I} \left\{ (Q_I - R_I)(1 - F_I(Q_I)) + \int_{Q_I}^1 [1 - F_I(x)] dx \right\} \\ &+ \frac{\lambda_{IG}(1 - F_I(Q_I))}{r + \delta + \lambda_I} (W_G - U) \end{aligned} \quad (4.53)$$



## Part III

# Quality of Jobs and Labor Market Search Frictions

## Chapter 5

# Constructing Labor Market Transitions Weights in Retrospective Data: An Application to Egypt and Jordan <sup>1</sup>

### 5.1 Introduction

As has been well established in the previous chapters, researchers, demographers and policy makers in the MENA region became increasingly interested in understanding employment histories or the worker's life course after schooling, with a focus on events, their sequence, ordering and transitions that people make from one labor market state to another. The Arab Spring countries, in particular, are currently continuously debating on how to respond to the economic crises and also on how to provide more equitable opportunities through their labor markets. Consequently, policy-relevant research on labor market dynamics becomes particularly valuable.

Given that there are no official statistics on labor market dynamics in the MENA

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region, as has been explained in parts I and II of this thesis, very little research has so far been done on the issue in the region. It has also been shown that in order to assess labor market dynamics in the two countries in question (Egypt and Jordan), detailed annual panel data on labor market statuses is required. The only possible way to obtain such panel data is to extract longitudinal retrospective panel datasets from the Egypt Labor Market Panel Survey fielded in 2006 and 2012 (ELMPS 2006 and 2012), and the Jordan Labor Market Panel Survey fielded in 2010 (JLMPS 2010). Yassine (2015) and Assaad, Krafft, and Yassine (2015) (part I in this thesis) explain that these datasets provide detailed labor market histories for those who ever worked as well as current employment/non-employment information for all interviewed individuals. This consequently allows the creation of retrospective longitudinal panels of the individuals' labor market states on an annual or semi-annual basis, going back in time from the year of the survey for each country. These retrospective panels suffer however from measurement errors. According to Langot and Yassine (2015) (chapter 3) and Assaad, Krafft, and Yassine (2015) (chapter 2), the retrospective information obtained from these surveys suffer from what is referred to as recall and design bias. Recall bias is defined as respondents mis-reporting their retrospective trajectory because they tend to forget some events or spells, especially the short ones. The design bias arises from the fact that different types of questions are being asked for current versus recall/retrospective statuses. There is therefore a question of salience/cognitive recognition by the respondents where by asking the questions differently, respondents, or even sometimes the enumerators, can interpret them differently. Yassine (2015) (chapter 1) and Assaad, Krafft, and Yassine (2015) (chapter 2) show for instance that due to the design of the questionnaires of the ELMPS and the JLMPS, statuses in the retrospective sections are sometimes being interpreted more of job statuses rather than labor market states. Langot and Yassine (2015) proposes a methodology to correct for this bias producing corrected aggregate transition rates obtained from the retrospective data. This methodology assumes that the contemporaneous (panel data) aggregate transition rates, obtained from the ELMPS 1998, 2006 and 2012, are the correct ones <sup>2</sup>.

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<sup>2</sup>See Assaad, Krafft, and Yassine (2015) (chapter 2) and Langot and Yassine (2015) (chapter 3) for more details.

The latter approach therefore limits to analyzing the macro aggregate indicators (time series) of the labor market transitions. Exploiting the micro-level individual information available on the workers' and jobs' characteristics underlying these transitions is however very important, especially if available in the data. Characterizing movements within the labor market, for instance, can help policy makers design various effective policies to address unemployment, informality or non-participation and reduce their adverse consequences. Tansel and Ozdemir (2015) provided an analysis of labor market dynamics in Egypt with an emphasis on formal/informal labor market states using contemporaneous panel data for the period 2006-2012, showing that increasing education levels can play an important role in reducing transitions into informal states of labor market. Their paper however studies labor market transitions over a period of six years. A lot of incidents and transitions can occur in between and these transitions need to be assessed on at least an annual basis.

This paper therefore builds on the methodology proposed by Langot and Yassine (2015) (chapter 3) and extends it to correct the data on the individual transaction level (i.e. micro level). The model proposed in this paper creates user-friendly weights that can be readily used by researchers relying on the ELMPS and JLMPS retrospective panels. The recall and design bias in the data cannot be ignored. As has been clarified in Bound, Brown, and Mathiowetz (2001), errors (even if random) in categorical or binary variables (which is the case of labor market transitions) are problematic. Whether the mis-measured variable is the dependant or independent variable, the regression estimates would be biased downwards (attenuated). In Assaad, Krafft, and Yassine (2015) (chapter 2), it was also shown that these errors are systematic i.e. related to covariates. Such relationships will bias any attempts to examine the relationship between covariates and mis-measured outcomes. Consequently, one can not ignore such measurement errors and the results of the applications shown at the end of this paper support this argument. Moreover, given the nature and the sample sizes of the datasets used, it's not possible to structurally estimate the bias, simultaneously with the estimation of any other model. First, the JLMPS is the first wave of the survey in Jordan. The retrospective responses can therefore not be overlapped with contemporaneous responses from another wave to identify whether an individual is mis-

reporting a labor market state in the past. Even when other waves are available as in the case of Egypt, the number of individuals who were interviewed in both surveys and can therefore be identified for mis-reporting, provides small sized samples when classified by the type of transitions (see Appendix 1.B in Chapter 1). These are even the sizes of the samples before categorizing them by observable characteristics, which means that estimations in that case would be based in some cases on only one observation, if not sometimes none.

The technique suggested by this paper shows that it is sufficient to have population, stocks and transitions, moments to correct over- or under-reporting biases in retrospective data. The true unbiased moments can be obtained from auxiliary information such as contemporaneous information from other waves of the same survey, or even external data sources, so long comparability between the variables' definitions is verified. Once the moments are matched on the aggregate level, a measurement error for each type of transition at a point in time  $t$  is estimated. This measurement error is then distributed among the sample's individual observations/transactions in the form of micro-data weights, such as observations that are being under-reported take higher weights and those over-reported take lower weights. The paper proposes two types of weights: (1) naive proportional weights and (2) differentiated predicted weights. Naive proportional weights offer the advantage of being simple to calculate and handy. However, Assaad, Krafft, and Yassine (2015) show that not only retrospective data will under-report past unemployment but also distort its characteristics. The retrospective panels are therefore not random. In an attempt, to re-obtain random samples within these panels, the differentiated predicted weights are constructed. Following an accurate random sample (which in our case is the most recent year of the retrospective panels), one can estimate the probability for an individual to make a specific type of labor market transition as a function of observable characteristics. If the individual is more probable to transit, then he is more probable to mis-report. Distributing the measurement error among the sample's observations according to these probabilities, via differentiated weights, allows to redress the retrospective panels into random samples readily used for micro-data analysis of labor market dynamics. Both transaction-level weights i.e. for each transition at a certain point in time, as well as panel weights i.e.

for an entire spell are built. In order to highlight the importance of these weights, the last section of this paper offers an application using these weights. The determinants of labor market transitions are analyzed via a multinomial regression analysis with and without the weights. The impact of these weights on the regressions estimations and coefficients is therefore examined and shown significant among the different labor market transitions, particularly separations.

The application demonstrated in this paper using the recall weights allows to estimate the markov transition probabilities for labor market states over time as function of observable characteristics. On the one hand such analysis allows to point out the chances of transitioning between and within employment and non-employment states. On the other hand, the obtained estimations are suggestive of the roles of state dependence in these labor market transitions. The markov transition probabilities are mainly estimated between the three labor market states, namely employment, unemployment and inactivity, over time as function of observable worker's, firm's characteristics as well as macroeconomic indicators such as labor market tightness. The paper also provides desaggregated labor market transitions, when possible, namely public wage work, private formal wage work, private informal wage work, self-employment and non-employment. Although it was not possible, given the samples' sizes and the nature of transitions, to construct the recall weights for female workers, transition probabilities using a gender-specific multinomial logit specification were predicted. The transition matrices are conditioned on different individual characteristics like gender, age, region of residence...etc and firm/job characteristics such as the size of the firm, the sector of employment...etc.

The rest of the paper is structured as follows. The next section describes the data treatment and the creation of transitions and panel weights. Section 3 surveys corrected and uncorrected descriptive statistics, as well as a counting analysis of the transition matrices. Section 4 provides an application showing results from multinomial logit regression models. Section 5 concludes.

## 5.2 Creating Weights

### 5.2.1 Data and Sampling

Data from Egypt and Jordan are used. The three rounds of the Egypt Labor Market Panel Survey (ELMPS), fielded in 1998, 2006 and 2012 and the first round of the Jordan Labor Market Panel Survey (JLMPS) fielded in 2010 are exploited. The two surveys are nationally representative including both detailed current employment and nonemployment information as well as labor market histories that allow for an assessment of employment and nonemployment transitions and spells' durations. The surveys elicit information on detailed individual characteristics as well as job (or firm) characteristics. Following the methodology and assumptions adopted by (Yassine, 2015), a retrospective longitudinal panel dataset is extracted for each country, going back ten years from the year of the survey, i.e. 2001-2011 for Egypt, and 2000-2010 for Jordan<sup>3</sup>.

The sample used in this paper includes male individuals between 15 and 49 years of age. The sample includes those who ever worked, the young unexperienced new labor market entrants and the individuals who are permanently out of the labor force. Female workers in this context are being excluded since their behaviour of entry and exit into/from the labor market is likely to be driven by personal motives such as marriage and child birth. Theory and steady-state assumptions made in the recall correction model can therefore be distorted and might not be fully applicable if female workers are included in the analysis. Female individuals between 15 and 49 years of age are also added to the analysis when non-corrected gender-specific regressions are estimated.

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<sup>3</sup>As the surveys are fielded at the beginning of the survey year, the last year's transitions are not captured fully and are therefore omitted from the observation period. For Jordan, the case was exceptional, even though the survey was fielded from February to April 2014 i.e during the first semester of the year, whether 2009/2010 was included or not to the analysis, the same results are obtained. It has been therefore opted to keep 2009/2010 in the analysis for sample size reasons.

## 5.2.2 Matching Population Moments <sup>4</sup>

The first step adopted in correcting the recall and design bias observed in the data, is matching the stocks' and transitions' moments of the biased data with true auxiliary information to be able to estimate the associated error terms to each type of transition on the aggregate level. The way the model is estimated differs between Egypt and Jordan, because of differences in the auxiliary data availability and number of waves of Labor Market Panel Survey fielded in the country. For both countries, the model is over-identified and further work is needed to develop tests of fit for the model. The model is used to structurally estimate, using a Simulated Method of Moments (SMM), a function representing the "forgetting rate" conditional on the individual's state in the labor market.

### Egypt

In Egypt, we have three waves of the ELMPS survey, each providing the true unbiased stocks of the most recent year of the relevant longitudinal retrospective panel, i.e. the most accurate one<sup>5</sup>. The ELMPS 2006 and 2012 longitudinal retrospective panels provide as well the labor market transitions' rates over time. These rates, are the transitions moments, which decay as one goes back in time due to the recall and design bias. There exists however two unbiased moments of these for the most recent year of each panel i.e. 2004/2005 from the ELMPS 2006 and 2010/2011 from the ELMPS 2012.

Following Langot and Yassine (2015) (chapter 3), a three-state model is built to correct for the aggregate labor market transitions between employment ( $E$ ), unemployment ( $U$ ) and inactivity ( $I$ ). The vector of the true labor market state occupied

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<sup>4</sup>This section draws heavily on the correction methodology developed in Chapter 3, which derives in details the equations and the identifying methodology.

<sup>5</sup>See Assaad, Krafft, and Yassine (2015) (chapter 2 Langot and Yassine (2015) (chapter 3) for a reason of this assumption



at year  $t$  is

$$Y(t) = \begin{bmatrix} E(t) \\ U(t) \\ I(t) \end{bmatrix} \quad (5.1)$$

where  $E(t)$ ,  $U(t)$  and  $I(t)$  represent the true proportion of employed, unemployed and inactive individuals respectively in year  $t$  (i.e. the unbiased moments of the population stocks). The vector

$$y(t) = \begin{bmatrix} e(t) \\ u(t) \\ i(t) \end{bmatrix} \quad (5.2)$$

denotes the observed empirical labor market state proportions at time  $t$ , with  $e(t)$ ,  $u(t)$  and  $i(t)$  being the observed proportion of employed, unemployed and inactive in year  $t$ . With  $\lambda_{lk}(t-1, t)$  being the transition rates from state  $l$  occupied in  $t-1$  to the state  $k$  occupied in  $t$ , the matrix

$$N(t-1, t) = \begin{bmatrix} \lambda_{EE}(t-1, t) & \lambda_{EU}(t-1, t) & \lambda_{EI}(t-1, t) \\ \lambda_{UE}(t-1, t) & \lambda_{UU}(t-1, t) & \lambda_{UI}(t-1, t) \\ \lambda_{IE}(t-1, t) & \lambda_{IU}(t-1, t) & \lambda_{II}(t-1, t) \end{bmatrix} \quad (5.3)$$

gives the observed transition probabilities between the year  $t-1$  and the year  $t$ . These are obtained by aggregating the expanded number of individuals making the transition  $lk$  from the year  $t-1$  to year  $t$  in the constructed retrospective panels and dividing by the stock of  $l$  in the year  $t-1$ <sup>6</sup>. This resembles the methodology adopted by Shimer (2012) to extract macro time-series of labor market flows from individual transaction-level micro-data. There exists a restriction on these transition rates: the sum of the elements of each column must be equal to one. Thus, we have:

$$\lambda_{EI}(t-1, t) = 1 - \lambda_{EU}(t-1, t) - \lambda_{EE}(t-1, t) \quad (5.4)$$

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<sup>6</sup>See chapter 1 for the way flows, such as job finding and separation rates, are being calculated

$$\lambda_{UI}(t-1, t) = 1 - \lambda_{UE}(t-1, t) - \lambda_{UU}(t-1, t) \quad (5.5)$$

$$\lambda_{IU}(t-1, t) = 1 - \lambda_{IE}(t-1, t) - \lambda_{II}(t-1, t) \quad (5.6)$$

This transition matrix in equation 5.3 leads to

$$y(t) = N'(t-1, t)y(t-1) \quad (5.7)$$

As previously mentioned, the observed transition probabilities are biased due to recall or design issues. An error term  $\varphi_z(t-1, t)$ , for  $z = E, U, I$ , is therefore defined and associated to the  $z$ -type agents. These error terms vary in time and increase as one goes back in history, showing the loss of accuracy and memory as older events are being reported. The true matrix of transition probabilities between years  $t-1$  and  $t$  can therefore be written as follows;

$$\begin{aligned} \Omega(t-1, t) &= \begin{bmatrix} \lambda_{EE} - \varphi_E & \lambda_{EU} + a_1\varphi_E & \lambda_{EI} + (1 - a_1)\varphi_E \\ \lambda_{UE} + b_1\varphi_U & \lambda_{UU} - \varphi_U & \lambda_{UI} + (1 - b_1)\varphi_U \\ \lambda_{IE} + c_1\varphi_I & \lambda_{IU} + (1 - c_1)\varphi_I & \lambda_{II} - \varphi_I \end{bmatrix} \\ &= \begin{bmatrix} \lambda_{EE} - \varphi_E & \lambda_{EU} + a_1\varphi_E & (1 - \lambda_{EE} - \lambda_{EU}) + (1 - a_1)\varphi_E \\ \lambda_{UE} + b_1\varphi_U & \lambda_{UU} - \varphi_U & (1 - \lambda_{UE} - \lambda_{UU}) + (1 - b_1)\varphi_U \\ \lambda_{IE} + c_1\varphi_I & (1 - \lambda_{IE} - \lambda_{II}) + (1 - c_1)\varphi_I & \lambda_{II} - \varphi_I \end{bmatrix} \end{aligned} \quad (5.8)$$

The above correction therefore allows to obtain:

$$Y(t) = \Omega'(t-1, t)Y(t-1) \quad (5.9)$$

where  $\Omega'(t-1, t)$  is the transposed matrix of  $\Omega(t-1, t)$ . A parametric functional form is imposed on these error terms  $\varphi_z(t-1, t)$  :

$$\varphi_z(t-1, t) = \nu_z(1 - \exp(-\theta_z(T - t)))$$

implying  $\varphi_z(T-1, T) = 0$  , i.e. assuming that the transition rates are correctly estimated for the most recent year  $T$  of the survey (as per the descriptive statistics shown in chapters 2 and 3). For the correction of the transition rates obtained from the ELMPS 2012, this characteristic becomes very useful and allows one to write  $\Omega(T-1, T) = N(T-1, T)$  for a given extracted retrospective panel data set. For the 2012 round, the assumption  $\Omega(2010, 2011) = N(2010, 2011)$  is made and  $\Omega(2004, 2005) = N(2004, 2005)$  for the 2006 round. This reflects that the most recent year of the retrospective panel extracted from a survey is the most accurate one. Given this three-state setting, one is able to estimate the parameters

$$\Theta_3 = \{\theta_E, \theta_U, \theta_I, \nu_E, \nu_U, \nu_I, a_1, b_1, c_1\}$$

where  $\dim(\Theta_3) = 9$ , by solving the following system

$$\begin{aligned} g(x_T, \Theta_3) &= \left\{ \begin{bmatrix} Y(2011)_{ELMPS12} \\ Y(2005)_{ELMPS06} \\ \lambda_{EE}(2004, 2005)|_{2006} \\ \lambda_{UU}(2004, 2005)|_{2006} \\ \lambda_{II}(2004, 2005)|_{2006} \\ \lambda_{EU}(2004, 2005)|_{2006} \\ \lambda_{UE}(2004, 2005)|_{2006} \\ \lambda_{IE}(2004, 2005)|_{2006} \end{bmatrix} - \begin{bmatrix} \tilde{\Omega}_1(\Theta_3) \\ \tilde{\Omega}_2(\Theta_3) \\ \tilde{\Omega}_3(\Theta_3) \\ \tilde{\Omega}_4(\Theta_3) \\ \tilde{\Omega}_5(\Theta_3) \\ \tilde{\Omega}_6(\Theta_3) \\ \tilde{\Omega}_7(\Theta_3) \\ \tilde{\Omega}_8(\Theta_3) \end{bmatrix} \right\} \\ &= [\psi_T - \psi(\Theta_3)] \end{aligned} \quad (5.10)$$

where

$$\begin{aligned}
\tilde{\Omega}_1(\Theta_3) &= \left( \prod_{t=2006}^{2011} \Omega'(t-1, t) \right) Y(2005)_{ELMPS06} \\
\tilde{\Omega}_2(\Theta_3) &= \left( \prod_{t=1998}^{2011} \Omega'(t-1, t) \right) Y(1997)_{ELMPS98} \\
\tilde{\Omega}_3(\Theta_3) &= \lambda_{EE}(2004, 2005)|_{2012} - \nu_E(1 - \exp(-\theta_E(2011 - 2005))) \\
\tilde{\Omega}_4(\Theta_3) &= \lambda_{UU}(2004, 2005)|_{2012} - \nu_U(1 - \exp(-\theta_U(2011 - 2005))) \\
\tilde{\Omega}_5(\Theta_3) &= \lambda_{II}(2004, 2005)|_{2012} - \nu_I(1 - \exp(-\theta_I(2011 - 2005))) \\
\tilde{\Omega}_6(\Theta_3) &= \lambda_{EU}(2004, 2005)|_{2012} - \nu_E(1 - \exp(-\theta_E(2011 - 2005))) \\
\tilde{\Omega}_7(\Theta_3) &= \lambda_{UE}(2004, 2005)|_{2012} - \nu_U(1 - \exp(-\theta_U(2011 - 2005))) \\
\tilde{\Omega}_8(\Theta_3) &= \lambda_{IE}(2004, 2005)|_{2012} - \nu_I(1 - \exp(-\theta_I(2011 - 2005)))
\end{aligned}$$

Similar to the derivation done for the two and three state model in chapter 3, it is found out that the identification of  $\Omega$  relies on restrictions laid out by equations that serve to guarantee the consistency of  $\Omega$  with the evolution of stocks between 2005 and 2011 as well as 1997 and 2005. Since  $1 = E + U + I$ , these would yield 4 restrictions only allowing the identification of only four free parameters. Six more restrictions are therefore added and identified by

$$\Omega(2004, 2005)_{ELMPS06} = \Omega(2004, 2005)_{ELMPS12}$$

The relations between the transition rates in equations 5.4, 5.5 and 5.6 is the reason that yield six restrictions are yielded, given this equation. Given the structure imposed by the three-state model, ten restrictions and nine free parameters: the model is therefore over-identified. Further tests after estimation can therefore be developed to test for the goodness of fit of the model.

In order to estimate  $\Theta = \{\theta_E, \theta_U, \theta_I, \nu_E, \nu_U, \nu_I\}$ , one solves  $J$ , where  $J$  is

$$J = \min_{\Theta_3} [\psi_T - \psi(\Theta_3)] W [\psi_T - \psi(\Theta_3)]' = g(x_T, \Theta_3) W g(x_T, \Theta_3)' \quad (5.11)$$

The estimated  $\hat{\theta}_z$ ,  $\hat{\nu}_z$ ,  $\hat{a}_1$ ,  $\hat{b}_1$  and  $\hat{c}_1$ , for  $z = E, U, I$ , are then used to reproduce

the true transition probabilities  $\Omega(t - 1, t)$  between the years 1999 and 2005 using the retrospective panel extracted from the ELMPS 2006.

## Jordan

The Jordan Labor Market Panel Survey (JLMPS) has a very similar questionnaire structure to the ELMPS and since retrospective information is required to construct the longitudinal panels, a similar bias with over-reported job findings and under-reported separations is observed. The available JLMPS 2010 is however the first and only round of the survey fielded in Jordan. The auxiliary information used to match the population stocks moments for Jordan is derived however from a comparable annual cross-sectional labor force surveys, the Employment and Unemployment Surveys (EUS), conducted by the Jordanian department of Statistics (DOS)<sup>7</sup>. These provide the whole sequence of  $Y(t)$ , in equation 5.1, for Jordan. To be able to match the transitions' moments as well, we obtain true unbiased non-employment to employment job finding rates and employment to non-employment separation rates for the years between 2007-2010, using the annual Job Creation Surveys (JCS). This of course adds to the over-identification of the correcting method with the Jordanian dataset. Given that using the JCS, we can only observe transitions between employment and non-employment, we build a two-state correction model for Jordan.

The true labor market histories are generated by a discrete-time Markov chain and the vector of the true labor market state occupied at year  $t$  now becomes

$$X(t) = \begin{bmatrix} E(t) \\ NE(t) \end{bmatrix} \quad (5.12)$$

where  $E(t)$  and  $NE(t)$  represent the true proportion of employed and non-employed

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<sup>7</sup>Although the official yearly labor force surveys conducted by the Egyptian Central Agency of Public Mobilisation and Statistics (CAPMAS) are available, these could not provide auxiliary information to be used to correct for the bias in the Egyptian data. Assaad and Krafft (2013) show that what is captured as under-employment by the Egypt labor market panel survey (ELMPS 2012), is defined as unemployment in the official labor force surveys (LFS). This explains the difference in the levels of unemployment rates obtained from the two surveys in 2012. With different definitions of employment and unemployment, using two non-comparable datasets is impossible. This difference was however not observed between the Jordanian EUS official surveys and the JLMPS 2010, see (Assaad, 2014).

respectively in the labor force in year  $t$ . These are therefore the unbiased true moments of the population stocks obtained from the data. The vector

$$x(t) = \begin{bmatrix} e(t) \\ ne(t) \end{bmatrix} \quad (5.13)$$

denotes the observed empirical labor market state proportions at time  $t$ , with  $e(t)$  and  $ne(t)$  being the observed proportion of employed and unemployed in the labor force in year  $t$ . These are the observed moments that decay, i.e. get biased due to the recall and design measurement errors as one goes back in time from the year of the survey. With  $\lambda_{lk}(t-1, t)$  being the transition rates from state  $l$  occupied in  $t-1$  to the state  $k$  occupied in  $t$ , the matrix

$$M(t-1, t) = \begin{bmatrix} \lambda_{E-E}(t-1, t) & \lambda_{E-NE}(t-1, t) \\ \lambda_{NE-E}(t-1, t) & \lambda_{NE-NE}(t-1, t) \end{bmatrix}_8 \quad (5.14)$$

gives the observed transition probabilities between the year  $t-1$  and the year  $t$ . These are obtained by aggregating the expanded number of individuals making the transition  $lk$  from the year  $t-1$  to year  $t$  in the constructed retrospective panels and dividing by the stock of  $l$  in the year  $t-1$ . There exists a restriction on these transition rates: the sum of the elements of each column must be equal to one,

$$\lambda_{E-NE}(t-1, t) = 1 - \lambda_{EE}(t-1, t) \quad (5.15)$$

$$\lambda_{NE-E}(t-1, t) = 1 - \lambda_{NE-NE}(t-1, t) \quad (5.16)$$

The transition matrix in equation 5.14 leads to

$$x(t) = M'(t-1, t)x(t-1) \quad (5.17)$$

where  $M'(t-1, t)$  is the transposed matrix of  $M(t-1, t)$ . The observed transition probabilities, as have been explained above, are biased due to recall and design measurement errors. To be able to correct this bias, an error term  $\varphi_z(t-1, t)$ , for  $z = E, NE$ , is defined and associated to the  $z$ -type agents. These error terms vary in time and increase

as one goes back in history, showing the loss of accuracy and memory as older events are being reported, as observed in the descriptive statistics in the previous section. The true matrix of transition probabilities between years  $t - 1$  and  $t$  can therefore be written as follows;

$$\begin{aligned}\Pi(t-1, t) &= \begin{bmatrix} \lambda_{E-E}(t-1, t) - \varphi_E(t-1, t) & \lambda_{E-NE}(t-1, t) + \varphi_E(t-1, t) \\ \lambda_{NE-E}(t-1, t) + \varphi_{NE}(t-1, t) & \lambda_{NE-NE}(t-1, t) - \varphi_{NE}(t-1, t) \end{bmatrix} \\ &= \begin{bmatrix} \lambda_{E-E}(t-1, t) - \varphi_E(t-1, t) & 1 - [\lambda_{E-E}(t-1, t) - \varphi_E(t-1, t)] \\ 1 - [\lambda_{NE-NE}(t-1, t) - \varphi_{NE}(t-1, t)] & \lambda_{NE-NE}(t-1, t) - \varphi_{NE}(t-1, t) \end{bmatrix}\end{aligned}\quad (5.18)$$

By correcting the observed transition matrix  $M(t-1, t)$ , in equation 5.14 and obtaining a true corrected one  $\Pi(t-1, t)$ , in equation 5.18, we obtain

$$X(t) = \Pi'(t-1, t)X(t-1) \quad (5.19)$$

where  $\Pi'(t-1, t)$  is the transposed matrix of  $\Pi(t-1, t)$ . For simplicity, the error terms  $\varphi_z(t-1, t)$ , for  $z = E, NE$ , are assumed to have the same functional form as in Egypt<sup>9</sup> :

$$\varphi_z(t-1, t) = \nu_z(1 - \exp(-\theta_z(T-t))) \quad (5.20)$$

implying  $\varphi_z(T-1, T) = 0$ . The worker flows are correctly estimated for the most recent year  $T$ , we therefore assume that  $\Pi(T-1, T) = M(T-1, T)$  for a given retrospective panel data set. The assumption  $\Pi(2009, 2010) = M(2009, 2010)$  is therefore made.

The parameters  $\Theta = \{\theta_E, \theta_{NE}, \nu_E, \nu_{NE}\}$  are estimated given the above setting and available data, using a Simulated Method of Moments (SMM). We solve the following

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<sup>9</sup>Further work is needed to expand on the role of this parametric assumption and to check to what extent this affects the results.

system, for  $t = 1991, \dots, 2010$  and  $n = 2007, \dots, 2010$

$$\begin{aligned}
g(x_T, \Theta) &= \left\{ \begin{bmatrix} X(t)|_{EUS(t)} \\ \lambda_{E-E}(n-1, n)|_{JCS(n)} \\ \lambda_{NE-NE}(n-1, n)|_{JCS(n)} \end{bmatrix} - \begin{bmatrix} \tilde{\Pi}_t(\Theta) \\ \tilde{\Pi}_{n1}(\Theta) \\ \tilde{\Pi}_{n2}(\Theta) \end{bmatrix} \right\} \\
&= [\psi_T - \psi(\Theta)]
\end{aligned} \tag{5.21}$$

where

$$\begin{aligned}
\tilde{\Pi}_t(\Theta) &= \Pi'(t-1, t)|_{JLMPS10} X(t-1)|_{EUS(t-1)} \\
\tilde{\Pi}_{n1}(\Theta) &= \lambda_{E-E}(n-1, n)|_{JLMPS10} - \nu_E(1 - \exp(-\theta_E(2010 - n))) \\
\tilde{\Pi}_{n2}(\Theta) &= \lambda_{NE-NE}(n-1, n)|_{JLMPS10} - \nu_U(1 - \exp(-\theta_U(2010 - n)))
\end{aligned}$$

This set of restrictions lead to  $t + 2n$  identifying equations, i.e. 28 identifying equations for Jordan. As explained in details in chapter 3, this results from  $E + NE = 1$  and from the restrictions on the transitions in equations 5.15 and 5.16.

This model for Jordan is therefore over identified with 4 free parameters and 28 restrictions. In order to be able to estimate  $\Theta = \{\theta_E, \theta_{NE}, \nu_E, \nu_{NE}\}$ , we solve  $J$ , where  $J$  is

$$J = \min_{\Theta} [\psi_T - \psi(\Theta)]' W [\psi_T - \psi(\Theta)] = g(x_T, \Theta)' W g(x_T, \Theta) \tag{5.22}$$

Estimating the parameters  $\theta_E$ ,  $\theta_U$ ,  $\nu_E$  and  $\nu_U$  allows us to build up the macro time series of the true transition probabilities  $\Pi(t-1, t)$  between the years 1991 and 2010 using the retrospective longitudinal panel extracted from the JLMPS 2010 survey.

### 5.2.3 Micro-data Transitions and Panel Weights

The second step of the correcting technique suggested in this paper is distributing the estimated measurement error, by matching population moments, among the sample's individual observations/transactions in the form of micro-data weights, such that observations that are being under-reported take higher weights and those over-reported take lower weights. This shows that it is sufficient to have population (i.e. stocks) and



transitions moments to correct over- or under-reporting biases in retrospective data. Once the moments are matched on the aggregate level, a measurement error for each type of transition at a point in time  $t$  is estimated. This measurement error can then be attributed among the sample's individual observations, reported for this specific type of transition in year  $t$ , in the form of micro-data transitions (per transition transaction per year) or panel (per spell per individual) weights. This can be done via two ways: a simple proportional attributing method or a differentiated predicting method. Both are discussed below in details.

### Naive Proportional Weights

For the sake of simplicity, the error terms can be distributed proportionally in the form of an adjustment factor ( $r_{jt}$ ) among the sample's individuals depending on the type of transition  $lk$  he/she undergoes between the years  $t$  and  $t - 1$ , with  $lk = EE, EU, EI, UE, UU, UI, IE, II, IU$ . First, a total correction factor is calculated for each type of transition  $lk$  (from state  $l$  in year  $t - 1$  to  $k$  in year  $t$ ). For a specific type of transition in a certain year, this is done by dividing the corrected transition rate by the observed transition rate and multiplying by the number of individuals who made this transition in that year. In simple words, this measures by how much the observed biased transition rate in year  $t$  need to be redressed on the aggregate level to obtain the true corrected rate. This can be written formally as follows;

$$R_{lk}(t - 1, t) = \frac{\lambda_{lk}(t - 1, t) \pm \Psi_z}{\lambda_{lk}(t - 1, t)} \times n_{lk}(t - 1, t) \quad (5.23)$$

where  $n$  is the number of individuals experiencing the transition  $lk$  from year  $t - 1$  to year  $t$  and  $\Psi_z$  is the associated error term estimated on the macro aggregate level (depending on the way it was estimated for each country). An individual ( $r_{ilk}(t - 1, t)$ ) adjustment factor is then calculated to be the attributed weight to the micro-data transitions  $lk$ . This is done here proportionally, i.e. assuming that all individuals mis-report the same way and hence they are all equiprobable and get the same weight, if they make the same type of transition between the year  $t - 1$  and the year  $t$ . This leads

to :

$$\begin{aligned}
r_{ilk}(t-1, t) &= \frac{1}{n_{lk}(t-1, t)} \times R_{lk}(t-1, t) \\
&= \frac{\lambda_{lk}(t-1, t) \pm \Psi_z}{\lambda_{lk}(t-1, t)}
\end{aligned} \tag{5.24}$$

### Differentiated Predicted Weights

The second method of attributing weights to the micro-data observations assumes that individuals mis-report differently. Assaad, Krafft, and Yassine (2015) show that not only retrospective data will under-report past unemployment but also distort its characteristics. The retrospective panels are therefore not random. In an attempt, to re-obtain random samples within these panels, the differentiated predicted weights are constructed. Following an accurate random sample (which in this case is the most recent year of the retrospective panels of each country), one can estimate the probability for an individual to make a specific type of labor market transition as a function of observable characteristics. If the individual is more probable to transit, then he is more probable to mis-report. Distributing the measurement error among the sample's observations according to these probabilities, via differentiated weights, allows to redress the retrospective panels into random corrected samples readily used for micro-data analysis of labor market dynamics. A 3-step procedure is therefore adopted:

1. First as in the naive proportional method, a total correction factor is calculated for each type of transition  $lk$  (from  $l$  in year  $t-1$  to  $k$  in year  $t$ ). For a specific type of transition in a certain year, this is done by dividing the corrected transition rate by the observed transition rate and multiplying by the number of individuals who made this transition. This can be written formally as follows;

$$R_{lk}(t-1, t) = \frac{\lambda_{lk}(t-1, t) \pm \Psi_z}{\lambda_{lk}(t-1, t)} \times n_{lk}(t-1, t) \tag{5.25}$$

, where  $n$  is the number of individuals experiencing the transition  $lk$  from year  $t-1$  to year  $t$  and  $\Psi_z$  is the associated error term estimated on the macro level.

2. The second step consists of determining the probability of individual  $i$  to tran-

sit from job  $l$  in year  $t - 1$  to job  $k$  in year  $t$ . This is done by predicting the probabilities of a transition  $lk$  after estimating a simple probit model ( $y=1$  for making a certain transition,  $y=0$  otherwise<sup>10</sup>) for each type of transition in the most recent year of each survey<sup>11</sup> as a function of a vector of observable characteristics/explanatory variables  $\mathbf{X}$ . The detailed results of these probit regressions are provided in the appendix 5.A. These probabilities are denoted as follows  $p_{ilk}(t - 1, t)$ . It is the probability that an individual  $i$  in the sample make a transition from state  $l$  in year  $t - 1$  to state  $k$  in year  $t$  in year  $t$ , given his observables in the most recent year of the retrospective panel.

3. An adjustment factor is then created for each individual  $i$  for each of his transitions  $lk$  from year  $t - 1$  to year  $t$  over the observation period of each country. This is calculated as follows:

$$r_{ilk}(t - 1, t) = \frac{p_{ilk}(t - 1, t)}{\sum_{i=1}^{n_{lk}(t-1,t)} p_{ilk}(t - 1, t)} \times R_{lk}(t - 1, t) \quad (5.26)$$

In simple words, if it is more probable for an individual to make a specific transition  $lk$ , it is more probable that he mis-reports. Consequently, the correction weight should be higher than for others who are less probable to make the transition. The aim of the  $r_{ilk}(t - 1, t)$  adjustment factor is to be able to redress the micro-data transitions of each individual not only to the corrected level, but also to give a higher weight to an individual, who according to the distribution of observable characteristics obtained from the probit regressions in (appendix 5.A), is more probable to have gone through this type of transition. It is important to note that this correction methodology does not alter the trends in transitions, or the changes in the characteristics distribution over time, neither it replicates the distribution of observables in the most recent year of the retrospective panel of the country. It serves only to distribute the weights among individuals who are already recorded as having reported the transition, to be able to obtain random

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<sup>10</sup>A separate model is conducted for each type of transition.

<sup>11</sup>The most recent year of the survey is 2010/2011 for Egypt and 2009/2010 for Jordan. According to the correction model's main assumption, these most recent years are the most accurate and hence reflect the true random distribution of observable characteristics for each type of labor market transition.

corrected retrospective panles. The adjustment factor  $r_{ilk}(t-1, t)$  are referred to as ***transition recall weights*** through out the rest of the paper. These are used to weigh the data in estimations when only transitions are relevant and durations are not needed, for instance in the descriptive statistics of the counting method and the multinomial logit regressions. It is also important to note that the data attrition and expansion weights are rescaled such that representative expanded totals are not distorted by the recall weights. This was not a problem when proportional weights were created.

### Panel Weights for Duration Analysis

The final step would be to create weights for the spells to be used in estimations when spells durations are needed such as survival analysis. For this purpose longitudinal panel recall weights for each spell  $s$  of each individual  $v$  are created, such that the weight is the product of all the adjustment factors  $r_{vij}(t-1, t)$  from the start year  $t$  till the end year of the spell  $t+k$ . This is given by the following expression:

$$w_{is}(t, t+k) = \prod_{t=t}^{t+k} r_{ilk}(t-1, t) \quad (5.27)$$

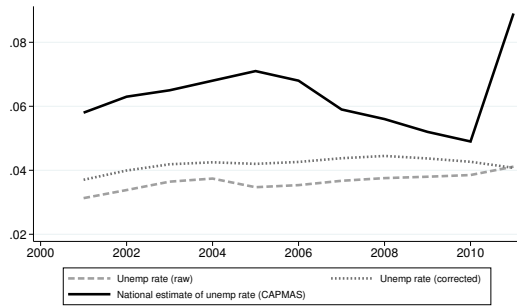
In appendix 5.B, preliminary attempts are shown on how these panel weights can be used in non-parametric survival analysis estimations and how they correct the Kaplan-Meier and Cumulative Incidence estimators. These panel weights are constructed in chapter 6 and used for the structural estimation of the Burdett-Mortensen model.

## 5.3 Corrected Versus Uncorrected Descriptive Statistics

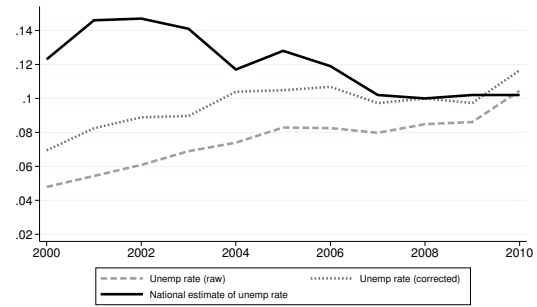
### 5.3.1 Stocks and Flows

Figures 5.1 to 5.6 show how these transitions recall weights correct labor market flows and stocks obtained from the retrospective longitudinal panels. It is obvious from

figures 5.1 and 5.2, how retrospective data biased both employment and unemployment where unemployment rates display a continuously increasing trend over time and are under-estimated for early years and vice versa for employment to population ratios. Observing the official statistics based on contemporaneous annual labor force surveys (i.e. true unbiased), these trends are incorrect. The proposed weights not only manage to correct the levels of these estimates but also the trends to be as close as possible to reality. For Egypt the difference in levels between the unemployment rate obtained from the ELMPS and the LFSS is due to as explained previously to the different definitions adopted in these two surveys. As for Jordan, the correction appears to be satisfactory and fitting the trend and levels of the official statistics between 2004 and 2010. For earlier years, the estimates remain biased even though lower than before. A possible reason to this might be the sample sizes as one goes back in time. These are however the best possible correcting weights one could currently obtain given the availability of waves and auxiliary information, using the current parametric form of the bias. It is possible that if one expands on the role of this shape of the bias as well as with the availability of the forthcoming JLMPS 2016, this correction methodology can be ameliorated. Figure 5.3 shows how the transitions recall weights help to slightly adjust the shares of the different employment sectors over time. This however becomes more obvious as the detailed transitions are explored in the counting method. In general, it is important to note that the proposed correction significantly alters the separation and job finding rates but does not affect the job-to-job transitions on the aggregate level. In Assaad, Krafft, and Yassine (2015), it has been shown that overlapping the retrospective panels obtained from the different rounds of the ELMPS, the obtained job-to-job aggregate transition rates were reliable. The inside structure, i.e. composition of these job-to-job transitions differ however with the introduction of the differentiated predicted weights. This becomes clearer below, using a non-parametric counting method to construct the transition matrices.



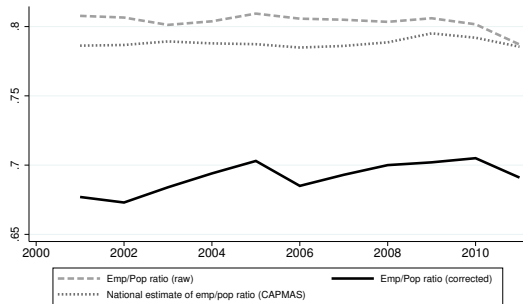
(a) Egypt



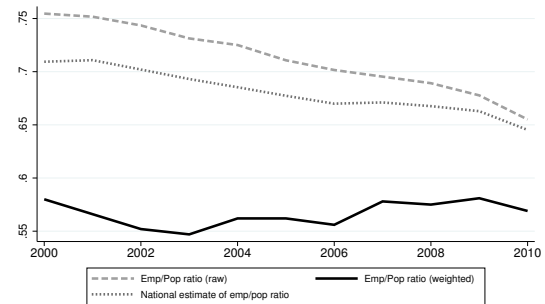
(b) Jordan

Source: Author's own calculations from ELMPS 2012, JLMPS 2010, LFSS 2001-2011 and EUS 2000-2010.

Figure 5.1: Evolution of official, corrected and uncorrected unemployment rate over time, Egypt 2001-2011 and Jordan 2000-2010, male workers, 15-49 years of age.



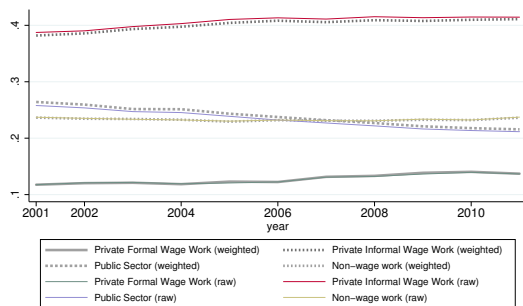
(a) Egypt



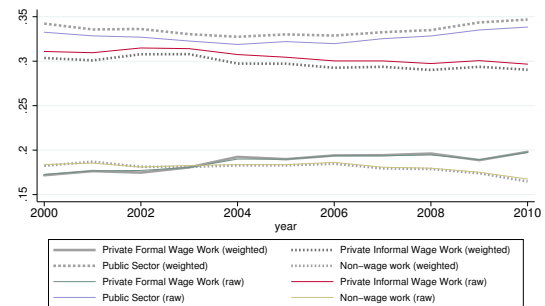
(b) Jordan

Source: Author's own calculations from ELMPS 2012, JLMPS 2010, LFSS 2001-2011 (CAPMAS) and EUS 2000-2010 (DOS).

Figure 5.2: Evolution of official, corrected and uncorrected employment to population ratio over time, Egypt 2001-2011 and Jordan 2000-2010, male workers, 15-49 years of age.



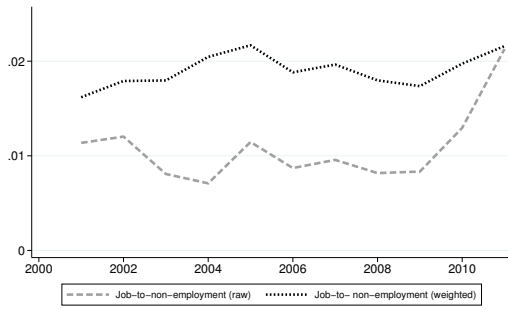
(a) Egypt



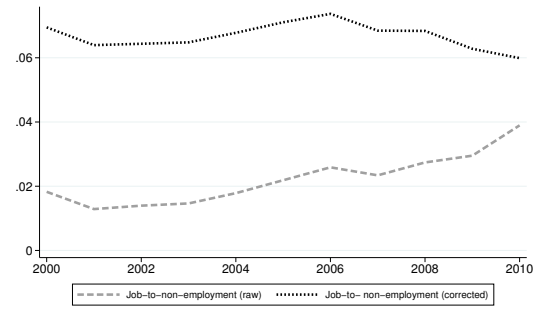
(b) Jordan

Source: Author's own calculations from ELMPS 2012, JLMPS 2010, LFSS 2001-2011 (CAPMAS) and EUS 2000-2010 (DOS).

Figure 5.3: Evolution of corrected and uncorrected employment sectors' shares in the market over time, Egypt 2001-2011 and Jordan 2000-2010, male workers, 15-49 years of age.



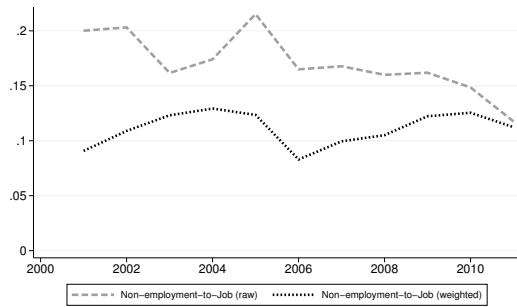
(a) Egypt



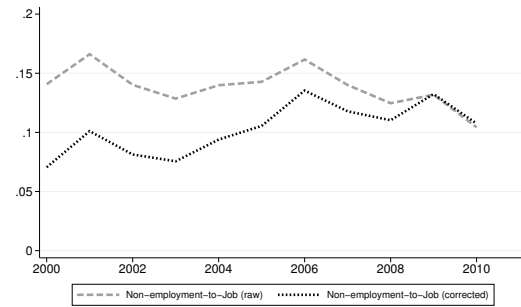
(b) Jordan

Source: Author's own calculations from ELMPS 2012 and JLMPS 2010.

Figure 5.4: Evolution of corrected and uncorrected job to non-employment separation rate over time, Egypt 2001-2011 and Jordan 2000-2010, male workers, 15-49 years of age.



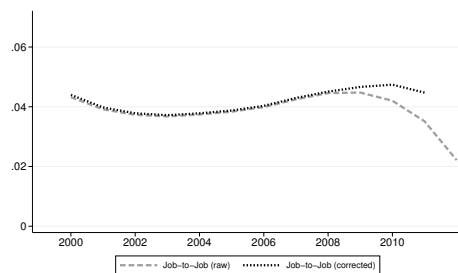
(a) Egypt



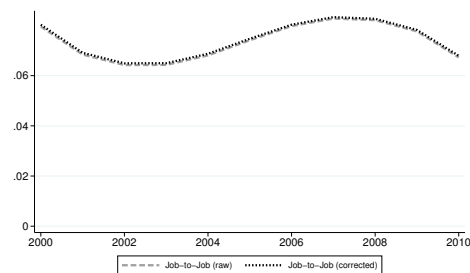
(b) Jordan

Source: Author's own calculations from ELMPS 2012 and JLMPS 2010.

Figure 5.5: Evolution of corrected and uncorrected non-employment to employment job finding rate over time, Egypt 2001-2011 and Jordan 2000-2010, male workers, 15-49 years of age.



(a) Egypt



(b) Jordan

Source: Author's own calculations from ELMPS 2012 and JLMPS 2010.

Figure 5.6: Evolution of corrected and uncorrected job-to-job transition rate over time, Egypt 2001-2011 and Jordan 2000-2010, male workers, 15-49 years of age.

### 5.3.2 Counting

In this section, to be able to point out changes in the samples and their structure as the recall weights are introduced, average transition probabilities between labor market states are calculated via a simple non-parametric counting method. All types of annual transitions are pooled over the constructed longitudinal panel of 10 years for each country. An individual can therefore for example be at time  $t$  in one of five states namely public wage work, private formal wage work, private informal wage work, self-employment and non-employment. An individual can contribute up to 10 transitions (over 10 years). It's important to note that an individual who has reported being in the public sector for the 10 years contribute to 10 transitions of type  $Public \rightarrow Public$ . The same methodology applies when transitions are being considered between employment, unemployment and inactivity, except that I choose to differentiate in that case between individuals staying in the same job (SJ) and those who move to another job (JJ). This distinction is interesting in how its estimates might be suggestive of how mobile the labor market in question is.

The tables 5.1-5.4 group these transitions (obtained from raw data) by gender for Egypt and Jordan. For males, these transitions are re-tabulated with both proportional and predicted transition recall weights, to point out the difference and the advantage of using a characteristics-specific weighting method. The realization of a particular transition as follows. Given a random variable of a labor market state realization at time  $t$  as  $Y(t)$  where the realizations of this variable is  $y(t) \in \{1, 2, 3, 4, 5\}$ . The realization of a particular transition from state  $l$  to state  $k$  is therefore defined as follows:

$$N_{lk} = \sum_{i=1}^N \sum_{t=0}^T I(y_i(t) = k, y_i(t-1) = l) \quad (5.28)$$

where  $i$  counts for all individuals and  $t$  counts for the time periods over the 10 year panel specific for each country.  $y_i(t)$  is therefore the realization of the labor market state of individual  $i$  in year  $t$ . The average transition probability is then calculated over the 10 year panel from state  $l$  to state  $k$  as  $P_{lk}$  as follows:



$$P_{lk}(t) = P(Y_t = k | Y_{t-1} = l) = \frac{N_{lk}}{\sum_{i=1}^N \sum_{t=0}^T I(y_i(t-1) = l)} \quad (5.29)$$

For each country these transitions are first reported for the total sample as well as for males and females in both transition probabilities and actual frequencies (expanded counts). The labor market states defined in this analysis are public wage (G) work, private formal wage work (F), private informal wage work (I), self-employment (NW) and non-employment (NE). Aggregated labor market states are classified as follows: Employed(E), Unemployed (U) and Out of Labor Force (O).

In order to make the paper reader friendly and to the point, the analysis is divided below into two main comparisons: (i) comparisons between gender-specific transitions and (ii) comparisons between the estimated transitions before and after correcting the bias.

### ***1. Males Versus Females:***

In both countries, job-to-job transitions rate is higher for male than for female workers. Given that the latter stay for a shorter period in the labor market and are more likely to exit faster, they do not experience a lot of movements from one job to another. Another possible explanation would be since its already more difficult for females to find a job than males (job finding probability whether from unemployment or inactivity is much lower for females in both Egypt and Jordan), it's very unlikely that a female worker would still for another job if she has got already one. Yassine (2015) shows that in Egypt almost 80% of the job transitions are voluntary.

Both countries share a much higher job exit probability for females than for males. Intuitively, these are more likely females exiting the labor market i.e. moving to inactivity most likely after getting married or child birth. This becomes clarified and supported as one goes through the multinomial regressions' estimations below. Two rates strongly support this argument, the females' formal sector separation rate (F→NE) and the females' informal sector separation rates (I→NE). These rates are strikingly high and show how the private sector does not provide a flexible program in terms of working hours, vacations..etc as the public sector

Going through the more detailed transitions, unsurprisingly the females highest job finding rates are transitions towards the public sector. The public sector provides a stable flexible job position for a female in the MENA region . Females in Jordan however seem to access jobs in the formal private sector much easier than their Egyptian peers though. In Egypt, evidence about the informal private sector being at a second resort after the public is noted.

Discussing employment dynamics in general, the Jordanian labor market is more mobile than the Egyptian labor market with much more churning as in higher job-to-job transition rates and higher separation rates. However the Jordanian labor market is much more segmented; inter-sectorial transitions for instance between the formal private and informal private wage work is much lower than in Egypt. A possible explanation to this might be the fact that Jordan has introduced flexibility in terms of contracts and employers' rights to laying off workers much earlier than Egypt. On the one hand, this tends to boost mobility in the labor market pushing to more high productivity jobs being created and more low-productivity jobs beng destroyed. Moreover, this flexibility scales down the difference between the formal and informal sector which is clear in the Jordanian case. Not only that the size of the informal sector is lower than the Egyptian labor market but the transitions between these sectors are minimized.

## ***2. Adding transitions recall weights:***

In general adding the transition recall weights corrects the over-estimated job finding rates and the under-estimated separation rates. Using proportional or predicted weights does not make a difference when correcting aggregated labor market transitions i.e. between the states E, U and O<sup>12</sup>. However, it is obvious how the detailed labor market transitions are modified once we introduce the predicted transition recall weights. This shows that these weights do make a difference and emphasize the importance of characterizing these weights according to the distribution of observed characteristics among the transitions if one wants to characterize labor market flows later on or study a more detailed level of transitions. Going back in time, the individuals who are more

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<sup>12</sup>Expansion weights are re-scaled with the prediction weights in order to preserve the national representativity of the sample.

probable to make a certain type of transition mis-report it, the structure and the characteristics of the sample therefore get distorted. Since the retrospective samples are in this case not random, adding the differentiated predicted weights, these samples are redressed to become random, under the assumption that the determinants of the probability of labor market transitions in the most recent year of the survey are the determinants of mis-reporting back in time. The next section confirms how the predicted recall weights are crucial if one needs to study labor market transitions by observable characteristics.

Males				Females											
G	3.45E+07	73136.25	92173.25	I	NW	NE	Total	G	1.67E+07	2.94E+04	2.03E+04	1.04E+04	NW	NE	Total
F	181675.9	1.81E+07	239673.1		215920	128636.5	1.89E+07	F	1.67E+04	2.00E+06	5.06E+03	1.68E+03	1.68E+03	1.78E+05	2.20E+06
I	559075	712592.3	5.93E+07	673075.7		1009761	6.23E+07	I	3.14E+04	2.71E+04	4.07E+06	3.97E+04	3.97E+04	5.58E+05	4.72E+06
NW	210394.9	151851.1	337294.7	3.43E+07		275904.9	3.53E+07	NW	5.91E+03	0.00E+00	2.18E+04	1.02E+07	1.02E+07	1.76E+05	1.04E+07
NE	765374.2	866283.2	3484579	1121628		3.66E+07	4.28E+07	NE	1.03E+06	3.01E+05	6.40E+05	4.93E+05	4.93E+05	1.62E+08	1.64E+08
Total	3.62E+07	1.99E+07	6.35E+07	3.64E+07		3.82E+07	1.94E+08	Total	1.78E+07	2.36E+06	4.76E+06	1.07E+07	1.07E+07	1.63E+08	1.99E+08
E	1.50E+08	500631.5	1066689	O	Total			E	3.33E+07	257071.9	908325.6	3.45E+07	3.45E+07		
U	1446242	4259803	66169.39	5.77E+06				U	675243.7	9686185	16712.45	1.04E+07	1.04E+07		
O	4791622	1160618	3.11E+07	3.71E+07				O	1785958	1278017	1.51E+08	1.54E+08	1.54E+08		
Total	1.56E+08	5.92E+06	3.22E+07	1.94E+08				Total	3.58E+07	1.12E+07	1.52E+08	1.99E+08	1.99E+08		
E	same job	new job	NE	Total				E	same job	new job	NE	Total	Total		
NE	1.44E+08	6050821	1567321	1.52E+08				NE	3.27E+07	565217.8	1165397	3.45E+07	3.45E+07		
Total	6237864		3.66E+07	4.28E+07				NE	2461202		1.62E+08	1.64E+08	1.64E+08		
	1.56E+08		38167321	1.94E+08				Total	3.58E+07		163165397	1.99E+08	1.99E+08		
Males (%)				Females (%)											
G	98.97%	0.21%	0.26%	I	NW	NE	Total	G	98.15%	0.17%	0.12%	0.06%	NW	NE	Total
F	0.96%	95.94%	1.27%		1.14%	0.68%	100.00%	F	0.76%	90.87%	0.23%	0.08%	0.08%	8.06%	100.00%
I	0.90%	1.14%	95.25%	1.08%		1.62%	100.00%	I	0.66%	0.57%	86.12%	0.84%	0.84%	11.80%	100.00%
NW	0.60%	0.43%	0.96%	97.23%		0.78%	100.00%	NW	0.06%	0.00%	0.21%	98.04%	98.04%	1.70%	100.00%
NE	1.79%	2.02%	8.13%	2.62%		85.44%	100.00%	NE	0.62%	0.18%	0.39%	0.30%	0.30%	98.50%	100.00%
Total	18.66%	10.25%	32.69%	18.73%		19.66%	100.00%	Total	8.94%	1.19%	2.39%	5.40%	5.40%	82.07%	100.00%
E	98.97%	0.33%	O	Total				E	96.62%	0.75%	2.64%	Total	Total		
U	25.06%	73.80%	1.15%	100.00%				U	6.51%	93.33%	0.16%	100.00%	100.00%		
O	12.93%	3.13%	83.94%	100.00%				O	1.16%	0.83%	98.01%	100.00%	100.00%		
Total	80.37%	3.05%	16.58%	100.00%				Total	17.98%	5.64%	76.38%	100.00%	100.00%		
E	same job	new job	NE	Total				E	same job	new job	NE	Total	Total		
NE	94.97%	3.99%	1.03%	100.00%				NE	94.98%	1.64%	3.38%	100.00%	100.00%		
Total	14.56%		85.44%	100.00%				NE	1.50%		98.50%	100.00%	100.00%		
	80.37%		19.63%	100.00%				Total	17.98%		82.02%	100.00%	100.00%		

Table 5.1: Count of Labor Market Transition Probabilities (obtained from raw data - ELMPS 2012), Male and Female workers, Ages 15-49 years old, Egypt 2001-2011

Predicted Weights		Proportional Weights														
		G	F	I	NW	NE	Total		G	F	I	NW	NE	Total		
G		3.50E+07	38952.07	5.06E+04	17257.23	92075.99	3.52E+07		G	3.42E+07	72485.36	91434.57	41067.42	268685	3.47E+07	
F		218926.5	1.77E+07	239669.3	1.93E+05	2.63E+05	1.86E+07		F	180231.9	1.79E+07	237755.7	214098.8	233337.1	1.88E+07	
I		6.20E+05	856441.4	5.82E+07	623274.4	2051949	6.24E+07		I	554438	706544.5	5.88E+07	667504.6	1786911	6.25E+07	
NW		182146.9	1.41E+05	2.93E+05	3.41E+07	351098.4	3.51E+07		NW	208637	150487.1	334348.1	3.40E+07	469233.4	3.52E+07	
NE		676054.4	719916.3	2316746	756191.4	3.83E+07	4.28E+07		NE	552968.7	617960	2495886	802093.7	3.83E+07	4.28E+07	
Total		3.67E+07	1.95E+07	6.11E+07	3.57E+07	4.11E+07	1.94E+08		Total	3.57E+07	1.94E+07	6.20E+07	3.57E+07	4.11E+07	1.94E+08	
E		E	U	O	Total				E	E	U	O	Total			
U		1.48E+08	1149816	1608351	1.51E+08				U	1.48E+08	1149816	1608351	1.51E+08			
O		1172505	4483965	45109.12	5.70E+06				O	1172505	4483965	45109.12	5.70E+06			
Total		3296403	1156815	3.26E+07	3.71E+07				Total	3296403	1156815	3.26E+07	3.71E+07			
		1.52E+08	6.79E+06	3.43E+07	1.94E+08					1.52E+08	6.79E+06	3.43E+07	1.94E+08			
E		same job	new job	NE	Total				E	same job	new job	NE	Total			
NE		1.42E+08	5999967	2758167	1.51E+08				NE	1.42E+08	5999967	2758167	1.51E+08			
Total		4468908		3.83E+07	4.28E+07				Total	4468908		3.83E+07	4.28E+07			
		1.52E+08		41058167	1.94E+08					1.52E+08		41058167	1.94E+08			
Predicted Weights (%)		Proportional Weights (%)														
		G	F	I	NW	NE	Total		G	F	I	NW	NE	Total		
G		99.43%	0.11%	0.14%	0.05%	0.26%	100.00%		G	98.63%	0.21%	0.26%	0.12%	0.77%	100.00%	
F		1.18%	95.09%	1.29%	1.04%	1.41%	100.00%		F	0.96%	95.39%	1.27%	1.14%	1.24%	100.00%	
I		0.99%	1.37%	93.34%	1.00%	3.29%	100.00%		I	0.89%	1.13%	94.06%	1.07%	2.86%	100.00%	
NW		0.52%	0.40%	0.84%	97.24%	1.00%	100.00%		NW	0.59%	0.43%	0.95%	96.69%	1.33%	100.00%	
NE		1.58%	1.68%	5.42%	1.77%	89.55%	100.00%		NE	1.29%	1.44%	5.84%	1.88%	89.55%	100.00%	
Total		18.92%	10.03%	31.49%	18.40%	21.16%	100.00%		Total	18.41%	10.03%	31.96%	18.43%	21.18%	100.00%	
E		E	U	O	Total				E	E	U	O	Total			
U		98.17%	0.76%	1.07%	100.00%				U	98.17%	0.76%	1.07%	100.00%			
O		20.56%	78.64%	0.79%	100.00%				O	20.56%	78.64%	0.79%	100.00%			
Total		8.90%	3.12%	87.98%	100.00%				Total	8.90%	3.12%	87.98%	100.00%			
		78.79%	3.51%	17.70%	100.00%					78.79%	3.51%	17.70%	100.00%			
E		same job	new job	NE	Total				E	same job	new job	NE	Total			
NE		94.19%	3.98%	1.83%	100.00%				E	94.19%	3.98%	1.83%	100.00%			
Total		10.45%		89.55%	100.00%				NE	10.45%		89.55%	100.00%			
		78.78%		21.22%	100.00%				Total	78.78%		21.22%	100.00%			

Table 5.2: Count of Labor Market Transition Probabilities (obtained from corrected weighted data - ELMPS 2012), Male workers, Ages 15-49 years old, Egypt 2001-2011

Males				Females			
G	3074467	19899.69	21188.6	21172.84	69435.24	3.21E+06	Total
F	57645.7	1725089	6716.838	4275.642	26166.57	1.82E+06	NE
I	7976.269	15226.04	2844811	79832.32	88348.96	3.04E+06	Total
NW	18982.46	14066.94	35359.2	1671810	28391.76	1.77E+06	NE
NE	159661.9	126229.2	182187.8	54693.81	3954051	4.48E+06	Total
Total	3.32E+06	1.90E+06	3.09E+06	1.83E+06	4.17E+06	1.43E+07	
E	9618520	140610.4	71732.09	9.83E+06	Total		
U	237352.8	526357.9	2115.21	7.66E+05			
O	285419.8	172624.7	3252953	3.71E+06			
Total	1.01E+07	8.40E+05	3.33E+06	1.43E+07			
E	same job	new job	NE	Total			
NE	8.90E+06	723167.1	212342.5	9.83E+06			
Total	522772.7		3.95E+06	4.48E+06			
	1.01E+07		4166393.5	1.43E+07			
Males (%)				Females (%)			
G	95.89%	0.62%	0.66%	0.66%	2.17%	100.00%	Total
F	3.17%	94.79%	0.37%	0.23%	1.44%	100.00%	NE
I	0.26%	0.50%	93.70%	2.63%	2.91%	100.00%	Total
NW	1.07%	0.80%	2.00%	94.53%	1.61%	100.00%	NE
NE	3.57%	2.82%	4.07%	1.22%	88.32%	100.00%	Total
Total	23.20%	13.28%	21.60%	12.80%	29.12%	100.00%	
E	97.84%	1.43%	0.73%	Total			
U	30.99%	68.73%	0.28%	100.00%			
O	7.69%	4.65%	87.66%	100.00%			
Total	70.88%	5.87%	23.25%	100.00%			
E	same job	new job	NE	Total			
NE	90.48%	7.36%	2.16%	100.00%			
Total	11.68%		88.32%	100.00%			
	70.88%		29.12%	100.00%			

Table 5.3: Count of Labor Market Transition Probabilities (obtained from raw - JLMPS 2010), Male and Female workers, Ages 15-49 years old, Jordan 2000-2010

Predicted Weights		Proportional Weights												
		G	F	I	NW	NE	Total	G	F	I	NW	NE	Total	
G		3083520	6883.494	7979.121	7419.83	189640	3.30E+06	G	2948064	19097.32	20335.01	20265.81	206777	3.21E+06
F		78273.09	1639251	8912.464	5696.656	45374.46	1.78E+06	F	55326.61	1654437	6415.231	4077.998	74156.59	1.79E+06
I		8823.079	17414.73	2620413	78337.65	296877	3.02E+06	I	7657.484	14530.63	2727062	76556.48	237406.4	3.06E+06
NW		15802.08	11148.19	29494.53	1602657	59344.29	1.72E+06	NW	18191.77	13485.27	33948.66	1602575	72895.82	1.74E+06
NE		131417.4	118343.4	146522.5	51074.26	4072086	4.52E+06	NE	137517.4	108053.2	156032.2	45754.73	4072086	4.52E+06
Total		3.32E+06	1.79E+06	2.81E+06	1.75E+06	4.66E+06	1.43E+07	Total	3.17E+06	1.81E+06	2.94E+06	1.75E+06	4.66E+06	1.43E+07
E		9222027	380089.9	211145.9	9.81E+06	Total		E	9222027	380089.9	211145.9	9.81E+06	Total	
U		210814.6	541675.3	2146.938	7.55E+05			U	210814.6	541675.3	2146.938	7.55E+05		
O		236542.9	177679.5	3350584	3.76E+06			O	236542.9	177679.4	3350584	3.76E+06		
Total		9.67E+06	1.10E+06	3.56E+06	1.43E+07			Total	9.67E+06	1.10E+06	3.56E+06	1.43E+07		
E		same job	new job	NE	Total			E	same job	new job	NE	Total		
NE		8.53E+06	693952.3	591235.8	9.81E+06			NE	8.53E+06	693952.3	591235.8	9.81E+06		
Total		447357.5		4.07E+06	4.52E+06			Total	447357.5		4.07E+06	4.52E+06		
		9.67E+06		4663321.8	1.43E+07				9.67E+06		4663321.8	1.43E+07		
Predicted Weights (%)		Proportional Weights (%)												
G		93.57%	0.21%	0.24%	0.23%	5.75%	100.00%	G	91.71%	0.59%	0.63%	0.63%	6.43%	100.00%
F		4.40%	92.22%	0.50%	0.32%	2.55%	100.00%	F	3.08%	92.20%	0.36%	0.23%	4.13%	100.00%
I		0.29%	0.58%	86.72%	2.59%	9.82%	100.00%	I	0.25%	0.47%	89.03%	2.50%	7.75%	100.00%
NW		0.92%	0.65%	1.72%	93.26%	3.45%	100.00%	NW	1.04%	0.77%	1.95%	92.04%	4.19%	100.00%
NE		2.91%	2.62%	3.24%	1.13%	90.10%	100.00%	NE	3.04%	2.39%	3.45%	1.01%	90.10%	100.00%
Total		23.15%	12.51%	19.63%	12.18%	32.54%	100.00%	Total	22.09%	12.63%	20.54%	12.20%	32.54%	100.00%
E		E	U	O	Total			E	E	U	O	Total		
U		93.98%	3.87%	2.15%	100.00%			E	93.98%	3.87%	2.15%	100.00%		
O		27.94%	71.78%	0.28%	100.00%			U	27.94%	71.78%	0.28%	100.00%		
Total		6.28%	4.72%	89.00%	100.00%			O	6.28%	4.72%	89.00%	100.00%		
		67.46%	7.67%	24.87%	100.00%			Total	67.46%	7.67%	24.87%	100.00%		
E		same job	new job	NE	Total			E	same job	new job	NE	Total		
NE		86.90%	7.07%	6.02%	100.00%			NE	86.90%	7.07%	6.02%	100.00%		
Total		9.90%		90.10%	100.00%			Total	9.90%		90.10%	100.00%		
		67.46%		32.54%	100.00%				67.46%		32.54%	100.00%		

Table 5.4: Count of Labor Market Transition Probabilities (obtained from corrected weighted - JLMPS 2010), Male workers, Ages 15-49 years old, Jordan 2000-2010

## 5.4 Determinants of Labor Market Transitions in Egypt and Jordan: An Application Using Transitions Weights

Why are the transitions' recall weights important? As an application to the transitions' recall weights, created in the previous section, this paper estimates the labor market transition probabilities in the two MENA countries Egypt and Jordan as a function of the workers' and firms' observable characteristics, with a focus on the employment dynamics. This section therefore aims mainly at estimating the turnover patterns and at exploring differences in the mobility behaviour. Although, this can be done empirically by duration models<sup>13</sup>, as will be done in the next section, it was suggested previously by Royalty (1998) that the interpretation of the estimated coefficients on event probabilities using discrete choice models is easier and the results are more accessible to policymakers<sup>14</sup>. I therefore choose to estimate the transition probabilities in this section using a multinomial logit (MNL) specification. The labor market transitions are modeled as a function of individual, household and job characteristics. Tansel and Ozdemir (2015) provided similar estimations of detailed sectorial transitions over a six-year using the ELMPS 2006 and 2012. A lot of short term transitions can however take place in between six years. Given the nature and type of data available for the countries in question, this paper chooses to pool all annual transitions from year  $t$  to year  $t + 1$  over a period of 10 years, for each country, using the retrospective information<sup>15</sup>. The methodology used in this section resembles that adopted by Theodossiou and Zangelidis (2009). They choose to focus on employment dynamics as in transitions

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<sup>13</sup>It is intended to extend this work to estimate a multi-state multi-spell model using the proposed panel weights to test for the duration dependence of the labor market transitions in these countries.

<sup>14</sup>A principle objective of this thesis in general is to address the importance of studying the dynamism of the labor market to policymakers. It is aimed to be perceived as a guide in countries where even official statistics fail to provide indicators about the labor market basic transitions (job finding and separations). Looking through the labor market transitions not only delivers a thorough idea (more than stocks) about the labor market's status quo but also gives hints on how to adjust stocks to targeted levels via flows going into and out of these stocks.

<sup>15</sup>An eventual test to the robustness of the proposed correction methodology and to compare transitions probabilities and coefficients obtained from retrospective and contemporaneous panel datasets, is to re-run the MNL regressions for Egypt for transitions between 2005 and 2011 (i.e. the closest 6 year period available from the retrospective data to the transitions discussed in Tansel and Ozdemir (2015)).



from employment only and use a multinomial probit specification <sup>16</sup>. It might also be interesting at a further step to pool data as done in Theodossiou and Zangelidis (2009) from all countries in question to obtain regional-level estimates. The MNL model is specified as follows.

$$Pr(X_{i,t+1} = j | X_{i,t} = k) = \frac{\exp(Z'_i \beta_{j|k})}{\sum_{l=0}^K \exp(Z'_i \beta_{l|k})} \quad (5.30)$$

$Z_i$  are the explanatory covariates for an individual  $i$ .  $X_{i,t}$  is the individual's labor market state at time  $t$ . To identify the MNL model, we take individuals who maintain their state between year  $t$  and  $t + 1$  as the base or reference group with zero coefficients. The MNL model is estimated by the maximum likelihood estimation method. The marginal effects of the explanatory variables are given as usual by the following expression.

$$\frac{\partial Pr(X_i = j)}{\partial z_m} = Pr(X_i = j | Z) \cdot [\beta_m^j - \sum_{l=0}^K \beta_m^l Pr(X_i = l | Z)] \quad (5.31)$$

For computational reasons and due to sample sizes, it was only possible to run the MNL model for each country for initially employed individuals, lumped in aggregate categories. These individuals have the choice of maintaining their job the next year (stay in the job-SJ, the reference group), moving to another job (job-to-job JJ), leave to unemployment (EU) or to inactivity (EO). For this group of MNL regressions, I include in the explanatory variables the origin type of job to show how being employed in a certain employment sector affects the turnover and mobility decisions, also the firm size (only available for Egypt) and the economic activity. As previously mentioned, the employment sectors defined in this study are public wage work (G), private formal wage work (F), private informal wage work (I) and self-employment (NW). Informal wage work is defined as a private wage worker who neither has a contract nor social security. Self-Employment includes unpaid family workers as well as employers (whether hiring or not hiring other workers). This is the group of regressions I choose to focus on in

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<sup>16</sup>Previous works by Dow and Endersby (2004) show very little difference between the predictions of both models for voting research. Moreover, Kropko (2007) and Kropko (2011) show through simulations that MNL nearly always provides more accurate results than MNP, even when the IIA assumption is severely violated.

this paper since no previous research works according to my knowledge have tackled the determinants of employment dynamics neither in Egypt nor Jordan.

In a second and third class of regressions, I estimate the MNL for unemployment (U) and inactivity (O) as the states of departure respectively. The results of these are reported in the appendix 5.C. These individuals have the choice of staying in the same state, whether (U or O) or transiting to one the other two labor market states. Since this paper does not provide structural estimations and is only estimating the transition probabilities via a reduced form model, it was not possible to include among the covariates of transitions from unemployment and out of the labor force, the characteristics of the destination job of the job finders, more precisely the employment sector, the firm size..etc. In order to get a sense of the type of jobs which transitioners from unemployment or out of the labor force end up with, an extra multinomial logit is carried out in the appendix 5.C showing transitions from non-employment (NE) to the four sectors of employment as opposed to the reference or base choice, staying non-employed. The sample had to lump both intially unemployed and initially inactive, otherwise the number of transitions would have been too few for the estimation to converge. I refer to the latter regression as the MNL of detailed transitions.

All the above MNL regressions are first estimated using the raw data for both males and females to obtain gender-specific estimations. They are then estimated at a second step only for Egyptian and Jordanian male workers first adding the proportional transition recall weights and second adding the differentiated predicted transition recall weights. The aim of these regressions is to show to what extent the recall and design measurement errors might bias our estimations of predicted probabilities, and if conclusions about the determinants of the transitions will change or not. Also, these estimations aim to show the importance of distributing these weights according to the distribution of observable characteristics of individuals. I provide below the results of these MNL regressions in the form of determinants of transitions from each labor market state. Table 5.9 in appendix 5.A show the list of definitions used for the covariates of these regressions. These are also the same definitions adopted for the explanatory variables of the probit regressions estimated in the correction section.

## Determinants of employment dynamics

The paper defines employment dynamics as the transitions from employment to another job in employment, to unemployment or to out of the labor force as opposed to staying in the same job. Tables 5.5, 5.6, 5.7 and 5.8 show the marginal effects and their standard errors of these transitions. These are calculated at the means of continuous variables and at the base categories for the categorical variables. Since it's hard to comment all covariates, this section tries to summarize the main important observations.

Age plays an important role in determining transitions out of one's job. Obviously all mobility in terms of job-to-job transitions and workers leaving their jobs occurs among the younger age groups whether males or females. This is significant (at different levels) for the JJ transitions in both Egypt and Jordan. For the employment to unemployment or inactivity transitions, the negative marginal effects are only significant for Egypt. Strikingly Jordanian male workers within the age group 35-49 years old are more probable to leave their jobs to inactivity than their younger peers. This effect is even more pronounced as one adds the proportional and predicted transition recall weights. This effect might be suggestive of trends of early retirement of male workers in the Jordanian market. For the Jordanian male workers, ages 25-34, raw data provided insignificant marginal effects. Adding the predicted weights showed a negative marginal effect at the 10% level of significance. For Egypt, adding the weights changes the magnitude and even the significance levels of the marginal effects. For instance, the effect becomes more pronounced among the age group 35-49 years old going through job-to-job transitions and the two old age groups (25-34 and 35-49) exiting their jobs to inactivity. The marginal effects of male workers leaving their jobs to unemployment become however insignificant.

As expected and anticipated in the counting section, marriage is crucial when it comes to discussing gender differentials. Married women are significantly more probable to leave their jobs to inactivity in both countries. In Jordan, married women are also less likely to move from one job to another. Possibly, these women are helping out their husbands with their income, either that they do not have the luxury to search on-the-job or even if they do, it's not that easy to find a job that accepts a married

woman with all potential maternity leaves and housework obligations. For men, it's the total opposite. In both countries, married men seems to be continuously on the move i.e. more probable to go through job-to-job transitions. This can be explained by the fact that a married man is always looking for better jobs or maybe does not have the luxury to stay unemployed or inactive if he leaves his job (whether voluntarily or involuntarily). This is confirmed in both Egypt and Jordan, by the negative marginal effects associated with the employment to unemployment and inactivity transitions of married men. These effects are even more pronounced as one adds the transitions recall weights in both countries especially the predicted weights.

Higher mobility patterns and job exits to unemployment are observed significantly among the more educated groups of individuals for both males and females in Egypt. In Jordan, these marginal effects are only significant for job-to-job transitions among male university graduates and job to unemployment transitions among female university graduates. Higher levels of education including intermediate and university levels also lowers the probability that male workers exit the labor market (EO). In general the effect of education gets more pronounced for Egypt as one adds the transition recall weights. For Jordan, it becomes significantly less probable to exit the labor market as a male university graduate. Also, literate males who do not have a formal education are less probable to move from one job to another than their illiterate peers. This effect becomes after being totally insignificant without weights to significant at the 10% level after using weights.

One of the very interesting determinants providing common grounds between both countries is the effect of time spent in the job before one transits to another job or state. This provides an indication to the duration dependence, that will thoroughly be examined through the next section. In both countries, the longer one stays in a job, the less probable he/she leaves this job in search for another i.e. job-to-job transitioners. This negative duration dependence is also significant for Egyptian workers moving to unemployment and inactivity. It only becomes significant for the Jordanian workers as the predicted transition recall weights are added to the estimation process.

Another major determinant of transitions in both countries is the type of employment occupied in the origin status of the initially employed individuals. Intuitively,

higher job-to-job mobility patterns are observed among the private male wage and non-wage workers than their peers employed in the public sector. This is also true for the informal female wage workers. Evidence of higher probability to exits to unemployment, in both countries among both males and females employed in the informal sector. This reflects the instability and flexibility of this sector as opposed to its formal counterpart. Confirming what has been previously discussed in the first non-parametric section, females employed in the formal and informal private sector are generally more likely to exit the labor market and become non-participants than when employed in the public sector.

Having a child below the age of six revealed as an insignificant determinant of all types of employment transitions except for the female jordanian workers. This is actually in line with what has been discussed previously in an unpublished manuscript by Hendy (2012) that Egyptian females tend to have an unpaid work for family or become self-employed after marriage and child birth contrarily to their Jordanian counterparts who mostly become housewives. Interestingly, adding the predicted transition recall weights reveals significant positive marginal effect of male workers having a child at home to exit the labor market. This might be suggestive to male workers helping the mothers of taking care of the children.

	EE		JJ		EU		EO	
	Males	Females	Males	Females	Males	Females	Males	Females
Age group (15-24 ommit.)								
25 - 34	0.009*** (0.002)	0.018*** (0.005)	0.004 (0.002)	-0.005 (0.003)	-0.001 (0.001)	-0.004* (0.002)	-0.012*** (0.001)	-0.009* (0.004)
35-49	0.028*** (0.002)	0.029*** (0.005)	-0.015*** (0.002)	-0.006* (0.003)	-0.002** (0.001)	-0.010*** (0.002)	-0.011*** (0.001)	-0.013** (0.004)
Marital St. (Single ommit.)								
Marital St. (Married)	-0.003 (0.002)	-0.013** (0.005)	0.010*** (0.002)	-0.008* (0.003)	-0.003** (0.001)	0.001 (0.002)	-0.004*** (0.001)	0.019*** (0.003)
Education (Illiterate ommit.)								
Read & Write	-0.010** (0.004)	-0.002 (0.009)	0.009* (0.003)	0.008 (0.006)	0.001 (0.001)	0.000 (0.002)	0.000 (0.002)	-0.006 (0.006)
Below Intermediate	-0.009*** (0.002)	-0.010 (0.008)	0.005* (0.002)	0.002 (0.004)	0.002** (0.001)	0.002 (0.002)	0.003* (0.001)	0.005 (0.006)
Intermediate & above	-0.017*** (0.002)	-0.017*** (0.005)	0.017*** (0.002)	0.007* (0.003)	0.002*** (0.000)	0.005*** (0.001)	-0.002* (0.001)	0.004 (0.004)
University & above	-0.025*** (0.003)	-0.014* (0.006)	0.025*** (0.003)	0.012** (0.004)	0.003** (0.001)	0.005* (0.002)	-0.004** (0.001)	-0.003 (0.005)
Experience in job	0.008*** (0.000)	0.007*** (0.001)	-0.006*** (0.000)	-0.003*** (0.000)	-0.000*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.003*** (0.001)
Experience Squared	-0.000*** (0.000)	-0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000* (0.000)
Region (Rural areas ommit.)								
Greater Cairo	-0.009** (0.003)	-0.002 (0.006)	0.003 (0.003)	0.001 (0.003)	0.000 (0.001)	-0.004* (0.002)	0.006*** (0.002)	0.005 (0.004)
Alex & Suez	-0.004 (0.003)	-0.002 (0.006)	0.001 (0.003)	-0.003 (0.003)	0.003* (0.001)	-0.003 (0.002)	0.000 (0.001)	0.008 (0.005)
Urban areas	0.006** (0.002)	-0.003 (0.004)	-0.006*** (0.002)	0.001 (0.003)	0.001 (0.000)	0.002 (0.002)	-0.001 (0.001)	0.000 (0.003)
Public Sector ommit.								
Formal Private WW	-0.020*** (0.004)	-0.031*** (0.007)	0.024*** (0.002)	-0.000 (0.003)	0.002* (0.001)	0.005* (0.002)	-0.006* (0.003)	0.026*** (0.006)
Informal Private WW	-0.027*** (0.003)	-0.069*** (0.008)	0.029*** (0.002)	0.015** (0.005)	0.003*** (0.001)	0.016*** (0.004)	-0.005 (0.003)	0.037*** (0.006)
Self-Employment	-0.031*** (0.004)	-0.017* (0.008)	0.034*** (0.003)	0.002 (0.004)	0.002* (0.001)	0.007 (0.005)	-0.005 (0.003)	0.008 (0.005)
Manufacturing ommit.								
Agriculture	0.004 (0.003)	0.021** (0.008)	-0.004 (0.002)	-0.007 (0.004)	-0.002* (0.001)	-0.006** (0.002)	0.002 (0.001)	-0.008 (0.006)
Services	0.007** (0.003)	0.014 (0.007)	-0.004 (0.002)	-0.005 (0.004)	-0.000 (0.001)	0.002 (0.002)	-0.003* (0.001)	-0.011* (0.005)
Construction	0.002 (0.003)	0.017 (0.019)	-0.001 (0.003)	-0.009 (0.009)	-0.001 (0.001)	0.010 (0.015)	-0.001 (0.001)	-0.018 (0.012)
Firm Size (1-4 ommit.)								
Firm Size (5-50)	-0.004 (0.002)	-0.005 (0.005)	0.004* (0.002)	-0.006 (0.003)	0.000 (0.001)	0.003 (0.002)	-0.001 (0.001)	0.008 (0.004)
Firm Size (50+)	0.002 (0.003)	-0.002 (0.006)	0.001 (0.003)	-0.004 (0.004)	0.000 (0.001)	0.003 (0.002)	-0.003** (0.001)	0.003 (0.005)
No child below 6 (ommit.)								
Child below 6	-0.004 (0.003)	-0.007 (0.005)	0.002 (0.002)	0.001 (0.003)	0.001 (0.001)	-0.000 (0.002)	0.002 (0.001)	0.007 (0.004)
Household size	0.003*** (0.000)	0.005** (0.002)	-0.002*** (0.000)	-0.000 (0.001)	-0.000 (0.000)	-0.001 (0.000)	-0.000* (0.000)	-0.004*** (0.001)
Unemp. Rate	0.001 (0.001)	0.002 (0.002)	-0.002** (0.001)	0.000 (0.001)	0.000 (0.000)	-0.001 (0.001)	0.001* (0.000)	-0.001 (0.001)
N(Obs.)	92250	20476	92250	20476	92250	20476	92250	20476

Table 5.5: Marginal Effects of Multinomial Regression of Transitions from Employment, by Gender , Ages 15-49 years old, Egypt 2001-2011.

	EE			JJ			EU			EO		
	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights
Age group (15-24 ommit.) 25 - 34	0.009*** (0.002)	0.017*** (0.003)	0.017*** (0.003)	0.004 (0.002)	0.004 (0.002)	0.001 (0.002)	-0.001 (0.001)	-0.004* (0.001)	0.002 (0.002)	-0.012*** (0.001)	-0.018*** (0.001)	-0.020*** (0.001)
35-49	0.028*** (0.002)	0.035*** (0.003)	0.044*** (0.005)	-0.015*** (0.002)	-0.015*** (0.002)	-0.030*** (0.002)	-0.002** (0.001)	-0.006** (0.002)	0.004 (0.004)	-0.011*** (0.001)	-0.015*** (0.002)	-0.018*** (0.002)
Marital St. (Single ommit.) Marital St. (Married)	-0.003 (0.002)	-0.000 (0.003)	0.013* (0.005)	0.010*** (0.002)	0.010*** (0.002)	0.015*** (0.002)	-0.003** (0.001)	-0.005** (0.002)	-0.017*** (0.005)	-0.004*** (0.001)	-0.005*** (0.001)	-0.011*** (0.002)
Education (Illiterate ommit.) Read & Write	-0.010** (0.004)	-0.009* (0.004)	-0.013** (0.004)	0.009* (0.003)	0.008* (0.003)	0.008** (0.003)	0.001 (0.001)	0.001 (0.002)	0.002 (0.002)	0.000 (0.002)	-0.000 (0.003)	0.004 (0.004)
Below Intermediate	-0.009*** (0.002)	-0.012*** (0.003)	-0.015*** (0.003)	0.005* (0.002)	0.005* (0.002)	0.008*** (0.002)	0.002** (0.001)	0.004* (0.002)	0.005* (0.002)	0.003* (0.001)	0.003 (0.002)	0.003 (0.002)
Intermediate & above	-0.017*** (0.002)	-0.017*** (0.003)	-0.035*** (0.003)	0.017*** (0.002)	0.017*** (0.002)	0.031*** (0.002)	0.002*** (0.000)	0.003** (0.001)	0.009*** (0.001)	-0.002* (0.001)	-0.004** (0.001)	-0.005*** (0.002)
University & above	-0.025*** (0.003)	-0.024*** (0.004)	-0.038*** (0.004)	0.025*** (0.003)	0.025*** (0.003)	0.043*** (0.003)	0.003** (0.001)	0.005* (0.002)	0.006** (0.002)	-0.004** (0.001)	-0.006** (0.002)	-0.011*** (0.002)
Experience in job	0.008*** (0.000)	0.009*** (0.000)	0.010*** (0.001)	-0.006*** (0.000)	-0.006*** (0.000)	-0.007*** (0.000)	-0.000*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)
Experience Squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Region (Rural areas ommit.) Greater Cairo	-0.009** (0.003)	-0.012*** (0.004)	-0.033*** (0.004)	0.003 (0.002)	0.003 (0.002)	0.019*** (0.003)	0.000 (0.001)	0.001 (0.002)	0.007** (0.003)	0.006*** (0.002)	0.008** (0.002)	0.007* (0.003)
Alex & Suez	-0.004 (0.003)	-0.007 (0.004)	-0.008 (0.004)	0.001 (0.003)	0.001 (0.003)	0.003 (0.003)	0.003* (0.001)	0.006** (0.003)	0.012*** (0.004)	0.000 (0.001)	0.000 (0.002)	-0.007*** (0.001)
Urban areas	0.006** (0.002)	0.004 (0.002)	0.007** (0.002)	-0.006*** (0.002)	-0.006*** (0.002)	-0.007*** (0.002)	0.001 (0.000)	0.002 (0.001)	0.004** (0.002)	-0.001 (0.001)	-0.000 (0.001)	-0.005*** (0.001)
Public Sector ommit. Formal Private WW	-0.020*** (0.004)	-0.019*** (0.004)	-0.031*** (0.005)	0.024*** (0.002)	0.025*** (0.002)	0.031*** (0.002)	0.002* (0.001)	0.003 (0.002)	0.006** (0.002)	-0.006* (0.003)	-0.008* (0.004)	-0.006 (0.005)
Informal Private WW	-0.027*** (0.003)	-0.028*** (0.004)	-0.050*** (0.005)	0.029*** (0.002)	0.029*** (0.002)	0.042*** (0.002)	0.003*** (0.001)	0.005** (0.002)	0.010*** (0.002)	-0.005 (0.003)	-0.005 (0.004)	-0.002 (0.004)
Self-Employment	-0.031*** (0.004)	-0.031*** (0.005)	-0.037*** (0.005)	0.034*** (0.003)	0.033*** (0.003)	0.040*** (0.003)	0.002* (0.001)	0.003 (0.002)	0.001* (0.001)	-0.005 (0.003)	-0.006 (0.004)	-0.004 (0.004)
Manufacturing ommit. Agriculture	0.004 (0.003)	0.005 (0.003)	0.003 (0.004)	-0.004 (0.002)	-0.003 (0.002)	-0.005 (0.003)	-0.002* (0.001)	-0.005** (0.002)	-0.002 (0.003)	0.002 (0.001)	0.003 (0.002)	0.004 (0.002)
Services	0.007** (0.003)	0.008** (0.003)	0.003 (0.003)	-0.004 (0.002)	-0.004 (0.002)	-0.002 (0.002)	0.000 (0.001)	-0.000 (0.002)	0.000 (0.003)	-0.003* (0.001)	-0.004* (0.002)	-0.001 (0.001)
Construction	0.002 (0.003)	0.003 (0.004)	0.000 (0.004)	-0.001 (0.003)	-0.001 (0.003)	-0.000 (0.003)	-0.001 (0.001)	-0.001 (0.002)	-0.001 (0.003)	-0.001 (0.001)	-0.001 (0.002)	0.001 (0.002)
Firm Size (1-4 ommit.) Firm Size (5-50)	-0.004 (0.002)	-0.004 (0.003)	-0.004 (0.003)	0.004* (0.002)	0.004* (0.002)	0.004* (0.002)	0.000 (0.001)	0.001 (0.002)	0.001 (0.002)	-0.001 (0.003)	-0.001 (0.001)	-0.001 (0.001)
Firm Size (50+)	0.002 (0.003)	0.003 (0.004)	-0.003 (0.004)	0.001 (0.003)	0.001 (0.003)	0.004 (0.003)	0.000 (0.001)	0.000 (0.002)	0.004 (0.003)	-0.003** (0.001)	-0.004* (0.002)	-0.004 (0.002)
No child below 6 (ommit.) Child below 6	-0.004 (0.003)	-0.005 (0.003)	-0.009** (0.003)	0.002 (0.002)	0.002 (0.002)	0.005 (0.002)	0.001 (0.001)	0.001 (0.001)	0.002 (0.002)	0.002 (0.001)	0.002 (0.001)	0.002 (0.002)
Household size	0.003*** (0.000)	0.003*** (0.001)	0.005*** (0.001)	-0.002*** (0.000)	-0.002*** (0.000)	-0.003*** (0.001)	-0.000 (0.000)	-0.000 (0.000)	-0.001 (0.001)	-0.000* (0.000)	-0.001* (0.000)	-0.001* (0.000)
Unemp. Rate	0.001 (0.001)	0.002* (0.001)	0.002* (0.001)	-0.002** (0.001)	-0.002** (0.001)	-0.002** (0.001)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.001)	0.001* (0.000)	0.000 (0.000)	0.000 (0.000)
N(Obs.)	92250	92250	92250	92250	92250	92250	92250	92250	92250	92250	92250	92250

Table 5.6: Marginal Effects of Multinomial Regression of Transitions from Employment, Male Workers , Ages 15-49 years old, Egypt 2001-2011.

	EE		JJ		EU		EO	
	Males	Females	Males	Females	Males	Females	Males	Females
Age group (15-24 ommit.)								
25 - 34	0.033*** (0.006)	0.028 (0.015)	-0.031*** (0.005)	-0.014 (0.011)	-0.001 (0.002)	0.006 (0.004)	-0.001 (0.002)	-0.019 (0.011)
35-49	0.040*** (0.007)	0.055*** (0.016)	-0.043*** (0.006)	-0.037** (0.011)	-0.002 (0.003)	-0.001 (0.004)	0.005* (0.002)	-0.017 (0.012)
Marital St. (Single ommit.)								
Marital St. (Married)	0.010 (0.006)	-0.029** (0.010)	0.010* (0.004)	-0.014 (0.008)	-0.012*** (0.003)	-0.000 (0.004)	-0.008** (0.003)	0.044*** (0.006)
Education (Illiterate ommit.)								
Read & Write	0.009 (0.009)	0.028 (0.028)	-0.003 (0.008)	-0.026 (0.017)	-0.002 (0.004)	0.001 (0.006)	-0.004 (0.003)	-0.003 (0.021)
Below Intermediate	-0.004 (0.008)	-0.023 (0.023)	0.008 (0.007)	-0.015 (0.015)	0.001 (0.004)	0.010 (0.006)	-0.005 (0.003)	0.028 (0.015)
Intermediate & above	-0.004 (0.009)	-0.015 (0.022)	0.008 (0.007)	-0.008 (0.015)	-0.001 (0.004)	0.005 (0.005)	-0.003 (0.003)	0.018 (0.013)
University & above	-0.014 (0.009)	-0.015 (0.023)	0.022** (0.008)	0.015 (0.015)	-0.003 (0.004)	0.014** (0.005)	-0.005 (0.003)	-0.014 (0.013)
Experience in job	0.003** (0.001)	0.008** (0.003)	-0.003*** (0.001)	-0.005** (0.002)	-0.000 (0.000)	-0.002 (0.001)	0.000* (0.000)	-0.002 (0.002)
Experience Squared	-0.000*** (0.000)	-0.000** (0.000)	0.000*** (0.000)	0.000** (0.000)	0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000* (0.000)
Region (Middle ommit.)								
North	-0.004 (0.004)	0.003 (0.009)	-0.002 (0.003)	-0.011 (0.007)	0.004* (0.002)	0.008 (0.004)	0.002* (0.001)	-0.001 (0.007)
South	0.015** (0.005)	0.043*** (0.011)	-0.015*** (0.004)	-0.015 (0.008)	0.002 (0.002)	-0.003 (0.004)	-0.002 (0.001)	-0.026*** (0.007)
Public Sector ommit.								
Formal Private WW	-0.060*** (0.005)	-0.060*** (0.011)	0.064*** (0.005)	0.028*** (0.008)	0.002 (0.002)	0.015*** (0.004)	-0.006*** (0.001)	0.016* (0.008)
Informal Private WW	-0.060*** (0.005)	-0.129*** (0.015)	0.050*** (0.004)	0.027** (0.009)	0.009*** (0.002)	0.030*** (0.006)	0.000 (0.001)	0.071*** (0.011)
Self-Employment	-0.025*** (0.005)	-0.034 (0.018)	0.027*** (0.004)	0.023 (0.014)	0.002 (0.002)	0.005 (0.005)	-0.003* (0.001)	0.006 (0.010)
Manufacturing ommit.								
Agriculture	-0.006 (0.008)	0.022 (0.019)	0.013 (0.008)	0.000 (0.014)	-0.004 (0.003)	-0.004 (0.005)	-0.003 (0.002)	-0.018 (0.013)
Services	0.004 (0.005)	-0.010 (0.012)	-0.006 (0.004)	0.016* (0.008)	0.001 (0.002)	0.005 (0.004)	0.001 (0.002)	-0.011 (0.009)
Construction	0.003 (0.007)	0.019 (0.037)	-0.003 (0.006)	-0.025 (0.014)	0.001 (0.003)	0.013 (0.019)	-0.001 (0.002)	-0.007 (0.028)
No child below 6 (ommit.)								
Child below 6	0.013 (0.007)	-0.022 (0.012)	-0.012 (0.007)	-0.001 (0.010)	-0.004 (0.004)	-0.004 (0.005)	0.003 (0.002)	0.028*** (0.008)
Household size	0.001 (0.001)	0.008*** (0.002)	-0.002* (0.001)	-0.002 (0.002)	0.000 (0.000)	-0.002 (0.001)	0.000 (0.000)	-0.004* (0.002)
Unemp. Rate	0.009*** (0.001)	0.003 (0.003)	-0.006*** (0.001)	0.002 (0.002)	-0.002*** (0.000)	-0.001 (0.001)	-0.000 (0.000)	-0.004* (0.002)
N(Obs.)	41101	7801	41101	7801	41101	7801	41101	7801

Table 5.7: Marginal Effects of Multinomial Regression of Transitions from Employment, by Gender , Ages 15-49 years old, Jordan 2000-2010.



	EE			JJ			EU			EO		
	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights
Age group (15-24 ommit.)												
25 - 34	0.033*** (0.006)	0.043*** (0.009)	0.037*** (0.008)	-0.031*** (0.005)	-0.028*** (0.005)	-0.043*** (0.006)	-0.001 (0.002)	-0.011 (0.008)	0.012 (0.006)	-0.001 (0.002)	-0.004 (0.005)	-0.006* (0.003)
35-49	0.040*** (0.007)	0.042*** (0.011)	0.036*** (0.010)	-0.043*** (0.006)	-0.040*** (0.006)	-0.067*** (0.006)	-0.002 (0.003)	-0.016 (0.009)	0.006 (0.007)	0.005* (0.002)	0.014* (0.007)	0.025*** (0.006)
Marital St. (Single ommit.)												
Marital St. (Married)	0.010 (0.006)	0.029** (0.010)	0.094*** (0.015)	0.010* (0.004)	0.012** (0.004)	0.014*** (0.004)	-0.012*** (0.003)	-0.023** (0.008)	-0.064*** (0.010)	-0.008** (0.003)	-0.017* (0.008)	-0.044** (0.014)
Education (Illiterate ommit.)												
Read & Write	0.009 (0.009)	0.018 (0.015)	0.048** (0.015)	-0.003 (0.008)	-0.002 (0.007)	-0.022* (0.009)	-0.002 (0.004)	-0.001 (0.010)	-0.023 (0.012)	-0.004 (0.003)	-0.014 (0.009)	-0.003 (0.006)
Below Intermediate	-0.004 (0.008)	0.004 (0.014)	0.011 (0.014)	0.008 (0.007)	0.008 (0.007)	-0.014 (0.009)	0.001 (0.004)	0.004 (0.009)	-0.002 (0.012)	-0.005 (0.003)	-0.016 (0.009)	0.006 (0.006)
Intermediate & above	-0.004 (0.009)	0.001 (0.014)	0.015 (0.014)	0.008 (0.007)	0.007 (0.007)	-0.014 (0.009)	-0.001 (0.004)	0.003 (0.010)	-0.013 (0.012)	-0.003 (0.003)	-0.011 (0.009)	0.012 (0.006)
University & above	-0.014 (0.009)	-0.002 (0.015)	0.040** (0.015)	0.022** (0.008)	0.021** (0.008)	-0.003 (0.010)	-0.003 (0.004)	-0.003 (0.011)	-0.022 (0.013)	-0.005 (0.003)	-0.016 (0.009)	-0.015** (0.005)
Experience in job	0.003** (0.001)	0.002 (0.001)	0.005*** (0.002)	-0.003*** (0.001)	-0.003*** (0.001)	-0.004*** (0.001)	-0.000 (0.000)	-0.000 (0.001)	-0.005*** (0.001)	0.000* (0.000)	0.001 (0.001)	0.003*** (0.001)
Experience Squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000** (0.000)	0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Region (Middle ommit.)												
North	-0.004 (0.004)	-0.017** (0.006)	-0.037*** (0.006)	-0.002 (0.003)	-0.003 (0.003)	0.013*** (0.003)	0.004* (0.002)	0.012** (0.005)	0.018*** (0.005)	0.002* (0.001)	0.007* (0.003)	0.007* (0.003)
South	0.015** (0.005)	0.013 (0.007)	0.014 (0.008)	-0.015*** (0.004)	-0.014*** (0.004)	-0.022*** (0.004)	0.002 (0.002)	0.006 (0.006)	0.019* (0.008)	-0.002 (0.001)	-0.005 (0.003)	-0.011*** (0.003)
Public Sector ommit.												
Formal Private WW	-0.060*** (0.005)	-0.053*** (0.008)	-0.104*** (0.007)	0.064*** (0.005)	0.062*** (0.005)	0.123*** (0.005)	0.002 (0.002)	0.009 (0.006)	0.010* (0.004)	-0.006*** (0.001)	-0.018*** (0.004)	-0.029*** (0.004)
Informal Private WW	-0.060*** (0.005)	-0.069*** (0.008)	-0.120*** (0.010)	0.050*** (0.004)	0.047*** (0.004)	0.077*** (0.004)	0.009*** (0.002)	0.024*** (0.006)	0.054*** (0.006)	0.000 (0.001)	-0.003 (0.003)	-0.011* (0.005)
Self-Employment	-0.025*** (0.005)	-0.016* (0.007)	-0.033*** (0.007)	0.027*** (0.004)	0.026*** (0.004)	0.041*** (0.003)	0.002 (0.002)	0.001 (0.006)	0.018*** (0.006)	-0.003* (0.001)	-0.011** (0.004)	-0.027*** (0.004)
Manufacturing ommit.												
Agriculture	-0.006 (0.008)	0.003 (0.011)	-0.007 (0.014)	0.013 (0.008)	0.014 (0.008)	0.017* (0.007)	-0.004 (0.003)	-0.007 (0.008)	0.004 (0.009)	-0.003 (0.002)	-0.010 (0.005)	-0.014 (0.009)
Services	0.004 (0.005)	0.001 (0.008)	0.010 (0.010)	-0.006 (0.004)	-0.005 (0.004)	-0.004 (0.004)	0.001 (0.002)	0.003 (0.006)	0.005 (0.006)	0.001 (0.001)	0.001 (0.005)	-0.012 (0.008)
Construction	0.003 (0.007)	-0.000 (0.013)	0.009 (0.012)	-0.003 (0.006)	-0.003 (0.006)	0.000 (0.005)	0.001 (0.003)	0.005 (0.010)	0.004 (0.008)	-0.001 (0.002)	-0.001 (0.007)	-0.013 (0.009)
No child below 6 (ommit.)												
Child below 6	0.013 (0.007)	0.021 (0.014)	-0.004 (0.010)	-0.012 (0.007)	-0.011 (0.007)	-0.013 (0.007)	-0.004 (0.004)	-0.020 (0.014)	-0.001 (0.009)	0.003 (0.002)	0.009 (0.006)	0.018*** (0.003)
Household size	0.001 (0.001)	-0.000 (0.001)	0.003* (0.001)	-0.002* (0.001)	-0.002* (0.001)	-0.004*** (0.001)	0.000 (0.000)	0.001 (0.001)	0.002** (0.001)	0.000 (0.000)	0.001 (0.001)	-0.001 (0.001)
Unemp. Rate	0.009*** (0.001)	0.004* (0.002)	0.003 (0.002)	-0.006*** (0.001)	-0.006*** (0.001)	-0.007*** (0.001)	-0.002*** (0.000)	0.001 (0.001)	0.003* (0.001)	-0.000 (0.000)	0.001* (0.001)	0.001 (0.001)
N(Obs.)	41101	41101	41101	41101	41101	41101	41101	41101	41101	41101	41101	41101

Table 5.8: Marginal Effects of Multinomial Regression of Transitions from Employment, Male Workers , Ages 15-49 years old, Jordan 2000-2010

## 5.5 Conclusion

Given that there are no official statistics on labor market dynamics in the MENA region, as has been explained in parts I and II of this thesis, the only way to study short-term labor market transitions in Egypt and Jordan is by extracting longitudinal retrospective panels. These panels were shown to suffer from recall and design measurement errors. This paper suggests a correction technique that shows that it is sufficient to have population, stocks and transitions, moments to correct over- or under-reporting biases in retrospective data. The true unbiased moments can be obtained from auxiliary information such as contemporaneous information from other waves of the same survey, or even external data sources, so long comparability between the variables' definitions is verified. Once the moments are matched on the aggregate level, a measurement error for each type of transition at a point in time  $t$  can be estimated. This measurement error is then distributed among the sample's individual observations/transactions in the form of micro-data weights, such as observations that are being under-reported take higher weights and those over-reported take lower weights. The paper proposes two types of weights: (1) naive proportional weights and (2) differentiated predicted weights. The paper shows significant different results as these weights are added showing how crucial correcting recall and design measurement errors is to be able to obtain unbiased estimations for labor market transition probabilities. These weights, especially the differentiated predicted weights, make significant changes to the levels and composition of the labor market transitions obtained from the retrospective data since now the samples are redressed to become random under the assumptions of the model. The correction methodology proposed in this paper alters significantly the rates of separations and job findings in Egypt and Jordan which have been shown, in previous chapters, to be under-estimated and over-estimated respectively.

The paper also shows the importance of these weights via an application by exploring the determinants of labor market transitions in general in two MENA region countries, Egypt and Jordan. The methodology discussed explores in particular the employment turnover patterns among the different groups of individuals in the market as well as their job-to-job mobility behaviour. The analysis is also done, even though

for using uncorrected data, on a gender-specific basis to be able to make conclusions about gender differentials in transitions.

The main findings of this paper show that Jordan has a much more mobile labor market than that of Egypt. For both male and female workers, job-to-job transitions rates and job to non-employment separation rates are higher. Age and gender play important roles as determinants to job turnover and mobility in both markets. More educated male workers are more mobile and prone to leaving to unemployment than their less educated/illiterate peers, especially in Egypt. The public sector in both countries is very stagnant as opposed to the private wage and non-wage employment. Public wage workers tend to remain employed during their entire career and only leave to inactivity as they wish to retire. The public sector also provides a flexible employer for the female workers in both Egypt and Jordan otherwise these workers are found to leave the labor market after their marriage or as they have a child (as in the case of Jordan for instance). The significant effects of the type of employment in the origin job are suggestive to the extent of state dependence of these labor market/state transitions.

Preliminary evidence from both the multinomial logit regressions and the non-parametric survival analysis show obvious negative duration dependence of these employment transitions. In both countries, Egypt and Jordan, for male workers, employment to unemployment transitions appear to accelerate at the early years of a job and then flatten out over time. The same pattern is observed for the job-to-job transitions, however these transitions tend to decelerate a bit later than the job leaves. For the Egyptian job to out of the labor force transitions, one observes a similar behavior to that of the job to unemployment. However, for Jordan, the pattern is a bit surprising where quits out of the labor market starts accelerating substantially between 10 years after appointment up to around 25 years after appointment. Female workers exhibit more or less similar patterns to those of the male workers except that they tend to leave employment much earlier and their job-to-job transitions are much less probable.

**Extensions:** This paper is a preliminary milestone in a bigger project, where first the correction methodology is aimed to be developed. Given the over-identification of the model, tests of goodness of fit are required to prove how reliable the obtained estimates are. Expanding on the role of the parametric form of the recall and design bias

is crucial to explore to what extent the obtained results rely on it. Among the applications of the weights, a multi-state multi-spell model is aimed to be built and estimated for the transitions in Egypt and Jordan and estimated using panel weights. These panel weights are also used in the next chapter (chapter 6) for the structural estimation of the Burdett-Mortensen model using duration data from Egypt and Jordan. Finally, cross-country comparisons are usually problematic if one ignores contextualizing the analysis to the nature of the market and institutions of each country. A country where flexible employment protection laws have been implemented long ago, such as Jordan, would definitely be expected to be more flexible in terms of job-to-job transitions and separations than another where short term contracts have just been introduced and allowed in the market. In order to be able to conclude some policy implications for each of the countries analyzed in this paper, the reduced form transitions estimated in this paper serve as a tool for a further step which would be plugging these estimates into a job search equilibrium model to simulate for the wage dispersion among the different socio-economic groups, the different labor market policies and hence conclude robust policy recommendations. These can also be compared to the results obtained from the structural estimation of the job-search model in chapter 6. Combining these techniques, where transition rates from state and duration dependence models are injected into a job search equilibrium model to simulate for policy implications, is a novel technique that according to my knowledge has not been previously adopted by the literature and is worth exploring in a future research agenda. Usually these models are used for simulations using a memoryless process such as poisson for the transitions.

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## 5.A Appendix

<b>Age group</b>	Age is a set of three dummies. Age 15-24 being the base category Age 25-34 Age 35-44
<b>Married</b>	is a dummy variable taking value one if the individual is married and 0 otherwise
<b>Region</b>	For Egypt: is a set of four dummies Rural areas being the base category Greater Cairo Alexandria and Suez Urban areas For Jordan: is a set of three dummies Middle area being the base category North area South area
<b>Education</b>	is a set of five dummies 1. The base category includes all illiterate individuals 2. A group of individuals who can read and write i.e. literate but never graduated from school 3. Below Intermediate education includes mainly primary and preparatory education. 4. A group of individuals who got intermediate & above education. This includes Secondary and Post-Sec diplomas (General and Technical) 5. A group of individuals who attained university degrees and post graduate studies.
<b>Experience</b>	For initially employed workers, this is the number of years an individual has been in this specific job. This gives a sense of duration dependence. For initially unemployed and inactive, this is the number of years since entry into the labor market. i.e. since his/her date of start of first job. This is equal to zero if the individual has never worked. (Further work is considered to change this in later versions to the number of years the individual has been unemployed/inactive)
<b>Origin Job</b>	This is only applicable for the initially employed individuals. It's a set of four dummies showing the type of employment in the origin job 1. Public wage work as the base category 2. Private formal wage work 3. Private Informal wage work 4. Non-Wage work
<b>Economic activity</b>	This is only applicable for the initially employed individuals. is a set of four dummies. 1. Manufacturing as the base category 2. Agriculture 3. Services/ Tertiary sector 4. Construction
<b>Child below 6</b>	is a dummy variable taking the value of 1 if a child of age 6 or less is present in the individual's household, and 0 otherwise
<b>Household size</b>	a continuous variable showing the number of individuals in the household.
<b>Unemployment rate</b>	The official unemployment rate in the country at the year of the transition. *The provincial unemployment rate is being considered for later versions of the paper.

Table 5.9: List of explanatory variables/ regressions' covariates

	EE (S <sub>J</sub> )	EE(JJ)	EU	EO	UE	OE	UU	OE	OO
Age Group (15-24 ommitted)									
Age Group (25-34)	0.088 (0.051)	-0.018 (0.062)	0.170 (0.087)	-0.754*** (0.121)	-0.489*** (0.106)	-0.799*** (0.087)	-0.026 (0.041)	-0.650*** (0.093)	-0.877*** (0.035)
Age Group (35-54)	0.214** (0.076)	-0.257** (0.089)	0.259* (0.131)	-0.424* (0.169)	-0.618*** (0.180)	-3.255*** (0.666)	-0.347*** (0.067)	-2.124*** (0.282)	-0.627*** (0.063)
Marital Status (Single ommitted)									
Marital Status (Married)	0.093 (0.053)	0.095 (0.061)	-0.347*** (0.097)	-0.307** (0.115)	-0.443*** (0.099)	-0.568*** (0.112)	-0.703*** (0.047)	-0.374*** (0.110)	-1.427*** (0.047)
Education (Illiterate ommitted)									
Education (Read and Write)	-0.112 (0.094)	0.128 (0.106)	0.133 (0.150)	0.033 (0.236)	0.265 (0.208)	0.110 (0.215)	0.120 (0.109)	0.086 (0.195)	-0.363** (0.117)
Education (Less than Intermediate)	-0.059 (0.069)	0.115 (0.075)	-0.035 (0.130)	-0.055 (0.155)	0.129 (0.173)	0.096 (0.123)	-0.144* (0.073)	-0.136 (0.117)	0.461*** (0.044)
Education (Intermediate and above)	-0.176** (0.059)	0.246*** (0.068)	0.105 (0.106)	-0.060 (0.130)	0.334* (0.148)	0.279* (0.116)	0.397*** (0.064)	0.154 (0.110)	0.029 (0.045)
Education (University and above)	-0.154* (0.074)	0.274*** (0.082)	0.041 (0.134)	-0.348 (0.199)	0.741*** (0.164)	0.755*** (0.140)	0.755*** (0.068)	0.584*** (0.124)	-0.495*** (0.056)
exp	0.039*** (0.006)	-0.035*** (0.006)	-0.029** (0.010)	-0.040** (0.012)	-0.015 (0.012)	-0.074*** (0.013)	-0.011* (0.005)	-0.022* (0.011)	-0.159*** (0.005)
exp_sq	-0.001*** (0.000)	0.001*** (0.000)	0.001 (0.000)	0.002*** (0.000)	0.001** (0.000)	0.004*** (0.001)	0.001*** (0.000)	0.002*** (0.000)	0.006*** (0.000)
Region (Rural ommitted)									
Region (Greater Cairo)	-0.231*** (0.055)	0.163* (0.063)	0.357*** (0.085)	0.127 (0.143)	0.005 (0.127)	-0.024 (0.107)	0.035 (0.049)	-0.123 (0.094)	0.158*** (0.037)
Region (Alexandrain,Suez)	-0.075 (0.064)	0.017 (0.070)	0.322** (0.109)	-0.296 (0.158)	0.115 (0.108)	-0.030 (0.111)	0.281*** (0.048)	-0.163 (0.098)	0.115*** (0.038)
Region (Urban areas)	0.015 (0.043)	-0.010 (0.051)	0.144* (0.071)	-0.290** (0.096)	0.086 (0.082)	0.012 (0.072)	0.124*** (0.033)	-0.074 (0.065)	0.101*** (0.024)
Origin Job (Public ommitted)									
Origin Job (Formal Private WW)	-0.435*** (0.068)	0.373*** (0.076)	0.492*** (0.126)	0.173 (0.172)	-0.048 (0.137)	-0.102 (0.146)			
Origin Job (Informal Private WW)	-0.463*** (0.059)	0.428*** (0.068)	0.475*** (0.107)	0.249 (0.148)	0.051 (0.127)	0.091 (0.130)			
Origin Job (Self-Employment)	-0.350*** (0.071)	0.373*** (0.083)	0.101 (0.147)	0.221 (0.169)	-0.087 (0.182)	0.047 (0.138)			
Without child (ommitted)									
With Child	-0.012 (0.051)	0.054 (0.062)	-0.051 (0.084)	0.003 (0.103)	-0.074 (0.099)	0.309*** (0.094)	-0.141*** (0.040)	0.160 (0.083)	0.465*** (0.035)
household size	0.028* (0.012)	-0.025* (0.012)	-0.048* (0.023)	0.000 (0.024)	-0.035 (0.022)	-0.036 (0.024)	-0.009 (0.008)	-0.033 (0.022)	-0.017** (0.006)
Constant	2.078*** (0.104)	-2.501*** (0.119)	-2.658*** (0.186)	-2.227*** (0.247)	-2.327*** (0.240)	-2.140*** (0.221)	-1.789*** (0.073)	-2.217*** (0.155)	-0.332*** (0.058)
N(Obs.)	38050	38050	38050	38050	38129	38129	49227	49227	49227

Table 5.10: Coefficients of Probit Regressions, showing the distribution of observable characteristics of labor market transitions in the most recent i.e. most accurate year of the survey, 2011/2012 for Egypt



	EE (SJ)	EE (JJ)	EU	EO	UE	OE	UU	OU	OO
Age Group (15-24 ommitted)									
Age Group (25-34)	0.026 (0.062)	-0.047 (0.073)	0.057 (0.090)	-0.222 (0.167)	-0.309*** (0.078)	-0.863*** (0.135)	-0.091 (0.135)	-0.375* (0.163)	-0.817*** (0.040)
Age Group (35-54)	0.032 (0.078)	-0.163 (0.091)	0.232* (0.113)	0.412* (0.177)	-0.759*** (0.133)	-0.772*** (0.176)	-0.418*** (0.079)	-0.199 (0.237)	-0.630*** (0.080)
Marital Status (Single ommitted)									
Marital Status (Married)	0.102 (0.060)	0.022 (0.069)	-0.307*** (0.087)	-0.524*** (0.129)	-0.362*** (0.089)	-0.616*** (0.115)	-0.654*** (0.056)	-0.119 (0.234)	-0.725*** (0.068)
Education (Illiterate ommitted)									
Education (Read and Write)	0.000 (0.144)	-0.044 (0.175)	-0.049 (0.185)	0.404 (0.282)	-0.027 (0.264)	0.080 (0.462)	-0.044 (0.114)	-0.185 (0.386)	-0.160 (0.096)
Education (Less than Intermediate)	-0.028 (0.134)	-0.050 (0.162)	0.116 (0.164)	0.273 (0.276)	0.257 (0.218)	0.105 (0.407)	0.387*** (0.104)	0.211 (0.358)	-0.765*** (0.086)
Education (Intermediate and above)	-0.013 (0.137)	-0.034 (0.166)	0.010 (0.168)	0.374 (0.272)	0.161 (0.222)	0.375 (0.404)	0.080 (0.106)	0.058 (0.364)	-0.401*** (0.086)
Education (University and above)	0.058 (0.142)	-0.042 (0.169)	-0.106 (0.197)	-0.557 (0.394)	0.357 (0.224)	0.634 (0.415)	0.543*** (0.110)	0.828* (0.363)	-1.046*** (0.102)
exp	0.031*** (0.009)	-0.017 (0.010)	-0.050*** (0.014)	0.029 (0.019)	-0.055*** (0.015)	-0.158*** (0.034)	-0.005 (0.007)	-0.276*** (0.066)	-0.327*** (0.015)
exp_sq	-0.001*** (0.000)	0.001 (0.000)	0.002*** (0.000)	-0.000 (0.001)	0.004*** (0.000)	0.006*** (0.001)	0.002*** (0.000)	0.008*** (0.002)	0.012*** (0.001)
Region (Rural Middle ommitted)									
Region (Rural North)	-0.107 (0.081)	0.069 (0.091)	0.168 (0.140)	0.150 (0.199)	0.027 (0.114)	0.119 (0.144)	0.029 (0.058)	0.243 (0.130)	-0.031 (0.049)
Region (Rural South)	0.106 (0.093)	-0.109 (0.105)	0.043 (0.153)	-0.327 (0.290)	-0.291* (0.141)	-0.566* (0.232)	0.227*** (0.062)	-0.005 (0.156)	-0.352*** (0.055)
Region (Urban Middle)	0.042 (0.064)	-0.107 (0.073)	0.150 (0.108)	0.005 (0.159)	-0.163 (0.096)	-0.127 (0.116)	-0.125* (0.049)	0.045 (0.115)	-0.139*** (0.039)
Region (Urban North)	-0.024 (0.068)	-0.034 (0.077)	0.178 (0.113)	0.004 (0.177)	-0.043 (0.096)	0.070 (0.124)	0.072 (0.050)	0.008 (0.120)	0.038 (0.042)
Region (Urban South)	0.014 (0.090)	-0.187 (0.107)	0.337* (0.143)	0.034 (0.210)	-0.095 (0.135)	-0.273 (0.170)	0.272*** (0.059)	0.154 (0.144)	-0.283*** (0.058)
Origin/Dest. Job (Public ommitted)									
Origin/Dest. Job (Formal Private WW)	-0.381*** (0.058)	0.505*** (0.067)	-0.019 (0.111)	-0.236 (0.204)	0.155 (0.092)	0.155 (0.114)			
Origin/Dest. Job (Informal Private WW)	-0.461*** (0.054)	0.446*** (0.065)	0.370*** (0.082)	0.228* (0.115)	0.165* (0.084)	0.203 (0.109)			
Origin/Dest. Job (Self-Employment)	-0.315*** (0.065)	0.331*** (0.078)	0.255** (0.097)	-0.020 (0.145)	-0.044 (0.108)	0.426*** (0.124)			
Without child (ommitted)									
With Child	-0.001 (0.087)	-0.010 (0.102)	0.013 (0.114)	0.177 (0.215)	0.021 (0.132)	-0.355 (0.286)	0.185* (0.082)	0.571 (0.351)	-0.128 (0.089)
hhsze	0.017 (0.010)	-0.024* (0.012)	0.004 (0.012)	-0.004 (0.022)	0.014 (0.013)	0.018 (0.015)	0.012 (0.006)	0.018 (0.015)	0.011* (0.005)
Constant	1.618*** (0.186)	-1.717*** (0.224)	-2.405*** (0.234)	-3.268*** (0.365)	-1.943*** (0.272)	-1.547*** (0.473)	-1.951*** (0.141)	-3.064*** (0.488)	1.180*** (0.120)
N(Obs.)	16858	16858	16858	16858	17036	17036	25925	25925	25925

Table 5.11: Coefficients of Probit Regressions, showing the distribution of observable characteristics of labor market transitions in the most recent i.e. most accurate year of the survey, 2009/2010 for Jordan

## 5.B K-M estimators and cumulative incidence curves

To show the impact of adding the panel weights on duration analysis, I carry out non-parametric estimations over a sample of individuals who were initially employed at the beginning of a spell and follow them to one of their failure events, which in this case would be a job-to-job , a job-to-unemployment or a job to inactivity (i.e. out of the labor force).

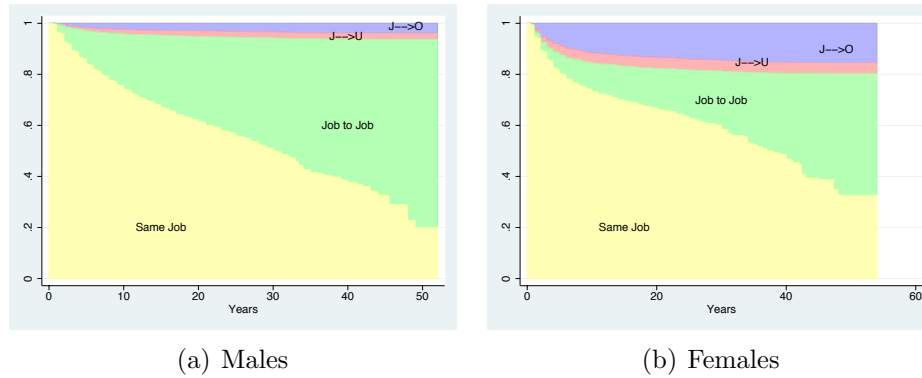


Figure 5.7: Transitions of initially employed workers by years since appointment, Egypt Males Vs. Females, Ages 15-49, 2000-2011.

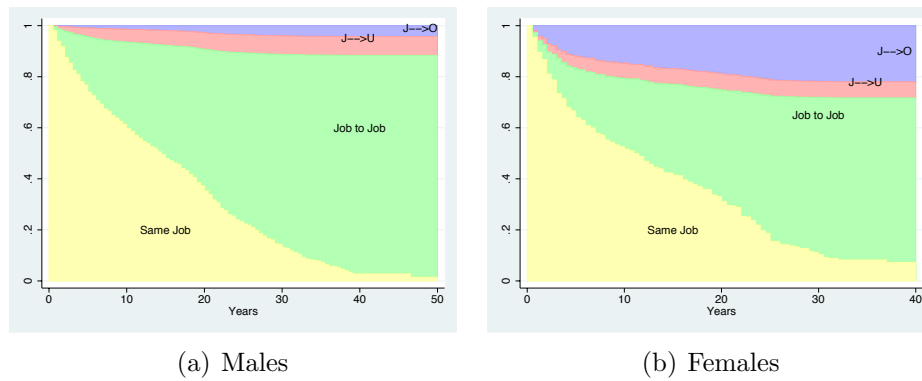
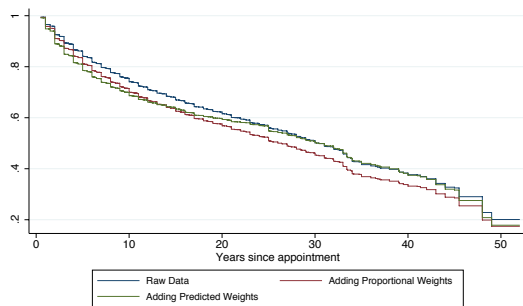
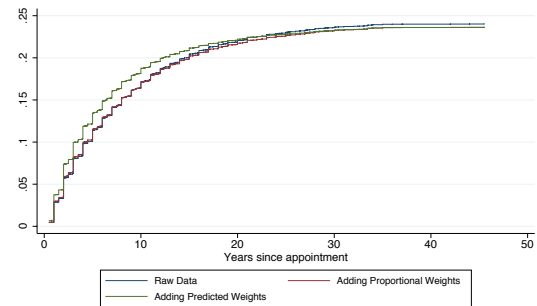


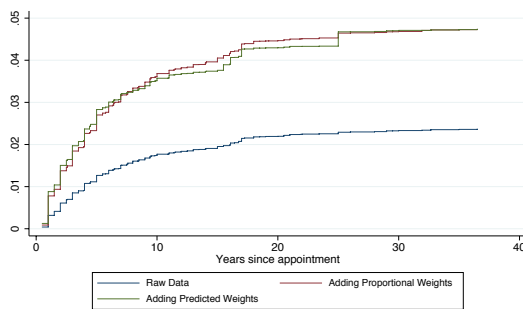
Figure 5.8: Transitions of initially employed workers by years since appointment, Egypt Males Vs. Females, Ages 15-49, 2000-2011.



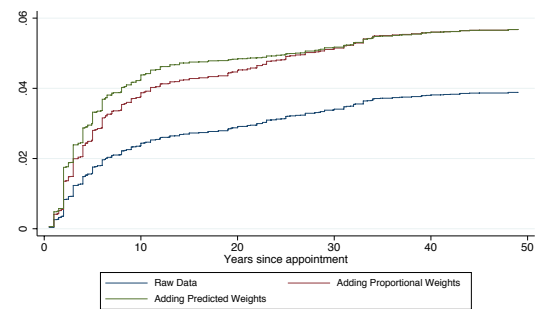
(a) KM Survival Function



(b) Job-to-job

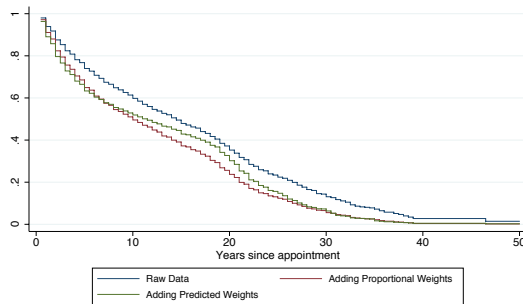


(c) Employment to Unemployment

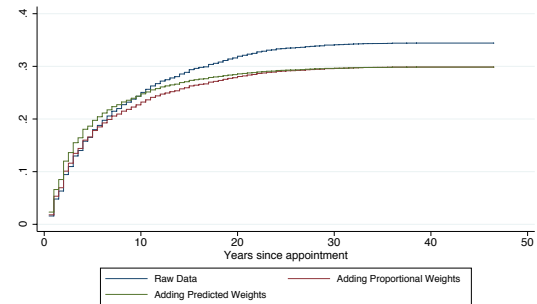


(d) Employment to Inactivity

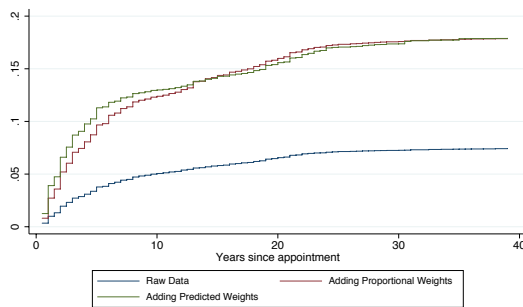
Figure 5.9: The impact of adding proportional and predicted longitudinal panel weights to the non-parametric Kaplan-Meier Survival and Cumulative Incidence Estimations, Male Workers, ages 15-49, Egypt.



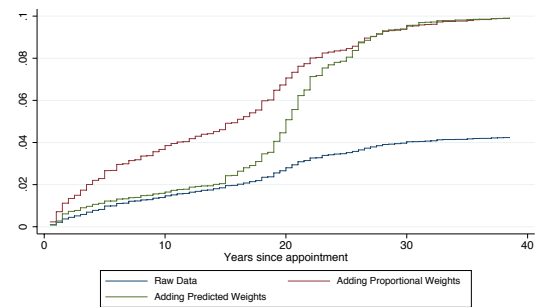
(a) KM Survival Function



(b) Job-to-job



(c) Employment to Unemployment



(d) Employment to Inactivity

Figure 5.10: The impact of adding proportional and predicted longitudinal panel weights to the non-parametric Kaplan-Meier Survival and Cumulative Incidence Estimations, Male Workers, ages 15-49, Jordan.

## 5.C Appendix

### 5.C.1 Determinants of transitions from unemployment

	UU		UE		UO	
	Males	Females	Males	Females	Males	Females
Age group (15-24 ommit.)						
25 - 34	0.029 (0.022)	0.019* (0.008)	-0.013 (0.022)	-0.017* (0.008)	-0.015*** (0.003)	-0.002 (0.001)
35-49	0.177*** (0.034)	0.005 (0.016)	-0.160*** (0.034)	-0.002 (0.016)	-0.016*** (0.003)	-0.002* (0.001)
Marital St. (Single ommit.)						
Marital St. (Married)	-0.104*** (0.022)	-0.000 (0.013)	0.092*** (0.022)	-0.002 (0.013)	0.012* (0.005)	0.002** (0.001)
Education (Illiterate ommit.)						
Read & Write	-0.011 (0.056)	0.047 (0.050)	0.019 (0.055)	-0.002 (0.042)	-0.008 (0.008)	-0.045 (0.029)
Below Intermediate	-0.039 (0.038)	0.075* (0.035)	0.035 (0.038)	-0.030 (0.023)	0.004 (0.010)	-0.045 (0.029)
Intermediate & above	-0.048 (0.033)	0.065* (0.033)	0.043 (0.032)	-0.022 (0.021)	0.005 (0.008)	-0.043 (0.028)
University & above	-0.074* (0.036)	-0.026 (0.035)	0.072* (0.035)	0.070** (0.024)	0.001 (0.008)	-0.044 (0.029)
Experience in job market	-0.012** (0.004)	-0.011*** (0.003)	0.013** (0.004)	0.009** (0.003)	-0.000 (0.002)	0.002** (0.001)
Experience Squared	0.000* (0.000)	0.001** (0.000)	-0.000* (0.000)	-0.000* (0.000)	-0.000 (0.000)	-0.000* (0.000)
Region (Rural areas ommit.)						
Greater Cairo	-0.049 (0.031)	-0.052** (0.020)	0.057 (0.031)	0.048* (0.019)	-0.009 (0.005)	0.005 (0.005)
Alex & Suez	-0.008 (0.027)	-0.038* (0.015)	0.010 (0.026)	0.035* (0.015)	-0.001 (0.006)	0.003 (0.002)
Urban areas	0.026 (0.019)	0.005 (0.007)	-0.021 (0.019)	-0.007 (0.007)	-0.005 (0.004)	0.002 (0.002)
No child below 6 (ommit.)						
Child below 6	-0.007 (0.024)	0.011 (0.014)	0.018 (0.023)	-0.012 (0.014)	-0.011 (0.007)	0.001 (0.001)
Household size	0.006 (0.005)	0.003 (0.003)	-0.005 (0.005)	-0.002 (0.003)	-0.000 (0.001)	-0.001 (0.000)
Unemp. Rate	0.010 (0.008)	0.002 (0.003)	-0.010 (0.008)	-0.001 (0.003)	0.000 (0.001)	-0.001 (0.001)
N(Obs.)	3762	6420	3762	6420	3762	6420
No. of transitions						

Table 5.12: Marginal Effects of Multinomial Regression of Transitions from Unemployment, by Gender , Ages 15-49 years old, Egypt 2001-2011

	UU			UE			UO		
	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights
Age group (15-24 ommit.)									
25 - 34	0.029 (0.022)	0.017 (0.020)	0.177*** (0.020)	-0.013 (0.022)	-0.006 (0.020)	-0.168*** (0.020)	-0.015*** (0.003)	-0.011*** (0.003)	-0.009*** (0.002)
35-49	0.177*** (0.034)	0.139*** (0.031)	0.251*** (0.020)	-0.160*** (0.034)	-0.127*** (0.031)	-0.241*** (0.020)	-0.016*** (0.003)	-0.012*** (0.003)	-0.010*** (0.002)
Marital St. (Single ommit.)									
Marital St. (Married)	-0.104*** (0.022)	-0.061** (0.020)	-0.141*** (0.025)	0.092*** (0.022)	0.055** (0.020)	0.119*** (0.025)	0.012* (0.005)	0.006 (0.003)	0.021** (0.007)
Education (Illiterate ommit.)									
Read & Write	-0.011 (0.056)	-0.010 (0.048)	-0.036 (0.049)	0.019 (0.055)	0.016 (0.048)	0.049 (0.048)	-0.008 (0.008)	-0.005 (0.006)	-0.013 (0.012)
Below Intermediate	-0.039 (0.038)	-0.036 (0.033)	-0.080* (0.034)	0.035 (0.038)	0.032 (0.032)	0.063* (0.031)	0.004 (0.010)	0.004 (0.008)	0.017 (0.019)
Intermediate & above	-0.048 (0.033)	-0.042 (0.028)	-0.074** (0.027)	0.043 (0.032)	0.039 (0.027)	0.077** (0.025)	0.005 (0.008)	0.003 (0.006)	-0.003 (0.012)
University & above	-0.074* (0.036)	-0.073* (0.031)	-0.129*** (0.033)	0.072* (0.035)	0.071* (0.031)	0.137*** (0.031)	0.001 (0.008)	0.002 (0.006)	-0.009 (0.013)
Experience in job market	-0.012** (0.004)	-0.012** (0.004)	-0.024*** (0.005)	0.013** (0.004)	0.011** (0.004)	0.023*** (0.004)	-0.000 (0.002)	0.001 (0.001)	0.001 (0.001)
Experience Squared	0.000* (0.000)	0.000* (0.000)	0.001** (0.000)	-0.000* (0.000)	-0.000* (0.000)	-0.001** (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Region (Rural areas ommit.)									
Greater Cairo	-0.049 (0.031)	-0.045 (0.029)	-0.100** (0.035)	0.057 (0.031)	0.049 (0.028)	0.105** (0.035)	-0.009 (0.005)	-0.004 (0.004)	-0.005 (0.004)
Alex & Suez	-0.008 (0.027)	-0.007 (0.024)	0.044 (0.028)	0.010 (0.026)	0.003 (0.023)	-0.042 (0.028)	-0.001 (0.006)	0.004 (0.007)	-0.001 (0.005)
Urban areas	0.026 (0.019)	0.019 (0.017)	0.028 (0.021)	-0.021 (0.019)	-0.016 (0.016)	-0.024 (0.021)	-0.005 (0.004)	-0.002 (0.003)	-0.004 (0.003)
No child below 6 (ommit.)									
Child below 6	-0.007 (0.024)	-0.015 (0.021)	-0.020 (0.024)	0.018 (0.023)	0.020 (0.021)	0.023 (0.024)	-0.011 (0.007)	-0.006 (0.005)	-0.002 (0.004)
Household size	0.006 (0.005)	0.007 (0.005)	0.013 (0.007)	-0.005 (0.005)	-0.006 (0.005)	-0.012 (0.007)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Unemp. Rate	0.010 (0.008)	0.006 (0.008)	0.007 (0.010)	-0.010 (0.008)	-0.004 (0.008)	-0.006 (0.010)	0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)
N(Obs.)	3762	3762	3762	3762	3762	3762	3762	3762	3762
No. of transitions									

Table 5.13: Marginal Effects of Multinomial Regression of Transitions from Unemployment, Male Workers , Ages 15-49 years old, Egypt 2001-2011

	UU		UE		<sup>a</sup>
	Males	Females	Males	Females	
15-24					
25 - 34	0.045 (0.033)	0.041 (0.028)	-0.045 (0.033)	-0.041 (0.028)	
35-49	0.166*** (0.048)	-0.061 (0.050)	-0.166*** (0.048)	0.061 (0.050)	
married=0					
married=1	-0.045 (0.029)	-0.015 (0.030)	0.045 (0.029)	0.015 (0.030)	
III.					
R&W	-0.061 (0.058)	0.430 (0.322)	0.061 (0.058)	-0.430 (0.322)	
Less than Int.	-0.120* (0.052)	0.365 (0.319)	0.120* (0.052)	-0.365 (0.319)	
Int. & above	-0.143** (0.054)	0.441 (0.314)	0.143** (0.054)	-0.441 (0.314)	
Univ & above	-0.209*** (0.059)	0.362 (0.317)	0.209*** (0.059)	-0.362 (0.317)	
exp	-0.023*** (0.005)	-0.031* (0.012)	0.023*** (0.005)	0.031* (0.012)	
exp_sq	0.001*** (0.000)	0.002* (0.001)	-0.001*** (0.000)	-0.002* (0.001)	
middle					
north	0.043* (0.020)	0.054 (0.029)	-0.043* (0.020)	-0.054 (0.029)	
south	0.068** (0.023)	0.118*** (0.029)	-0.068** (0.023)	-0.118*** (0.029)	
child=0					
child=1	-0.068 (0.041)	-0.006 (0.046)	0.068 (0.041)	0.006 (0.046)	
hhsz	0.006 (0.004)	-0.003 (0.006)	-0.006 (0.004)	0.003 (0.006)	
UR_official	0.022*** (0.006)	0.008 (0.008)	-0.022*** (0.006)	-0.008 (0.008)	
N(Obs.)	3544	1599	3544	1599	
No. of transitions					

Table 5.14: Marginal Effects of Multinomial Regression of Transitions from Unemployment, by Gender , Ages 15-49 years old, Jordan 2000-2010

<sup>a</sup>Only 6 male transitions were observed for Jordan from Unemployment to inactivity. I therefore chose to drop this category from the analysis.

	UU			UE		
	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights
Age group (15-24 ommit.)						
25 - 34	0.045 (0.033)	0.044 (0.031)	0.130*** (0.030)	-0.045 (0.033)	-0.044 (0.031)	-0.130*** (0.030)
35-49	0.166*** (0.048)	0.153*** (0.045)	0.273*** (0.045)	-0.166*** (0.048)	-0.153*** (0.045)	-0.273*** (0.045)
Marital St. (Single ommit.)						
Marital St. (Married)	-0.045 (0.029)	-0.021 (0.027)	-0.045 (0.029)	0.045 (0.029)	0.021 (0.027)	0.045 (0.029)
Education (Illiterate ommit.)						
Read & Write	-0.061 (0.058)	-0.049 (0.053)	-0.100 (0.113)	0.061 (0.058)	0.049 (0.053)	0.100 (0.113)
Below Intermediate	-0.120* (0.052)	-0.111* (0.048)	-0.058 (0.089)	0.120* (0.052)	0.111* (0.048)	0.058 (0.089)
Intermediate & above	-0.143** (0.054)	-0.125* (0.050)	-0.112 (0.090)	0.143** (0.054)	0.125* (0.050)	0.112 (0.090)
University & above	-0.209*** (0.059)	-0.193*** (0.055)	-0.141 (0.093)	0.209*** (0.059)	0.193*** (0.055)	0.141 (0.093)
Experience in job market	-0.023*** (0.005)	-0.023*** (0.004)	-0.013* (0.005)	0.023*** (0.005)	0.023*** (0.004)	0.013* (0.005)
Experience Squared	0.001*** (0.000)	0.001*** (0.000)	0.000 (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.000 (0.000)
Region (Middle ommit.)						
Region (North)	0.043* (0.020)	0.041* (0.019)	0.062* (0.024)	-0.043* (0.020)	-0.041* (0.019)	-0.062* (0.024)
Region (South)	0.068** (0.023)	0.068** (0.021)	0.207*** (0.022)	-0.068** (0.023)	-0.068** (0.021)	-0.207*** (0.022)
No child below 6 (ommit.)						
Child below 6	-0.068 (0.041)	-0.060 (0.038)	-0.014 (0.043)	0.068 (0.041)	0.060 (0.038)	0.014 (0.043)
Household size	0.006 (0.004)	0.006 (0.004)	0.006 (0.004)	-0.006 (0.004)	-0.006 (0.004)	-0.006 (0.004)
Unemp. Rate	0.022*** (0.006)	0.038*** (0.006)	0.039*** (0.006)	-0.022*** (0.006)	-0.038*** (0.006)	-0.039*** (0.006)
N(Obs.)	3544	3544	3544	3544	3544	3544

Table 5.15: Marginal Effects of Multinomial Regression of Transitions from Unemployment, Male Workers , Ages 15-49 years old, Jordan 2000-2010



## 5.C.2 Determinants of transitions from out of the labor force

	OO		OE		OU	
	Males	Females	Males	Females	Males	Females
Age group (15-24 ommit.)						
25 - 34	-0.040** (0.015)	0.015*** (0.001)	0.039** (0.014)	-0.005*** (0.001)	0.001 (0.007)	-0.009*** (0.001)
35-49	0.117*** (0.024)	0.019*** (0.001)	-0.084*** (0.024)	-0.008*** (0.001)	-0.033*** (0.002)	-0.011*** (0.001)
Marital St. (Single ommit.)						
Marital St. (Married)	-0.140*** (0.008)	0.005*** (0.002)	0.129*** (0.008)	-0.003* (0.001)	0.011** (0.004)	-0.002* (0.001)
Education (Illiterate ommit.)						
Read & Write	-0.088** (0.031)	-0.006 (0.004)	0.069* (0.029)	0.006 (0.004)	0.019 (0.014)	0.001 (0.001)
Below Intermediate	-0.039*** (0.011)	0.001 (0.001)	0.033** (0.011)	-0.001 (0.001)	0.005 (0.005)	0.000* (0.000)
Intermediate & above	-0.095*** (0.010)	-0.012*** (0.001)	0.070*** (0.010)	0.002* (0.001)	0.025*** (0.004)	0.010*** (0.001)
University & above	-0.059*** (0.011)	-0.041*** (0.002)	0.024* (0.010)	0.019*** (0.002)	0.035*** (0.004)	0.022*** (0.001)
Experience in job market	-0.023*** (0.005)	0.000 (0.001)	0.029*** (0.004)	0.001* (0.000)	-0.006** (0.002)	-0.001* (0.001)
Experience Squared	0.001*** (0.000)	-0.000 (0.000)	-0.001*** (0.000)	-0.000 (0.000)	0.000* (0.000)	0.000** (0.000)
Region (Rural areas ommit.)						
Greater Cairo	0.010 (0.009)	0.003 (0.002)	-0.010 (0.008)	0.002 (0.001)	0.000 (0.004)	-0.005*** (0.001)
Alex & Suez	0.009 (0.009)	0.003 (0.002)	-0.009 (0.009)	0.002 (0.001)	0.000 (0.004)	-0.005*** (0.001)
Urban areas	0.010 (0.006)	0.001 (0.001)	-0.013* (0.006)	-0.000 (0.001)	0.002 (0.003)	-0.001 (0.001)
No child below 6 (ommit.)						
Child below 6	0.030*** (0.008)	0.002 (0.002)	-0.024*** (0.007)	0.000 (0.001)	-0.006 (0.004)	-0.002* (0.001)
Household size	-0.000 (0.002)	0.001** (0.000)	0.002 (0.001)	-0.000 (0.000)	-0.001 (0.001)	-0.000 (0.000)
Unemp. Rate	0.007* (0.003)	0.001 (0.001)	-0.006* (0.003)	-0.001* (0.000)	-0.001 (0.002)	0.000 (0.000)
N(Obs.)	23921	95337	23921	95337	23921	95337

Table 5.16: Marginal Effects of Multinomial Regression of Transitions from Inactivity, by Gender , Ages 15-49 years old, Egypt 2001-2011

	OO			OE			OU		
	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights
Age group (15-24 ommit.)									
25 - 34	-0.040** -0.015 0.117*** -0.024	-0.035** (0.013) 0.093*** (0.013)	-0.099*** (0.019) 0.119*** (0.003)	0.039** -0.014 -0.084*** -0.024	0.032** (0.012) -0.061*** (0.013)	0.019 (0.013) -0.089*** (0.003)	0.001 -0.007 -0.033*** -0.002	0.003 (0.007) -0.032*** (0.002)	0.079*** (0.018) -0.031*** (0.001)
Marital St. (Single ommit.)									
Marital St. (Married)	-0.140*** -0.008	-0.093*** (0.007)	-0.297*** (0.012)	0.129*** -0.008	0.081*** (0.006)	0.193*** (0.011)	0.011** -0.004	0.012** (0.004)	0.104*** (0.011)
Education (Illiterate ommit.)									
Read & Write	-0.088** -0.031	-0.067** (0.026)	-0.139** (0.047)	0.069* -0.029	0.047* (0.022)	0.095* (0.044)	0.019 -0.014	0.020 (0.015)	0.043 (0.027)
Below Intermediate	-0.039*** -0.011	-0.028** (0.009)	-0.008 (0.007)	0.033** -0.011	0.022** (0.008)	0.004 (0.006)	0.005 -0.005	0.005 (0.004)	0.004 (0.004)
Intermediate & above	-0.095*** -0.01	-0.073*** (0.008)	-0.069*** (0.006)	0.070*** -0.01	0.048*** (0.007)	0.046*** (0.006)	0.025*** -0.004	0.025*** (0.004)	0.023*** (0.004)
University & above	-0.059*** -0.011	-0.049*** (0.008)	-0.158*** (0.009)	0.024* -0.01	0.015* (0.007)	0.116*** (0.009)	0.035*** -0.004	0.035*** (0.004)	0.042*** (0.005)
Experience in job market	-0.023*** -0.005	-0.016*** (0.004)	-0.032*** (0.008)	0.029*** -0.004	0.021*** (0.003)	0.031*** (0.009)	-0.006** -0.002	-0.005* (0.002)	0.001 (0.002)
Experience Squared	0.001*** (0.000)	0.001** (0.000)	0.001 (0.001)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001 (0.001)	0.000* (0.000)	0.000 (0.000)	-0.000 (0.000)
Region (Rural areas ommit.)									
Greater Cairo	0.01 -0.009	0.011 (0.007)	0.035*** (0.007)	-0.01 -0.008	-0.011 (0.006)	-0.030*** (0.006)	0.000 -0.004	-0.000 (0.004)	-0.005 (0.004)
Alex & Suez	0.009 -0.009	0.007 (0.008)	0.023** (0.008)	-0.009 -0.009	-0.008 (0.006)	-0.020** (0.007)	0.000 -0.004	0.000 (0.004)	-0.003 (0.004)
Urban areas	0.01 -0.006	0.008 (0.005)	0.022*** (0.006)	-0.013* -0.006	-0.011* (0.004)	-0.020*** (0.005)	0.002 -0.003	0.002 (0.003)	-0.001 (0.003)
No child below 6 (ommit.)									
Child below 6	0.030*** -0.008	0.020** (0.006)	0.031*** (0.007)	-0.024*** -0.007	-0.013* (0.005)	-0.010 (0.006)	-0.006 -0.004	-0.006 (0.004)	-0.022*** (0.004)
Household size	-0.000 -0.002	0.001 (0.001)	0.002 (0.002)	0.002 -0.001	0.001 (0.001)	-0.002 (0.001)	-0.001 -0.001	-0.001 (0.001)	-0.001 (0.001)
Unemp. Rate	0.007* -0.003	0.002 (0.003)	0.002 (0.003)	-0.006* -0.003	-0.001 (0.002)	-0.001 (0.003)	-0.001 -0.002	-0.001 (0.002)	-0.001 (0.002)
N(Obs.)	23921	23921	23921	23921	23921	23921	23921	23921	23921

Table 5.17: Marginal Effects of Multinomial Regression of Transitions from Inactivity, Male Workers , Ages 15-49 years old, Egypt 2001-2011

	OO		OE		OU	
	Males	Females	Males	Females	Males	Females
15-24	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
25 - 34	0.037* (0.016)	0.008*** (0.002)	-0.048*** (0.010)	-0.008*** (0.002)	-0.048*** (0.010)	-0.000 (0.001)
35-49	0.084*** (0.012)	0.017*** (0.002)	-0.058*** (0.009)	-0.011*** (0.002)	-0.058*** (0.009)	-0.006*** (0.001)
married=0	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
married=1	-0.086*** (0.013)	0.009*** (0.002)	0.070*** (0.011)	-0.002 (0.001)	0.070*** (0.011)	-0.008*** (0.001)
Ill.	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
R&W	-0.027* (0.011)	-0.000 (0.002)	0.008 (0.008)	0.000 (0.002)	0.008 (0.008)	-0.000 (0.001)
Less than Int.	-0.135*** (0.009)	-0.004 (0.002)	0.067*** (0.008)	0.001 (0.002)	0.067*** (0.008)	0.003*** (0.001)
Int. & above	-0.067*** (0.008)	-0.012*** (0.002)	0.043*** (0.007)	0.005* (0.002)	0.043*** (0.007)	0.007*** (0.001)
Univ & above	-0.101*** (0.010)	-0.061*** (0.004)	0.051*** (0.008)	0.028*** (0.003)	0.051*** (0.008)	0.033*** (0.003)
exp	-0.018*** (0.004)	-0.003*** (0.001)	0.023*** (0.004)	0.004*** (0.001)	0.023*** (0.004)	-0.001 (0.000)
exp_sq	0.001*** (0.000)	0.000** (0.000)	-0.001*** (0.000)	-0.000*** (0.000)	-0.001*** (0.000)	0.000 (0.000)
middle	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
north	0.008 (0.006)	-0.002 (0.002)	-0.016*** (0.004)	-0.002* (0.001)	-0.016*** (0.004)	0.004*** (0.001)
south	-0.012 (0.008)	-0.010*** (0.002)	-0.013* (0.005)	-0.003* (0.001)	-0.013* (0.005)	0.013*** (0.002)
child=0	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
child=1	-0.002 (0.018)	0.015** (0.005)	-0.006 (0.014)	-0.013** (0.004)	-0.006 (0.014)	-0.003 (0.003)
hhsize	0.001 (0.001)	0.000 (0.000)	-0.001 (0.001)	-0.000 (0.000)	-0.001 (0.001)	-0.000 (0.000)
UR_official	0.004* (0.002)	0.003*** (0.000)	-0.003* (0.001)	-0.000 (0.000)	-0.003* (0.001)	-0.003*** (0.000)
N(Obs.)	16280	52191	16280	52191	16280	52191
No. Of transitions						

Table 5.18: Marginal Effects of Multinomial Regression of Transitions from Inactivity, by Gender , Ages 15-49 years old, Jordan 2000-2010

	OO			OE			OU		
	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights	raw data	proportional weights	predicted weights
15-24	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
25 - 34	0.037* (0.016)	0.037* (0.016)	-0.012 (0.019)	-0.048*** (0.010)	-0.048*** (0.010)	-0.022* (0.010)	-0.048*** (0.010)	0.012 (0.013)	0.034 (0.018)
35-54	0.084*** (0.012)	0.084*** (0.012)	0.145*** (0.004)	-0.058*** (0.009)	-0.058*** (0.009)	-0.101*** (0.002)	-0.058*** (0.009)	-0.026*** (0.008)	-0.044*** (0.003)
married=0	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
married=1	-0.086*** (0.013)	-0.086*** (0.013)	-0.129*** (0.017)	0.070*** (0.011)	0.070*** (0.011)	0.041*** (0.010)	0.070*** (0.011)	0.015 (0.008)	0.088*** (0.016)
Ill.	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
R&W	-0.027* (0.011)	-0.027* (0.011)	0.002 (0.012)	0.008 (0.008)	0.008 (0.008)	-0.004 (0.012)	0.008 (0.008)	0.019** (0.007)	0.001 (0.001)
Less than Int.	-0.135*** (0.009)	-0.135*** (0.009)	-0.107*** (0.012)	0.067*** (0.008)	0.067*** (0.008)	0.052*** (0.011)	0.067*** (0.008)	0.068*** (0.005)	0.055*** (0.003)
Int. & above	-0.067*** (0.008)	-0.067*** (0.008)	-0.043*** (0.011)	0.043*** (0.007)	0.043*** (0.007)	0.033** (0.011)	0.043*** (0.007)	0.024*** (0.004)	0.010*** (0.001)
Univ & above	-0.101*** (0.010)	-0.101*** (0.010)	-0.215*** (0.016)	0.051*** (0.008)	0.051*** (0.008)	0.075*** (0.012)	0.051*** (0.008)	0.050*** (0.006)	0.140*** (0.012)
exp	-0.018*** (0.004)	-0.018*** (0.004)	-0.012 (0.025)	0.023*** (0.004)	0.023*** (0.004)	0.149*** (0.012)	0.023*** (0.004)	-0.005*** (0.002)	-0.137*** (0.021)
exp.sq	0.001*** (0.000)	0.001*** (0.000)	-0.000 (0.001)	-0.001*** (0.000)	-0.001*** (0.000)	-0.003*** (0.001)	-0.001*** (0.000)	0.000* (0.000)	0.003*** (0.000)
middle	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
north	0.008 (0.006)	0.008 (0.006)	0.000 (0.006)	-0.016*** (0.004)	-0.016*** (0.004)	-0.010* (0.004)	-0.016*** (0.004)	0.007 (0.004)	0.010* (0.005)
south	-0.012 (0.008)	-0.012 (0.008)	-0.008 (0.008)	-0.013* (0.005)	-0.013* (0.005)	-0.022*** (0.005)	-0.013* (0.005)	0.025*** (0.006)	0.030*** (0.007)
child=0	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
child=1	-0.002 (0.018)	-0.002 (0.018)	0.032 (0.025)	-0.006 (0.014)	-0.006 (0.014)	-0.062* (0.025)	-0.006 (0.014)	0.008 (0.012)	0.030*** (0.008)
hhsze	0.001 (0.001)	0.001 (0.001)	-0.003 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	0.001 (0.001)
UR_official	0.004* (0.002)	0.004* (0.002)	0.008*** (0.002)	-0.003* (0.001)	-0.003* (0.001)	0.000 (0.001)	-0.003* (0.001)	-0.001 (0.001)	-0.008*** (0.002)
N(Obs.)	16280	16280	16280	16280	16280	16280	16280	16280	16280

Table 5.19: Marginal Effects of Multinomial Regression of Transitions from Inactivity, Male Workers , Ages 15-49 years old, Jordan 2000-2010

### 5.C.3 Detailed Transitions

	NE->NE						NE->G						NE->F					
	Females			Males			Females			Males			Females			Males		
	No weights	Prop. Weights	Pred. Weights	No weights	Prop. Weights	Pred. Weights	No weights	Prop. Weights	Pred. Weights	No weights	Prop. Weights	Pred. Weights	No weights	Prop. Weights	Pred. Weights	No weights	Prop. Weights	Pred. Weights
Age group (15-24 ommit.)																		
25 - 34	0.004** (0.001)	-0.027** (0.010)	-0.031*** (0.009)	0.065*** (0.006)	-0.001 (0.001)	-0.002 (0.001)	0.031*** (0.005)	0.027*** (0.004)	-0.002 (0.003)	0.001 (0.000)	0.002 (0.003)	-0.001 (0.001)	-0.001 (0.001)	0.012** (0.005)	0.011** (0.004)	-0.008*** (0.002)		
35-54	0.008*** (0.001)	0.092*** (0.015)	0.061*** (0.011)	0.107*** (0.005)	-0.002* (0.001)	-0.002 (0.001)	-0.002 (0.006)	0.001 (0.005)	-0.014*** (0.002)	-0.007* (0.003)	-0.014*** (0.002)	-0.001* (0.001)	-0.001* (0.001)	-0.009 (0.005)	-0.007* (0.003)	-0.014*** (0.001)		
Marital St. (Single ommit.)																		
Marital St. (Married)	0.004** (0.001)	-0.128*** (0.007)	-0.082*** (0.006)	-0.183*** (0.010)	0.001 (0.001)	0.001 (0.001)	0.024*** (0.003)	0.016*** (0.002)	0.035*** (0.005)			-0.001* (0.001)	-0.001* (0.001)	0.026*** (0.003)	0.018*** (0.002)	0.031*** (0.005)		
Education (Illiterate ommit.)																		
Read & Write	-0.007* (0.004)	-0.067** (0.025)	-0.048* (0.020)	-0.086* (0.034)	0.004* (0.002)	0.002 (0.002)	0.002 (0.004)	0.002 (0.003)	0.002 (0.003)			0.000 (0.000)	0.000 (0.000)	0.008 (0.005)	0.006 (0.004)	0.008 (0.005)		
Below Intermediate	-0.000 (0.001)	-0.027* (0.011)	-0.019* (0.008)	-0.002 (0.006)	0.000 (0.000)	0.000 (0.000)	0.004 (0.002)	0.003 (0.002)	0.000 (0.001)			0.000 (0.000)	0.000 (0.000)	0.007** (0.003)	0.005** (0.002)	0.001 (0.001)		
Intermediate & above	-0.006*** (0.001)	-0.061*** (0.009)	-0.044*** (0.007)	-0.049*** (0.006)	0.004*** (0.000)	0.002 (0.001)	0.011*** (0.002)	0.008*** (0.001)	0.005*** (0.001)			0.002*** (0.000)	0.002*** (0.000)	0.015*** (0.002)	0.011*** (0.001)	0.006*** (0.001)		
University & above	-0.031*** (0.002)	-0.022* (0.010)	-0.017* (0.008)	-0.123*** (0.009)	0.028*** (0.002)	0.028*** (0.002)	0.026*** (0.003)	0.019*** (0.002)	0.035*** (0.005)			0.004*** (0.001)	0.004*** (0.001)	0.027*** (0.003)	0.019*** (0.002)	0.032*** (0.003)		
Experience in job market	-0.003*** (0.001)	-0.025*** (0.003)	-0.019*** (0.002)	-0.031*** (0.005)	0.001** (0.000)	0.001** (0.000)	0.001 (0.001)	0.001 (0.001)	0.002** (0.001)			0.001*** (0.000)	0.001*** (0.000)	0.006*** (0.001)	0.005*** (0.001)	0.008*** (0.002)		
Experience Squared	0.000*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001** (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)			-0.000** (0.000)	-0.000** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.001* (0.000)		
Region (Rural areas ommit.)																		
Greater Cairo	-0.001 (0.002)	0.004 (0.008)	0.005 (0.006)	0.019** (0.007)	-0.002* (0.001)	-0.002* (0.001)	0.000 (0.003)	-0.001 (0.002)	-0.007** (0.002)			0.003*** (0.001)	0.003*** (0.001)	0.014*** (0.001)	0.009*** (0.002)	0.010*** (0.003)		
Alex & Suez	-0.001 (0.001)	0.007 (0.008)	0.006 (0.006)	0.024*** (0.008)	0.000 (0.001)	0.000 (0.001)	0.011** (0.004)	0.006* (0.003)	0.007 (0.004)			0.002*** (0.001)	0.002*** (0.001)	0.012*** (0.003)	0.003*** (0.003)	0.004 (0.004)		
Urban areas	0.001 (0.001)	0.011* (0.006)	0.009* (0.004)	0.018** (0.005)	0.001 (0.001)	0.001 (0.001)	-0.001 (0.002)	-0.001 (0.002)	-0.002 (0.003)			-0.000 (0.000)	-0.000 (0.000)	-0.003 (0.002)	-0.002 (0.001)	-0.001 (0.002)		
No child below 6 (ommit.)																		
Child below 6	0.001 (0.001)	0.025*** (0.007)	0.014** (0.005)	0.018** (0.007)	0.000 (0.001)	0.000 (0.001)	-0.001 (0.002)	-0.001 (0.002)	-0.003 (0.003)			-0.002* (0.001)	-0.002* (0.001)	-0.005 (0.003)	-0.004* (0.002)	-0.007* (0.003)		
Household size	0.001** (0.000)	-0.000 (0.001)	0.000 (0.001)	0.003 (0.002)	-0.000 (0.000)	-0.000 (0.000)	0.001 (0.000)	0.000 (0.000)	0.001 (0.001)			0.000 (0.000)	0.000 (0.000)	-0.001* (0.001)	-0.001 (0.001)	-0.001 (0.001)		
Unemp. Rate	0.001* (0.000)	0.008** (0.003)	0.003 (0.002)	0.003 (0.003)	-0.000 (0.000)	-0.000 (0.000)	-0.002 (0.001)	-0.001 (0.001)	-0.002 (0.002)			0.000 (0.000)	0.000 (0.000)	-0.003* (0.001)	-0.002 (0.001)	-0.004 (0.002)		
N(Obs.)	101757	27683	27683	27683	101757	27683	27683	27683	27683			101757	27683	27683	27683	27683		

Table 5.20: Egypt

	NE -> I				NE -> NW			
	Females	Males No weights	Males Prop. Weights	Males Pred. Weights	Females	Males No weights	Males Prop. Weights	Males Pred. Weights
Age group (15-24 ommit.)								
25 - 34	-0.002** (0.001)	-0.012 (0.008)	-0.004 (0.006)	-0.040*** (0.004)	0.000 (0.001)	-0.004 (0.004)	-0.002 (0.003)	-0.015*** (0.002)
35-54	-0.004*** (0.001)	-0.071*** (0.008)	-0.048*** (0.006)	-0.061*** (0.004)	-0.000 (0.001)	-0.008 (0.010)	-0.007 (0.006)	-0.019*** (0.002)
Marital St. (Single ommit.)								
Marital St. (Married)	-0.003** (0.001)	0.058*** (0.006)	0.036*** (0.004)	0.090*** (0.008)	-0.001 (0.001)	0.020*** (0.003)	0.012*** (0.002)	0.028*** (0.004)
Education (Illiterate ommit.)								
Read & Write	0.001 (0.002)	0.044 (0.023)	0.030 (0.018)	0.067* (0.033)	0.001 (0.002)	0.013 (0.008)	0.010 (0.006)	0.009 (0.005)
Below Intermediate	0.001 (0.001)	0.003 (0.009)	0.001 (0.007)	-0.003 (0.005)	-0.001 (0.001)	0.012** (0.004)	0.010** (0.003)	0.005** (0.002)
Intermediate & above	0.001 (0.001)	0.018* (0.009)	0.013 (0.007)	0.027*** (0.005)	-0.001 (0.001)	0.016*** (0.003)	0.012*** (0.002)	0.012*** (0.001)
University & above	0.001 (0.001)	-0.038*** (0.009)	-0.027*** (0.006)	0.032*** (0.007)	-0.002*** (0.001)	0.007* (0.003)	0.005* (0.002)	0.024*** (0.003)
Experience in job market	0.001** (0.000)	0.013*** (0.002)	0.010*** (0.002)	0.016*** (0.004)	0.000 (0.000)	0.004*** (0.001)	0.003*** (0.001)	0.004*** (0.001)
Experience Squared	-0.000 (0.000)	-0.001** (0.000)	-0.000*** (0.000)	-0.001 (0.000)	-0.000 (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000** (0.000)
Region (Rural areas ommit.)								
Greater Cairo	0.003*** (0.001)	0.002 (0.007)	0.002 (0.005)	-0.003 (0.006)	-0.003*** (0.001)	-0.020*** (0.003)	-0.015*** (0.002)	-0.020*** (0.002)
Alex & Suez	0.003** (0.001)	-0.009 (0.006)	-0.005 (0.005)	-0.016** (0.006)	-0.003*** (0.000)	-0.021*** (0.003)	-0.015*** (0.002)	-0.019*** (0.002)
Urban areas	0.001 (0.000)	-0.006 (0.004)	-0.004 (0.003)	-0.012** (0.004)	-0.002*** (0.000)	-0.001 (0.003)	-0.001 (0.002)	-0.003 (0.003)
No child below 6 (ommit.)								
Child below 6	-0.000 (0.001)	-0.010 (0.005)	-0.004 (0.004)	-0.003 (0.005)	0.001 (0.001)	-0.009* (0.004)	-0.006* (0.003)	-0.004 (0.003)
Household size	-0.001*** (0.000)	-0.001 (0.001)	-0.001 (0.001)	-0.003** (0.001)	0.000 (0.000)	0.002*** (0.001)	0.001*** (0.000)	0.001 (0.001)
Unemp. Rate	-0.000 (0.000)	-0.002 (0.002)	0.001 (0.002)	0.003 (0.002)	-0.000* (0.000)	-0.001 (0.001)	-0.000 (0.001)	0.000 (0.001)
N(Obs.)	101757	27683	27683	27683	101757	27683	27683	27683
No. of transitions								

Table 5.21: Egypt

	NE->NE						NE->G						NE->F					
	Females			Males			Females			Males			Females			Males		
	No weights	Prop. Weights	Pred. Weights	No weights	Prop. Weights	Pred. Weights	No weights	Prop. Weights	Pred. Weights	No weights	Prop. Weights	Pred. Weights	No weights	Prop. Weights	Pred. Weights	No weights	Prop. Weights	Pred. Weights
Age group (15-24 ommit.)																		
25 - 34	0.007** (0.002)	0.017 (0.013)	0.017 (0.013)	0.017 (0.013)	0.017 (0.013)	0.017 (0.013)	0.001 (0.001)	-0.004 (0.005)	-0.015** (0.007)	0.002 (0.007)	0.002 (0.007)	-0.003** (0.001)	0.002 (0.001)	0.002 (0.007)	-0.003 (0.008)	0.002 (0.007)	0.002 (0.007)	-0.003 (0.008)
35-54	0.012*** (0.002)	0.069*** (0.011)	0.069*** (0.011)	0.069*** (0.011)	0.069*** (0.011)	0.069*** (0.011)	-0.002* (0.001)	-0.022*** (0.004)	-0.029*** (0.006)	-0.015*** (0.005)	-0.015*** (0.005)	-0.006*** (0.001)	-0.006*** (0.001)	-0.015*** (0.005)	-0.023*** (0.005)	-0.015*** (0.005)	-0.015*** (0.005)	-0.023*** (0.005)
Marital St. (Single ommit.)																		
Marital St. (Married)	0.006*** (0.002)	-0.068*** (0.010)	-0.068*** (0.010)	-0.068*** (0.010)	-0.068*** (0.010)	-0.068*** (0.010)	0.001 (0.001)	0.045*** (0.007)	0.026*** (0.007)	0.012* (0.005)	0.012* (0.005)	-0.004*** (0.001)	-0.004*** (0.001)	0.012* (0.005)	0.015* (0.006)	0.012* (0.005)	0.012* (0.005)	0.015* (0.006)
Education (Illiterate ommit.)																		
Read & Write	-0.001 (0.002)	-0.021* (0.010)	-0.021* (0.010)	-0.021* (0.010)	-0.021* (0.010)	-0.021* (0.010)	0.000 (0.001)	0.003 (0.004)	-0.003 (0.004)	0.002 (0.004)	0.002 (0.004)	0.001 (0.001)	0.001 (0.001)	0.002 (0.004)	-0.008 (0.008)	0.002 (0.004)	0.002 (0.004)	-0.008 (0.008)
Below Intermediate	-0.004* (0.002)	-0.093*** (0.008)	-0.093*** (0.008)	-0.093*** (0.008)	-0.093*** (0.008)	-0.093*** (0.008)	0.001* (0.001)	0.028*** (0.003)	0.027*** (0.003)	0.015*** (0.003)	0.015*** (0.003)	0.001 (0.001)	0.001 (0.001)	0.015*** (0.003)	0.007 (0.008)	0.015*** (0.003)	0.015*** (0.003)	0.007 (0.008)
Intermediate & above	-0.009*** (0.002)	-0.057*** (0.008)	-0.057*** (0.008)	-0.057*** (0.008)	-0.057*** (0.008)	-0.057*** (0.008)	0.003*** (0.001)	0.022*** (0.003)	0.014** (0.003)	0.014*** (0.003)	0.014*** (0.003)	0.004*** (0.001)	0.004*** (0.001)	0.014*** (0.003)	0.004 (0.008)	0.014*** (0.003)	0.014*** (0.003)	0.004 (0.008)
University & above	-0.045*** (0.004)	-0.083*** (0.009)	-0.083*** (0.009)	-0.083*** (0.009)	-0.083*** (0.009)	-0.083*** (0.009)	0.023*** (0.002)	0.034*** (0.004)	0.047*** (0.006)	0.041*** (0.005)	0.041*** (0.005)	0.018*** (0.002)	0.018*** (0.002)	0.041*** (0.005)	0.053*** (0.010)	0.041*** (0.005)	0.041*** (0.005)	0.053*** (0.010)
Experience in job market	-0.007*** (0.001)	-0.024*** (0.002)	-0.024*** (0.002)	-0.024*** (0.002)	-0.024*** (0.002)	-0.024*** (0.002)	0.002*** (0.000)	0.007*** (0.001)	0.009*** (0.002)	0.005*** (0.001)	0.005*** (0.001)	0.003** (0.001)	0.003** (0.001)	0.005*** (0.001)	0.009*** (0.001)	0.005*** (0.001)	0.005*** (0.001)	0.009*** (0.001)
Experience Squared	0.000*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	-0.000* (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Region (Middle ommit.)																		
Region (North)	0.001 (0.001)	0.018*** (0.005)	0.018*** (0.005)	0.018*** (0.005)	0.018*** (0.005)	0.018*** (0.005)	0.002** (0.001)	0.022*** (0.003)	0.026*** (0.003)	-0.016*** (0.002)	-0.016*** (0.002)	-0.003** (0.001)	-0.003** (0.001)	-0.016*** (0.002)	-0.018*** (0.003)	-0.016*** (0.002)	-0.016*** (0.002)	-0.018*** (0.003)
Region (South)	-0.000 (0.002)	0.011 (0.006)	0.011 (0.006)	0.011 (0.006)	0.011 (0.006)	0.011 (0.006)	0.007*** (0.001)	0.042*** (0.004)	0.026*** (0.004)	-0.017*** (0.003)	-0.017*** (0.003)	-0.003** (0.001)	-0.003** (0.001)	-0.017*** (0.003)	-0.023*** (0.003)	-0.017*** (0.003)	-0.017*** (0.003)	-0.023*** (0.003)
No child below 6 (ommit.)																		
Child below 6	0.017*** (0.005)	-0.009 (0.013)	-0.009 (0.013)	-0.009 (0.013)	-0.009 (0.013)	-0.009 (0.013)	-0.004 (0.002)	-0.002 (0.006)	-0.030* (0.012)	0.007 (0.005)	0.007 (0.005)	-0.009** (0.003)	-0.009** (0.003)	0.007 (0.005)	-0.015 (0.013)	0.007 (0.005)	0.007 (0.005)	-0.015 (0.013)
Household size	0.000 (0.000)	0.003* (0.001)	0.003* (0.001)	0.003* (0.001)	0.003* (0.001)	0.003* (0.001)	0.000 (0.000)	0.001* (0.000)	0.002** (0.001)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.001 (0.001)	0.000 (0.000)	0.000 (0.000)	0.001 (0.001)
Unemp. Rate	0.001* (0.000)	0.011*** (0.002)	0.011*** (0.002)	0.011*** (0.002)	0.011*** (0.002)	0.011*** (0.002)	-0.000 (0.000)	-0.005*** (0.001)	-0.005*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.001* (0.000)	-0.001* (0.000)	-0.004*** (0.001)	-0.005*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.005*** (0.001)
N(Obs.)	53790	19824	19824	19824	19824	19824	53790	19824	19824	53790	19824	53790	19824	53790	19824	53790	19824	19824

Table 5.22: Jordan



	NE -> I				NE -> NW			
	Females	Males No weights	Males Prop. Weights	Males Pred. Weights	Females	Males No weights	Males Prop. Weights	Males Pred. Weights
Age group (15-24 ommit.)								
25 - 34	-0.002* (0.001)	-0.014 (0.008)	-0.014 (0.008)	-0.034** (0.011)	0.000 (0.001)	-0.002 (0.007)	-0.002 (0.007)	-0.002 (0.011)
35-54	-0.004** (0.001)	-0.026*** (0.007)	-0.026*** (0.007)	-0.046*** (0.013)	0.000 (0.001)	-0.005 (0.007)	-0.005 (0.007)	-0.017 (0.015)
Marital St. (Single ommit.)								
Marital St. (Married)	-0.002* (0.001)	0.001 (0.006)	0.001 (0.006)	0.002 (0.006)	-0.000 (0.001)	0.009** (0.004)	0.009** (0.004)	0.007* (0.004)
Education (Illiterate ommit.)								
Read & Write	-0.001 (0.002)	0.011 (0.008)	0.011 (0.008)	-0.001 (0.009)	0.000 (0.001)	0.006** (0.002)	0.006** (0.002)	0.009 (0.006)
Below Intermediate	0.001 (0.001)	0.039*** (0.007)	0.039*** (0.007)	0.040*** (0.009)	0.000 (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.010*** (0.003)
Intermediate & above	0.001 (0.001)	0.011 (0.006)	0.011 (0.006)	0.008 (0.009)	0.000 (0.001)	0.011*** (0.002)	0.011*** (0.002)	0.008* (0.003)
University & above	0.004* (0.002)	-0.000 (0.006)	-0.000 (0.006)	0.005 (0.009)	0.001 (0.001)	0.009*** (0.002)	0.009*** (0.002)	0.016** (0.005)
Experience in job market	0.002*** (0.001)	0.010*** (0.001)	0.010*** (0.001)	0.012*** (0.002)	0.000* (0.000)	0.002** (0.001)	0.002** (0.001)	0.002 (0.001)
Experience Squared	-0.000* (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000 (0.000)	-0.000** (0.000)	-0.000** (0.000)	-0.000 (0.000)
Region (Middle ommit.)								
Region (North)	-0.002** (0.001)	-0.021*** (0.003)	-0.021*** (0.003)	-0.014*** (0.003)	0.001 (0.001)	-0.003 (0.002)	-0.003 (0.002)	-0.005 (0.003)
Region (South)	-0.003** (0.001)	-0.028*** (0.003)	-0.028*** (0.003)	-0.030*** (0.003)	-0.001** (0.000)	-0.008*** (0.002)	-0.008*** (0.002)	-0.012*** (0.002)
No child below 6 (ommit.)								
Child below 6	-0.005* (0.002)	0.006 (0.007)	0.006 (0.007)	-0.015 (0.011)	0.001 (0.001)	-0.002 (0.005)	-0.002 (0.005)	-0.010 (0.012)
Household size	-0.000 (0.000)	-0.004*** (0.001)	-0.004*** (0.001)	-0.003*** (0.001)	0.000 (0.000)	-0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)
Unemp. Rate	0.000 (0.000)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.001 (0.001)
N(Obs.)	53790	19824	19824	19824	53790	19824	19824	19824

Table 5.23: Jordan

## Chapter 6

# A Structural Estimation of Labor Market Frictions Using Data with Measurement Error: Evidence from Egypt and Jordan<sup>1</sup>

### 6.1 Introduction

Research on labor market dynamics of the MENA region and its policy implications remains disturbingly limited and at its infant phase. With high persistent unemployment rates over the last decade, there has been an increasing urge to explore the dynamics of these labor markets under the presence of search frictions awaiting to resolve the current paradox, where increasing GDP growth rates do not seem to create enough jobs to absorb new labor market entrants. Pissarides (2002) shows that the search equilibrium environment allows modeling an equilibrium in the labor market

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<sup>1</sup>This paper has previously been circulated under a different title “Structural labor market transitions and wage dispersion in Egypt and Jordan”. The construction of spells has been modified, recent waves of data sets are now used and recall/design measurement errors are now being considered. The estimation methodology is also modified to allow for both right and left censoring. The novel idea of this paper is mainly based on my Masters thesis at the University of Paris 1 Pantheon-Sorbonne. I would like to thank my masters’ thesis supervisor Fabien Postel-Vinay as well as my PhD supervisor François Langot for all the help and guidance. Microeconomics seminar Participants at the ETE masters program (2009-2010) also provided valuable remarks. Comments and suggestions, at early stages of this reasearch paper, from Ragui Assaad and Nicolas Jacquemet, are gratefully acknowledged.

in the presence of search frictions. Consequently, the time delay for an unemployed worker to access a job or for a firm to fill an open vacancy, is possibly explained.

In his review of the search equilibrium literature, Launov (2006) shows that there exists two main approaches to modeling search equilibrium on the labor market. This classification basically depends on the way the nature of search frictions and the nature of equilibrium wage setting are viewed. The first approach is to account for search frictions in the form of incomplete information about the available vacancies, which generates a time delay until the meeting/matching between the unemployed workers and firms with vacancies takes place. Diamond (1982), Mortensen (1982) and Pissarides (1985) adopted this approach. Wages are determined in this case through a Nash bargaining process as long as the application of the Nash solution to the equilibrium wage determination is justified (Binmore, Rubinstein, and Wolinsky, 1986). The second class of models assumes that search frictions result from workers' incomplete information about the offered wages. In this case workers receive take-it or leave-it wage offers (one per period) and have the choice to either accept or reject the offer before they can draw a new one. Early job search models adopted this approach that was added later on to the search equilibrium framework by Diamond (1971), Albrecht and Axell (1984) and Burdett and Mortensen (1998). Wages are hence determined in these models via a wage posting game among employers.

Assessing the inflows and outflows of unemployment becomes possible using the first approach where the transition rates can be obtained in function of labor market tightness, workers' search intensities..etc (Pissarides, 1990). Langot and Yassine (2015,2015b) (Chapters 3 and 4) choose to adopt this approach in an attempt to understand the nature of the dynamics of the Egyptian labor market, in terms of whether workers find jobs or not and how jobs are destroyed. This method however does not allow to portray the quality of jobs and movements of workers up the job ladder since it is less informative about on-the-job search and no endogenous wage offer distributions can be obtained. Empirical applications are consequently very limited using the first approach. In contrast, the second approach adopts a model with wage posting and on-the-job search which solves for a unique endogenous wage offer distribution which is a crucial feature that facilitates the estimation and the empirical application of the

model. This paper therefore chooses to focus on the second class of models.

These theoretical research efforts have been followed by a growing empirical literature dealing with the structural estimation of equilibrium search models to study persistent wage and unemployment differentials. Mortensen and Pissarides (1999) show that job and worker flows along with wage dispersion are the two main empirical phenomena that enable labor market analysis via the search framework. Eckstein and Van den Berg (2007) and Van Den Berg (1999) survey the empirical literature and discuss most applications of these models. Bowlus (1997) studies gender wage differentials, Bontemps, Robin, and Van den Berg (2000) discuss evidence of sectorial wage differences, Bowlus, Kiefer, and Neumann (2001) analyze the transition from school to work for young workers while Bowlus and Eckstein (2002) allow for discrimination and skill differentials in their estimations. Finally, Ridder and Berg (2003) and Jolivet, Postel-Vinay, and Robin (2006) provide cross-country comparisons of estimates from equilibrium search models.

In this paper, a rudimentary partial equilibrium job search model is used to estimate the structural labor market transitions between employment and non-employment states. No previous attempts, to the best of my knowledge, were made to estimate job search equilibrium models for the two MENA countries in question namely Egypt and Jordan. Employment and non-employment spells are obtained from extracted synthetic 6-year panels using retrospective information available in the Egypt labor market panel survey (ELMPS) fielded in 2012 and the Jordan labor market panel survey fielded in 2010.

Jolivet, Postel-Vinay, and Robin (2006) estimate a similar partial equilibrium job search model a la Burdett-Mortensen. They however allow for wage cuts when workers move from one job to the other, referring to those as involuntary job moves. This paper's labor turnover model and estimation methodology resemble theirs except that it is not possible to allow for wage cuts given the information available in the datasets used. Jolivet, Postel-Vinay, and Robin (2006) also show the close correspondance between the determinants of labor turnover and wage mobility, and the determinants of the cross-sectional wage distribution. This correspondance is used in this paper to be able to exploit the datasets available for the countries in question, (*i*) to provide a quantitative

measure of the search frictions and (ii) to test to what extent the model fits the data i.e. reality and the particular nature of these developing countries' labor markets.

The analysis in this paper adopts Bontemps, Robin, and Van den Berg (2000) two-step semi-parametric estimation procedure. First, the accepted earnings distribution is non-parametrically estimated. Second, these estimates are used to recover frictional parameters using maximum likelihood techniques. Along with Mortensen (2003), Bontemps, Robin, and Van den Berg (2000) have also demonstrated that both heterogeneity in firms' productivity and search frictions are necessary to fit the wage distribution. Although, this paper focuses on the labor supply side, this context is implicitly taken into consideration to allow for a theoretical wage distribution that fits its empirical counterpart.

Previous literature using the same or similar datasets such as Assaad, Krafft, and Yassine (2015) (chapter 2 and Langot and Yassine (2015) (chapter 3) have shown however that the retrospective information obtained from Egypt labor market panel surveys (ELMPS) for instance, suffer from what is referred to as recall and design bias. Following the same steps as in Yassine (no date) (chapter 5), the aggregate labor market transition rates are corrected by estimating the measurement errors using auxiliary information for each country to match true unbiased population moments (whether transitions or stocks). These are then used to create readily-used longitudinal panel weights for each individual spell dependent on the state occupied at the start and at the end of the spell as well as its duration and the type of transition occurring after it ends. Not only that the paper is used to study the labor market differentials between the two MENA countries (Egypt and Jordan), it also aims at measuring to what extent the estimated labor market frictional parameters can be biased due to measurement error in retrospective accounts.

The analysis in this paper focuses on the labor market imperfections and provides a quantitative measure of the importance of frictions for each country for a sample of male private wage workers between 15 and 49 years of age in the year 2006 and 2004 for Egypt and Jordan respectively. The frictional parameters are also examined among two age-groups, namely "the youngs 15-24 years old" and "the olds 25-49 years old". The estimations are carried out using maximum likelihood techniques delivering frictional

transition parameters for each country, for the samples with and without longitudinal correcting panel weights, as well as for two different age groups. Indeed, the data used contains sufficient information on wages, labor markets states, durations and transitions required to identify the model's structural transition parameters. However, the major advantage of using these labor market panel surveys (ELMPS and JLMPS) is that they have similar questionnaires' structures. This paper is therefore using homogenised similar data for the two MENA countries. This allows for interesting intra and inter-country comparisons.

The main findings of the paper can be summarized as follows. In general, the Jordanian labor market is more flexible than the Egyptian, especially among the younger group of workers; job durations are relatively shorter. In contrast, Egyptian young workers have shorter non-employment spells. In Egypt, the duration of remaining non-employed declines with age; as one gets older (more precisely moves from the 15-24 years old group to the 25-49 years old group), job offers arrive at a faster rate. In Jordan, however, non-employment durations get shorter for the old group of workers and are shorter than that for the Egyptian old workers. Young Egyptian workers are found to have the highest level of search frictions ( $\kappa_1$  estimates being the smallest), relative to the older Egyptian workers and Jordanian workers -both young and old. This implies that the firms' monopsony power in this trench of the Egyptian market is the highest leading to low levels of salaries. Since small firms tend to pay lower wages, a higher density of small sized firms is captured for the Egyptian market. This result is confirmed by the empirical data. This paper also shows that correcting for the recall and design bias in the used datasets matters significantly to the estimation of the job destruction probabilities. The estimates of the index of search frictions is as a result sensitive to this correction.

The rest of the paper is divided as follows. Section 2 overviews the data treatment and the descriptive statistics of the analysis samples used. A model, along the lines of chapters 3 and 5, is built to correct for the recall and design bias allowing to attribute

proportional weights<sup>2</sup> to the micro-data to be able to use it the estimations. The third section provides a description of the partial equilibrium job search model estimated. Section 4 describes the estimation methodology, the empirical results obtained and compares the extent and nature of search frictions when using or not using correcting panel weights, across the three countries and across the different age groups. Section 5 concludes.

## 6.2 Data and Sampling

### 6.2.1 A Brief Description of the Samples

Data from Egypt and Jordan are used. The third rounds of the Egypt Labor Market Panel Survey (ELMPS), fielded in 2012 and the Jordan Labor Market Panel Survey (JLMPS) of 2010 are exploited. The surveys are nationally representative including both detailed current employment and nonemployment information as well as labor market histories that allow for an assessment of employment and nonemployment transitions and spells' durations. The surveys elicit information on cross-sectional earned wages and detailed individual characteristics. The major advantage of the two surveys used, lies in the similarity between their questionnaires' structures<sup>3</sup>. The datasets are therefore closely homogenized and harmonized for the three countries allowing interesting inter-country comparisons.

The analysis sample of this study consists of a cohort of private male wage workers, between 15 and 49 years of age for each country. Using guidelines and assumptions from Yassine (2014) (chapter 1), semi-annual employment/non-employment retrospective trajectories have been extracted over a period of 6 years preceding the year of survey, i.e. 2006-2012 for Egypt and 2004-2010 for Jordan.

Female workers are excluded to avoid gender wage differentials' and labor force participation issues. Female workers' movements in and out of employment are likely

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<sup>2</sup>Proportional weights are currently used for simplicity, assuming that all individuals making the same type of transition in the same year mis-report retrospectively the same way. Further work is needed to relax this assumption and to carry out the estimations using differentiated predicted weights, as in chapter 5.

<sup>3</sup>See chapter 1 for a detailed discussion of the structure of these surveys, the type of questions used to survey the respondents and the way the answers are coded in the data.

to be driven by personal motives such as child birth and marriage. Moreover, since I rely on retrospective information to create synthetic panel datasets, the sample is limited to ages 15-49, to avoid backward attrition as discussed by (Yassine, 2014). This is mainly done to avoid including in the analysis old groups of people that may not be well representative in the retrospective panel since some old people might have been alive back in 2006 and 2004 for Egypt and Jordan respectively but were not present to be interviewed in the year of the survey. One of the aims of the paper is to capture, if any, the differentials between the younger and older group of the sample in terms of frictional transition parameters and wage dispersion. For this purpose, distinction is made between two age group sub-samples, 15 to 24 years of age and 25 to 49 years of age. The estimations are therefore re-run separately for each sub-sample for each country.

Table 6.1 provides an overview of the descriptive statistics of the samples and sub-samples used in the estimations. All durations are estimated in years and the wages are in local currency rates. The wage distributions were observed to have very long tails. To avoid the estimation procedure being sensitive to outliers in the wage data, the lowest and highest 0.75% (for Egypt) and 1.5% (for Jordan) of the wage observations in each sample and sub-sample are trimmed.



	Egypt			Jordan		
	ALL	15-24 years	25-49 years	ALL	15-24 years	25-49 years
<b>No. of individuals</b>	<b>7001</b>	<b>4001</b>	<b>3000</b>	<b>3218</b>	<b>1798</b>	<b>1420</b>
Employed	4776	1999	2777	1683	577	1106
Unemployed	2225	2002	223	1535	1221	314
Age	25.13	19.30	32.91	25.76	18.77	34.62
(std. dev.)	(8.35)	(2.82)	(6.81)	(9.32)	(2.79)	(6.84)
<b>Unemployed</b>	<b>31.78%</b>	<b>50.04%</b>	<b>7.43%</b>	<b>47.70%</b>	<b>67.91%</b>	<b>22.11%</b>
utoj	927	873	54	437	373	64
	41.66%	43.61%	24.22%	28.47%	30.55%	20.38%
Mean spell length	5.11	4.83	9.55	10.31	10.91	6.77
(std. dev.)	3.13	(2.60)	(6.21)	(5.99)	(6.04)	(4.26)
Right Censored	1298	1129	169	1098	848	250
	58.34%	56.39%	75.78%	71.53%	69.45%	79.62%
Left Censored	1918	1712	206	1317	1033	284
	86.20%	85.51%	92.38%	85.80%	84.60%	90.45%
<b>Employed</b>	<b>68.22%</b>	<b>49.96%</b>	<b>92.57%</b>	<b>52.30%</b>	<b>32.09%</b>	<b>77.89%</b>
jtoj	767	420	347	513	226	287
	16.06%	21.01%	12.50%	30.48%	39.17%	25.95%
Mean spell length	8.41	6.14	11.16	8.73	5.98	10.89
(std. dev.)	(6.06)	(3.67)	(7.15)	(5.99)	(3.52)	(6.61)
jtou	318	186	132	225	69	156
	6.66%	9.30%	4.75%	13.37%	11.96%	14.10%
Mean spell length	10.03	6.55	14.94	11.91	6.71	14.21
(std. dev.)	(7.27)	(3.35)	(8.40)	(7.85)	(3.54)	(8.14)
Right Censored	3691	1393	2298	945	282	663
	77.28%	69.68%	82.75%	56.15%	48.87%	59.95%
Left Censored	4405	1719	2686	1558	500	1058
	92.23%	85.99%	96.72%	92.57%	86.66%	95.66%
<b>Wage Distribution</b>						
Min	108.33	100	120	52	48	60
Max	8000	7000	12966.67	5720	4180	7870
P10	403.24	400	433.33	150	150	150
Median	864.5	842	900	250	250	270
P90	1562	1542.67	2000	600	500	833.33
P90/P10	3.87	3.86	4.62	4.00	3.33	5.56
Skewness	3.49	3.47	5.81	5.51	6.09	4.90
Kurtosis	23.49	23.98	49.76	35.74	42.78	28.97
Mean	1006.09	972.6	1174.28	407.05	347.61	538.84
(std. dev.)	(709.15)	(658.78)	(1199.64)	(664.13)	(504.95)	(1007.83)

a. Durations are expressed in years. These spells' lengths account for left censored observations i.e. those spells which started before 2006 (for Egypt) and 2004 (for Jordan). They exclude right censored observations.

b. Wages are monthly wages expressed in local currencies.

Table 6.1: Descriptive Statistics

## 6.2.2 Creating Longitudinal Recall Weights

Since the structural estimations of the job search model rely mainly on duration data, I was concerned by how biased the results might be if start and end dates of spells are mis-reported or if some spells are even reported at all. The limitations and potential errors synthetic panel data, constructed from retrospective accounts, are subject to, were discussed by previous literature working with the same data attempting to build conclusions on the dynamics of the labor markets in the MENA region. Assaad, Krafft, and Yassine (2015) (chapter 2) have provided detailed evidence on how different labor market statuses, especially unemployment, are prone to misreporting over time, comparing retrospective and contemporaneous data for the same individuals over time using the Egypt Labor Market Panel Surveys (ELMPS) 1998, 2006 and 2012. In an attempt to measure the impact of the new Egypt labor law implemented in 2004 on the job finding and separation time series flows of the country, (Langot and Yassine, 2015) (chapter 3) were concerned by the recall and design bias observed in the data. Even with high quality collection methods and accurate cross-validated questions, the Egypt labor market panel survey and retrospective information are subject to a memory bias (recall error), where individuals tend to over-report their past employment statuses and under-report their non-employment spells especially the short ones. The way the survey is designed and questions are interpreted might have also contributed to what (Langot and Yassine, 2015) refer to as a potential design bias in the data. Given the very rich information obtained about the most recent employment/non-employment vector versus relatively limited information about past trajectories, the observed underestimation of separations and over-estimation of job findings as one goes back in time is accentuated.

(Langot and Yassine, 2015) proposed a theoretical model to correct the aggregate transition rates obtained from the retrospective data with the assumption that the contemporaneous panel data transitions and stocks rates are the correct ones. In the latter paper, this methodology has been adopted given that three waves of the Egypt labor market panel survey 1998, 2006 and 2012 are available. To be able to correct the aggregate transition rates obtained from the retrospective accounts of the ELMPS 2012, auxiliary information is therefore used from the contemporaneous information

(i.e. the unbiased information) obtained from the ELMPS 1998 and 2006 surveys. The retrospective panels extracted for Jordan, given the similar structure of the survey's questionnaire, are biased as well due to the recall and design errors. The available JLMPS 2010 is however the first and only round of the survey fielded in Jordan. Yassine (no date) (chapter 5) proposed to derive auxiliary information on true unbiased population stocks moments from comparable annual cross-sectional labor force surveys, the Employment and Unemployment Surveys (EUS), conducted by the Jordanian department of Statistics (DOS) as well as non-employment to employment job finding rates and employment to non-employment separation rates for the years between 2007-2010, from the annual Job Creation Surveys (JCS), to be able to identify the correction model in this case.

Following the same steps as in chapter 5, the first step adopted in correcting the recall and design bias observed in the data, is matching the stocks' and transitions' moments of the biased data with true auxiliary information to be able to estimate the associated error terms to each type of transition on the aggregate level. Consequently, the way the model is estimated differs between Egypt and Jordan, because of the differences in the auxiliary data availability and the number of waves of Labor Market Panel Survey fielded in the country. For both countries, the model is over-identified and further work is needed to develop tests of fit for the model. The model is used to structurally estimate, using a Simulated Method of Moments (SMM), a function representing the "forgetting rate" conditional on the individual's state in the labor market. Chapters 3 and 5 describe in details the setting of the model and the identification strategy for each of the two countries using the relevant datasets.

The second step of the correcting technique is then distributing the estimated measurement errors among the sample's individual observations/transactions in the form of micro-data weights, such that observations that are being under-reported take higher weights and those over-reported take lower weights. This shows that it is sufficient to have population (i.e. stocks) and transitions moments to correct over- or under-reporting biases in retrospective data. Once the moments are matched on the aggregate level, a measurement error for each type of transition at a point in time  $t$  is estimated. This measurement error can then be attributed among the sample's individual obser-

vations, reported for this specific type of transition in year  $t$ , in the form of micro-data transitions weights per transition transaction per year. This can be done via two ways, as explained in chapter 5: a simple proportional attributing method or a differentiated predicting method. These two methods depend on whether one assumes if individuals making the same transition in year  $t$  mis-report the same way or not.

For the sake of simplicity at this stage of the paper, the error terms are distributed proportionally in the form of an adjustment factor ( $r_{ilk}(t-1, t)$ ) among the sample's individuals depending on the type of transition  $lk$  the individual undergoes between the years  $t-1$  and  $t$ , with  $lk = EE, EU, EI, UE, UU, UI, IE, II, IU$ . First, a total correction factor is calculated for each type of transition  $lk$  (from state  $l$  in year  $t-1$  to  $k$  in year  $t$ ). For a specific type of transition in a certain year, this is done by dividing the corrected transition rate by the observed transition rate and multiplying by the number of individuals who made this transition in that year. In simple words, this measures by how much the observed biased transition rate in year  $t$  need to be redressed on the aggregate level to obtain the true corrected rate. This can be written formally as follows;

$$R_{lk}(t-1, t) = \frac{\lambda_{lk}(t-1, t) \pm \Psi_z}{\lambda_{lk}(t-1, t)} \times n_{lk}(t-1, t) \quad (6.1)$$

where  $\lambda_{lk}(t-1, t)$  is the transition rate from state  $l$  occupied in  $t-1$  to the state  $k$  occupied in  $t$ . These rates are obtained by aggregating the expanded number of individuals making the transition  $lk$  from the year  $t-1$  to year  $t$  in the constructed retrospective panels and dividing by the stock of  $l$  in the year  $t-1$ <sup>4</sup>.  $n$  is the number of individuals experiencing the transition  $lk$  from year  $t-1$  to year  $t$  and  $\Psi_z$  is the associated error term estimated on the macro aggregate level (depending on the way it was estimated for each country). An individual ( $r_{ilk}(t-1, t)$ ) adjustment factor is then calculated to be the attributed weight to the micro-data transitions  $lk$ . This is done here proportionally, i.e. assuming that all individuals mis-report the same way and hence they are all equiprobable and get the same weight, if they make the same

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<sup>4</sup>See chapter 1 for the way flows, such as job finding and separation rates, are calculated.

type of transition between the year  $t - 1$  and the year  $t$ . This leads to :

$$\begin{aligned} r_{ilk}(t-1, t) &= \frac{1}{n_{lk}(t-1, t)} \times R_{lk}(t-1, t) \\ &= \frac{\lambda_{lk}(t-1, t) \pm \Psi_z}{\lambda_{lk}(t-1, t)} \end{aligned} \quad (6.2)$$

Figures 6.1 and 6.2 show how these weights correct labor market flows and stocks obtained from the longitudinal retrospective panel datasets.

The final step of the correction methodology would be how to use these weights in the structural estimation of the job search model, which relies mainly on spell duration data. For this purpose longitudinal panel weights for each spell are created, such that the panel weight is the product of all the adjustment factors  $r_{jt}$  from the start year till end year of a given spell. The longitudinal panel weight for a given spell  $n$  of individual  $i$  that starts in year  $t$  and ends in year  $T$  is therefore given by the following expression:

$$w_{in} = \prod_{t=t}^T r_{jti}$$

Figure 6.3 uses the average job turnover indicators over a 6-year period for both Egypt and Jordan that we obtain in table 6.1. It shows the weighted non-parametric Kaplan-Meier smoothed job spell hazard rates for the overall samples of both countries as well as by age groups. Although these estimates might not be very precise due to the high percentage of censored observations in the samples, but they demonstrate very interesting and obvious inter-country differences. It is noted that the Jordanian labor market is more flexible than the Egyptian, especially among the younger group of workers; job durations are shorter. These curves suggest a slight negative duration dependence in Egypt and in contrast a positive duration dependence in Jordan, particularly among the old workers.

Figure 6.4 finally plots the non-parametric Kaplan-Meier estimates on the non-employment spell smoothed hazard rates i.e. the job accession rates. These estimates include both new labor market entrants and job re-accessions after a job separation. Once again, different patterns in the duration dependence in both countries are ob-

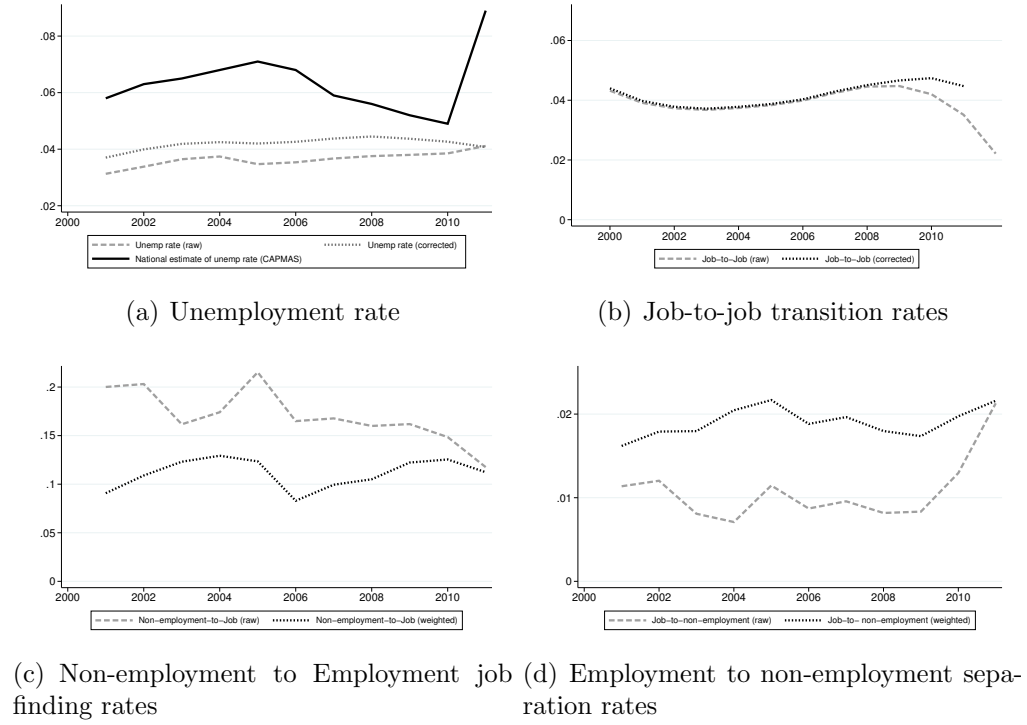


Figure 6.1: Corrected descriptive statistics for stocks and flows obtained using synthetic panel data of ELMPs 2012, male workers in **all sectors**, ages 15-49 years old

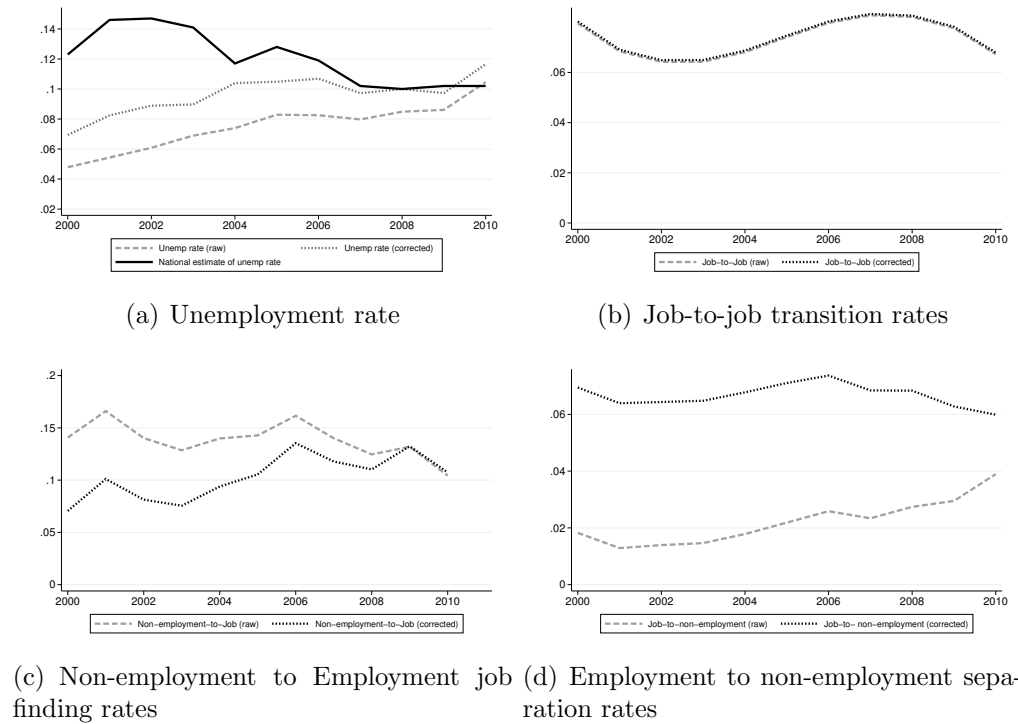


Figure 6.2: Corrected descriptive statistics for stocks and flows obtained using synthetic panel data of JLMPS 2010, male workers in **all sectors**, ages 15-49 years old

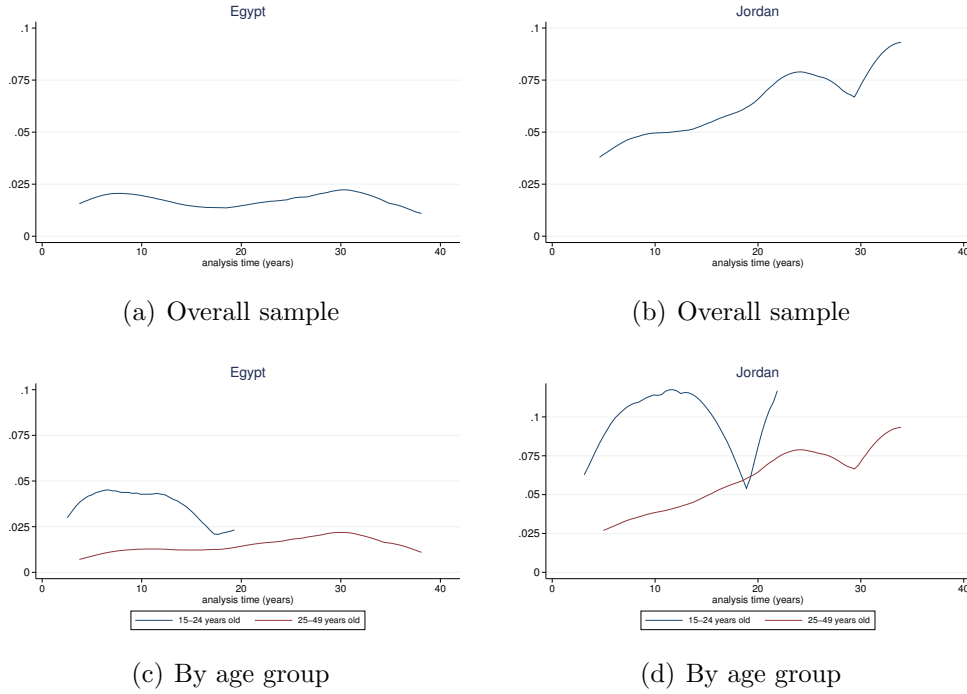


Figure 6.3: Job spell hazard rates (job durations in years), male private wage workers, 15-49 years of age

served. For Egypt, job accession rate is high at relatively short durations (i.e. early years of the labor market career) then drops abruptly to remain constant at longer durations. This negative duration dependence is observed for both young and old Egyptian workers. In Jordan the pattern is different. In general, Jordanian workers seem to access jobs later than their Egyptian peers (late labor market entrants)<sup>5</sup>. Job accession rates are in general low for the 15-24 years old group, yet are relatively high at shorter durations and reveal a negative duration dependence pattern. Positive duration dependence is observed however for the old group of workers till it reaches the peak at about 20 years then drops abruptly afterwards.

<sup>5</sup>It's important to note here that in the construction of the non-employment spells, when the elapsed duration could not be deduced through the retrospective accounts, this is assumed to be the date at which the individual turned 15 years old i.e. the minimum age to be considered in the analysis sample.

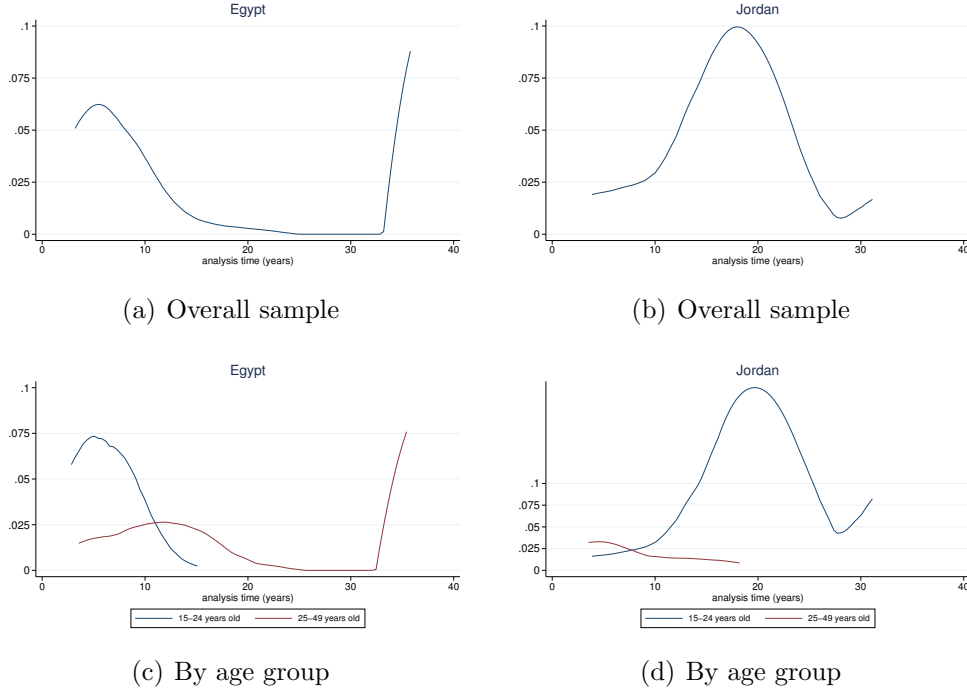


Figure 6.4: Non-employment hazard rates (non-employment durations in years), male private wage workers, 15-49 years of age

## 6.3 The Burdett-Mortensen Model

### 6.3.1 The environment

This section provides a description of the partial equilibrium job search model to be estimated, along the lines of Burdett and Mortensen (1998) and Bontemps, Robin, and Van den Berg (2000). Focus is made on the supply side that is populated by a continuum of *ex ante* identical workers whose behavior is characterized by the standard job search model with on-the-job search. These workers are risk-neutral agents who maximize their expected present value of future income stream with infinite horizon;  $m$  is the large number of these homogenous workers in the economy. It is assumed that the worker can be in one of two states, employed or unemployed and  $u$  is the number of unemployed. Workers are assumed to search for jobs both when employed and when unemployed. In both cases the probability of receiving an offer is distributed according to a standard poisson process where  $(\lambda_0)$  is the arrival rate of job offers while unemployed, and  $(\lambda_1)$  when employed.  $\phi$  is the reservation wage when unemployed, whereas the wage earned  $w$  is the reservation wage when employed. When unemployed



a worker has utility flow given by  $b$ ; this is assumed equal among workers and can be interpreted as the value of leisure (or non-market time) or the level of unemployment benefit per period net of search costs.

When employed, workers earn their wage  $w$ . There is no endogenous job destruction deriving from productivity shocks, but  $\delta$  is the exogenous probability that a job is destroyed at every moment in time. Define  $\kappa_0 = \lambda_0/\delta$  and  $\kappa_1 = \lambda_1/\delta$ .  $\kappa_1$  is used later on as a measure of the importance of search frictions in the market. Finally, let  $F(w)$  represent the distribution of wages offered to workers and  $G(w)$  the distribution of wages actually paid to (i.e. accepted by) the employed workers. The latter is the earnings distribution.

### 6.3.2 Worker behavior

Given this framework, the present value of being unemployed,  $U$ , solves the continuous asset pricing equation

$$\rho U = b + \lambda_0 \left( \int_{\underline{w}}^{\bar{w}} \max\{V(x), U\} dF(x) - U \right) \quad (6.3)$$

where  $\rho$  is the common discount rate,  $V(w)$  is the lifetime utility that a worker derives from working for a wage of  $w$ ,  $\bar{w}$  is the upper bound of the support of  $F$  and  $\underline{w}$  is the lowest posted wage (the lower support of  $F$ ) ;  $\underline{w} = \max\{\phi, w_{min}\}$  , where  $w_{min}$  can be any institutional wage floor. This equation simply states that the opportunity cost of unemployment, the left-hand side of 6.3, is equal to the sum of the value of non-market time and the expected gain of finding an acceptable job, the right-hand side of 6.3. Analogously, the present value of being employed at wage  $w$ , solves

$$\rho V(w) = w + \delta(U - V(w)) + \lambda_1 \left( \int_{\underline{w}}^{\bar{w}} \max\{V(x), V(w)\} dF(x) - V(w) \right) \quad (6.4)$$

which consists of the current wage, the likelihood and value of becoming unemployed (getting laid off) and the likelihood and value of receiving an alternative job offer. It is obvious that the utility flow of the employed worker is assumed to be equal to his

current wage (i.e.  $w$ ).

Since  $V(w)$  increases with  $w$ <sup>6</sup> and  $U$  is independent of it, there exists a reservation wage  $\phi$  such that the indifference condition  $V(w) = U$ . By Virtue of 6.3 and 6.4 and integrating by parts, one obtains a formal definition of  $\phi$  as follows:

$$\phi = b + (\lambda_0 - \lambda_1) \int_{\phi}^{\bar{w}} \frac{\bar{F}(x)}{\rho + \delta + \lambda_1 \bar{F}(x)} dx. \quad (6.5)$$

Burdett and Mortensen (1998) shows that focusing on the limiting case of zero discounting and setting  $\rho = 0$ , equation 6.5 can be re-written in the following simpler form:

$$\phi = b + (\kappa_0 - \kappa_1) \int_{\phi}^{\bar{w}} \frac{\bar{F}(x)}{1 + \kappa_1 \bar{F}(x)} dx \quad (6.6)$$

This equation defines the reservation wage  $\phi$  as a function of the structural parameters of the model.

Equation 6.6 explains how the possibility on-the-job search affects the optimal search strategy of an unemployed worker. If wage offers arrive more frequently when unemployed than when employed ( $\lambda_0 > \lambda_1$ ), the reservation wage  $\phi$  exceeds the value of non-market time  $b$ . In that case it is more rewarding to search while unemployed and the worker rejects wage offers in the interval  $(b, \phi)$ , even though this might cause a utility loss over the short run. When the arrival rate is independent of employment status ( $\lambda_0 = \lambda_1$ ), the worker is indifferent between searching while employed and while unemployed. Any job that compensates for the foregone value of non-market time is acceptable in this case and thus  $\phi = b$ . If on-the-job search is not possible ( $\lambda_1 = 0$ ), the expression in (6) reduces to the standard optimality condition. This discussion is crucial for the interpretation of the model's estimated parameters and is used in explaining the estimation results over the next section.

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<sup>6</sup> $V'(w) = \frac{1}{\rho + \delta + \lambda_1 \bar{F}(w)}$

### 6.3.3 Steady-state stocks and flows

The equation of motion of unemployment in this economy is given by the difference between the inflow and the outflow of the stock. It therefore follows that in steady state,

$$\delta(m - u) = \lambda_0[1 - F(\phi)]u \quad (6.7)$$

Since no worker would be willing to accept a wage lower than the reservation wage,  $F(\phi)$  is therefore equal to zero. This implies using further manipulations that the equilibrium unemployment rate is as follows:

$$\frac{u}{m} = \frac{\delta}{\delta + \lambda_0} = \frac{1}{1 + \kappa_0}, \quad (6.8)$$

Using an analogous argument the steady-state earnings distribution  $G$  can be derived. This represents the cross-sectional wage distribution of currently employed workers, associated with a given wage offer distribution  $F$ . Given the initial allocation of workers to firms, the number of workers employed receiving a wage no greater than  $w$  is  $G(w)(m - u)$ ; the evolution of this stock over time is therefore

$$\frac{dG(w)(m - u)}{dt} = \lambda_0 F(w)u - \{\delta + \lambda_1[1 - F(w)]\}G(w)(m - u), \quad (6.9)$$

The outflow (second term of the right-hand side of equation 6.9) is simply equal to the sum of workers previously holding a job that has been destroyed (i.e. laid off, losing their job due to a demand shock) and those who find a better opportunity (receiving an offer greater than  $w$ ) and hence quit their old job. The inflow consists of those workers who are already unemployed and receive an offer greater than  $\phi$  but still less than  $w$  (the first term on the right-hand side of 6.9). In a steady state, these flows should be equal. A structural relationship between the distribution of wages actually paid to employed workers and the distribution of wages offered can therefore be derived as follows:

$$\begin{aligned}
G(w) &= \frac{F(w)}{\delta + \lambda_1[1 - F(w)]} \cdot \frac{\lambda_0 u}{m - u} \\
&= \frac{F(w)}{1 + \kappa_1[1 - F(w)]} \\
&\Leftrightarrow \\
1 - F(w) &= \frac{1 - G(w)}{1 + \kappa_1 G(w)}
\end{aligned} \tag{6.10}$$

for all  $w$  on the common support of  $F$  and  $G$ . Since workers tend to move up the wage range over time, the earnings distribution lies to the right of the wage offer distribution, or more formally,  $G$  first-order stochastically dominates  $F$  as  $F(w) - G(w) \geq 0$  for all  $w$  and  $\kappa_1 \geq 0$ . The discrepancy between the earnings and wage offer distributions depends on  $\kappa_1$  which is equal to the expected number of wage offers during a spell of employment (which may consist of several consecutive job spells) and can be thought of a relative measure of competition among firms for workers. With  $g(w)$  and  $f(w)$  being the densities of the corresponding cumulative distributions, it is also possible to re-write the above structural relationship between the earnings and offered wages as in equation 6.11.

$$f(w) = \frac{1 + \kappa_1}{[1 + \kappa_1 G(w)]^2} g(w) \tag{6.11}$$

The model also allows to predict the average size of a firm  $l(w|\phi, F)$ , in equation 6.12, offering a wage  $w$  given  $\phi$  and  $F$ . This specifies the steady state number of workers available to a firm offering a particular wage conditional on the wage offered by other firms (i.e.  $F$ ) and the workers' reservation wage  $\phi$ , given uniform random sampling of firms.  $l(w|\phi, F)$  is increasing in  $w$  and continuous on the support of the distribution  $F$ .

$$\begin{aligned}
l(w|\phi, F) &= \frac{g(w)}{f(w)}(m - u) \\
\Leftrightarrow l(w|\phi, F) &= \frac{[1 + \kappa_1 G(w)]^2}{1 + \kappa_1}(m - u)
\end{aligned} \tag{6.12}$$

## 6.4 Estimation

### 6.4.1 The Likelihood Function

In the analysis sample, individuals are sampled from the stock of nonemployed and employed workers, rather than the flow. The contribution of an individual's spell to the likelihood function therefore depends on the state he/she is in at the year  $t = 0$ , i.e. 2006 for the Egyptian sample and 2004 for the Jordanian. A binary variable indicates the state of the agent in year  $t = 0$ , where unemployed workers take 0 and employed 1. Only the first spell that is in progress at the date  $t = 0$  when the individuals are sampled, is used. Information on subsequent spells are not used. Individuals who were self-employed or employed by the government for some period during the time span of the 6-year observation period are dropped. The behaviour of public and non-wage workers as well as their employers are likely to differ to a great extent from the behavior explained by the model. It is also important to note that no distinction is made between unemployed and out of the labor force. The empirical counterpart of the theoretical state of unemployment in the model is therefore nonemployment; this includes both the unemployed as well as the non-participants.

Some spells might have started before the date of sampling  $t = 0$ . These spells are left censored and are denoted by an indicator  $c_{il}$  with  $i = 0, 1$ . An elapsed duration  $t_{il}$  (with  $i = 0, 1$ ) is therefore defined as the duration from the moment a spell started until the sampling date. For individuals who ever worked, the elapsed date is deduced from the retrospective accounts of the surveys. For individuals who never worked, if the spell started before the year  $t = 0$  and the elapsed date is not provided by the retrospective questions of the survey, this is assumed to be the date at which the individual turns 15 years old (which is the minimum age to be considered in our sample). Right-censored observations are those spells in progress beyond the observation period. These are denoted by the indicator  $c_{ir}$ , with  $i = 0, 1$ . The duration from the sampling date until the moment at which the spell ends is defined as the residual duration  $t_{ir}$ . The total duration of an individual's spell  $t_i$  is therefore the sum of the elapsed  $t_{il}$  and residual  $t_{ir}$  durations.

For each worker in the sample, the earned wage; denoted by  $w$ , is observed. Since

wages are not available in the retrospective information obtained from the ELMPS and the JLMPS, only the cross-sectional wages' distributions of 2012 and 2010 in Egypt and Jordan respectively, are used as a proxy for all wage purposes in the model <sup>7</sup>

About the distribution of the spells' durations, it is known that at a certain time  $t_i$  after the start of the spell, a renewal of states (a transition) takes place. Since the backbone process of the model is Poisson, the waiting time between any two adjacent events is then exponentially distributed with parameter  $\theta$ . Renewal probability for  $Poi(\theta)$  is shown to be equal to  $\theta$  (see Lancaster (1990)). The appropriate density for the spells' durations can therefore be defined as follows:

$$f(t_i) = \theta e^{-\theta t_i} \quad (6.13)$$

For the unemployed agents, the corresponding Poisson rate is just  $\lambda_0$ . For the employed ones, the Poisson rate is a sum of transition intensities to either unemployment  $\delta$  or a better-paid job  $\lambda_1 \bar{F}(w)$ , i.e.  $\theta = \delta + \lambda_1 \bar{F}(w)$ .

To complete the formulation of the individual contributions to the likelihood one notes that:

- **For Unemployed:** Equilibrium probability of sampling an unemployed agent is given by  $\frac{u}{m} = \frac{\delta}{\delta + \lambda} = \frac{1}{1 + \kappa_0}$ . In case an unemployment-to-job (utoj) transition is observed, the offered wage and the value of the wage offer density  $f(w_0)$  are known and can be recorded.
- **For Employed:** Equilibrium probability of sampling an agent who earns wage  $w$  is  $g(w)\lambda_0/(\delta + \lambda_0) = g(w)\kappa_0/(1 + \kappa_0)$ . The model allows for two types of transitions from employment: employment to unemployment (jtou) and job-to-job transition (jtoj). The probabilities of renewal to unemployment and to another job are  $Pr(j \rightarrow u) = \delta/(\delta + \lambda_1 \bar{F}(w))$  and  $Pr(j \rightarrow j) = \lambda_1 \bar{F}(w)/(\delta + \lambda_1 \bar{F}(w))$  respectively.

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<sup>7</sup>This should not be a strong assumption. In the estimation, wages are needed to obtain the earned wages density. This is done for the unemployed who have acquired a job at the end of their spell or for the employed who have switched jobs. The cross-sectional years represent the last year of a 6-year panel observation period. In developing countries such as Egypt and Jordan, the occurrence of multiple spells over a period of 6 years is not very common. The wage observed by the end of the observation period is therefore most likely the wage accepted by the end of a recorded individual's spell.

For both the employed and the unemployed, an incompletely observed spell duration (i.e. a right censored spell duration) is taken into consideration where renewal probabilities are dropped and the density is replaced by the survivor function.

With this, the likelihood functions of an unemployed individual  $L_0$  and of an employed individual  $L_1$  become

$$L_0 = \frac{\lambda_0^{2-c_{0r}-c_{0l}}}{1+\kappa_0} \exp\{-\lambda_0 \times t_0\} f(w)^{1-c_{0r}} \quad (6.14)$$

$$\begin{aligned} L_1 = & \frac{\kappa_0}{1+\kappa_0} g(w) [\delta + \lambda \bar{F}(w)]^{1-c_{1l}} \exp - [\delta + \lambda_1 \bar{F}(w)](t_1) \times \left\{ \left[ \frac{\lambda_1 \bar{F}(w)}{\delta + \lambda_1 \bar{F}(w)} \right]^v \right. \\ & \times \left. \left[ \frac{\delta}{\delta + \lambda_1 \bar{F}(w)} \right]^{1-v} \right\}^{1-c_{1r}} \end{aligned} \quad (6.15)$$

where  $v = 1$ , if there is a job-to-job transition, and 0 otherwise.

Since labor force surveys are being exploited, the theoretical wage offer distribution and density functions are unknown. No analytical solution for  $F(w)$  is available. A “nonparametric two-step procedure” is therefore adopted as proposed by (Bontemps, Robin, and Van den Berg, 2000) for the estimation of the structural parameters.

1. On the first step, the non-parametric estimates of  $G(w)$  and  $g(w)$  are computed, using a gaussian kernel estimator for the density  $g(w)$  and the empirical cumulative distribution for  $G(w)$ . Let  $\hat{G}(w)$  and  $\hat{g}(w)$  denote such estimates. Conditional on  $\kappa_1$ , consistent estimates of  $\bar{F}$  and  $f$  are

$$\hat{\bar{F}} = \frac{1 - \hat{G}(w)}{1 + \kappa_1 \hat{G}(w)}$$

and

$$\hat{f}(w) = \frac{1 + \kappa_1}{[1 + \kappa_1 \hat{G}(w)]^2} \hat{g}(w)$$

2.  $\bar{F}$  and  $f$  are then replaced in the likelihood function by the preceding expressions

to be able to obtain a baseline set of parameter estimates  $\hat{\lambda}_0$ ,  $\hat{\lambda}_1$ ,  $\hat{\delta}$  and  $\hat{\kappa}_1$  by maximizing the sample log-likelihood function separately for each country and for each age agroup. Since one of the aims of this paper is to test to what extent the search frictions parameters' estimates might be biased due to recall and design bias, the estimation for each sample (or sub-sample) is conducted twice, with and without the created longitudinal panel recall weights.

## 6.4.2 Empirical Results

	Egypt		Jordan	
	Raw Data	With panel weights	Raw Data	With panel weights
<b>All</b>				
$\lambda_0$	0.173 [0.161,0.184]	0.173 [0.162,0.184]	0.0885 [0.0810,0.0961]	0.0916 [0.0846,0.0985]
$\lambda_1$	0.18 [0.163,0.197]	0.171 [0.152,0.191]	0.171 [0.154,0.188]	0.187 [0.166,0.208]
$\delta$	0.106 [0.0986,0.113]	0.131 [0.119,0.143]	0.0533 [0.0485,0.0581]	0.0768 [0.0698,0.0837]
$\kappa_1$	1.698 [1.518,1.878]	1.305 [1.120,1.490]	3.208 [2.796,3.620]	2.435 [2.10,2.77]
<b>15-24 years</b>				
$\lambda_0$	0.189 [0.176,0.202]	0.191 [0.179,0.202]	0.0793 [0.0717,0.0870]	0.0787 [0.0716,0.0859]
$\lambda_1$	0.267 [0.236,0.299]	0.262 [0.221,0.302]	0.328 [0.283,0.373]	0.401 [0.339,0.463]
$\delta$	0.178 [0.164,0.192]	0.224 [0.200,0.248]	0.0847 [0.0743,0.0950]	0.117 [0.102,0.131]
$\kappa_1$	1.500 [1.303,1.697]	1.170 [0.951,1.388]	3.872 [3.185,4.560]	3.427 [2.768,4.068]
<b>25-49 years</b>				
$\lambda_0$	0.158 [0.130,0.186]	0.15 [0.116,0.185]	0.204 [0.164,0.244]	0.212 [0.180,0.244]
$\lambda_1$	0.151 [0.128,0.174]	0.144 [0.121,0.166]	0.133 [0.114,0.152]	0.139 [0.117,0.160]
$\delta$	0.0395 [0.0342,0.0447]	0.0448 [0.0373,0.0524]	0.0366 [0.0313,0.0419]	0.0538 [0.0464,0.0612]
$\kappa_1$	3.823 [3.084,4.561]	3.214 [2.462,3.967]	3.634 [2.925,4.343]	2.584 [2.071,3.096]

Table 6.2: Estimation Results

This section presents in table 6.2 the estimation results obtained for each country with and without the longitudinal panel recall weights. Generally among all the samples and sub-samples, the estimates for  $\lambda_0$  and  $\lambda_1$  are robust. Almost the same results are



obtained whether the recall weights are being used or not. The panel weights however play a crucial role in the estimation of the job destruction parameter  $\delta$  and consequently the search frictions index  $\kappa_1$ . The job destruction estimates are significantly underestimated if one does not take into consideration the recall and design bias in the data. Conclusions about the magnitude of search frictions can therefore be misled. With higher job destruction rates, the level of search frictions is higher driving the estimates of  $\kappa_1$  to be significantly smaller after correction. It's important to highlight here that the estimations of the frictional parameters in this paper are obtained using annual durations over a 6-year observation period. That being said, these rates are relatively low when compared to other countries' estimations reflecting the rigidity of these labor markets.

Examining the results obtained from the Egyptian sample, the arrival rate of acceptable wage offers when unemployed is found to be significantly lower than when employed for the young workers. For this young group of workers, searching on the job is more rewarding than searching when unemployed. Interestingly, their reservation wage  $\phi$  is extremely low to the extent that it might be lower than the non-market time  $b$ . Young Egyptian workers do however have a higher rate of finding jobs, whether unemployed or employed, than the older workers. For the older group 25-49 years, however, the difference between searching for a job when unemployed or employed becomes nil. Their reservation wage  $\phi$  is relatively higher but just as high as the foregone value of the non-market time. In Jordan, the pattern is slightly similar except that as it has been shown in the descriptive statistics, Jordanians access jobs later than the Egyptians. This could possibly be explained by Jordanians spending more years in education (i.e. non-participation) than Egyptians. The rate of arrival of acceptable wage offers when unemployed for the old group (25-49 years old) is much higher (more than double) than that of the youngs. Yet, the same pattern applies as one compares the  $\lambda_0$  and  $\lambda_1$ . Again for the youngs, it is more worth it to search on-the-job than when unemployed. The situation for the unemployed ameliorates as one gets older, where  $\lambda_0$  exceeds  $\lambda_1$ . The reservation wage of this group is higher than the value of non-market time.

According to these results, the estimated average duration of non-employment in

Egypt is 5.7 years and 11 years in Jordan. It's crucial to note here that the empirical counterpart of the unemployment state in the theoretical model is non-employment. These durations of non-employment therefore include years of inactivity as well, which might be the reason why these durations do seem lengthy. The non-employment duration varies by age group where in Egypt the young workers might take up to 5 years to access a job while older workers can stay up to 6.7 years. It's very interesting that for Jordan it's the other way around. Older unemployed agents in Jordan only take up to 4.7 years to access jobs, while the young unemployed agents can stay trapped (voluntarily in case of education) in non-employment up to 12 years.

In both countries, the young group of workers experience more job-to-job transitions (i.e. more churning in this market), with the young Jordanians being the most mobile. The average duration (for the overall sample) of an employment relationship terminated by a job-to-job transition is almost the same for both countries, of about 5.3-5.8 years. The estimated parameters for the age group sub samples however show that much of the churning occurs in both countries among the young aged groups. That's when the on-the-job search activity is relatively high. As an individual grows older, the  $\lambda_1$  rate slows down to almost the half in Egypt and the third in Jordan.

The very rigid and immobile nature of these MENA region countries becomes even confirmed as one examines the rate at which jobs are being destroyed. Unsurprisingly, the rate at which a job is destroyed for an individual of age 15-24 years old is significantly higher than that of a worker aged 25-49 years. Generally, the  $\delta$  estimates, even after correction from the measurement error, are strikingly low. The extent to how measurement errors are able to bias our estimates become obvious as we compare the weighted and unweighted average duration of a job ending with a separation. Indeed, estimates of the job destruction parameters become significantly distorted when the recall and design bias is ignored.

In general the estimated parameters are very low, reflecting the rigidity of these labor markets. One might think that this might be partly artificial due to the fact that all spells are truncated from below at six months<sup>8</sup>. These parameters would be in that case biased downwards. In a non-truncated sample, the estimated parameter

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<sup>8</sup>See chapter 1 for a discussion on the questionnaires and the data recorded by the enumerators.

converges to the true parameter  $1/\mathbf{E}(d)$ , where  $d$  is a variable of observed durations  $d_1, d_2, d_3, \dots, d_n$  of  $n$  individuals. When the sample is truncated, the biased parameter would converge to  $1/\mathbf{E}(d|d \geq \underline{D})$ , where  $\underline{D}$  is the duration below which the spells are truncated. By how much the estimated parameter in that case would be biased mainly depends on the probability of having durations that are below  $\underline{D}$ , i.e. in our case below six months. If this probability is very small, which is thought to be the case in Egypt and Jordan given their labor market institutional framework as well as their employment culture (chapter 1), the difference between the estimated parameter using truncated and non-truncated spells would be negligible.

In addition to the transition parameters of the model, table 6.2 provides estimates of the “summary index of search frictions”  $\kappa_1 = \lambda_1/\delta$ . This index gives a measure of the speed at which workers climb the wage ladder, as well as the average number of offers received in the time interval before the next worker becomes unemployed. One notes that the two labor markets suffer from high levels of search frictions with relatively low estimates of  $\kappa_1$ . This is particularly true for the young Egyptian private waged workers. It is also important to note that the significant difference in the magnitude of these indices when weighted and unweighted originates mainly from the differences between the corrected and uncorrected delta. Again, this confirms the importance of correcting the data before building up conclusions on these labor markets since estimates of frictional parameters in this case can be misleading and over-estimated as in the case of the  $\kappa_1$ . Assuming an equal opportunity of receiving better offers during the year, young workers in Egypt receive more job offers during the year than their older peers, but the opposite is true in Jordan.

Moreover, the theoretical model shows that the distribution of earned wages  $G(w)$  first-order stochastically dominates  $F(w)$ . The extent of this phenomenon depends on the magnitude  $\kappa_1$ . It’s simply a measure of inter-firm competition on the labor market. If  $\kappa_1$  tends to zero, this means that  $\lambda_1$  tends to zero, meaning that employed workers never get higher job values than what firms are offering them. In simple words, it means that once a worker draws from  $F(w)$  (i.e. accepts a job), he/she actually gets stuck there since it’s very unlikely to find a better job with a better offer.  $G(w)$  becomes confounded then with  $F(w)$  and the workers tend to accept what

they are offered. Conversely, as  $\kappa_1$  becomes large, the distribution  $G(w)$  becomes more and more concentrated at high job values. In the limit where  $\kappa_1$  tends to infinity, employed workers tend to move immediately to the most valuable job or firm in the market (simply the best job with the best offer); in other words, tending towards a Walrasian labor market. The estimated low  $\kappa_1$  results and figures 6.5, 6.6 and 6.7 show that both countries incline more towards the monopsonistic case of the market, especially the young group of workers in Egypt. According to the theoretical model, small firms pay low wages and big firms pay higher wages. Given the low levels of salaries in both countries, higher densities of small firms (figures 6.11, 6.12 and 6.13) are obtained. Again, the density of small firms is the highest among the young Egyptian workers since they have the highest level of search frictions. Appendix 6.A shows all corresponding probability density functions of these figures.

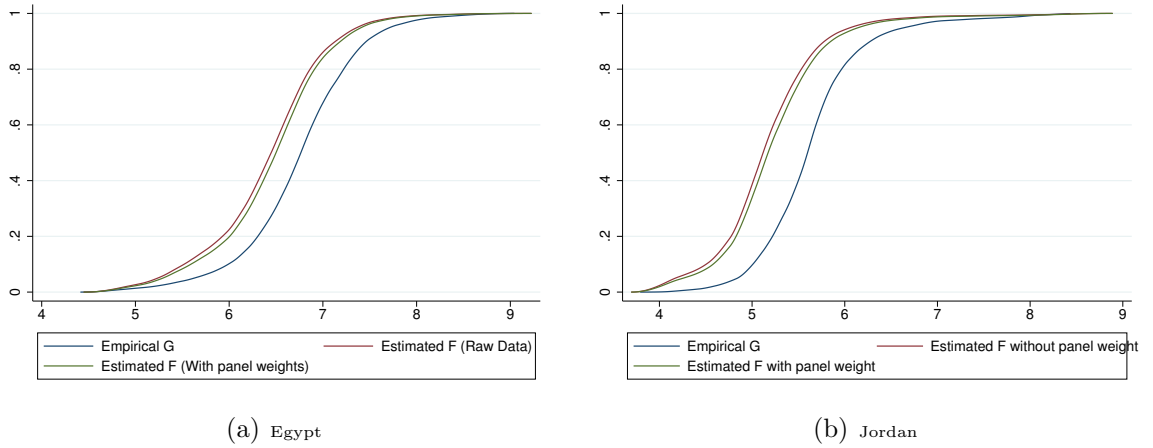


Figure 6.5: Private male wage workers, 15-49 years of age (All sample)

### 6.4.3 Goodness of fit

Although the model delivers interesting intra and inter-country comparisons of the search friction parameters and the underlying distributions of wages and firms' sizes, one needs to assess how close these estimations are to the observed empirical data and whether they fit reality. Previous empirical literature has used informal graphical data fit analysis tests for the model for this purpose. These eyeball tests can be done using our datasets to get a sense of how well the model is doing in explaining the Egyptian

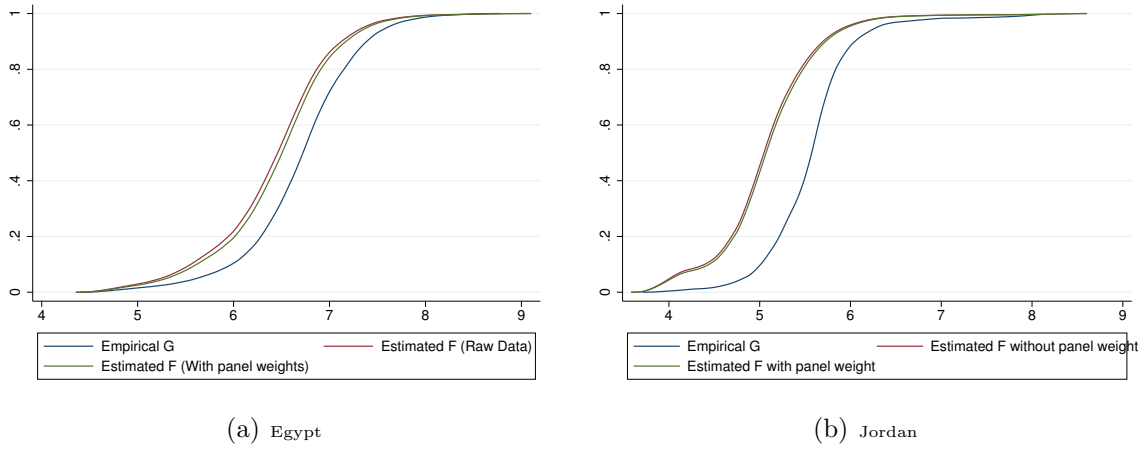


Figure 6.6: Private male wage workers, 15-24 years of age

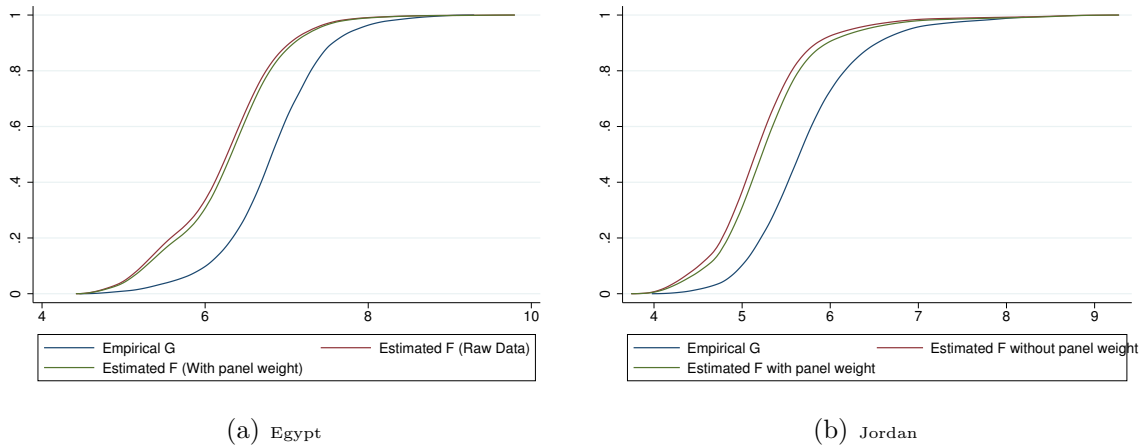


Figure 6.7: Private male wage workers, 25-49 years of age

and Jordanian labor markets.

Following Jolivet, Postel-Vinay, and Robin (2006), the cdf of wages accepted by workers who were just hired from unemployment can be used as a direct estimator  $\hat{F}^0(\cdot)$  of the wage offers sampling estimated sampling distribution  $F(\cdot)$ . Empirically, this direct estimator confirms the first stochastic dominance of the earnings distribution over the offered wages as suggested in the theoretical model, for the overall sample and the young age groups. The wage distributions however get slightly distorted for the old Egyptian age group, probably due to the small number of observations used in the non-parametric estimation. Figure 6.10 still plots the empirical  $F$ , of the old Egyptian workers however, to get at least an idea of the level of  $F$ . The predicted theoretical  $\hat{F}(\cdot)$  obtained using the maximum likelihood estimate of  $\kappa_1$ , is then compared to the

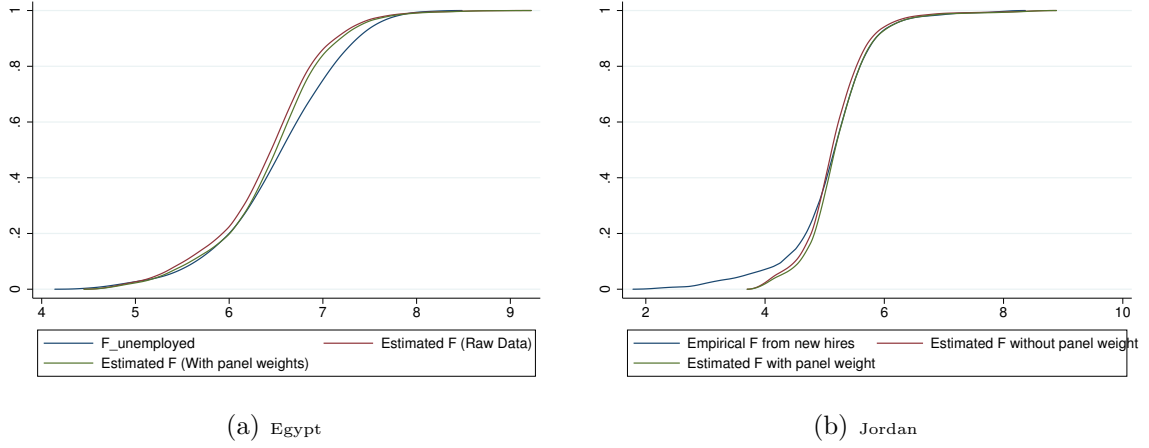


Figure 6.8: Private male wage workers, 15-49 years of age (All sample)

observed  $\hat{F}^0(\cdot)$  obtained from the cross-sectional wages' distribution of workers who were just hired from non-employment in the ELMPS 2012, JLMPS 2010 and TLMPS 2012.

$$\hat{F}(\omega; \hat{\kappa}_1) = \frac{(1 + \hat{\kappa}_1)\hat{G}(\omega)}{1 + \hat{\kappa}_1\hat{G}(\omega)} \quad (6.16)$$

In general, the model's predicted wage offer distributions are close to their empirical estimators in both countries Egypt and Jordan and for all age groups, except for the Egyptian old group of workers. As figures 6.8, 6.9 and 6.10 are scrutinized carefully though, it is found that the model is doing much better in replicating reality in the Jordanian labor market. Only the lowest 10-20% of the wage distributions are not perfectly captured. For Egypt, however, this is only true for the lowest 50% of the wage distributions and the highest wages in the distribution.

The availability of a categorized empirical distribution of the sizes of firms in the data makes it possible to compare in figures 6.11, 6.12 and 6.13 the empirical and theoretical ( $\hat{l}(w)$ ) distributions of firms' sizes in these labor markets. These comparisons confirm the above discussion about the high peaks and concentrations in the densities of small sized firms in these countries. This phenomenon is confirmed by the empirical histograms of the categories of firms' sizes. In general, the theoretical model is capturing the overall picture of the labor markets, both Egypt and Jordan. It might be however

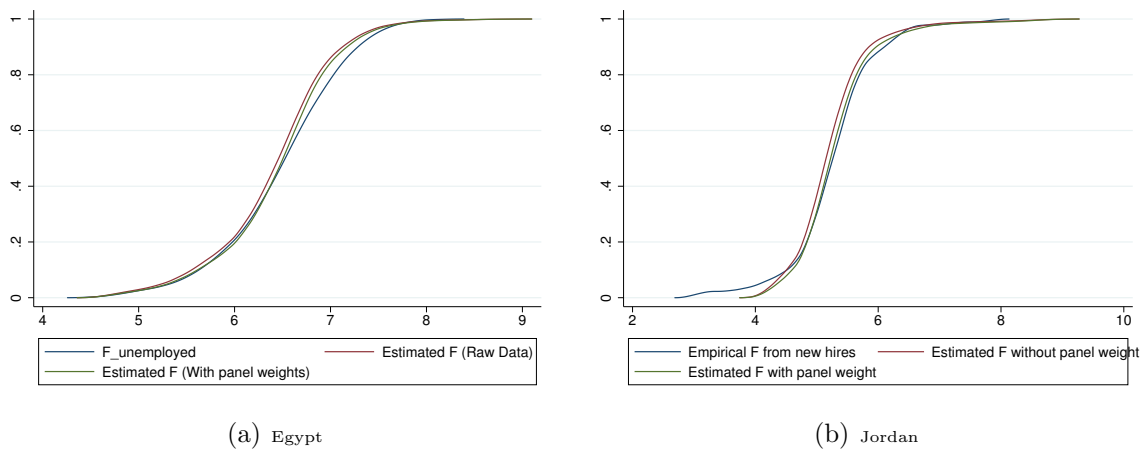


Figure 6.9: Private male wage workers, 15-24 years of age

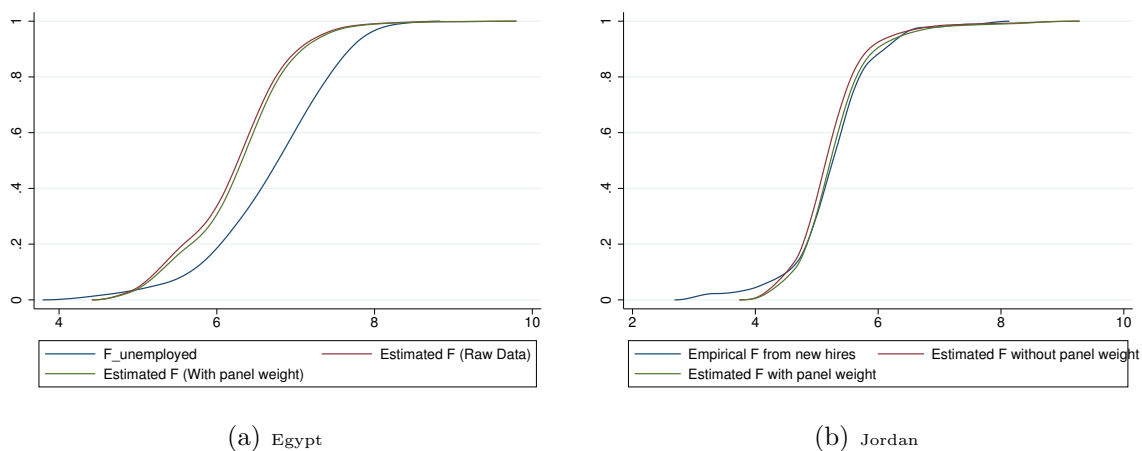


Figure 6.10: Private male wage workers, 25-49 years of age

under-estimating the density of the small sized firms especially among the older age groups. For the young age groups in both Egypt and Jordan, the model is providing theoretical distributions of  $l(w)$  that provide relatively good fits of the data.

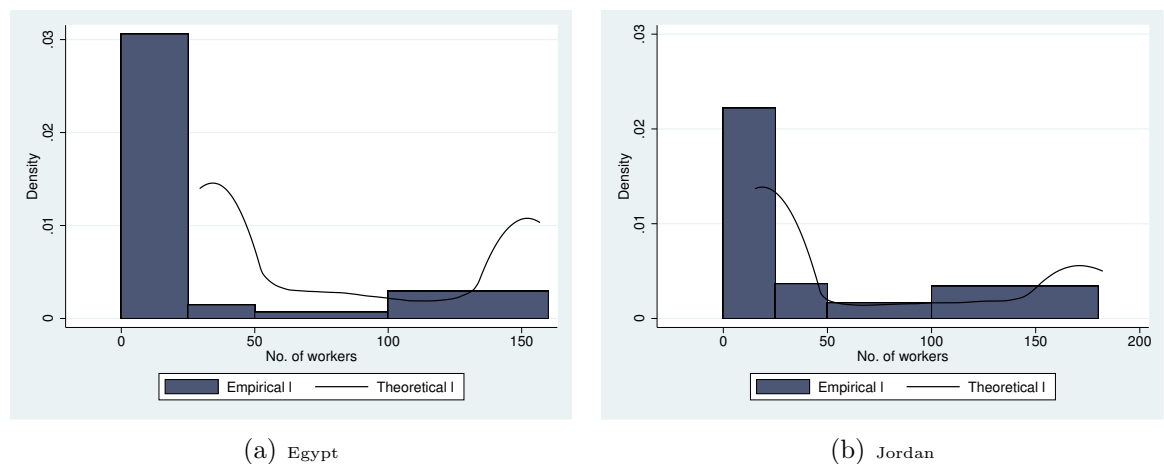


Figure 6.11: Private male wage workers, 15-49 years of age (All sample)

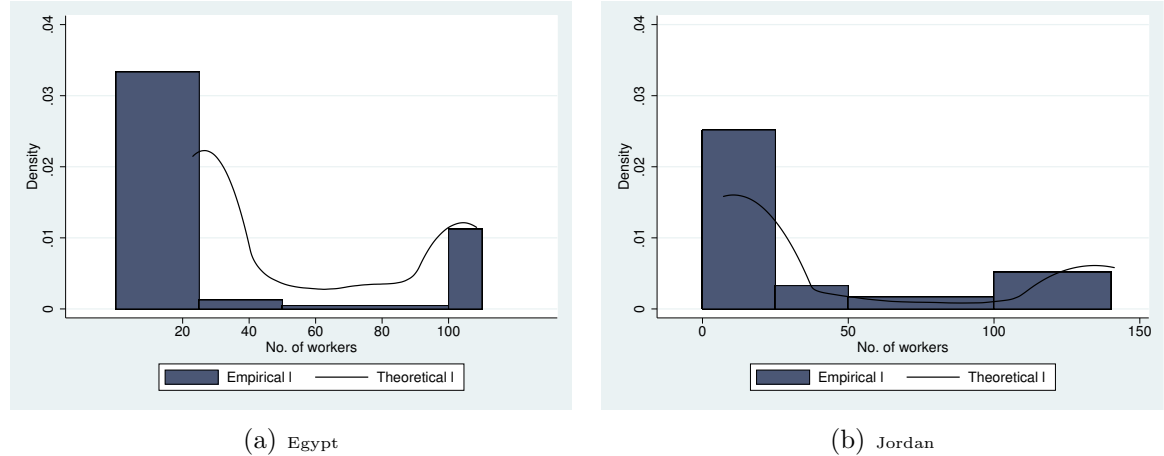


Figure 6.12: Private male wage workers, 15-24 years of age



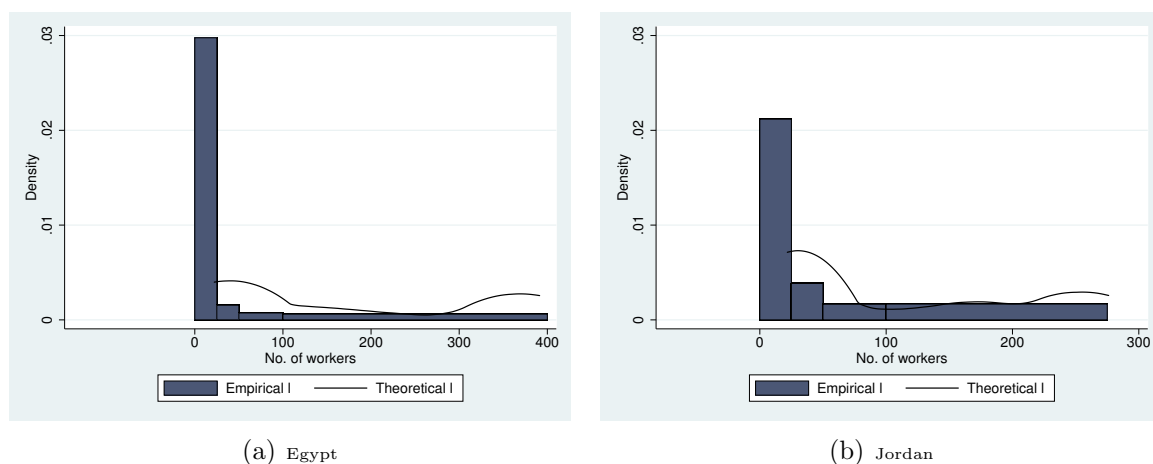


Figure 6.13: Private male wage workers, 25-49 years of age

## 6.5 Conclusion

In a region that tends to suffer from a high nature of rigidity, this paper aims at being a preliminary endeavor to explore the labor market search frictions of the MENA region, particularly Egypt and Jordan. This paper provides an empirical estimation of a rudimentary partial equilibrium search model a la Burdett and Mortensen, where the Egyptian and Jordanian labor market surveys, fielded in 2012 and 2010 respectively are used. Using retrospective information, 6-year synthetic panels are created to be able to detect employment and non-employment spells. Since the data suffers from a recall and design bias, a model is developed following previous literature to correct the transition rates on the aggregate level. These corrections are then attributed proportionally to the micro-data in the form of adjustment factors. These adjustment factors allow the creation of longitudinal panel weights specific to each type and duration of spell and transition of each individual. One of the aims of this paper is to measure to which extent the estimated frictional parameters can be biased due to the recall and design measurement error. The main finding of this paper is that the job creation and job-to-job frictional parameters are robust to the bias. The job destruction  $\delta$  parameter is however significantly under estimated if one does not correct for the measurement error. Since, correcting for the recall and design bias matters significantly to the estimation of the job destruction probabilities, the estimates of the index of search frictions are as

a result sensitive to this correction. These are consequently smaller reflecting higher search frictions in these labor markets.

Overall, the Jordanian labor market is found to be more flexible than the Egyptian, especially among the younger group of workers; job durations are relatively shorter. In contrast, Egyptian young workers have shorter non-employment spells. In Egypt, job offers arrive at a faster rate for the non-employed as they get older, however in Jordan, it is the reverse. Non-employment durations for the Jordanian old group of workers is shorter than that for the Egyptian old workers. This shows that Jordanian workers tend to access jobs later than their Egyptian peers, probably due to longer years of schooling. Young Egyptian workers are found to have the highest level of search frictions ( $\kappa_1$  estimates being the smallest), relative to the older Egyptian workers and Jordanian workers - both young and old. This implies that the firms' monopsony power in this trench of the Egyptian market is the highest leading to low levels of salaries. Since small firms tend to pay lower wages, a higher density of small sized firms is captured for the Egyptian market. This result is confirmed by the empirical data.

This analysis is likely to contribute to the new emerging literature dealing with the MENA region labor markets. To the best of my knowledge, it represents the first attempt to estimate the dynamics and search frictions of these labor markets in a framework of equilibrium job search models. Since a lot of nature-specific aspects, such as informality, awaiting queues for the public sector and non-wage mobility determinants, need to be taken into consideration, it's likely that this paper's estimates might be slightly overestimating rigidity by limiting the analysis to only the private wage employment sector of these labor markets.

**Extensions:** Further work is needed to re-run estimations carried out in this chapter, using the differentiated predicted weights built in chapter 5. This is likely to affect the results since the sample limits to private wage workers, who are likely to mis-report differently than public and non-wage workers for instance. Moreover, this becomes particularly valuable as the distinction between the two age groups is made. The youngs and the olds do not simply mis-report in the same way. Moreover, since the proposed correction has a significant impact on the final estimates of the BM parameters, more

investigation is needed to expand on the role of the parametric function assumed for the decay of information as one goes back in time, especially that differences are possible between the way the loss of memory and accuracy occurs in Egypt and Jordan. The over-identification of the model should allow for the development of tests of fit for the model. Finally, since the available data allows the distinction between the different employment sectors, namely public, informal and formal wage work, it should be interesting to extend the model as has been done Meghir, Narita, and Robin (2012) and Bradley, Postel-Vinay, and Turon (2013), and estimate the frictional parameters as the market is segmented into different sectors. The comparison between the simple and extended Burdett Mortensen parameters might reveal interesting conclusions relevant to the particular nature of the developing countries in question characterized by the presence of oversized public sectors and unregulated private informal jobs<sup>9</sup>.

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<sup>9</sup>See chapter 1 for a survey on the labor market institutional framework in Egypt and Jordan.

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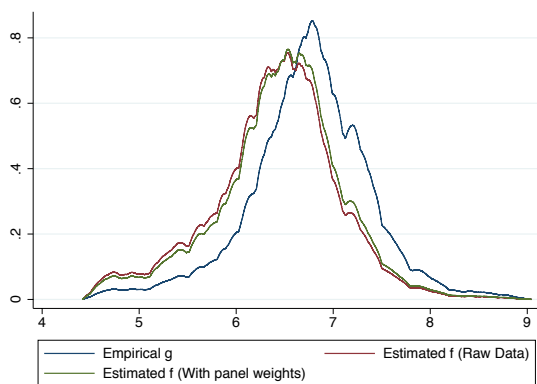
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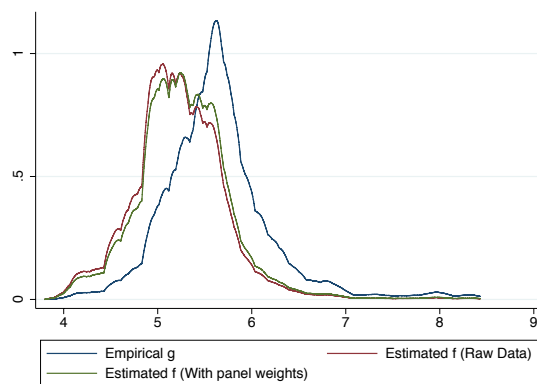
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## 6.A Empirical Estimations

This section reports the probability density functions (PDFs) of the empirical and estimated wage offers and earnings obtained from the data and from the model’s estimations. These correspond to the cumulative distribution functions presented in the chapter.

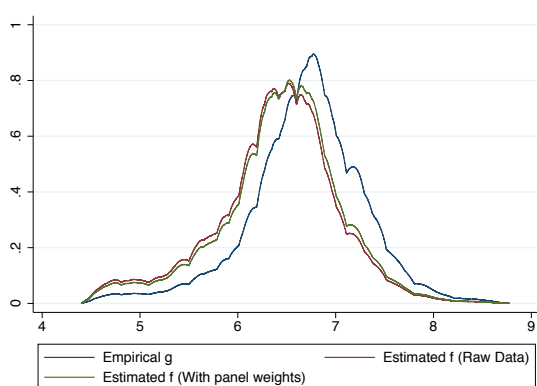


(a) Egypt

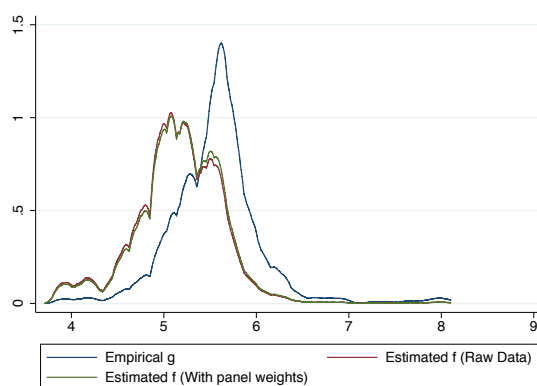


(b) Jordan

Figure 6.14: Theoretical PDFs of wage offers and earnings, private male wage workers, 15-49 years of age (All sample)

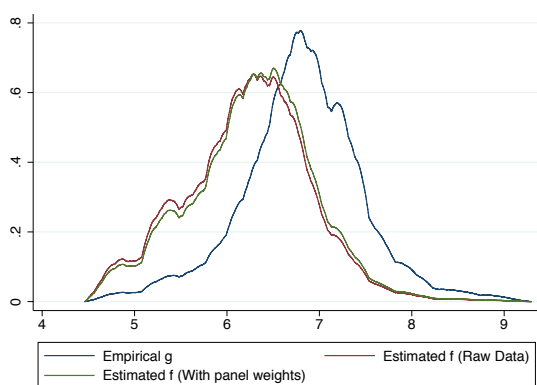


(a) Egypt

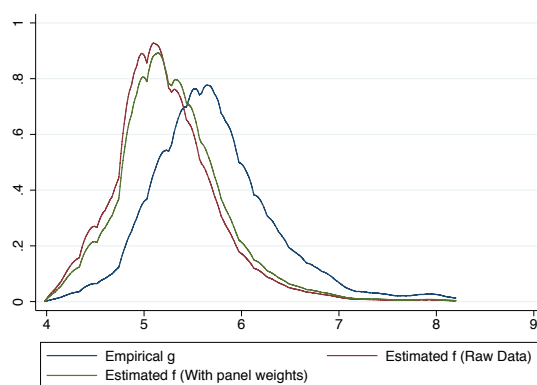


(b) Jordan

Figure 6.15: Theoretical PDFs of wage offers and earnings, private male wage workers, 15-24 years of age

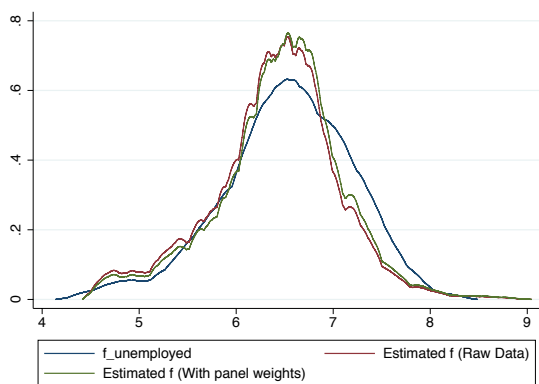


(a) Egypt

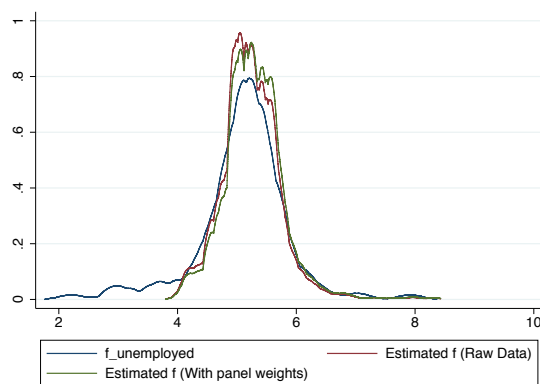


(b) Jordan

Figure 6.16: Theoretical PDFs of wage offers and earnings, private male wage workers, 25-49 years of age

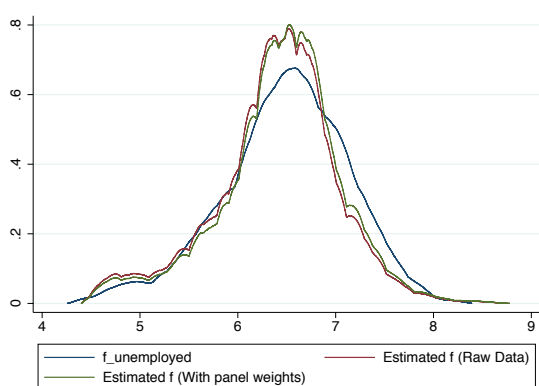


(a) Egypt

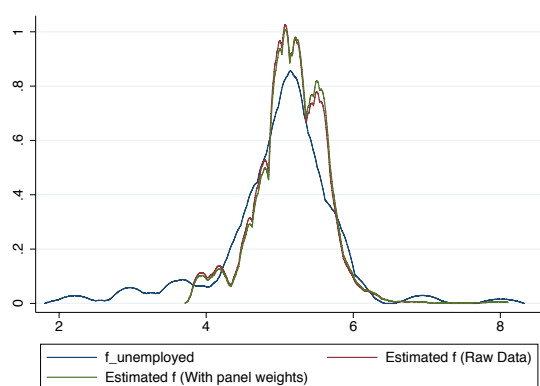


(b) Jordan

Figure 6.17: Empirical and theoretical PDFs of wage offers, private male wage workers, 15-49 years of age (All sample)

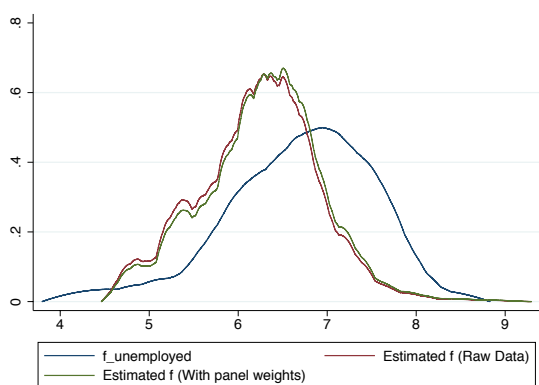


(a) Egypt

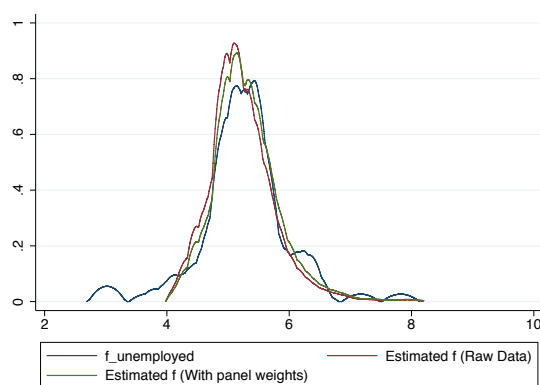


(b) Jordan

Figure 6.18: Empirical and theoretical PDFs of wage offers, private male wage workers, 15-24 years of age



(a) Egypt



(b) Jordan

Figure 6.19: Empirical and theoretical PDFs of wage offers, private Male age workers, 25-49 years of age



# General Conclusion

The history of institutions in most developing countries led their labor markets to be very rigid, where private sector contractual opportunities approached the rules of public sector appointments. This thesis outsets novel questions about the understanding of labor markets dynamics and the role of institutions in these developing nations, particularly Egypt and Jordan. Such markets are generally characterized by low levels of employment, high rates of youth unemployment, oversized public sectors and large unregulated informal sectors. In order to be able to analyze the reasons behind these stagnant stocks, an exhaustive study of the flows underlying these stocks is needed. The main objective of this thesis is therefore to look at those specific labor markets, particularly their labor market flows, under the lens of well-understood and tested structural models.

Given budgetary and availability constraints, it has been shown that panel data, fielded at relatively spaced dates (points in time), with short retrospective modules to fill in the gaps between waves are the only best available data one can obtain, short of continuous administrative data, to study the short-term transitions of these labor markets. These spaced panels can even be absent in some cases, where information can only be obtained from retrospective questions of a cross-sectional survey. The originality of the work lies therefore in the extraction of flow dynamics time series of the Egyptian and Jordanian labor markets from these retrospective accounts. Even with high quality collection methods and accurate cross-validated questions, these retrospective information are however subject to what is referred to as a recall and design bias. Given the long time interval between, and sometimes the absence of, the waves of the surveys used, it was not possible to use simple methods of memory bias correction used in previous literature. A methodological contribution to the literature is therefore provided,

where an original method correcting this recall and design error, using the markovian structure of the labor market transitions, is proposed. Using a Simulated Method of Moments (SMM), a function representing the "forgetting rate" conditional on the individual's state in the labor market, is structurally estimated. The correction technique is very useful in the case of developing countries' data showing that it is sufficient to have population, stocks and transitions, moments to correct over- or under-reporting biases in retrospective data. The correction is done over the different chapters both for the macro aggregate transitions as well as for the transition and duration individual-level data. The latter was done by the creation of readily user-friendly micro-data weights. These could be naive proportional as well as differentiated predicted weights. These weights, especially the differentiated predicted weights, make significant changes to the levels and composition of the labor market transitions obtained from the retrospective data and allows the samples to be corrected and redressed to become random under the assumptions of the model. The proposed correction methodology assumes a specific parametric functional form of the estimated error terms. Further work is needed to expand on the role of this functional form and to test to what extent the obtained results depend on it. The over-identification of the model can also allow one to develop tests of fit for the estimated error terms and hence the corrected transition matrices. Calculating boot-strapped standard errors can also prove very useful in testing for the significance of the correction methodology and is considered for future work.

The labor market dynamics stylized facts deduced as these flows are constructed and corrected are the first of this kind and may prove useful to researchers and policy-makers working on various aspects of the Egyptian and Jordanian labor markets. Knowledge of those facts is crucial to be able to monitor business cycles, detect inflection points and assess labor market tightness. It is important to ensure a healthy dynamic labor market where productive jobs are being created, existing jobs are getting more productive and less productive jobs are being destroyed. This does not seem to be happening at all in the Egyptian and Jordanian labor markets where most of the turnover is occurring in small informal sector jobs, job-to-job transitions are extremely low and when they occur it is because people are moving within or to the informal sector. One has to note though that the Jordanian labor market, given the history and evolution of its

regulatory institutional framework, is more flexible and mobile than the Egyptian labor market. Yet, there is some evidence that suggests that the Jordanian labor market is much more segmented than the Egyptian; the informal sector serving mostly as an intermediary in Egypt, while in Jordan it appears to be a segment in the market that functions on its own attracting specific workers. The informality aspect of both markets surely requires more investigation and further research.

Given the rigidity of these labor markets, major international organizations have therefore encouraged reforms, to introduce more flexibility in these labor markets. The second part of the thesis investigates the impact of introducing such flexible employment protection regulations on the labor market outcomes of these developing countries. In order to be able to do so, the introduction of the labor law (No.12) in Egypt in 2003 is evaluated. This Egypt labor law came to action in 2004 aiming at increasing the flexibility of the hiring and firing processes in Egypt. The empirical findings suggest that the labor market reform increased significantly the separation rates and had no significant impact on the job finding rates. With increased separations and unchanged job findings, the unemployment rates in the Egyptian labor market were shifted upwards after 2004.

These empirical results can be viewed as inconsistent with the usual equilibrium search Mortensen and Pissarides model, where an increase in the labor market flexibility, modeled as a downward shift of the firing costs, would definitely increase the separation and the finding rates. Among the possible proposed explanations behind such an observed unusual phenomenon could be the fact that Egypt is a developing country where corruption is one of the main barriers to business encountered by the entrepreneurs. A model is therefore developed to show theoretically how the conventional equilibrium search model can account for this phenomenon and hence to match the empirical data. In another chapter, this puzzle was also explained by extending the Mortensen and Pissarides (1994) model to account for the informal and public sectors, which represent big shares of employment. Even though the policy is directed to the formal private sector, it surely affects the interaction and the flow of workers between the different employment sectors. Using the model and numerical analysis, it was shown that the reform succeeded in scaling down the difference between formal

and informal sectors by shifting employment towards the formal sector by liberalizing it. This has however been accompanied simultaneously by a trending increase in the real wages of public sector workers and eventually less hiring by government jobs due to the government's budget constraint. Simulating these variations, the model reveals that the increase in public sector wages tends to crowd out the positive effect on the private formal sector's job creation, it even reduces it. The increase in public sector wages in this case acts as an extra taxation to the job creations in the formal and informal sector. The net effect observed after the 2004 Egypt labor law is therefore an increase in the unemployment rates, due to the partial failure of the reform, since job separations in all cases are enhanced, but job creations remain unchanged or even dampened.

The developed theoretical model does not limit to explaining the impact of firing taxes and public sector wages. The aim is to take this work further by testing for the impact of changes in other policy parameters on the labor market equilibrium and generalizing the study to other developing labor markets. Another process that has been neglected in this model and is worth exploring in a future research agenda is the jobs formalization. Endogenizing productivities and when would jobs be formal or informal is also an interesting question that can be used to extend the model.

The final part of this thesis investigates the labor market search frictions in the Egyptian and Jordanian labor market, where these frictions result from the workers' incomplete information about the offered wages. These are important to look through the quality of jobs accessed by these workers and investigate their movements up the job ladder. An empirical estimation of a rudimentary partial equilibrium search model à la Burdett and Mortensen is done, where the Egyptian and Jordanian labor market surveys are used. The estimated frictional parameters are extremely low confirming the rigidity of the labor markets in question. The Jordanian labor market proved to be more flexible than the Egyptian, especially among the younger group of workers. In Egypt, job offers arrive at a faster rate for the non-employed as they get older, however in Jordan, it is the reverse. Young Egyptian workers are found to have the highest level of search frictions, relative to the older Egyptian workers and the Jordanian workers, implying that the firms' monopsony power in this trench of the Egyptian

market is the highest leading to low levels of salaries. Further work is needed to re-run estimations of this model, using the differentiated predicted weights. This is likely to affect the results since the sample limits to private wage workers, who are likely to mis-report differently than public and non-wage workers for instance. This also becomes particularly valuable as the distinction between two age groups, who do not necessarily mis-report the same way, is made. Since the available data allows the distinction between the different employment sectors, namely public, informal and formal wage work, it should be interesting to extend the model to include these sectors, and estimate the frictional parameters as the market is segmented. The comparison between the simple and extended Burdett-Mortensen frictional parameters might reveal interesting conclusions relevant to the particular nature of developing countries.

## Abstract

Policy prescriptions for poor developing countries struggle to expand employment opportunities to raise their income levels. Among these are the MENA Arab countries that have recently experienced an unprecedented tide of popular uprisings following the rising poverty, inequality and exclusion, much of which is related to the labor market. Since the flow approach to labor markets has become the basic toolbox to modern labor economics, this thesis has at its central insight explaining the functioning of those specific labor markets, particularly the Egyptian and Jordanian, using the search equilibrium theory. It looks at analyzing job accession, separations and mobility trends. Overall, evidence of high levels of rigidity is revealed. The impact of introducing flexible employment protection regulations in these rigid markets is then discussed both empirically and theoretically. Findings show that lowering firing costs in Egypt increased significantly the job separations, but had no impact on job creations. This partial failure of the liberalization reform is interpreted theoretically by a crowding out effect due to increased corruption set up costs or increased public sector wages. A novel theoretical matching model a la Mortensen Pissarides is developed allowing for the existence of public, formal private and informal private sectors, reflecting the particular nature of developing countries. Workers' movements up the job ladder is then explored through a structural estimation of the frictional parameters in a job search model a la Burdett Mortensen. These markets are found to have very high levels of search frictions especially among the young workers. Given the non-availability of panel data to study labor market flows, longitudinal retrospective panel datasets are extracted from the Egypt and Jordan Labor Market Panel Surveys. These panels are then compared to available contemporaneous cross-sectional information, showing that they suffer from recall and design measurement errors. An original methodology is therefore proposed and developed to correct the biased labor market transitions both on the aggregate macro-level, using a Simulated Method of Moments (SMM), as well as on the micro-individual transaction level, using constructed micro-data weights.

**Keywords:** Equilibrium search models, recall measurement error, informality, public sector, unemployment, separation, job finding, on-the-job search, Egypt, Jordan.

## Resumé

Dans les pays en voie de développement, les politiques visent à augmenter les opportunités d'emploi afin d'élever les revenus et les niveaux de vie des populations. Parmi ces pays, les pays arabes de la région MENA ont récemment connu une vague de soulèvement populaires, faisant suite aux accroissements de la pauvreté, des inégalités et de l'exclusion, résultats des faibles performances du marché du travail. Comme l'analyse des flux est devenu l'outil de base de l'économie du travail moderne, cette thèse propose d'expliquer le fonctionnement de ces marchés du travail assez spécifiques, particulièrement ceux de l'Égypte et de la Jordanie, en utilisant la théorie de la recherche d'emploi. Elle se penche sur l'analyse des créations et destructions d'emploi ainsi que des mobilités entre emplois. Elle montre que ces marchés sont très rigides. L'impact de l'introduction des réformes structurelles, visant à flexibiliser l'emploi est ensuite discuté de manière empirique ainsi que théorique. Les résultats montrent que la baisse des coûts de licenciement en Égypte a augmenté significativement les destructions d'emploi, mais n'a eu aucun impact sur les créations. Cet échec partiel de la réforme est un paradoxe empirique, qui est interprété théoriquement par un effet d'éviction dû à l'augmentation du coût de la corruption ou/et à l'augmentation des salaires du secteur public. Une extension originale du modèle théorique de Mortensen-Pissarides est alors développée, permettant l'existence de trois secteurs, public, privé formel et privé informel. Ce cadre rend compte de la nature particulière des pays en voie de développement. Pour examiner la qualité des emplois et pour étudier les avancements dans l'échelle des salaires, une estimation structurelle du modèle de Burdett-Mortensen est ensuite proposée. Elle permet d'étudier et mesurer les frictions d'appariement sur les marchés du travail égyptien et jordanien. Les paramètres estimés sont extrêmement faibles, soulignant la forte rigidité de ces marchés. Le marché du travail jordanien s'avère, par contre, être plus flexible que l'égyptien. Compte tenu de la non-disponibilité de données de panels annuelles dans ces pays, il est montré que des données de panel retrospectives peuvent être utilisées, pour étudier les transitions de court terme sur ces marchés du travail. Ces données de panel sont par contre soumises à un biais de mémoire. Une méthode originale de correction du biais de mémoire est donc proposée et développée. Elle vise à corriger les transitions à la fois au niveau macro, en utilisant une méthode de moments simulés, ainsi qu'au niveau micro, en construisant des matrices de poids.

**Mots-clés:** Modèles de recherche d'emploi, biais de rappel, informalité, secteur public, chômage, créations et destructions d'emploi, mobilité, Égypte, Jordanie.