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Björn Nilsson

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THÈSE DE DOCTORAT

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Educational and labor market trajectories of youth in
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par Björn NILSSON**

Dirigée par **Philippe DE VREYER**

Mohamed A. MAROUANI

COMPOSITION DU JURY :

Philippe DE VREYER
Université Paris-Dauphine
Directeur de thèse

Mohamed Ali MAROUANI
Université Paris 1 - Panthéon-Sorbonne
Co-Directeur de thèse

David MARGOLIS
PSE-CNRS
Rapporteur

Michael GRIMM
Université de Passau
Rapporteur

Florence JUSOT
Université Paris-Dauphine
Présidente du jury

Hans LÖFGREN
Banque Mondiale
Membre du jury

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Till min familj.

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même si je sais que Raphaëlle monopolise bien l'attention. Guillaume, François, Aurélien, Laurianne, Clémence, j'espère que les soirées jeux et les visites de la salle du sport pourront reprendre de mon côté car vous me manquez souvent. Cela vaut également pour Julien et la soirée console tant évoquée. Et Guillaume, tu peux compter sur moi pour venir voir un match de rugby maintenant. Matthieu, en tant qu'épistémologue et historien de la pensée le chapitre 2 t'est spécialement dédié. Ensuite, je passe à celle dont l'aventure est partiellement parallèle à la mienne: Alissia, jeune migrante interne, mère et bientôt docteur! J'ai beaucoup de beaux souvenirs avec toi et des moments passés à regarder Malcolm dans ton appartement à Crimée il y a un bail. Je suis sûr qu'on n'imaginait pas une seconde qu'on serait tous les deux docteurs en économie aujourd'hui. Les amis de l'IEDES: Ewen, Claire, Clément. Je vous remercie de n'avoir jamais abandonné nos rendez-vous même quand les emplois du temps étaient les plus incompatibles; je suis toujours extrêmement content de vous voir, et de pouvoir vous compter parmi mes amis. D'ailleurs, vous êtes probablement curieux de savoir ce que j'ai foutu toutes ces années pendant que vous étiez en train de travailler. Je vous propose alors de lire les pages qui suivent pour vous faire une petite idée. Aliyah, j'espère également que nous aurons l'occasion de nous voir plus souvent désormais, car le temps qui coule entre chacun de nos rendez-vous est trop long à mon goût! Je me remémore non sans fierté et non sans sourire que j'ai traduit le sermon de l'Imam à ton mariage (en traduisant culte par *cult*, n'oublions pas ;)). Je n'oublie pas non plus les copains plus anciens, du pays nordique lointain qui est le mien: Patric, Stefan, Erik, Michael, Anton; je suis ravi que nous ayons gardé des liens, même si les occasions de se voir sont malheureusement peu nombreuses. Enfin, la place commençant cruellement à manquer, je voudrais dire que bien d'autres personnes comptent pour moi, et que leur éventuelle omission dans ces remerciements est à mettre sur les problèmes de mémoire qu'aucun (me connaissant bien) ne contesterait.

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Résumé en français

1 Introduction

Le droit au travail décent est fondamental. La déclaration des droits de l'homme des Nations Unies stipule que "toute personne a droit au travail, au libre choix de son travail, à des conditions équitables et satisfaisantes de travail et à la protection contre le chômage" (UN General Assembly 1948). Davantage qu'un moyen de subvenir à ses besoins, le travail peut conférer à l'individu une identité sociale, un sentiment de sens à la vie, et plus largement, le maintien de l'identité sociale à travers les possibilités d'émancipation et d'autonomie sous-jacentes à la capacité d'assurer son indépendance. Reconnaisant ceci, les décideurs politiques des pays du monde entier sont devenus conscients des enjeux entourant la question de l'emploi, et notamment de la question de l'emploi des jeunes. En occident, la transition de l'école vers le marché du travail s'est complexifiée ces dernières décennies (Ryan 2001), s'accompagnant de plus de périodes de chômage, d'emploi précaire, et de durées d'embauche plus courtes. Dans beaucoup de pays en développement également, les perspectives des jeunes ont changé au cours des dernières décennies. Les passerelles entre l'éducation supérieure et l'emploi public, empruntées par les générations africaines précédentes, ne constituent peut-être plus une option viable (Asaad, Binzel, and Gadallah 2010; Calvès and Schoumaker 2004), et l'éducation en général ne semble pas être un garant immuable d'emploi, tel que constaté dans les pays de la région du Moyen Orient et de l'Afrique du Nord (MENA) (Kabbani and Kothari 2005). En outre, les opportunités d'emploi pour les jeunes dans le monde apparaissent de plus en plus souvent dans le secteur informel (Cho et al. 2012; Drechsler, Jütting, and Xenogiani 2008).

En un sens, pour comprendre les transitions sur le marché du travail, nous sommes obligés de regarder au-delà de la transition elle-même. La réussite sur le marché du travail dépend de facteurs comme l'éducation, la capacité intrinsèque de l'individu, le genre, la santé, les contacts, la chance, l'intensité de recherche, les arrangements au sein du ménage, et la nature du marché lui-même. Certains de ces facteurs, comme la santé ou la capacité intrinsèque de l'individu, ont des déterminants qui précèdent sa naissance, tel que le démontre la littérature sur les effets *in utero* (voir Eide and Showalter (2011) pour une synthèse de ces travaux). Il n'est donc pas surprenant de trouver de fortes

transmissions intergénérationnelles de statuts d'emploi et d'éducation dans les pays en développement (Bhalotra and Rawlings 2011). Par ailleurs, les jeunes sont ancrés dans des arrangements formels et informels, parmi lesquels le ménage est sans doute le plus évident. L'ancrage dans de tels arrangements est certainement d'autant plus fort que les individus se situent dans des contextes où les filets de sécurité formels ainsi que les infrastructures autour du marché du travail sont lacunaires. Le fait d'ignorer les interactions au sein des ménages pourrait donc être particulièrement réducteur dans ces contextes. Ainsi, ancrée dans un ensemble de choix, de dotations et de contraintes qui reflètent l'organisation économique tant au niveau sociétal qu'au niveau du ménage, la transition de l'école vers le marché du travail ne s'étudie pas aisément.

Du point de vue des décideurs, le succès des jeunes sur le marché du travail reflète le concours de circonstances dépendant de facteurs macroéconomiques et microéconomiques à la fois. Un des canaux de transmission du succès réside dans la famille, et l'allocation des ressources au sein des ménages a ainsi été abondamment étudiée depuis les premières contributions de Gary Becker à l'économie de la famille (Becker 1960, 1962, 1965). Les économistes ont essayé d'ouvrir la boîte noire du ménage pour essayer d'éclairer les logiques sous-jacentes à ces allocations, s'intéressant aux critères qui régissent la façon dont le chef de ménage alloue les ressources aux autres membres du ménage. Des règles de décision dérivées de modèles unitaires ou collectifs du ménage permettent aux chercheurs de prédire l'impact de chocs, à la fois sur des membres individuels et sur le ménage dans son ensemble. Néanmoins, les données sont souvent insuffisamment détaillées pour inférer des constats comportementaux, et la nécessité de simplifier un monde infiniment complexe afin d'atteindre une malléabilité mathématique réduit le pouvoir prédictif de tels modèles. En effet, les hypothèses derrière les modèles unitaires et collectifs n'ont pas trouvé de support empirique dans les pays en développement (Dercon and Krishnan 2000; Goldstein and Udry 2008; Kazianga and Wahhaj 2017). Le corpus—large, et croissant—de résultats empiriques sur l'impact de chocs dans les ménages des pays en développement peut fournir une base plus pragmatique pour les politiques publiques lorsque celles-ci s'efforcent de réduire les inégalités et minimiser le risque de conflit social, tout en prenant en compte la multiplicité des contraintes auxquelles les jeunes font face. Cette thèse se propose d'apporter une contribution à cette littérature à travers cinq chapitres, résumés ci-dessous. Bien que traitant d'aspects différents des trajectoires des jeunes, et en s'appuyant sur des méthodes différentes appliquées sur des terrains différents, leur dénominateur commun est qu'ils s'appuient sur des données empiriques de pays à bas ou à moyen revenu pour répondre à des questions précises liées au processus

de transition dans l'éducation et d'intégration sur le marché du travail.

2 Chapitre I : La transition de l'école vers le marché du travail dans les pays en développement

Le premier chapitre dresse un bilan autour du concept de transition de l'école vers le marché du travail dans les pays en développement. Bien que la littérature autour de ce concept ait été revue par Ryan (2001), un traitement exhaustif se focalisant sur les pays en développement n'a jusqu'alors pas été réalisé. Bien qu'ils ne forment pas un ensemble homogène, les marchés du travail des pays en développement présentent certaines caractéristiques qui font qu'une analyse menée séparément semble justifiée : parmi ces caractéristiques se trouvent l'importante taille du secteur informel et de l'auto-emploi, le poids du secteur agricole, la profusion du travail familial non-rémunéré, une participation sur le marché du travail souvent très genrée, une segmentation public-privé du marché du travail et une fragmentation de la société en milieux urbain et rural qui interagit avec les différences soulignées dessus.

Le mouvement "L'Éducation pour tous", important effort multilatéral sous les auspices des Nations Unies, a souligné l'importance de la promotion de l'éducation à l'échelle mondiale. Ainsi, un nombre d'objectifs liés aux inégalités de scolarisation et à l'accès à l'éducation pour tous ont été définis et des stratégies de suivi ont été mises en place. Bien que l'éducation n'ait pas pour unique objectif de rendre les citoyens économiquement autonomes en garantissant des possibilités d'emploi, cet aspect est sans doute l'un des plus importants. Les conséquences du manquement d'un gouvernement à ces obligations en termes de créations d'opportunités face à une jeunesse désœuvrée peuvent être importantes, comme nous l'avons pu constater récemment lors des révolutions du printemps arabe. Si l'importance de l'éducation a ainsi été fermement assise dans les documents stratégiques des bailleurs et organisations internationaux, la cohésion n'est pas garantie quant à la façon de garantir ces opportunités. De nombreuses initiatives à de nombreuses échelles ont été mises en place, et le concept de transition de l'école vers le marché du travail résume cette multitude de processus. Jusqu'alors, un traitement extensif de cette thématique n'a pas été réalisé pour les pays en développement. Or, outre la spécificité de leurs marchés du travail, et le retard en termes d'objectifs éducatifs qu'accusent certains de ces pays, le groupe de pays en développement (et en particulier les plus pauvres d'entre eux) se distingue également par des populations jeunes. Bien que leurs taux de

fertilité et de mortalité soient en légère baisse, des régions importantes comme l'Afrique subsaharienne et l'Asie du Sud n'ont pas encore achevé leur transition démographique. Ceci implique que les décennies à venir seront d'une importance cruciale dans la définition du sentier de croissance qu'emprunteront ces pays.

Cet article est composé de trois sections. La première section discute du concept de la transition de l'école vers le marché du travail. La deuxième section examinera comment la littérature économique (et notamment la littérature sur la recherche de travail [search and matching]) peut être mobilisée pour envisager les transitions vers le marché du travail, et examinera les extensions de cette théorie pour prendre en compte les réalités des pays en développement. La dernière section fournit une revue de littérature des déterminants d'une transition réussie dans les pays en développement.

2.1 La transition de l'école vers le marché du travail : une transition difficile à cerner

La transition de l'école vers le marché du travail est un processus multiforme, dont les contours sont difficiles à appréhender. Intuitivement, la transition pourrait faire référence au temps qui s'écoule depuis la fin de l'École jusqu'à l'obtention d'un travail stable. O'Higgins (2008) distingue deux aspects des transitions: le *succès* et la *facilité* de la transition. Cette distinction a le mérite de séparer les éléments de nature dynamique (efficience, fluidité) des éléments de nature statique (salaire à la sortie, satisfaction dans l'emploi). Pour aborder le concept statistiquement, certaines études ont défini la transition comme une durée mesurable, avec un début et une fin. Ainsi, Bowers (1998) définit le début de la transition comme le moment où l'individu quitte définitivement l'école. Matsumoto and Elder (2010) conditionnent ce début de transition à la volonté de trouver un travail. La fin ne serait autre que l'obtention d'un travail stable à temps plein (Bowers 1998), ou d'un travail à durée déterminée mais satisfaisant (Matsumoto and Elder 2010). Quoiqu'il en soit, les indicateurs mesurés avec des données agrégées souffrent de certains problèmes, tels ceux soulignés par O'Higgins (2008). En particulier, pour mesurer la transition moyenne dans une économie, l'OCDE utilise comme début de la transition l'âge auquel un certain pourcentage de la population (50% ou 75%) a quitté l'école, et comme fin de la transition l'âge auquel ce même pourcentage a trouvé un emploi. Ceci fournit un indicateur agrégé des transitions dans l'économie. Le problème est que ce procédé sous-entend que tout le monde va à l'école, en sort, cherche un travail et ne retourne pas à l'école. En pondérant ces pourcentages par la proportion d'enfants allant à l'école et la proportion d'étudiants intégrant le marché du travail, Guarcello

et al. (2005) obtiennent un indicateur amélioré. Il reste que ce type d'exercice s'appuie souvent sur des données de la même année pour des individus à des stades de transition différents, supposant ainsi implicitement que le marché du travail est stationnaire.

Certaines des lacunes de ces indicateurs agrégés peuvent être contournées lorsque les transitions sont estimées sur la base de données individuelles. Ceci nécessite des informations détaillées sur le parcours scolaire et professionnel des enquêtés. Cependant, dans la mesure où les transitions ne sont observables que pour les individus qui les ont achevées, leur agrégation pourra toutefois fournir une image biaisée de la durée de transition de l'économie. En revanche, ces transitions peuvent être estimées y compris quand il y a une censure à droite, via l'estimateur de Kaplan-Meier par exemple. De façon générale, les modèles de durée se sont avérés être une méthode de prédilection pour l'étude des transitions de l'école vers le marché du travail.

2.2 L'environnement de transition dans la théorie économique

La plupart des études qui envisagent de donner un cadre analytique aux transitions sur le marché du travail se situe dans la lignée de la théorie du "matching", dont le modèle fondateur est celui développé en plusieurs articles par Dale Mortensen, Christopher Pissarides et Peter Diamond. Le modèle met l'accent sur les frictions qui peuvent exister sur le marché du travail, permettant d'expliquer des phénomènes tels que le chômage volontaire, des arbitrages de transition, dépendance d'état et d'autres caractéristiques des marchés du travail modernes que la théorie de l'offre et de la demande a plus de mal à expliquer. Le modèle initial a rapidement été étendu pour prendre en compte des choix éducationnels. S'intéressant particulièrement à la première entrée sur le marché du travail, Neal (1999) développe un modèle où les travailleurs sont incités à repousser la recherche d'un match parfait avec un employeur avant d'avoir décidé d'un choix de carrière. Globalement, la difficulté des jeunes peut dans ces modèles être abordée par l'asymétrie d'information entre jeunes chômeurs et employeurs : les compétences intrinsèques des individus sont méconnues par les firmes, et elles le sont d'autant plus que le candidat est en début de carrière. Certains modèles ont également introduit de l'hétérogénéité individuelle, essayant de mieux rendre compte de la forte hétérogénéité des transitions observée empiriquement. En supposant que les individus ont des préférences différentes quant à l'intensité de la recherche ou quant au salaire de réservation, ou en supposant que les firmes sont capables de classer les candidats, il est possible de concilier le modèle de matching avec des durées de transitions hétérogènes.

La question la plus importante pour la revue de littérature actuelle est celle de l'adéquation entre la littérature sur le matching avec la réalité des marchés du travail dans les pays en développement. Si les notions de salaire de réserve et de coût de recherche paraissent bien rendre compte des agissements des travailleurs dans les pays occidentaux, ces notions pourraient passer au second plan dans d'autres contextes. Plusieurs auteurs ont choisi d'ajouter un secteur informel au modèle (Albrecht, Navarro, and Vroman 2009; Flórez 2015; Satchi and Temple 2009), et Serneels (2007) étudie dans cette logique la polarisation du marché du travail en Ethiopie. Ses données suggèrent qu'il est rationnel pour de jeunes hommes qualifiés de rester au chômage tant que la probabilité de trouver un bon emploi dans le secteur public dépasse 10%. En estimant la probabilité avec un modèle de type constant par morceaux (piecewise constant hazard rate), il obtient une probabilité de 18%, suggérant que l'attente d'un emploi public en Ethiopie est rationnel. D'autres extensions pertinentes à la littérature traitent des réseaux sociaux (Calvo-Armengol and Zenou 2005; Wahba and Zenou 2005). Enfin, une littérature expérimentale émergente pour les marchés du travail des pays en développement essaie de regarder si les frictions semblent réellement être un frein à l'obtention d'un emploi. Groh et al. (2015) montrent qu'un assouplissement des frictions sur le marché du travail des jeunes qualifiés à Amman n'a provoqué aucune amélioration significative de l'emploi des jeunes. Des résultats récents d'Ethiopie (Abebe et al. 2016a; Abebe et al. 2016b) sont également mitigés.

2.3 Les déterminants de la transition de l'école vers le marché du travail

Etre éduqué est souvent perçu comme un moyen d'assurer un emploi de qualité, et l'éducation a souvent été introduite comme facteur explicatif dans les modèles de durée essayant d'expliquer la transition vers le marché du travail. Les résultats sont cependant mitigés : si l'éducation permet de réduire la durée de transition à la fois en Egypte, en Mongolie (Matsumoto and Elder 2010) ou au Burkina Faso (Calvès, Kobiané, and N'Bouké 2013), une relation non-monotone apparaît dans d'autres études (Galiani and Hopenhayn 2003; Serneels 2007). Une explication potentielle et un phénomène de queue—les jeunes diplômés préférant attendre des opportunités d'emploi de qualité plutôt que de prendre un emploi qu'ils estiment insuffisant. En ce sens, le secteur public a souvent été le secteur de prédilection des jeunes qualifiés africains. Avec l'augmentation générale des niveaux d'études, ce canal n'est plus toujours aussi rentable (Calvès and Schoumaker 2004).

On retrouve les facteurs agissant sur l'emploi et le revenu du travail dans les études sur la durée de transition. Ainsi, être un homme est associé à des transitions plus courtes. En revanche, plusieurs aspects de l'employabilité, comme les réseaux sociaux ou les compétences cognitives et non-cognitives, n'ont pas encore été étudiés dans un contexte de transition vers le marché du travail.

Un certain nombre d'études a tenté de synthétiser les résultats d'évaluation de programmes pour l'emploi. Les résultats sont hétérogènes, mais suggèrent tout de même une meilleure efficacité des programmes de promotion de l'entrepreneuriat ou de formation que les programmes de subventions ou de services à l'emploi. Ces études ont par ailleurs reconnu que l'on manque d'évidence concernant les effets de long-terme des programmes implémentés.

3 Chapitre II : Progrès technique biaisé et impacts sur le marché du travail malaisien

Le deuxième chapitre, macroéconomique et co-écrit avec Mohamed Ali Marouani, porte sur le progrès technique biaisé et les politiques éducatives en Malaisie. De nombreux pays ont connu des expansions importantes de leurs systèmes éducatifs, qui ont été accompagnées par une hausse continue du niveau de qualification des élèves sortants du système scolaire. Ces augmentations ont également conduit à élever la proportion d'individus sur le marché du travail en possession de diplômes post-secondaires. Si, pendant ce temps, la demande de compétences des firmes était restée la même, la théorie économique prédirait une baisse du salaire relatif des travailleurs qualifiés par rapport à celui des travailleurs non-qualifiés. Or, empiriquement ce mécanisme n'est pas toujours observé. Aux Etats-Unis, la "prime" des travailleurs qualifiés a même augmenté pendant une période d'expansion des études universitaires. Bien que le débat sur les origines de ce phénomène ne soit pas clos, plusieurs auteurs (Autor, Katz, and Krueger 1998) affirment qu'un progrès technique biaisé envers les travailleurs qualifiés devrait y participer. Notamment, les énormes progrès de l'informatique, qui (au moins au début de l'ère informatique) étaient réservés à des métiers qualifiés, ont permis aux travailleurs qualifiés de voir leur productivité augmenter plus que proportionnellement à celle des moins qualifiés. Cette augmentation de la productivité aurait contrebalancé celle des

effectifs de travailleurs qualifiés, permettant leurs salaires de croître plus vite malgré une offre de travail croissante. Nous explorons dans cet article ce mécanisme pour la Malaisie, un pays à moyen revenu qui a connu une expansion importante de la part de travailleurs qualifiés au cours des dernières décennies.

En Malaisie, la proportion de travailleurs avec au plus un niveau d'éducation primaire est passée de 60% en 1990 à 30% en 2010. Parallèlement, celle des individus ayant une éducation post-secondaire est passée d'environ 8% à plus de 20% sur la même période. Cette expansion a été voulue par le gouvernement malaisien, désireux de transformer sa force productive pour devenir une économie à haut revenu. Le gouvernement table par ailleurs sur un taux d'inscription dans l'éducation tertiaire de 40% de la cohorte pertinente en 2020.

Nous nous appuyons sur plusieurs sources de données. D'abord, pour faire un bilan de l'évolution salariale en Malaisie, nous disposons de micro-données pour la période 1990 à 2010. Cependant, les salaires ne sont connus que depuis 2007, et il est ainsi difficile de fournir une image des écarts salariaux sur longue période. Néanmoins, un graphique fournissant les niveaux de salaire par qualification pour les quatre années dont nous disposons, fait état d'une stabilité importante des salaires relatifs, et des estimations de la littérature du rendement de l'éducation ne font pas non plus état d'une baisse significative de la prime des travailleurs qualifiés. Ainsi, la baisse du salaire relatif des travailleurs qualifiés, voulue par la loi de l'offre et de la demande, est absente. Le phénomène du progrès technique biaisé apparaît ainsi comme une explication plausible dans le cas malaisien. Il est cependant important d'écarter d'autres origines potentielles—un changement structurel tiré par une demande mondiale modifiée pourrait également être à l'origine du phénomène. Pour examiner ceci, nous décomposons la variation de la proportion de qualifiés dans la force de travail en deux composantes : $\Delta S = \sum_i \Delta S_i \bar{E}_i + \sum_i \bar{S}_i \Delta E_i$, où S_i est la part de travail qualifié au niveau de l'industrie, et E_i la part de l'emploi de chaque industrie dans l'emploi total. Les variables barrées font référence à des moyennes temporelles. Cette décomposition permet ainsi de voir si la variation de la proportion agrégée est due à une réallocation sectorielle du travail, ou si elle est au contraire le fruit d'une augmentation du travail qualifié au sein des secteurs. Il s'avère que c'est plutôt la deuxième explication qui est privilégiée, car la composante intra-sectorielle explique 74% de la variation, contre 26% pour la composante inter-sectorielle. Le même résultat est trouvé pour plusieurs agrégations sectorielles.

Suite à cette analyse, nous introduisons un progrès technique biaisé dans un modèle d'équilibre général calculable, appliqué à la Malaisie et basé sur une matrice de comptabilité sociale de 2005. Le modèle contient un bloc de migration, un salaire minimum, 23 secteurs d'activité et 20 facteurs de production (le capital, et des travailleurs de 19 niveaux et spécialisations différentes). A partir d'une estimation avec seulement 4 points dans le temps, nous obtenons un coefficient de biais du progrès technique de 8%. Pour ne pas surestimer le progrès technique biaisé, nous introduisons un biais de 4% dans le modèle. Le modèle est dynamique séquentiel, avec une solution par année modélisée. Il comporte notamment un module éducationnel séparé, fournissant chaque année une demande d'éducation par niveau et par spécialité, fonction de salaires relatifs et de préférences initiales. Les paramètres du modèle sont fixés en fonction des valeurs d'équilibre à l'année de base (2005). Les élasticités sont estimées ou fixées à des niveaux raisonnables au regard de la littérature. Le modèle comporte cinq bouclages, dont le plus important est le bouclage macro : la propension marginale à épargner des ménages est constante, créant ainsi un investissement qui sera défini par la somme des épargnes disponibles de tous les agents dans l'économie.

Nous effectuons deux types de simulations. D'abord, est envisagé le contrefactuel d'un progrès technique neutre. Le coefficient de biais du progrès technique est ainsi réduit à 1 (équivalent à 0% de biais). La deuxième simulation fixe une limite supérieure au nombre de places dans l'éducation tertiaire égale au nombre de places existantes en 2005. Ces deux simulations sont rétrospectives, dans la mesure où elles sont appliquées dès 2005, avec des résultats contrefactuels analysés jusqu'en 2020.

La première simulation définit ainsi un progrès technique neutre. Ceci n'implique pas que la productivité globale des facteurs est affectée, car celle-ci est fixe, dépendant des taux de croissance sectoriels de la période. Les résultats montrent clairement l'avantage du progrès technique biaisé pour les travailleurs qualifiés : leurs salaires auraient moins crû en son absence (se situant à un niveau 8.5% inférieur à son niveau de référence simulé en 2020). Inversement, les salaires des travailleurs peu qualifiés auraient connu une croissance plus importante. Ces constats font écho à ceux concernant le chômage, où celui des peu qualifiés auraient été moins important en l'absence de biais. La deuxième simulation produit essentiellement l'effet inverse : en réduisant le nombre de travailleurs qualifiés, leurs salaires auraient davantage augmenté, et leur chômage se serait davantage réduit. Ainsi, ces deux phénomènes (progrès technique biaisé et quotas de places dans l'enseignement supérieur) peuvent tous les deux être considérés comme des rentes obtenues

par les travailleurs qualifiés déjà sur le marché. Le fait que le gouvernement malaisien a choisi d’opter pour une politique de *portes ouvertes* concernant l’enseignement supérieur a contrecarré les effets du progrès technique biaisé.

Dans une dernière section, nous examinons l’impact potentiel de ces simulations sur les inégalités de salaire. Calculant un coefficient de Gini pour l’année 2010, et appliquant à travers une microsimulation les variations salariales données par le modèle aux salaires de l’enquête, nous pouvons comparer l’évolution des inégalités sur la période 2010-2020 sous les différents scénarios. D’abord, le scénario de référence fait état d’une réduction des inégalités. Ainsi, malgré le progrès technique biaisé, l’augmentation du nombre de travailleurs qualifiés, couplé à l’introduction d’un salaire minimum en 2013, provoque une baisse du coefficient de Gini.

Table 1: Résumé d’indices de distribution

	2010 LFS	Ref.	Sim. 1	Sim. 2	Sim. 3
		SBTC, no rationing	No SBTC, no rationing	SBTC, rationing	NO SBTC, rationing
Coefficient de Gini	0.40743	0.3782	0.36686	0.39393	0.38078
Indice d’Atkinson	0.24532	0.2143	0.20306	0.23019	0.21683
p90/p10	6.415	5.66	5.458	6.133	5.695
p90/p50	2.52	2.399	2.301	2.559	2.425

Source: Calculs de l’auteur sur la base des résultats de la modélisation.

On voit cependant dans le tableau 1, qu’en l’absence de progrès technique biaisé (Simulation 1), le coefficient de Gini aurait été encore inférieur de 1.1 points. Cette baisse est importante (l’indice de Gini évoluant généralement très lentement), et avoisine la hausse de l’indice de la simulation 2, qui est de 1.5 points. La simulation 2, introduisant un rationnement du nombre de places dans l’éducation supérieure, fait alors augmenter les inégalités. Que les deux simulations contrefactuelles jouent en sens inverse est visible dans la dernière colonne, où l’indice de Gini est similaire à celui obtenu dans le scénario de référence.

Ainsi, le progrès technique biaisé a un impact néfaste sur l’évolution des inégalités salariales en Malaisie. Son évolution des dernières années a cependant été contrecarrée par la politique volontariste du gouvernement malaisien d’accroissement des dotations

éducationnelles des travailleurs malaisiens. Dans ce chapitre, nous avons supposé que le biais du progrès technique était sans lien avec la productivité totale des facteurs, de manière à isoler l'impact du biais sur le marché du travail. D'autres études pourraient envisager à explorer le lien entre productivité totale des facteurs et progrès technique biaisé de manière plus approfondie.

4 Chapitre III : Externalités occupationnelles de l'éducation des jeunes frères et sœurs

Ce chapitre propose d'étudier les externalités de l'éducation pouvant être engendrées dans un ménage lorsqu'un des jeunes membres de la fratrie s'éduque. Plus précisément, il s'agit de mesurer l'impact d'une augmentation de l'éducation des jeunes frères et sœurs sur l'occupation de leurs aînées. Des corrélations entre membres d'une fratrie ont pu être observées dans divers contextes (comme la fécondité ou l'établissement d'un ménage indépendant,), et peuvent résulter de dotations similaires, d'un environnement partagé ou de stratégies d'égalisation parentales. Les modèles statiques d'allocation du temps au sein des ménages ignorent souvent que la décision d'éduquer les enfants n'est pas prise au même moment pour tous les enfants, et que les coûts associés à leur scolarisation peuvent avoir changé entre les moments de prise de décision. Cette variation de coût est ce qui est exploitée dans ce chapitre, qui s'appuie sur des données de recensement indonésiennes et utilise un programme de construction d'écoles comme source de variation exogène de l'éducation au sein de la fratrie.

Les mécanismes pouvant conduire l'éducation d'un jeune membre d'une fratrie à impacter l'occupation de son aîné sont multiples, et émanent à la fois de modèles d'allocation des ressources et de résultats empiriques de la littérature économique. Le tableau 2 ci-dessous détaille cinq canaux, non mutuellement exclusifs. Si les trois premiers mécanismes peuvent trouver leurs sources dans les modèles d'allocation des ressources au sein des ménages classiques, les externalités (mécanisme 4) sont plutôt à prendre de la littérature sur les réseaux sociaux et les marchés du travail. Il est en effet démontré que le réseau social de l'individu a un impact sur son insertion sur le marché du travail, et ceci dans la quasi-totalité des économies où des études ont été menées (Jackson 2008). La fratrie, au-delà d'être une unité économique, est un réseau social, et ainsi un échange d'information opère entre membres de ce réseau social. Enfin, le dernier mécanisme émane d'un constat empirique d'après lequel la présence d'un aîné peut contribuer au

financement de la scolarisation des frères et soeurs plus jeunes (Emerson and Souza 2008).

Table 2: Impacts potentiels d’une augmentation exogène de l’éducation du jeune frère/sœur (A)

Canal	Effet sur le travail de marché de l’ainé (B)	Mécanisme
Spécialisation	Baisse	Le rendement marginal de B est décroissant de la dotation éducationnelle de A. Le ménage se spécialise en termes d’occupation et réduit le travail de B en faveur de tâches domestiques.
Effet revenu	Baisse	Le revenu de A suffisent au ménage et B n’a plus besoin de travailler.
Rivalité	Baisse/Hausse	L’éducation de A améliore son pouvoir de négociation au sein du ménage, le conduisant à choisir l’allocation des occupations dans le ménage.
Externalité	Hausse	L’éducation de A apporte des (meilleures) opportunités d’emploi pour B, le conduisant à entrer sur le marché du travail.
Contrainte de ressources	Hausse	B est forcé de travailler pour financer l’éducation de A. Une fois au travail, des coûts irrécupérables peuvent l’amener à y rester.

Confronté à une multitude de canaux possibles, ce chapitre prendra un point de départ résolument empirique. La première sous-section décrira les données utilisées pour l’analyse empirique, ainsi que la spécification économétrique retenue. La seconde sous-section détaillera les résultats obtenus et discutera de leur validité.

4.1 Données et spécification économétrique

Je me sers d’un échantillon du recensement indonésien de 1980 pour réaliser les estimations. L’échantillon du recensement, en accès libre via le projet IPUMS, contient 7 234 577 observations, et est représentatif de la population indonésienne au niveau national. Les données sont en coupe transversale, et il est impossible d’apparier des membres de familles vivant dans des ménages différents. Cette contrainte m’oblige à choisir des données de 1980, car la variation exogène de scolarisation qui va être utilisée est liée à la construction d’écoles dans la période de 1974 à 1978. En utilisant des ménages en 1980,

date relativement proche du programme, je minimise le risque d’avoir un échantillon fortement biaisé par des départs de membres de la fratrie. Bien que minimisé, ce biais n’est sans doute pas nul, et les résultats présentés doivent être considérés comme ayant une validité interne uniquement.

Le programme exploité comme source de variation est un vaste programme de construction d’écoles en Indonésie. Le programme, dont le déploiement a été finement décrit par Duflo (2001), visait à améliorer l’accès à l’éducation primaire des enfants indonésiens. Pendant 4 ans, le gouvernement indonésien a construit plus de 60 000 écoles primaires—un projet d’expansion scolaire sans précédent. Le programme a été introduit de sorte que les régions ayant les plus faibles taux de scolarisation ont été les premières à bénéficier du programme. Pour mesurer l’impact d’une variation de la dotation éducationnelle au sein de la fratrie, j’emploie la stratégie d’identification de Duflo—c’est-à-dire une estimation en deux étapes (2SLS), utilisant une interaction entre région et année de naissance comme instrument de l’éducation. La première étape consiste ainsi en une régression du nombre d’années à l’école sur l’âge, le sexe, un ensemble de variables reflétant la taille et la position de l’individu au sein de la fratrie, la région, des caractéristiques du frère/sœur aîné le plus proche, ainsi qu’une interaction entre l’âge et la région. C’est cette dernière interaction qui servira d’instrument pour l’éducation : l’intensité du programme variant entre régions, être né en 1970 dans la région A n’est pas associé à la même augmentation moyenne d’années d’école qu’être né en 1970 dans la région B, et être né en X dans la région de Jakarta n’est pas associée à la même augmentation qu’être né en Y dans la région de Jakarta, en contrôlant pour l’effet statique d’être né dans une année particulière et dans une région particulière. Cette intensité servira donc de variation exogène de l’éducation pour les jeunes membres des fratries.

J’estime cette régression sur un échantillon restreint aux individus entre 6 et 30 ans, qui ont au moins un frère ou une sœur en âge d’avoir pu bénéficier du programme. Pour améliorer l’identification, je choisis uniquement des couples de frères/sœurs proches et pour lesquels l’un a 18 ans ou plus, l’autre moins. L’écart d’âge moyen est de 3,8 ans pour l’échantillon total, assurant une hétérogénéité de traitement. Ainsi, le plus jeune est en âge d’avoir été affecté par le programme (d’autant plus qu’il est jeune) tandis que l’aîné ne l’est pas. Ceci implique également qu’uniquement un couple par ménage peut être exploité, et il n’est donc pas possible d’ajouter un effet fixe ménage à la spécification.

Les variables d’outcome reflètent l’occupation principale des aînés: ce sont la partici-

pation sur le marché du travail, le travail domestique non-marchand (tâches ménagères), et l'inactivité. Une désagrégation plus fine est également opérée, dans un second temps, en distinguant le travail dans l'agriculture du travail salarié ou le travail dans l'entreprise familiale. La variable d'outcome est à chaque fois une variable dichotomique, et le modèle est ainsi un modèle de probabilité linéaire. Des tests de robustesse ont montré que les effets marginaux estimés à partir d'un modèle non-linéaire de type Probit ou Logit sont très proches de ceux obtenus avec un modèle de probabilité linéaire, et le premier est donc retenu pour améliorer la vitesse de calcul.

4.2 Résultats et interprétations

Les résultats de la première étape montrent que l'interaction entre année de naissance et intensité de construction d'écoles dans la région est un bon prédicteur du nombre d'années passées à l'école. Ils suggèrent que les plus jeunes sont relativement plus affectés par la construction d'écoles. Ainsi, un enfant de 10 ans en 1980 a en moyenne 0.35 années d'éducation de plus qu'un enfant de 17 ans par mille écoles construites dans la région. Il est important de souligner que l'estimation contrôle pour l'âge et pour la région, de sorte que l'interaction reflète uniquement une variation induite par la construction d'école et non une différence systématique entre régions ou cohortes. Un F-test sur l'ensemble des interactions entre âge et intensité de construction d'écoles fournit une valeur de 60, suggérant que le critère d'inclusion de l'instrument est bien respecté.

Une deuxième régression est ensuite effectuée, où la variable dépendante reflète l'occupation de l'ainé. Cette variable occupationnelle reflète l'occupation principale de l'individu. Les individus peuvent soit travailler (dans un travail salarié, pour leur propre compte, ou dans l'entreprise familiale), soit effectuer des tâches domestiques, soit être inactifs. Cette deuxième étape montre qu'une augmentation exogène de l'éducation du membre le plus jeune du couple accroît la probabilité que le membre aîné ait un travail salarié, et réduit celle qu'il se consacre principalement aux tâches domestiques. Les coefficients ne sont pas significatifs pour le fait d'être salarié, d'avoir un deuxième emploi, de travailler en services ou d'être marié. Comme l'échantillon est réduit aux couples de frères et sœurs où l'ainé a quitté l'école, les résultats sont conditionnels au fait d'avoir un frère ou une sœur aîné(e) qui a quitté l'école. La taille des coefficients est relativement élevée : un enfant qui achève les six années d'éducation primaire augmente la probabilité que son aîné travaille de 13,2 points de pourcentage, et réduit celle d'effectuer des tâches domestiques

de 10,4 points de pourcentage. Quand l'échantillon principal est décomposé en quatre, pour mieux étudier l'aspect du genre, nous constatons que les résultats énoncés ci-dessus semblent tirés par des couples où le jeune membre de la fratrie est un garçon. L'impact sur les tâches domestiques est visible uniquement sur les filles aînées, car les garçons ne déclarent pratiquement jamais effectuer des tâches domestiques comme activité principale.

Plusieurs mécanismes sont possiblement à l'œuvre derrière les résultats évoqués ci-dessus. Une explication potentielle est le besoin qu'aurait l'ainé de travailler pour financer la scolarisation du jeune. Si c'était le cas, en restreignant l'échantillon aux couples où les deux frères/sœurs ont achevé leurs études, l'effet devrait disparaître. Cette régression est effectuée, et au lieu de disparaître, l'effet trouvé est renforcé, suggérant qu'une contrainte de crédit n'est pas ce qui a poussé les frères/sœurs aînés à travailler pour financer les études de leurs cadets.

La dernière partie de ce travail s'interroge sur la possible spécialisation occupationnelle au sein des ménages indonésiens. Une série de régressions avec des outcomes alternatifs est alors effectuée : les résultats ne suggèrent pas que l'impact trouvé émane d'une spécialisation au niveau de la fratrie, car le potentiel à gagner des individus ne semble pas orienter l'occupation choisie dans une direction cohérente avec la maximisation du revenu au niveau du ménage. De plus, le ménage n'abaisse ni le pourcentage de travailleurs dans l'entreprise familiale ni celui dans l'agriculture suite à une augmentation de la dotation éducationnelle d'un enfant. Un effet de pair ou externalité positive semble alors être l'explication la plus prometteuse, bien que des travaux ultérieurs sur des données plus détaillées seraient à même d'affirmer via quel(s) mécanisme(s) l'effet trouvé opère.

5 Chapitre IV : Quand la solidarité échoue : effets hétérogènes sur les enfants de décès d'adultes dans les ménages sénégalais

Le quatrième chapitre a été co-écrit avec Philippe De Vreyer. Il porte sur les conséquences d'un décès d'adulte dans les ménages sénégalais, en se focalisant sur les enfants du ménage. Une littérature importante a cherché à mesurer l'impact de l'orphelinage sur la scolarisation des enfants en Afrique, notamment dans des pays où l'épidémie de Sida a laissé d'importants nombres d'orphelins. Ces articles (Ainsworth and Filmer 2006; Evans and Miguel 2007) ont en général trouvé que la perte d'un parent réduit la probabilité de scolarisation des enfants. Certains auteurs ont cependant cherché à nuancer ces

résultats, arguant qu'à revenu égal, la perte d'un parent semble avoir un effet limité sur la scolarisation des enfants (Bennell 2005). Une piste intéressante a été explorée par Case, Paxson, and Ableidinger (2004), qui étudient le lien de parenté entre l'enfant et la personne décédée. Leur approche puise dans la biologie de l'évolution en examinant l'hypothèse d'Hamilton. Cette hypothèse affirme que le comportement altruiste entre deux individus d'une même espèce est une fonction croissante de leur proximité génétique. Autrement dit, le comportement entre parent et enfant devrait être plus altruiste que le comportement entre enfant et grands-parents, ou entre enfant et oncle. S'appuyant sur des données en coupe transversale de 10 pays, ils concluent qu'au sein des ménages, les enfants orphelins sont moins bien lotis en termes de scolarisation que les enfants non-orphelins, validant ainsi l'hypothèse d'Hamilton. Notre objectif dans cet article est d'examiner l'hypothèse d'Hamilton dans le contexte des ménages sénégalais, en ajoutant d'autres dimensions que la scolarisation—le travail, le confiage et l'aide domestique. Ce contexte diffère de celui qui est souvent étudié car l'épidémie de Sida a été moins importante au Sénégal que dans les pays de l'Est ou du Sud de l'Afrique. Enfin, à la différence de Case, Paxson, and Ableidinger (2004), nous utilisons des données de panel qui nous permettent de purger nos estimations d'un effet individuel statique.

5.1 Données et contexte

Dans ce chapitre, nous examinons l'hypothèse d'Hamilton dans un contexte particulier qui est celui du Sénégal. Le Sénégal connaît un fort taux de polygamie, et plusieurs femmes partagent souvent un même toit avec leur mari commun. Le contexte sénégalais, et ouest-africain plus généralement, est également caractérisé par une présence forte du confiage en tant que stratégie d'adaptation face à des chocs idiosyncratiques.

Nous exploitons les données de l'enquête PSF (Pauvreté et Structure Familiale), une enquête de panel en deux vagues dont les données ont été collectées en 2006-2007 et en 2011-2012. Une particularité de l'enquête est qu'elle identifie des unités de consommation au sein du ménage, appelées noyaux. Ces noyaux ne se partagent pas de façon égale les ressources au sein du ménage. La construction des noyaux est issue des traditions sénégalaises : le premier noyau est celui du chef de ménage, qui a souvent la charge d'un parent isolé ou d'un enfant dont la mère est absente. D'autres noyaux sont formés par les épouses du chef de ménage et leurs enfants communs. Enfin, des frères et sœurs ou autre parents peuvent également constituer des noyaux. Nous exploitons ce découpage

des ménages en noyaux pour tester l'hypothèse de solidarité vis-à-vis des enfants au sein des ménages. Les questions que nous posons sont les suivantes : d'une part, sans distinguer entre les enfants, quel est l'impact du décès d'un adulte en âge de travailler sur leur scolarisation, probabilité de travailler et/ou d'être confiés? Dans un deuxième temps, nous nous focalisons sur les décès de chefs de noyaux. La question devient alors : les enfants se trouvant dans le noyau de la personne décédée sont-ils traités différemment des enfants des autre noyaux en termes de scolarisation, de travail et/ou de confiage?

Les décès sont des événements relativement rares, mais étant donné l'importance de la taille des ménages sénégalais, près de 20% des enfants présents dans les deux vagues ont perdu un membre de leur ménage dans l'intervalle entre les enquêtes. Seuls un quart de ces enfants sont concernés par le décès d'un chef de noyau du ménage, et 1% de l'échantillon total par le décès du chef de leur propre noyau.

5.2 Spécification économétrique et résultats

Pour estimer l'impact du décès d'un adulte, nous utilisons une régression en double différence. La spécification est la suivante :

$$Y_{c,t} = \alpha + \beta_1 X_{c,t} + \beta_2 T_{c,t} + \gamma_t + \delta_c + \epsilon_{c,t} \quad (1)$$

Avec $Y_{c,t}$ l'outcome de l'enfant c en année t , $X_{c,t}$ des caractéristiques de l'enfant variant dans le temps, $T_{c,t}$ l'effet du traitement (égal à un à la période 2 si l'enfant vit dans un ménage qui a subi un décès), γ_t une variable dichotomique pour la vague d'enquête, δ_c un effet fixe de l'enfant, et $\epsilon_{c,t}$ un terme d'erreur idiosyncratique.

Dans la deuxième partie du chapitre, quand nous nous focalisons sur les décès des chefs de noyaux, la spécification ci-dessous est retenue :

$$Y_{c,t} = \alpha + \beta_1 X_{c,t} + \beta_2 T_{c,t} + \beta_3 T_{c,t} \times indT_{c,t} + \gamma_t + \delta_c + \epsilon_{c,t} \quad (2)$$

La variable dépendante est ici limitée au décès des chefs de noyaux, et l'interaction $\beta_3 T_{c,t} \times indT_{c,t}$ est ajoutée. La variable qui indique le décès d'un chef de noyau est

interagit avec une variable indiquant que l'enfant fait partie du noyau de la personne décédée. La variable $T_{c,t}$ contrôle ainsi pour l'appartenance à un ménage qui connaît un décès de chef de noyau, de manière à ce qu'une comparaison puisse être effectuée entre enfants de noyaux différents. Nous ajoutons également une spécification en effets fixe ménage, où uniquement les ménages qui connaissent des décès apparaissent.

Deux sources de biais potentielles menacent la validité de nos résultats. D'abord, les décès ne sont pas aléatoires et la probabilité d'un décès dans un ménage a toutes les chances d'être liée à des caractéristiques inobservables du ménage, elles-mêmes corrélées aux occupations des enfants. Pour minimiser cette source d'endogénéité nous tirons profit de la dimension panel des données pour produire des estimations contenant un effet fixe enfant. Par ailleurs, nous remarquons que les résultats de ces estimations sont peu différents de ceux de modèles à effets fixes aléatoires, suggérant que ce biais est limité. Une deuxième source de biais est celui lié à la prévisibilité des décès. Si les décès sont prévisibles pour le ménage, l'ajustement peut s'opérer avant même le décès, et dans certains cas avant même la première vague de l'enquête. Ceci induirait un biais vers zéro. Pour examiner cette source de biais nous nous tournons vers deux sources d'information complémentaires : des données épidémiologiques, et la santé subjective. D'abord, la majorité des décès au Sénégal ne peuvent être associés à des maladies chroniques ou de longue durée. Les accidents et les décès liés à l'accouchement représentent plus d'un quart des décès; la tuberculose et les infections respiratoires représentent 16%, la malaria et les diarrhées 10%. De surcroît, 79% des personnes décédées entre les deux vagues déclaraient un état de santé moyen ou bon (comparé à 97% parmi les survivants). Ces deux informations suggèrent que les décès survenus entre les deux vagues de l'enquête sont, du moins en grande partie, imprévus à la première vague.

La première série de régressions étudie l'impact d'un décès sur l'ensemble des enfants du ménage. Les résultats montrent que le fait d'être dans un ménage qui a connu un décès n'a pas d'impact significatif sur la probabilité d'être ou d'avoir été scolarisé. Quant à la probabilité de travailler ou d'effectuer des tâches domestiques, ces deux outcomes voient leur probabilité augmenter en cas de décès de certains individus. Le décès d'un homme en âge de travailler est associé à une probabilité accrue d'avoir un emploi de 0,11 points de pourcentage, tandis que celui d'une femme en âge de travailler est associé à 3,72 heures de tâches domestiques supplémentaires pour l'enfant. Les résultats montrent également une probabilité accrue de confiage en cas de décès du chef de ménage.

Dans la deuxième partie de l'article, nous nous focalisons sur les décès de chefs de noyau. Rappelons d'abord que la plupart des noyaux sont constitués d'épouses du chef de ménage et de ses enfants avec le chef de ménage. Dans cette configuration, le décès d'un chef de noyau implique le décès de la mère biologique pour les enfants du noyau, et le décès d'une femme en âge de travailler qui ne lui est pas liée biologiquement pour les enfants des autres noyaux. Conformément à l'hypothèse d'Hamilton, nous observons que le décès d'un chef de noyau accroît la probabilité de travailler des enfants du noyau, et réduit celle d'être scolarisée. L'impact est élevé, la probabilité d'être scolarisée étant réduite de 0,25 points de pourcentage, tandis que celle de travailler augmente de 0,24 points de pourcentage. Aucun effet n'est trouvé pour les enfants des autres noyaux. Ces résultats sont maintenus lorsque nous remplaçons l'effet fixe enfant par un effet fixe ménage. Ainsi, il semblerait que la solidarité intra-ménage au Sénégal a de fortes limites. La prise en compte de ce constat par les décideurs publics et les bailleurs internationaux ferait que l'organisation de transferts aux ménages au Sénégal gagnerait en efficacité.

6 Chapitre V : Symptômes dépressifs parentaux et travail et scolarisation des enfants: une étude sur données mexicaines

Le cinquième et dernier chapitre de mon travail de thèse porte sur la dépression des parents au Mexique et ses conséquences sur l'occupation des enfants. La dépression est devenue le deuxième contributeur aux années de vie en bonne santé perdues à l'échelle mondiale. Elle est ainsi responsable de pertes de bien-être significatives, non seulement dans les pays développés, mais également dans les pays en développement. Les estimations de prévalence à long-terme suggèrent que la probabilité d'être touché par la dépression une fois dans la vie dépasse les 10%, à la fois dans les pays à bas-, moyen- et haut revenu. Le pourcentage d'individus ayant accès à un traitement est néanmoins très faible dans les pays n'appartenant pas au groupe des pays à haut revenu. Pourtant, des études récentes telles celle publiée dans *The Lancet* (Chisholm et al. 2016) suggèrent que le rendement des interventions dans le domaine de la santé mentale est très élevé ; dans l'étude mentionnée, les bénéfices dépassent les coûts d'un facteur compris entre 2 et 3 quand seuls les coûts économiques sont pris en compte, et de 3 à 6 quand la valeur économique d'une bonne santé est intégrée.

L'attention portée à la dépression et aux autres maladies mentales autour du monde est très inégalement distribuée, et ceci est reflété dans les dépenses publiques allouées à

la santé mentale. Au Mexique, 1.96\$ sont dépensés par personne et année, à comparer aux 60\$ des pays à haut revenu, et aux 250\$ des Etats-Unis. En plus des conséquences sur le travail, qui sont sans doute celles auxquelles le plus grand nombre d'études ont été consacrées (montrant en général une plus faible activité et une plus faible rémunération chez les personnes atteintes de troubles mentaux), la santé mentale a des conséquences sur la vie privée. Bon nombre des personnes souffrant de dépression et autres troubles mentaux sont des parents, et la maladie pourrait bien influencer la façon dont se passe l'éducation des enfants, ainsi que les décisions prises concernant les enfants. La littérature psychologique a notamment montré qu'une dégradation de la santé mentale des parents a une influence sur leur la probabilité d'avoir des comportements maladaptés avec les enfants (Berg-Nielsen, Vikan, and Dahl 2002; LeFrançois 2010; Smith 2004). Un changement de comportement, ainsi qu'une baisse de revenu induite par l'arrivée de troubles mentaux pourrait influencer l'allocation du temps des enfants.

L'objectif de ce chapitre est ainsi d'estimer l'impact de variations de symptômes dépressifs de parents mexicains sur la scolarisation et le travail de leurs enfants. Pour ce faire, je dispose de trois vagues de l'enquête Mexican Family Life Survey, une enquête en panel effectuée par des chercheurs mexicains et américains. La première sous-section introduira les données et le contexte théorique, tandis que la deuxième présentera la méthodologie et les résultats. Elle tentera également d'aller plus loin en examinant les mécanismes à l'œuvre.

6.1 Données et contexte théorique

Un modèle théorique simple permet d'illustrer deux mécanismes à travers lesquels des symptômes dépressifs peuvent modifier la décision de scolariser ou de faire travailler l'enfant. Le modèle adopté est un modèle avec un parent et un enfant représentatifs, où le parent travaille à temps plein et où l'enfant divise son temps entre l'éducation et le travail. Il est admis que le parent prenne la décision pour l'enfant. Il est par ailleurs supposé que la santé mentale affecte positivement à la fois la rémunération du parent et l'efficacité avec laquelle le temps passé à l'école est converti en utilité. En maximisant son utilité, le parent choisit ainsi un niveau de scolarisation et de travail d'équilibre pour l'enfant, qui dépendent de θ_p , un paramètre reflétant son état de santé mentale.

Dans le modèle décrit ci-dessus, une détérioration de l'état de santé mentale du parent

conduit à une augmentation du travail de l'enfant et une réduction de son temps passé à l'école. Deux mécanismes sont à l'œuvre : d'abord, la détérioration de l'état de santé du parent induit une perte de revenu qui pourra être compensée en faisant travailler l'enfant. Deuxièmement, la productivité marginale de l'éducation étant une fonction croissante de l'état de santé mentale du parent, l'école devient moins rentable et sera en partie substituée pour du travail. Ainsi un effet revenu et un effet de substitution conduisent les ménages mexicains à faire travailler leurs enfants tout en réduisant leur investissement à l'école.

Je dispose d'un échantillon d'enfants mexicains vivant chez leurs parents (ou avec leur parent et un beau-parent), et qui sont observés (ainsi que leurs parents) à trois moments dans le temps: en 2002, en 2005-2006, et en 2009-2011. L'enquête contient un module de santé mentale contenant 20 questions caractérisant des symptômes dépressifs, spécialement construit pour la population mexicaine (Calderón-Narváez 1997). Les réponses sont classées sur une échelle de Likert, prenant les valeurs 1 -Jamais; 2-Parfois; 3-Souvent; 4-Tout le temps. Les individus sont interrogés sur la présence des symptômes sur les 4 dernières semaines, et les valeurs des réponses sont ensuite additionnées pour former un score de symptômes dépressifs allant de 20 à 80. La spécification retenue est celle de la probabilité linéaire, où une série de variables dichotomiques au niveau de l'enfant constituent les variables dépendantes. Les variables indépendantes sont la consommation par tête, la vague de l'enquête, la santé subjective de l'enfant, la participation sur le marché du travail des parents, l'hospitalisation des parents dans les 12 derniers mois, le nombre de maladies chroniques des parents dans les 12 derniers mois, et le score moyen de symptômes dépressifs des parents. Cette dernière variable est la variable d'intérêt, et on s'attend à ce qu'elle joue positivement sur le travail des enfants et négativement sur leur scolarité.

Même dans une spécification avec effets fixes individuels, l'identification du coefficient de notre variable d'intérêt est menacée par l'endogénéité. En effet, des variables variant dans le temps, dans le même sens que les symptômes dépressifs et avec les variables dépendantes sont susceptible de confondre l'identification. Pour mieux identifier le coefficient, je procède alors à une estimation en deux étapes, avec un instrument pour les symptômes dépressifs qui varient dans le temps et qui est exogène (conditionnellement à l'effet fixe individuel). Cet instrument est le fait d'avoir été agressé dans la rue (et uniquement dans la rue). La violence n'est malheureusement pas un phénomène rare au Mexique, et toutes les catégories socioprofessionnelles sont concernées. Le lien entre

violence et troubles mentaux a été établi dans plusieurs études (telles que Kilpatrick et al. (1985) and Ribeiro et al. (2013)).

6.2 Résultats, mécanismes et robustesse

Les estimations en effets fixes individuels établissent un lien entre les symptômes dépressifs des parents et la probabilité d'avoir travaillé un jour des enfants. Ils font également apparaître un lien entre le score moyen dépressif et la probabilité de l'enfant d'avoir redoublé, et la probabilité qu'il combine école et travail. En outre, il y a une corrélation positive avec le fait d'être inactif. En revanche, l'estimation ne montre pas de corrélation significative entre le fait de travailler au moment de l'enquête, ou d'être à l'école. Ces résultats vont ainsi partiellement dans le sens d'une confirmation des intuitions du modèle théorique. Cependant, la possible endogénéité de la variable reflétant les symptômes dépressifs fait qu'une estimation en deux étapes est réalisée. La première étape confirme que le fait d'avoir été agressé dans la rue est bien positivement corrélé au score de symptômes dépressifs, y compris quand un effet fixe individuel est présent. Ainsi, les parents qui entre deux vagues ont été agressés dans la rue ont en moyenne connu une détérioration plus forte de leur état de santé mentale. Le résultat est particulièrement robuste en ce qui concerne l'agression des femmes. Quand l'agression dans la rue est utilisée comme instrument dans la deuxième étape, les résultats sont qualitativement semblables à ceux des effets fixes individuels, à deux exceptions près. Le coefficient du score de symptômes dépressifs sur la probabilité de travailler actuellement est désormais positif et significatif. De même, l'augmentation des symptômes dépressifs est désormais corrélé à une probabilité accrue d'être scolarisé. Si le premier de ces résultats va dans le sens des intuitions théoriques, le deuxième peut en apparence sembler problématique. Néanmoins, deux mécanismes peuvent affecter la probabilité d'être scolarisé : le redoublement, qui tend à prolonger le temps passé à l'école pour un niveau de diplôme donné, et la poursuite des études vers un niveau de diplôme plus élevé. L'examen des mécanismes montre que c'est le premier mécanisme qui l'emporte. Une décomposition par âge montre en effet que les enfants en âge d'être au collège sont ceux qui tirent cet effet. Pour les enfants plus âgés, le coefficient des symptômes dépressifs parentaux sur leur présence à l'école est négatif.

Les résultats sont robustes à une série de tests de robustesse. Pour que le coefficient soit identifié, l'exogénéité de l'instrument ne doit pas faire de doute. Ainsi, j'explore une

série de spécifications alternatives qui ajoutent des variables de contrôle supplémentaires dans les deux étapes de la régression. Ainsi, les résultats sont robustes à l'exclusion des individus qui ont été physiquement blessés ou qui ont perdu de grosses sommes d'argent lors de leur agression; ils sont également robustes à l'ajout de la probabilité subjective de se faire agresser. Cette probabilité peut être appréhendée comme une information privée quant aux types de risque auxquels la personne s'expose.

Quant aux mécanismes pouvant engendrer les résultats ci-dessus, une série de régressions est effectuée pour évaluer l'importance relative desdits mécanismes. Dans un premier temps, des régressions en effets fixes individuels montrent une corrélation positive entre inactivité et scores de symptômes dépressifs, ainsi qu'une corrélation négative entre symptômes dépressifs et travail pour les parents. Cependant, les coefficients baissent en taille et ne sont plus significatifs quand le score est instrumenté. En revanche, le score est significativement lié au nombre de symptômes physiques des enfants, et au score de symptômes dépressifs de l'enfant (même si celui-ci n'est mesuré que pour les enfants de 15 ans ou plus). Ainsi il semblerait qu'une détérioration de l'interaction entre parent et enfant, et/ou du comportement des parents, plutôt qu'un facteur purement lié au revenu, soit derrière les résultats.

7 Conclusion

Les chapitres ici résumés ont tous été motivés par une volonté de comprendre et de mesurer des composantes des trajectoires des jeunes dans l'éducation et sur le marché du travail. Ainsi, le premier chapitre discute du concept de transition de l'école au marché du travail, en fournissant une revue exhaustive de la littérature théorique et empirique pouvant être mise en lien avec ce concept. Je constate ici que la nature même des trajectoires des jeunes dans les pays en développement est méconnue et mérite de nombreuses études (descriptives) pour informer quant aux véritables enjeux auxquels la génération actuelle est confrontée. Deuxièmement, les déterminants des transitions réussies doivent également être davantage étudiés. En lien avec cette recommandation, une incorporation plus systématique de l'historique de l'éducation et de l'expérience sur le marché du travail des individus dans les enquêtes socio-économiques irait dans ce sens.

Dans le deuxième chapitre, nous étudions deux dimensions desdites transitions: l'offre d'éducation, et la demande de compétences. Nous confirmons le rôle important à la fois de la politique éducative et du biais en faveur du travail qualifié dans le façonnement du

marché du travail, et plus globalement dans la lutte contre les inégalités.

Les chapitres 3, 4 et 5 se focalisent sur les interactions au sein des ménages, en exploitant des données d'enquête. Ces chapitres soulignent l'importance de tenir compte de l'environnement dans lequel sont immergés les individus—en particulier le ménage. En mobilisant le programme de construction d'écoles INPRES comme source exogène de variation de l'éducation, je montre que l'éducation d'un jeune membre d'une fratrie déplace ses aînés vers le marché du travail et réduit la probabilité que ses grandes sœurs soient cantonnées aux tâches ménagères. L'examen des résultats suggère une externalité positive de l'éducation du jeune membre comme mécanisme le plus plausible. Au Sénégal, nous trouvons que l'impact du décès d'un adulte sur les enfants dépend du lien entre la personne décédée et l'enfant—un lien qui n'est souvent pas biologique dans le contexte organisationnel des ménages sénégalais. Enfin, le dernier chapitre complète le chapitre 4 en ce qu'il s'intéresse aux chocs sur les adultes du ménage. Dans un contexte différent—celui du Mexique—je montre qu'une variation de l'état de santé mentale des parents a des implications sur l'occupation des enfants. Ainsi, les programmes d'intervention dans le domaine de la santé mentale peuvent avoir d'importantes externalités, jusque-là non prises en compte dans les estimations de rendement (qui sont par ailleurs déjà très élevés).

Ces résultats contribuent à une littérature large et transversale visant à comprendre ce qui est derrière l'allocation des ressources au sein du ménage et comment les enfants peuvent être mobilisés pour faire face à des chocs. Ils participent au débat sur la pertinence des modèles d'allocation des ressources présents dans la littérature, et s'interrogent également sur la façon dont des chocs de santé modifient l'allocation des ressources au sein du ménage.

References

- Abebe, G et al. (2016a). *All the Fun of the (Job) Fair. Matching Firms and Workers in a Field Experiment in Ethiopia*. Tech. rep. Working Paper.
- Abebe, Girum et al. (2016b). *Curse of Anonymity or Tyranny of Distance? The Impacts of Job-Search Support in Urban Ethiopia*. Tech. rep. National Bureau of Economic Research.
- Ainsworth, Martha and Deon Filmer (2006). “Inequalities in children’s schooling: AIDS, orphanhood, poverty, and gender”. In: *World Development* 34.6, pp. 1099–1128.

- Albrecht, James, Lucas Navarro, and Susan Vroman (2009). “The Effects of Labour Market Policies in an Economy with an Informal Sector”. In: *The Economic Journal* 119.539, pp. 1105–1129.
- Assaad, Ragui, Christine Binzel, and May Gadallah (2010). “Transitions to Employment and Marriage Among Young Men in Egypt”. In: *Middle East Development Journal* 2.01, pp. 39–88.
- Autor, David H, Lawrence F Katz, and Alan B Krueger (1998). “Computing inequality: have computers changed the labor market?” In: *The Quarterly Journal of Economics* 113.4, pp. 1169–1213.
- Becker, Gary S (1960). “An Economic Analysis of Fertility”. In: *Demographic and economic change in developed countries*. Columbia University Press, pp. 209–240.
- (1962). “Investment in Human capital: A Theoretical Analysis”. In: *Journal of Political Economy* 70.5, pp. 9–49.
- (1965). “A Theory of the Allocation of Time”. In: *The Economic Journal* 75.299, pp. 493–517.
- Bennell, Paul (2005). “The Impact of the AIDS Epidemic on the Schooling of Orphans and Other Directly Affected Children in Sub-Saharan Africa”. In: *The Journal of Development Studies* 41.3, pp. 467–488.
- Berg-Nielsen, Turid Suzanne, Arne Vikan, and Alv A Dahl (2002). “Parenting Related to Child and Parental Psychopathology: A Descriptive Review of the Literature”. In: *Clinical Child Psychology and Psychiatry* 7.4, pp. 529–552.
- Bhalotra, Sonia and Samantha B Rawlings (2011). “Intergenerational persistence in health in developing countries: The penalty of gender inequality?” In: *Journal of Public Economics* 95.3, pp. 286–299.
- Bowers, N (1998). *Getting started, settling in: the Transition from Education to the Labour Market*.
- Calderón-Narváez, Guillermo (1997). “Un cuestionario para simplificar el diagnóstico del síndrome depresivo”. In: *Revista de Neuro-Psiquiatría* 60.2, pp. 127–135.
- Calvès, Anne E, Jean-François Kobiané, and Afiwa N’Bouké (2013). “Privatization of Education and Labor Force Inequality in Urban Francophone Africa: The Transition from School to Work in Ouagadougou”. In: *World Development* 47, pp. 136–148.
- Calvès, Anne-Emmanuèle and Bruno Schoumaker (2004). “Deteriorating Economic Context and Changing Patterns of Youth Employment in Urban Burkina Faso: 1980–2000”. In: *World development* 32.8, pp. 1341–1354.
- Calvo-Armengol, Antoni and Yves Zenou (2005). “Job matching, social network and word-of-mouth communication”. In: *Journal of Urban Economics* 57.3, pp. 500–522.

- Case, Anne, Christina Paxson, and Joseph Ableidinger (2004). “Orphans in Africa: Parental death, poverty, and school enrollment”. In: *Demography* 41.3, pp. 483–508.
- Chisholm, Dan et al. (2016). “Scaling-up treatment of depression and anxiety: a global return on investment analysis”. In: *The Lancet Psychiatry* 3.5, pp. 415–424.
- Cho, Yoonyoung et al. (2012). *Labor Markets in Middle and Low Income Countries: Trends and Implications for Social Protection and Labor Policies*. Washington DC: World Bank, World Bank Social Protection Discussion Papers No. 67613.
- Dercon, Stefan and Pramila Krishnan (2000). “In Sickness and in Health: Risk Sharing within Households in Rural Ethiopia”. In: *Journal of Political Economy* 108.4, pp. 688–727.
- Drechsler, Dennis, Johannes Jütting, and Theodora Xenogiani (2008). “Is Informal Normal? Towards more and better jobs”. In: *Poverty in Focus* 16, pp. 8–9.
- Duflo, Esther (2001). “Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment”. In: *American Economic Review* 91.4, pp. 795–813.
- Eide, Eric R and Mark H Showalter (2011). “Estimating the relation between health and education: What do we know and what do we need to know?” In: *Economics of Education Review* 30.5, pp. 778–791.
- Emerson, Patrick M and Andre Portela Souza (2008). “Birth Order, Child Labor, and School Attendance in Brazil”. In: *World Development* 36.9, pp. 1647–1664.
- Evans, David K and Edward Miguel (2007). “Orphans and schooling in Africa: a longitudinal analysis”. In: *Demography* 44.1, pp. 35–57.
- Flórez, Luz Adriana (2015). “The Search and Matching Equilibrium in an Economy with an Informal Sector: A Positive Analysis of Labor Market Policies”. In: *Desarrollo y Sociedad* 75, pp. 51–99.
- Galiani, Sebastian and Hugo A Hopenhayn (2003). “Duration and risk of unemployment in Argentina”. In: *Journal of Development Economics* 71.1, pp. 199–212.
- Goldstein, Markus and Christopher Udry (2008). “The Profits of Power: Land Rights and Agricultural Investment in Ghana”. In: *Journal of Political Economy* 116.6, pp. 981–1022.
- Groh, Matthew et al. (2015). “Testing the importance of search frictions and matching through a randomized experiment in Jordan”. In: *IZA Journal of Labor Economics* 4.1, pp. 7–27.
- Guarcello, Lorenzo et al. (2005). *School-to-Work Transitions in Sub-Saharan Africa: an overview*. Understanding Children’s Work Project Working Paper Series 43933.
- Jackson, MO (2008). *Social and Economic Networks*.

- Kabbani, Nader and Ekta Kothari (2005). *Youth employment in the MENA region: A Situational Assessment*. World Bank Social Protection Discussion Paper 534.
- Kazianga, Harounan and Zaki Wahhaj (2017). “Intra-household resource allocation and familial ties”. In: *Journal of Development Economics* 127, pp. 109–132.
- Kilpatrick, Dean G et al. (1985). “Mental health correlates of criminal victimization: a random community survey.” In: *Journal of Consulting and Clinical Psychology* 53.6, pp. 866–873.
- LeFrançois, Brenda A (2010). “Distressed fathers and their children: A review of the literature”. In: *International Journal of Social Psychiatry* 58.2, pp. 123–130.
- Matsumoto, Makiko and Sara Elder (2010). *Characterizing the school-to-work transitions of young men and women: Evidence from the ILO school-to-work transition surveys*.
- Neal, Derek (1999). “The Complexity of Job Mobility among Young Men”. In: *Journal of Labor Economics* 17.2, pp. 237–261.
- O’Higgins, Niall (2008). *Guide to the School-to-Work Transition*. Unpublished manuscript.
- Ribeiro, Wagner Silva et al. (2013). “The Impact of Epidemic Violence on the Prevalence of Psychiatric Disorders in Sao Paulo and Rio de Janeiro, Brazil”. In: *PloS one* 8.5, e63545.
- Ryan, Paul (2001). “The School-to-Work Transition: A Cross-National Perspective”. In: *Journal of Economic Literature* 39.1, pp. 34–92.
- Satchi, Mathan and Jonathan Temple (2009). “Labor markets and productivity in developing countries”. In: *Review of Economic Dynamics* 12.1, pp. 183–204.
- Serneels, Pieter (2007). “The Nature of Unemployment among Young Men in Urban Ethiopia”. In: *Review of Development Economics* 11.1, pp. 170–186.
- Smith, Marjorie (2004). “Parental mental health: disruptions to parenting and outcomes for children”. In: *Child & Family Social Work* 9.1, pp. 3–11.
- UN General Assembly (1948). *The Universal Declaration of Human Rights*.
- Wahba, Jackline and Yves Zenou (2005). “Density, social networks and job search methods: Theory and application to Egypt”. In: *Journal of Development Economics* 78.2, pp. 443–473.

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General Introduction

The right to decent work is a fundamentally recognized one. The United Nations' declaration of human rights encompasses the "right to work, to free choice of employment, to just and favorable conditions of work, and to protection against unemployment" (UN General Assembly 1948). More than a way of providing for oneself, work confers on individuals a sense of purpose and contributes to the building and maintaining of a social identity, through the possibilities of emancipation and autonomy that come with being able to provide for oneself. Recognizing this, policy makers around the world have become acutely aware of the necessity of ensuring that labor market possibilities for youth prevail. In western countries, the transition from school to work has become more complex in recent years (Ryan 2001), associated with more job shopping, longer spells of precarious employment and increased unemployment. In many developing countries as well, the prospects of youth have changed over the last decades. The pathways between higher education and public employment available to previous generations of Africans may no longer be a viable option (Assaad, Binzel, and Gadallah 2010; Calvès and Schoumaker 2004), and education no longer seems to guarantee employment in some contexts, as illustrated by the soaring unemployment rates of university graduates in several countries in the Middle East & North Africa (Kabbani and Kothari 2005). Furthermore, the employment opportunities for the world's youth increasingly occur in the informal sector (Cho et al. 2012; Drechsler, Jütting, and Xenogiani 2008).

In a sense, to understand labor market transitions we need to look further than the transition itself. Success in the labor market depends on such things as education, ability, gender, health, contacts, luck, search intensity, household arrangements and the nature of the labor market itself. Some of these variables, such as health or ability, have origins preceding birth, as shown by the literature on *in utero* effects (see Eide and Showalter (2011) for an overview). It thus comes as no surprise to find strong intergenerational transmissions of labor market and educational status in developing countries (Bhalotra and Rawlings 2011). Furthermore, individuals are embedded in formal and informal arrangements, of which the household is perhaps the most prominent one. This is likely to hold especially true in contexts where formal safety nets and job market infrastructures

are lacking. Ignoring the interactions within households may consequently be particularly reductive in these contexts. Thus, set in a disarray of endowments, choices and constraints reflecting organization both at the societal and the individual or household level, making sense of the transition from education to the labor market is no easy task.

From a policy maker’s perspective, the success of young persons in the labor market hinges on a large (potentially infinite) number of factors, both macroeconomic and microeconomic in nature. One such factor is the allocation of resources within family networks. Since the early contributions of Gary Becker to the economics of education and the family (Becker 1960, 1962, 1965), economists have attempted to look into the black box of the family, to determine how and according to which criteria parents invest in their children. Deriving decision rules from unitary—and later collective—models of the household enables researchers to predict the effects of shocks, both on individual members and on households on the whole. Often, however, data are simply not rich enough to infer behavioral assumptions from empirical studies and the need to simplify a complex world in order to achieve tractability reduces the predictive power of such models. Indeed, the assumptions behind both the unitary and collective household models have failed to find consistent support in developing countries (Dercon and Krishnan 2000; Goldstein and Udry 2008; Kazianga and Wahhaj 2017). The large and growing body of empirical evidence on the impacts of shocks can (in addition to providing empirical tests for theoretical models) provide a more pragmatic basis for guided policy intervention aiming to reduce inequalities and minimize the risk of social conflict, while taking into account the multiplicity of constraints facing youth. This thesis aims to contribute to that body of evidence through five chapters, summarized in section 4 below. Although varying in geographical context and methodology, their common denominator is that they all draw on empirical data from low- and middle-income countries to answer questions related to the process of educational progress and labor market integration.

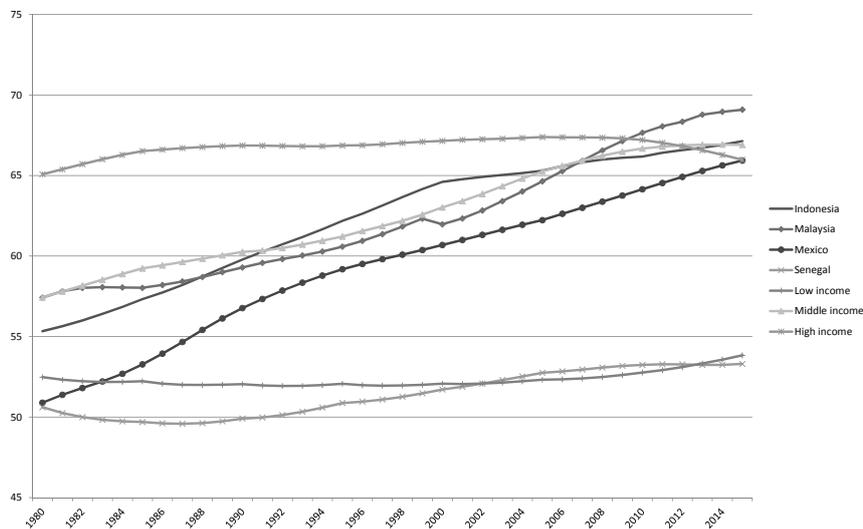
1 Background: demographic opportunities?

There have never been more young people on earth¹. In the world’s 48 least developed countries, children and adolescents make up a majority of the population. Furthermore, in

¹Web Page of the United Nation’s Office of the Secretary-General’s Envoy on Youth: <http://www.un.org/youthenvoy/2015/04/10-things-didnt-know-worlds-population>. Accessed on April 10, 2017.

much of the developing world, the demographic transition has yet to enter its final stages (or has hardly started), and important demographic dividends are likely to prevail in the decades to come. This dividend, theorized in demographic transition theory, essentially states that countries going through modernization see both their fertility and mortality rates drop. As such, a window in time is created in which a country benefits from a high proportion of individuals in working age, creating opportunities for increased GDP per capita growth (Kirk 1996).

Figure 1: Share of population of working age (15-65), World Bank income groups and selected countries



Source: World Development indicators, available at <http://data.worldbank.org/wdi>; accessed February 24, 2017.

Figure 1 clearly illustrates the various stages of demographic transition for low-income, middle-income and high-income countries respectively. High-income countries, whose demographic transition is in the final stages, have had a high, yet stable share of working-age population for the last three decades. Middle-income countries, such as Indonesia and Mexico, have seen their shares of working-age population increase heavily over the same time period, reaching the levels of high-income countries. This transition occurred despite the fact that life expectancy and the share of people older than 65 increased: this proved to be insufficient to compensate for the dramatic fall in fertility that these countries have

experienced. Finally, less developed countries on average are yet to start the demographic transition. Their shares of the population in working age are increasing slowly, but fertility remains high and the share of the population below the age of 15 remains close to 45%.

The fact that the demographic transition, with lowered fertility rates and increased life expectancy, has accompanied higher growth rates has been concluded in several contexts (e.g. East Asia, Bloom and Williamson (1998); Ireland, Bloom and Canning (2003)). However, the mechanisms through which the demographic dividend works have been up for debate. Recent evidence suggests that the demographic dividend is nothing more than an *education dividend* (Cuaresma, Lutz, and Sanderson 2014). In other words, the mere fact that a decrease in fertility reduces the share of dependent individuals in the economy is insufficient for growth to take off. The higher growth rates found in countries where the demographic transition is taking place thus required a catalyst: the economy does not mechanically expand to employ the excess labor supply, as the recent worldwide financial crisis has reminded us of. Instead, the authors argue, growth gains result from investments in education, which have provided increases in labor productivity. Such investments might well have been rendered possible through an increase in savings associated with decreased fertility. Whichever the underlying cause, youth bulges (such as the present one in the Middle East & North Africa) put youth in command of the future of their countries. As seen in recent years in the abovementioned region, a failure to provide this generation with decent labor market opportunities puts countries at risk of social upheaval, with potentially disastrous consequences.

2 How are youth doing in developing economies' labor markets?

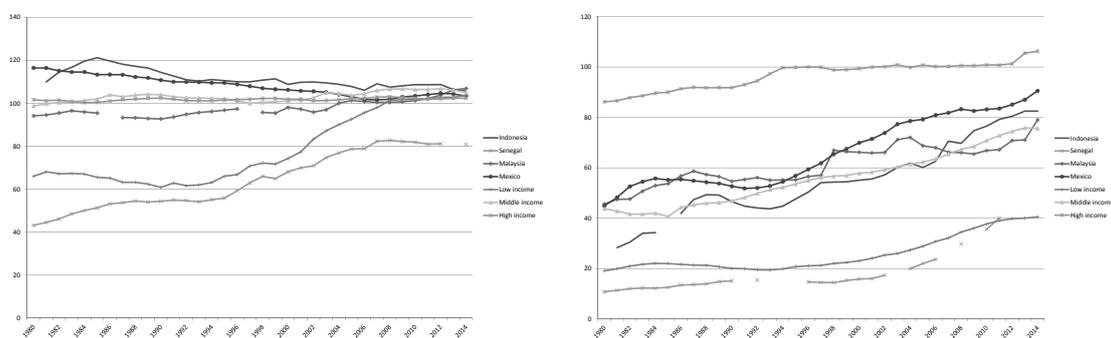
2.1 Recent evolutions in educational attainment and child labor

As can be seen from Figure 2, enrollment rates have progressed significantly since the 2000 Dakar Framework for Action² and the Millennium Development Goals, which both established a goal of universal primary education. Although secondary education is far from universal, its improvement has also been quite remarkable over the last 25 years, in both low-, middle- and high-income countries. Although this is good news,

²The World Education Forum held in Dakar in 2000 agreed on a framework for action in six goals: expand early childhood care and education; provide free and compulsory primary education for all; promote learning and life skills for young people and adults; increase adult literacy by 50%; achieve gender parity by 2005, gender equality by 2015; improve the quality of education.

low-income countries are still facing a gross enrollment rate of 40% in secondary education. Synchronically, tertiary education has expanded across the world, such that one fifth of the relevant global cohort is now enrolled in higher education (Schofer and Meyer 2005). The expansion over the last decades has been particularly rapid in developed countries, but developing countries are beginning to follow, and the enrollment rates in many developing countries are now higher than those of developed countries only a few decades ago.

Figure 2: Gross enrollment rates at primary (left) and secondary (right) level, World Bank income groups and selected countries



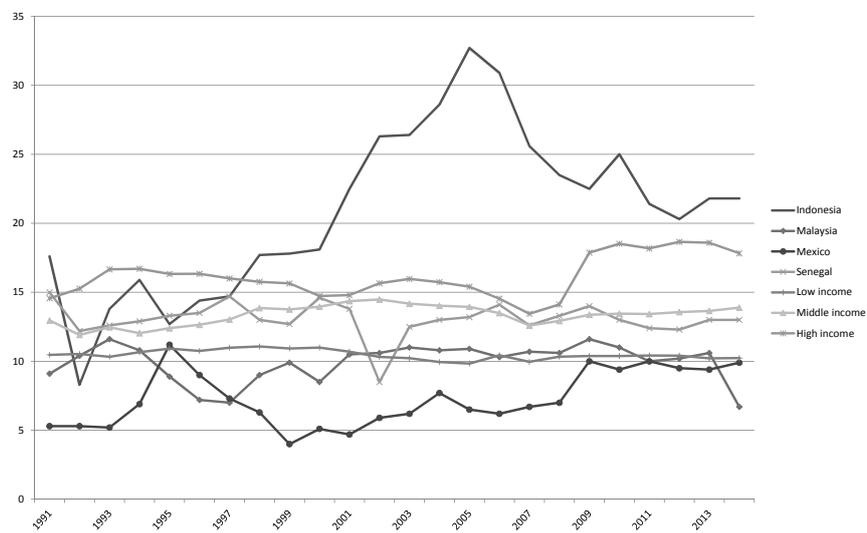
Source: World Development indicators, available at data.worldbank.org/wdi; accessed February 24, 2017.

Reassuringly, the increase in enrollment rates over the period concurs with a decrease of child labor at a global level. Between 2000 and 2012, the share of children aged 5-17 who were working decreased from 16% to 10.6% (ILO 2013). Sub-Saharan Africa concentrates the highest shares of child labor, with 21.4% in 2012, compared to 8.6% for the MENA region, 8.8% for Latin America and 9.3% for Asia and the Pacific. It should be noted, however, this does not strictly imply that child employment has decreased in the same proportions, the two being different statistical concepts³. Looking at unemployment, the increasing enrollment figures do not seem to be mirrored in a decreasing unemployment in youth, as shown by Figure 3.

Instead, unemployment, while fluctuating, rather seems to be on a slightly increasing trend in the very recent period. This is possibly linked to the global economic downturn starting in 2007. However, unemployment may not be a very relevant indicator of youth's labor market situation in contexts where being idle is impossible. In many of the world's

³Child labor excludes light work for children above the minimum legal working age, while child employment does not necessarily.

Figure 3: Unemployment rate, (ages 15-24), World Bank income groups and selected countries



Source: World Development indicators, available at data.worldbank.org/wdi; accessed February 24, 2017.

poorest countries, not doing a productive activity is simply not an option if the household wants to provide for all its members. Thus, the official unemployment rate—even the relaxed one—may carry little weight with local policy makers. Labor economists have since long recognized the need to extend labor market indicators to include measures of the nature of work, in order to appropriately assess inadequacies in the labor market. As such, the ILO has focused on measuring underemployment, a situation in which the worker does not find his/her employment situation adequate, either due to time constraints (not being able to work as many hours as desired) or due to the nature of the job (willingness to change). Although youth unemployment rates went down between 2012 and 2014 in a large share of the developing world (the MENA region and Asia being exceptions), working conditions in low-income countries are still a cause for concern, since stable employment seems to be a good that's becoming scarcer (Elder and Rosas 2015). In most low-income countries, three out of four young workers find themselves in irregular employment (own-account work, unpaid family work, temporary labor or casual paid employment), and nine out of ten young workers are in informal employment. The situation slightly improves when one looks at middle-income countries, where two out of three young workers are informally employed (Elder and Rosas 2015).

2.2 The nature of the transition

How do youth in developing countries move through formal education and onto the labor market? First, recall that despite the progress mentioned above, large numbers of children are still without access to education—particularly in Sub-Saharan Africa—and many start working at a very early age. For those who do spend time in education, the little evidence available suggests that their prospects vary a lot from country to country. Garcia and Fares (2008) give an account of the school-to-work transition in Africa, showing substantial heterogeneity among countries. In the countries surveyed, age at first job varies from 8.4 years in Burkina Faso to 17.1 in Mozambique. These differences carry over to transition times for those who spent time in education. Table 3 shows the average transition times for a number of African countries. The starting point of a transition is the age at which the average schoolgoer leaves school, and is thus conditioned on having gone to school. The relatively high ages at which youth school goers leave education do not imply high educational attainment. The fact that many start school later than the official age, and repeat grades, inflates the figure. What can be seen from the table is that transition lengths are heterogeneous. While it takes only a year for transition to occur in Côte d'Ivoire, it takes almost 7 years in Mozambique.

Table 3: Transition times from Garcia and Fares (2008)

<i>Country</i>	<i>Beginning point of transition</i>	<i>End point of transition</i>	<i>Length of transition</i>
Burkina Faso	17.1	18.6	1.5
Burundi	18.8	20.7	1.9
Cameroon	19	23.8	4.8
Côte d'Ivoire	17.4	18.4	1
Ethiopia	18	23.4	5.4
Gambia, The	17.4	23.2	5.8
Kenya	17.7	22.6	4.9
Madagascar	17.2	19	1.8
Malawi	18.8	24.4	5.6
Mozambique	16.7	23.4	6.7
Sao Tomé and Príncipe	15.9	21.3	5.4
Uganda	18	21.3	3.3
Zambia	17.5	22.4	4.9

Source: Garcia and Fares (2008).

Decomposing their indicator, Garcia and Fares (2008) show that transitions are longer for young women than for young men, and most of the time longer in rural areas than in urban ones. Cunningham and Salvagno (2011) study youth employment transitions in Brazil, Mexico and Argentina. Against a backdrop of evidence of youth job shopping and relative employment instability in the region (Chacaltana 2005; Fajnzylber and Reyes 2005) they find a common trend among youth in the three countries: young people seem to leave education, spend some time in the informal sector, and then either obtain a formal employment job or go back to school. At an older age, a significant share switches into self-employment. The authors' interpretation is that informal sector jobs are being used as stepping stones for access to the formal sector, providing youth with informal on-the-job training valued in the labor market. This suggests that the pathways taken by youth may be less intuitive than thought. It therefore seems crucial to study the constraints facing youth in childhood and adolescence, since these condition the sets of possible outcomes they may aspire to achieve, and thus the nature of their transitions to adulthood in general.

3 Setting youth in appropriate contexts: the household as a decision-maker

Youth are a particularly vulnerable subset of the working age population, with lower wages, higher turnover and generally more precarious working conditions than their older counterparts. However, it makes little sense to reflect on youth outside of the economic and social contexts within which they evolve. Like other economic agents, they enter into contractual arrangements with other individuals for mutual benefit. One such almost universal arrangement, tethered in tradition may it be, is the household. Recognizing this, economists have at least since Gary Becker taken an interest in the economics of households and families. It is indisputable that many of the most important decisions made in the life of an individual—whether to educate him/herself (and how much), whether to take on extra work, to migrate, to marry etc.—are taken jointly with other people such as parents, siblings or friends. In developing country contexts in particular, young persons may even have very little to say about these decisions, which may be the domain of the household head, of older siblings, or other members of local networks. Most likely, it is a product of the wishes and constraints of a number of individuals. Thus, the desires, needs and endowments of one's proximity, as well as the relative bargaining power of the individuals that constitute it, act as additional determinants of youth's potential life trajectories. In order to explicitly account for household interactions in economic decision processes, the economics literature first provided a unitary household model, where the household was treated as if it maximized a unique utility function (arising with identical preferences, or if one household member is making all the decisions). The unitary model features an income pooling property, such that the welfare implications of a transfer to the household are independent of the recipient (Alderman et al. 1995). However, income pooling does not fit well with the data, and the theoretical hypotheses required to support the unitary model, such as Becker's rotten kid theorem (Becker 1974), are not credible in many contexts.

The family of collective household models were suggested as an alternative to the unitary model (Chiappori 1992). These models all relax the income pooling assumption. Furthermore, a subset of them assume that the bargaining processes of individuals in the household lead to Pareto efficient decisions; an assumption that implies that testable conditions can be derived for the collective model (Vermeulen 2002). The collective model has opened up the black box of intra-household allocations of resources, since it relies on

sharing rules: optimal allocations derived from individual utilities⁴. The assumption of Pareto efficiency, while not extremely restrictive, has however failed tests in the literature (Dercon and Krishnan 2000; Duflo and Udry 2004). Kazianga and Wahhaj (2017) look at plot and labor allocation in Burkina Faso from an angle of kinship ties. They find that in extended family households, individuals do not seem to operate at Pareto efficiency, thus rejecting the main testable implication of collective household models. Operating at Pareto efficiency is related to risk sharing. In a dynamic setting, where lifetime income shares are allocated within the household, idiosyncratic shocks disturb the allocative equilibrium. As noted by Dercon and Krishnan (2000), if the collective model holds individual income shocks should be pooled, even in a bargaining setting. Risk sharing at the household level has received some attention in the literature, with mixed results. Mostly, some extent of risk sharing is found to take place, and the extent of it has often been linked to initial wealth (Dercon and Krishnan 2000).

The evidence on Pareto efficiency at the household level in developing countries is thus weak. Yet, partial risk sharing seems to occur, which means that the theoretical endeavors to constitute a model of household behavior need to be continued. In this regard, recognition that households are not static—they split up, reshape, take in and lose members—seems especially important (Foster and Rosenzweig 2002). Related to transitions, the informal risk sharing arrangements that occur at the household level have important implications for youth’s trajectories in developing countries. If shocks are not pooled, and the most vulnerable youth within households (such as girls, later-born or non-biological children) bear the burden of adjustment, intergenerational transmission of vulnerability is reinforced. An illustration of the consequences of a lack of resources in childhood can be found in the abundant literature on the adult outcomes of early living circumstances (Currie and Almond 2011). To understand the choices and constraints facing youth as they enter schooling, progress, graduate, leave and seek (or not) a job, family arrangements thus seem particularly important. This is likely to hold true in all contexts, but it may be of special importance in developing country settings, where formal safety nets are lacking and informal risk sharing arrangements constitute the first defense line against poverty.

⁴In this, it also reconnected with the methodological individualism dear to neo-classical economics

4 Objectives and outline of the chapters

The chapters in the following pages are concerned with youth, education and work. Providing jobs for young people is indubitably important, especially given the apparent worsening, or at least, non-improvement of youth's labor market prospects in the developing world, which concomitantly with the demographic dividend sets the stage for a tragedy of missed opportunities. This means that continued efforts to provide evidence regarding the conditions under which labor market interventions work are necessary. Related to this endeavor, an increased understanding of the interdependencies of family members could contribute to more efficient policy interventions. This thesis thus seeks to emphasize the importance of family arrangements in evaluating the intra-household allocative impacts of shocks. Although spillover effects are easily thought of, they are not systematically sought after. This observation includes the literature on impact evaluations, where a focus on the entire household might nuance or reinforce some of the conclusions regarding educational and labor market interventions.

Although research questions differ among chapters, the overall objective of this thesis is to further the understanding of economic processes related to young people's destinies in the labor market. Chapter 1 provides a literature review of school-to-work transition studies in developing countries. I therein discuss the theoretical foundations of the school-to-work transition, and contend that the lion's share of the literature has placed it in a search and matching framework, given that this framework is explicitly concerned with flows inside—and in and out of—the labor market. Despite restrictive conditions for nesting a proportional hazards model in a theoretical search and matching setting, the proportional hazards model is the most commonly used model for studying transitions in the labor market. I thereafter survey studies of microeconomic and macroeconomic determinants of successful transitions. Being a woman is systematically associated with longer transition lengths. Education mostly shortens transition lengths, except for dualistic labor markets where queuing for public sector jobs is a rational option.

Chapter 2, co-written with Mohamed Ali Marouani, studies the Malaysian labor market through the lens of skill-biased technological change (SBTC). We argue that SBTC was a feature of the Malaysian labor market, and apply a retrospective computable general equilibrium model to see how Malaysian graduates would have fared under two counter-factual scenarios: 1) the absence of skill-biased technological change, and 2) a stricter educational policy, modeled as an unwillingness to expand the number of students

in higher education institutions during the period 2005-2020. The results show that the *open-door* educational policy of Malaysia is likely to have exerted a downward pressure on tertiary wages, limiting the inequality-increasing effects of skill-biased technological change.

Chapter 3 looks at sibling occupational spillovers in Indonesia, using census data from 1980. Revisiting the INPRES school construction program of 1974-1978, it estimates the causal variation in labor market participation among older siblings as a function of exogenous variations in schooling of their younger siblings, affected by the program. I find that additional schooling displaces older siblings' from housekeeping into the labor market. The effect remains once the sample is restricted to sibling pairs where both siblings are out of school, suggesting that the effect is not merely due to financing of the younger child's education. Moreover, the results lend weak support to the presence of occupational specialization at the household level—a situation where occupations are distributed according to the relative returns to these occupations among siblings. Rather, they are indicative of positive labor market spillover effects among siblings.

Chapter 4, co-authored with Philippe De Vreyer, examines the impact of adult deaths in Senegalese households on children's work and schooling outcomes. In a first part, using two rounds of the *Poverty and Family Structure* (PSF) survey, we find limited impacts from the death of an unspecified adult on children's outcomes. However, since polygamy is widespread in Senegal and households are large, we then focus on the impact of children whose primary caregiver dies. Using both individual and household fixed effects, we find a strong and significant effect on school presence and on work for those children who lost their primary caregiver. This suggests the consequences of shocks are far from equally distributed within households in Senegal, suggesting limits to the often-cited extended family solidarity prevailing in the African context.

Chapter 5 studies the impact of parental depressive symptoms on child schooling and work in Mexico. Bad mental health in parents can translate into bad parenting, revenue loss and bad child mental health, and might have profound implications on the child's development. I first use a simple theoretical model to establish predictions for the influence of depression on child schooling and work. Then, using three waves of the Mexican Family Life Survey, I use violent assault in the street as a source of exogenous variation in parental depressive symptoms to test the above predictions. I find that increases in parental depressive symptoms, as measured by a 20-item depression scale

specifically developed for the Mexican context, lead to higher repetition rates and higher work rates in children. The effects are not driven by parents who had high levels of depressive symptoms in the first round of the survey.

References

- Alderman, Harold et al. (1995). “Unitary versus collective models of the household: is it time to shift the burden of proof?” In: *The World Bank Research Observer* 10.1, pp. 1–19.
- Assaad, Ragui, Christine Binzel, and May Gadallah (2010). “Transitions to Employment and Marriage Among Young Men in Egypt”. In: *Middle East Development Journal* 2.01, pp. 39–88.
- Becker, Gary S (1960). “An Economic Analysis of Fertility”. In: *Demographic and economic change in developed countries*. Columbia University Press, pp. 209–240.
- (1962). “Investment in Human capital: A Theoretical Analysis”. In: *Journal of Political Economy* 70.5, pp. 9–49.
- (1965). “A Theory of the Allocation of Time”. In: *The Economic Journal* 75.299, pp. 493–517.
- (1974). “A Theory of Social Interactions”. In: *Journal of Political Economy* 82.6, pp. 1063–1093.
- Bhalotra, Sonia and Samantha B Rawlings (2011). “Intergenerational persistence in health in developing countries: The penalty of gender inequality?” In: *Journal of Public Economics* 95.3, pp. 286–299.
- Bloom, David E, David Canning, et al. (2003). “Contraception and the Celtic Tiger”. In: *Economic and Social Review* 34.3, pp. 229–248.
- Bloom, David E and Jeffrey G Williamson (1998). “Demographic Transitions and Economic Miracles in Emerging Asia”. In: *The World Bank Economic Review* 12.3, pp. 419–455.
- Calvès, Anne-Emmanuèle and Bruno Schoumaker (2004). “Deteriorating Economic Context and Changing Patterns of Youth Employment in Urban Burkina Faso: 1980–2000”. In: *World development* 32.8, pp. 1341–1354.
- Chacaltana, Juan (2005). *Trayectorias laborales de jóvenes peruanos*. Unpublished manuscript.
- Chiappori, Pierre-Andre (1992). “Collective Labor Supply and Welfare”. In: *Journal of Political Economy* 100.3, pp. 437–467.
- Cho, Yoonyoung et al. (2012). *Labor Markets in Middle and Low Income Countries: Trends and Implications for Social Protection and Labor Policies*. Washington DC: World Bank, World Bank Social Protection Discussion Papers No. 67613.
- Cuaresma, Jesús Crespo, Wolfgang Lutz, and Warren Sanderson (2014). “Is the Demographic Dividend an Education Dividend?” In: *Demography* 51.1, pp. 299–315.
- Cunningham, Wendy and Javier Bustos Salvagno (2011). *Youth employment transitions in Latin America*. World Bank Policy Research Working Paper 5521.
- Currie, Janet and Douglas Almond (2011). “Human capital development before age five”. In: *Handbook of labor economics* 4, pp. 1315–1486.
- Dercon, Stefan and Pramila Krishnan (2000). “In Sickness and in Health: Risk Sharing within Households in Rural Ethiopia”. In: *Journal of Political Economy* 108.4, pp. 688–727.

- Drechsler, Dennis, Johannes Jütting, and Theodora Xenogiani (2008). “Is Informal Normal? Towards more and better jobs”. In: *Poverty in Focus* 16, pp. 8–9.
- Duffo, Esther and Christopher Udry (2004). *Intrahousehold Resource Allocation in Cote d’Ivoire: Social Norms, Separate Accounts and Consumption Choices*. National Bureau of Economic Research Working Paper 10498.
- Eide, Eric R and Mark H Showalter (2011). “Estimating the relation between health and education: What do we know and what do we need to know?” In: *Economics of Education Review* 30.5, pp. 778–791.
- Elder, Sarah and Gianni Rosas (2015). *Global Employment Trends for Youth 2015: Scaling up investments in decent jobs for youth*. Tech. rep. International Labor Organization.
- Fajnzylber, Eduardo and Gonzalo Reyes (2005). “Dinámica del empleo juvenil: Resultados preliminares con datos del seguro de cesantía”. In: *Santiago, Expansiva*.
- Foster, Andrew D and Mark R Rosenzweig (2002). “Household Division and Rural Economic Growth”. In: *The Review of Economic Studies* 69.4, pp. 839–869.
- Garcia, Marito and Jean Fares (2008). “Transitions to Working Life for Africa’s Youth”. In: *Youth in Africa’s Labor Market*. World Bank, pp. 15–25.
- Goldstein, Markus and Christopher Udry (2008). “The Profits of Power: Land Rights and Agricultural Investment in Ghana”. In: *Journal of Political Economy* 116.6, pp. 981–1022.
- ILO (2013). *Marking progress against child labour: Global estimates and trends 2000-2012*.
- Kabbani, Nader and Ekta Kothari (2005). *Youth employment in the MENA region: A Situational Assessment*. World Bank Social Protection Discussion Paper 534.
- Kazianga, Harounan and Zaki Wahhaj (2017). “Intra-household resource allocation and familial ties”. In: *Journal of Development Economics* 127, pp. 109–132.
- Kirk, Dudley (1996). “Demographic Transition Theory”. In: *Population studies* 50.3, pp. 361–387.
- Ryan, Paul (2001). “The School-to-Work Transition: A Cross-National Perspective”. In: *Journal of Economic Literature* 39.1, pp. 34–92.
- Schofer, Evan and John W Meyer (2005). “The Worldwide Expansion of Higher Education in the Twentieth Century”. In: *American Sociological Review* 70.6, pp. 898–920.
- UN General Assembly (1948). *The Universal Declaration of Human Rights*.
- Vermeulen, Frederic (2002). “Collective Household Models: Principles and Main Results”. In: *Journal of Economic Surveys* 16.4, pp. 533–564.

Chapter 1

The School-to-work transition in developing countries

1 Introduction

The importance of human capital in the development process has been strongly underlined in the academic and policy discourse over the last 50 years, and education for all has been made a top priority of international organizations such as the UNESCO and the World Bank in the last decades. At the World Education Forum in Dakar, held in 2000, 164 governments pledged to achieve six education related goals by 2015, recognizing education as the “key to sustainable development and peace and stability within and among countries” (UNESCO 2000). However, less has been said about what happens after education. Graduation is the end of an educational process, but also the start of another, lifetime process of providing for oneself. In many of the world’s poorest countries, youth constitute a majority of the population. It is probably not an overstatement to say that the economic, social and political development of the societies in which youth live hinges on the capacity of policy makers to provide them with decent employment prospects. Concomitantly, youth in developing countries face a different set of challenges: the concentration of skilled jobs in urban areas and sometimes in the public sector implies that rural youth may have little to gain from education unless they migrate to urban areas; the lack of wage jobs means self-employment may be the only option for some youth (lack of contractual arrangements and social protection further implies that self-employment may be as good an employment as one gets); severe financial constraints may prevent individuals from creating small-scale businesses, or limit the size and profitability of those created; ethnic or gender discrimination can prevent underprivileged youth from succeeding in the labor market; informal decision structures such as the household may assign specific roles to youth, preventing them from realizing their potential. The shaping of good employment policy therefore relies on evidence of good practice from multiple historical and geographical contexts. The keys to making the School-to-work transition (SWT) efficient can be sought in the body of evidence from various programs, policies, studies and reports that have been undertaken. Nonetheless, the school-to-work transition is a multiform and dynamic process, and the recommendations derived from any study of SWT are conditional both on the particular context in which the study was undertaken and on the methodological choices and approaches its authors settled on.

The lion’s share of the evidence from school-to-work transitions is based on data from high-income countries, essentially from Europe and North America, and while Ryan (2001) and Bradley and Nguyen (2004) have reviewed the evidence of school-to-work transitions in developed countries, to my knowledge no extended review of the evidence

from developing countries has been undertaken. This article aims to bridge this gap in the literature. While it should be recognized that developing countries in no way constitute a group of homogeneous economies with similar labor markets and educational systems, they do share a number of factors which distinguish them from developed economies (Campbell and Ahmed 2012; Fields 2011): important shares of informal labor, self-employment, agricultural labor and unpaid family work; important credit and income constraints; weak social security; important labor market segmentation [public vs. private, formal vs. informal], and altogether an urban-rural fragmentation interacting with the aforementioned. In light of this and against a backdrop of increased access to education as promoted by the Education for all initiative, an extended review of the evidence on the labor market prospects of graduates from developing countries seems warranted. Quintini and Martin (2014) compare school-to-work transitions in eight advanced and eight emerging countries⁵. They find that youth in emerging countries experience longer transitions and leave education earlier, while at the same time having higher rates of inactivity.

The contours of the School-to-work transition are not narrowly defined in the literature. Reversed transitions (going back to school) as well as simultaneous presence in multiple states (working while in school, holding several jobs) are possible, such that the SWT must be considered as a lifelong process within which a number of transitions occur. This is especially important to emphasize inasmuch as these transition processes have become more complex in the last decades, with more long-term unemployment and more job shifts and mismatches (Allen and Velden 2007). What is to be deemed a successful labor market destiny might also change over the life cycle: looking at Argentina, Brazil and Mexico, Cunningham and Salvagno (2011) map out the typical transition patterns of youth and find that they tend to leave school to spend a short time in the informal sector, before moving to the formal sector, and then later in life becoming self-employed. Rather than attempting to narrow down the concept, I shall here initially consider it as an umbrella term for a number of processes all related to the capacity of educational systems to provide individuals with knowledge and capabilities that render them prone to a more successful work-life.

The structure of the paper is as follows. Section 2 discusses the school-to-work transition concept and the efforts made to operationalize it from a statistical point of view. Section 3 considers how economic theory, and in particular the job search and

⁵The countries included are Argentina, Australia, Brazil, Canada, Chile, France, Germany, Indonesia, Italy, Mexico, South Africa, Spain, Turkey, United Kingdom, United States.

matching framework, has been mobilized to consider the SWT. Section 4 reviews the evidence regarding individual determinants of success in the labor market. Section 5 extends the review to external determinants, discussing labor market policies targeting youth in developing countries. The last section concludes.

2 The imperceptible contours of the school-to-work transition

A “catch-all term for the activities of young people as they bounce around or struggle along between full-time schooling and full-time, possibly career, employment” (Ryan 2003), the school-to-work transition⁶ is perhaps better characterized intuitively as that period of time during which an individual leaves school and finds stable employment. O’Higgins (2008) conveniently distinguishes two main features of the transition: the *success* in achieving an identified outcome, and the *ease* with which this takes place. In essence the questions asked are: where are youth heading upon leaving school, and how do they get there? While surely reductive in the characterization of a complex and dynamic multi-state process, it serves as a useful separator of those elements of the transition that are of a dynamic nature (smoothness, efficiency, state dependence) from those that are static (and in general describing the state of leave in the transition).

A number of studies, mainly carried out through international organizations such as the ILO and the OECD, have attempted to approach the SWT as a statistical concept. As such, the school-to-work transition becomes a measurable length, and its blurry delineations need to be fixed. The starting point of the transition is generally taken as “permanent” school leave (Bowers 1998), but might be conditioned on a willingness to look for work upon school leave (Matsumoto and Elder 2010), thereby excluding those who were not destined for the labor market in the first place. One could also argue that the transition starts before graduation; work-study combinations or apprenticeships might constitute stepping stones for individuals, facilitating or even guaranteeing employment immediately upon school leave⁷. The ending point of the transition also requires settling on a decision of achieved transition. While full-time stable employment has been used by the OECD (Bowers 1998; OECD 1998), the ILO’s *Work4Youth* has adopted definitions including various qualitative measures of the work experience, such as satisfaction and contract type (Elder and Koné 2014; Matsumoto and Elder 2010). According to this

⁶ The School-to-work transition in the U.S. more typically refers to learning experiences at an employer’s work site (Ryan 2001). This is not the definition adopted in this text.

⁷The ILO’s *Work4Youth* consider the transition to start upon graduation *or* from the individual’s first economic activity.

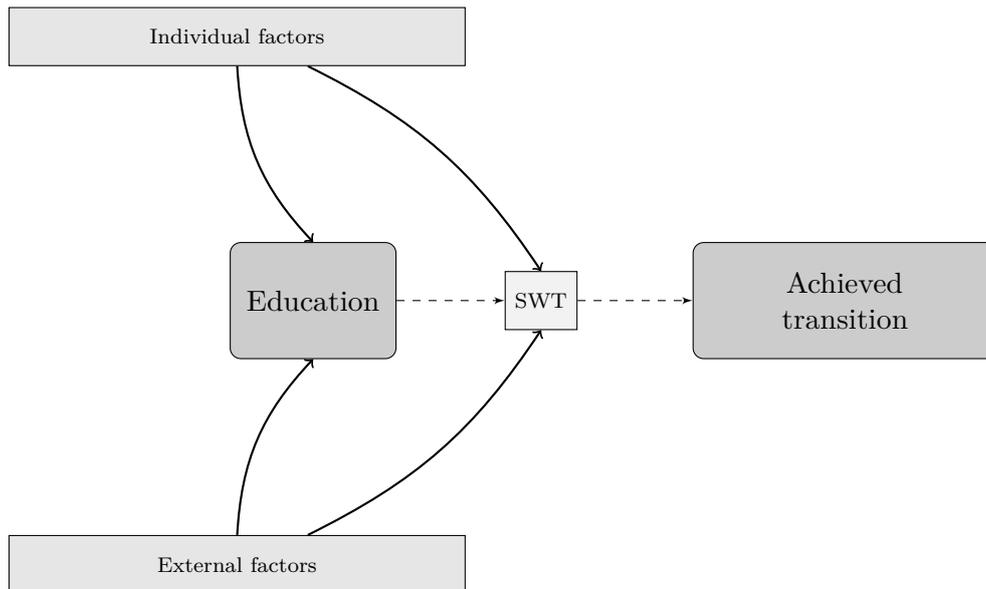
definition, a completed transition requires stable *or* satisfactory employment, even when the latter is temporary- or self-employment.

A range of indicators have been used to assess the smoothness of the transition from school to work using cross-sectional data. While settling on definitions on various aspects of transitions would alleviate some of the confusion reigning around the concept, summing up individual evidence brings about different methodological obstacles when data is, as is often the case, cross-sectional in nature. O'Higgins (2008) provides a discussion of duration indicators used in the literature. The OECD uses the age at which a certain percentage of the population has left school (50% or 75% depending on studies), and compares this with the age at which the same percentage has found a job. Essentially, this gives rise to an indicator of the average duration of transitions in the economy. O'Higgins (2008) points out several questionable assumptions in this approach (particularly in the context of developing countries), such as the (implicit) assumption that everyone goes to school, ends up in employment, does not go back to education and remains in employment upon entering it. Thus, this approach fails to account for individuals who do not enter the labor market upon school leave, who may be numerous in developing countries (in particular women). Guarcello et al. (2005), applying a similar method, condition the average school leave and work entry ages on the probabilities of ever being in school and work. The authors recognize a problem with the approach: since it is impossible from cross-sectional data to know whether or not individuals in school will later transit into employment, their average age gap can only be interpreted as such if age of school leave is uncorrelated with the probability of future employment. Another problem, linked to this one, is that the data drawn from a single point in time reflects two cohorts (the populations used to compute the average age of school leave and the average age of entry into employment are different) which only gives rise to a meaningful indicator in the case of a stationary labor market. Finally, the often large shares of informal employment in developing countries require that surveys possess the appropriate modules to qualify and quantify informal labor if meaningful SWT indicators are to be constructed.

Event history data and panel data overcome some of these problems since transitions can be computed directly for the individual. Aggregating individual transitions however still leads to a biased indicator since only those individuals whose transition is completed can be used in the computation. Thus, there are grounds for studying the microeconomic determinants of transition lengths using survival analysis, which provides identified estimators even in the presence of *right-censored* observations. Such studies are numerous

(e.g. Fallon (1983), Galiani and Hopenhayn (2003), Khan and Yousaf (2013), Nordman and Pasquier-Doumer (2015), and Tansel and Taşçı (2010)) and will be discussed below.

Figure 4: Conceptual chart of the school-work transition process



Considering the school-to-work transition process in its most intuitive form (see Figure 4)—as that of a three stage-process beginning with education and ending in an achieved transition—serves as a useful tool for structuring the outline of the following literature review. Individuals enter into educational systems that vary in quality, organizational and institutional setting. Their success in these systems can be linked to a number of internal and external factors that need not be easily distinguishable. If one’s education is—as commonly believed—a determinant of the quality and smoothness of the school-to-work transition, the determinants of “success” in education are by definition also indirect determinants of success in the SWT. These determinants (family background, institutional setting, innate ability, school inputs, extra-curricular help, etc.) have been studied in the educational literature and will not be covered here. Instead, I focus on three dimensions: the theoretical linkages between the determinants of the SWT and the labor market; the relationship between individual background variables and the SWT; and lastly, the relationship between aggregate factors and individual SWT.

3 The transition environment in theory

3.1 The search and matching literature

Most theoretical work on the transition from education to work is set in the Diamond-Mortensen-Pissarides search and matching framework (Mortensen 1970, 1986; Mortensen and Pissarides 1999). The framework goes beyond the notion that frictionless and centralized labor markets exist, and thus permits to account for voluntarily unemployment, transition arbitrages, state dependence and other features of modern labor markets that the general equilibrium standard supply and demand framework has difficulties explaining. Concerned with flows between states in the labor market, it provides a good starting point for a theoretical approach to the school-to-work transition. In a seminal paper, Mortensen (1970) considers unemployment duration as an optimal stopping problem for an individual receiving a series of wage offers: he or she will accept a wage offer when the net lifetime utility of taking the job is above the net lifetime utility of waiting for another wage offer. Wolpin (1987) uses a similar framework to parameterize a search model using data on the school-to-work transition of high school graduates taken from the National Longitudinal Survey. In this reservation wage setting, the parameters determining the job finding rate are: cost of search, the probability of receiving an offer, and the distribution of initial wage offers. Other earlier attempts to parameterize search models in the literature include Jensen and Westergård-Nielsen (1987), who estimate a search model on the transition from higher education to work in Denmark, or Blau (1991), Flinn and Heckman (1982), and Lynch (1985). Van den Berg (1990b) estimates a structural model including the transition to inactivity. Blau and Robins (1990) develop a framework where four components determine the job-finding rate: the choice of search methods, the choice of how many firms to contact given the set of search methods, the rate at which offers are received given the contact rate, and the decision to accept an offer given the offer rate. Parameters linked to these components are derived from an empirical model.

The models cited above are essentially all optimal stopping problems, thus relying on dynamic programming techniques. Rust (1992) investigates whether agents' behavior generally conforms to the rationale of Bellman's principle of a stationary backward-inductive reasoning, used to solve dynamic programming problems. His review of the literature concludes that continuous-time dynamic programming models applied to macro data have not fared as well as their discrete-time equivalents applied to micro data. He furthermore shows that if no restrictions are imposed on the preferences and beliefs of

agents, a parameterization can always be found which rationalizes their choices. However, if restrictions are imposed on preferences from prior knowledge of reasonable behavior, the Bellman rationale can be tested from data. The study lends credibility to the aforementioned models since some of the most successful discrete-time models are restricted to binary choice problems, and particularly optimal stopping problems.

A long list of contributions to the random matching literature have integrated schooling choices. Laing, Palivos, and Wang (1995) embed this choice into an endogenous growth model featuring search frictions, showing that education and subsequently growth decrease in the amount of search frictions, represented by entry costs and an exogenous matching rate. Acemoglu (1996) and Booth and Coles (2007) also explore human capital accumulation in a matching setting, showing that a random (at least partially) search process creates a situation of incomplete contracts leading to socially suboptimal human capital investment decisions (a *hold-up* problem). Charlot and Decreuse (2005)⁸ show that self-selection into education might lead to an overeducation problem, since private agents consider unemployment and wage outcomes when making their education decision, but not the impact of this decision on job creation. In an extension to their framework (Charlot and Decreuse 2010) they consider individuals to be heterogeneous in terms of schooling costs, showing that this leads to overeducation among ‘rich’ individuals (with low schooling costs) and undereducation among the ‘poor’. Becker (2006) drops the assumption of an *ex ante* schooling decision, introducing a framework in which education is time-consuming and individuals choose between continuing education or taking up a job, thus endogenizing drop out-rates and the opportunity cost of education.

A strand of papers is explicitly concerned with job search theory and the dynamics of the transition to stable employment. Neal (1999) considers a two-stage search process to explain complex job changes (involving a change of tasks in addition to a change of employer), which at the same time provides a setting in which young and inexperienced men and women resort to more complex moves in the labor market than their older, more experienced counterparts. The model implies that workers have an incentive to postpone search for a good worker-firm match until they have settled on a good career choice. Similarly, the idea that the number of matches is higher at labor market entry has been investigated in Bucher (2010) and Kitao, Ljungqvist, and Sargent (in press) among others. Common to these contributions is the assumption that information on productivity is

⁸Mendolicchio, Paolini, and Pietra (2012) adopt a more general framework, which under fairly general assumption conforms with the composition effect identified by (Charlot and Decreuse 2005).

revealed only upon forming a match. García-Belenguer and Moral Carcedo (2011) explore the interactions between educational systems and unemployment rates in a setting where education levels function as signals for unobservable ability and firms face firing costs.

This body of work thus sets the transition from education to employment in an environment with friction, essentially approximating the matching function and its related properties to agents' transition strategies, and inferring behavioral assumptions from model parameterizations. Although random matching models seem to rationalize a number of empirical findings, they rely on a fairly strong assumption of how graduates (recruiting firms) look for and obtain jobs (employees). Alternative assumptions have been discussed in the literature and are worth mentioning. Directed job search involves workers choosing which firms to apply to (Moen 1997; Montgomery 1991a), possibly applying at several firms simultaneously (Albrecht, Gautier, and Vroman 2006; Galenianos and Kircher 2009); the stock & flow approach (Coles and Smith 1998; Coles 1994; Ebrahimi and Shimer 2010; Gregg and Petrongolo 2005) considers that a match is not necessarily available for all agents upon their entry into the market. Subsequently, rejected agents disappear from the stock of possible matches for the agents on the other side of the market, and unmatched agents on both sides need to wait for new flows to arrive, yet remain in competition with both old unmatched agents and new ones (this framework thus gives a theoretical explanation for decreasing hazard in unemployment). Another literature extends the search or recruitment decision to multiple agents (Albrecht, Anderson, and Vroman 2010; Ek and Holmlund 2010; Guler, Guvenen, and Violante 2012).

What are then the implications of search & matching theory in the context of youth and school-to-work transitions? As Pissarides (2011) states it, “the matching function captures many features of frictions in labor markets that are not made explicit...it takes time to find a good match, the length of time it takes varies across workers in unpredictable ways, and if there were more job vacancies available, on average workers would find a good job much faster”. Empirics indeed show that individual characteristics are highly significant in the determination of transition rates across individuals (Petrongolo and Pissarides 2001). Petrongolo and Pissarides (2001) give two examples of the introduction of heterogeneity allowing for individual-specific hazard rates: by assuming that workers have different preferences over search intensity or over reservation wages, or that firms have preferences over candidates and are able to rank them. Both these are able to reconcile the matching framework with subject-specific hazard rates for transitions in the labor market.

3.2 What is known about the matching process in developing countries?

In the context of developing countries, however, many of the research questions opened by extensions to the job search literature might intuitively seem of secondary importance. Rather, one of the most distinctive features of developing countries' labor markets is the size of the informal sector. The search and matching framework has thus recently been extended to incorporate a dualistic labor market accounting for an informal sector (Albrecht, Navarro, and Vroman 2009; Flórez 2015; Satchi and Temple 2009; Zenou 2008). Albrecht, Navarro, and Vroman (2009) include worker heterogeneity in their model, accounted for by differential productivities in the formal sector (but workers are equally productive in the informal sector). This generates varying opportunity costs of informal sector employment, implying that the workers with the highest productivity will reject informal sector work and wait for a formal-sector job⁹, while low-productivity workers will be shut out of the formal sector. If education and productivity are correlated, this environment could allow for longer transitions into work of higher educated individuals. Kerr (2011) builds a dual labor market model for Tanzania, predicting little movement between the formal and the informal sector, which is supported by the empirical analysis.

The first to estimate a job search model in the context of a developing country were Tunali and Assaad (1992), who study the construction sector in Egypt. They test their theoretical predictions, notably that human capital should increase (decrease) employment (unemployment) durations. However, coefficients do not show up as significant in their Weibull specification (they are however of the correct sign). Rama (1998) estimates a Cobb-Douglas matching function for Tunisia, showing that skilled workers have a smoother matching process than unskilled workers. The low coefficient of unemployed unskilled workers suggests that unskilled employment is almost entirely demand-driven, although it could also indicate a lower willingness to accept any job offer in this group of workers. Serneels (2007) considers unemployment in urban Ethiopia through a time-to-first job lens. Set in a dual market model, individuals choose between taking up a lifetime *bad* job or waiting for a good job, requiring skills. A worker will stay unemployed as long as the probability of finding a good job exceeds the inverse of the relative wage in the two sectors, taking into account household support available for the unemployed. The data show that young males will remain in unemployment as long as

⁹A further important assumption is that working in the informal sector disallows for job search in the formal sector.

the probability of finding a good job exceeds 10%. Using a piecewise constant hazard model, he estimates the probability of getting a civil servant job to be 18%, lending support to the rationale for queuing in the Ethiopian public sector.

In addition to structural differences such as high shares of informality, dualities (urban/rural, public/private) or multiple job holding that are less present in developed countries, the job search process in developing countries' labor markets relies heavily on social networks rather than formal institutions (Campbell and Ahmed 2012; Cling et al. 2007). Network extensions to the matching literature include Calvó-Armengol (2004), Calvó-Armengol and Jackson (2004), and Calvó-Armengol and Zenou (2005) and aim to account for the empirical observation that individuals find their jobs not only through formal methods, but also through informal methods or a combination of them. Theoretical predictions therefrom include the fact that the probability of finding a job is increasing in the size of the social network. Wahba and Zenou (2005) look at Egypt and find that the probability of having found a job through one's social network, conditional on having a job, is increasing and concave in population density, conform to the predictions of their model. Nordman and Pasquier-Doumer (2015) look at the impact of the social network on labor market transitions in Burkina Faso, using a competing risk framework. Distinguishing between network size and strength of ties, they show that the former is not significantly related to labor market transitions. Strength of ties, however, reduces the transition hazard for self-employed and unemployed alike, while weak ties help in the transition from wage employment to self-employment.

A small but rapidly growing literature studies the nature of search frictions in developing countries. This literature, mainly experimental, collects evidence on the effects of interventions designed to modify important parameters of the job search framework—primarily search costs. Groh et al. (2015) look at the nature of the matching process in Amman, Jordan, by means of a randomized experiment. Interestingly, in a context of high unemployment rates of high skilled youth, and where firms declare having difficulties finding good recruits, smoothing the matching process did not lead to a lowering of unemployment in the treatment group. A majority of matches either rejected the interview, or rejected or quickly left a job that was proposed to them. When asked why, a majority of candidates answered that they found the job unsuitable or not right for their career paths. This suggest that reservation utilities (based on more than mere pecuniary factors) rather than informational search frictions explain high-skilled unemployment. Informational frictions were also examined by Abebe et al. (2016a) in

Ethiopia. They organized job fairs in Addis Ababa, Ethiopia, where workers and firms met at minimal search costs. They conclude on very modest returns to the intervention, with only one job created per 10 firms invited. Another study from Ethiopia shows that giving transport subsidies to workers increases their probabilities of having stable and formal employment (Abebe et al. 2016b). Jensen (2012) uses evidence from a randomized experiment in India where women in selected villages were informed about the existence of a nearby job opportunity, as well as strategic information on how to get a job. As a result of the intervention, women’s fertility and likelihood to get married were reduced, and labor market participation and schooling increased. Interestingly, from a SWT perspective, the intervention also modified women’s aspirations in terms of work and fertility throughout life, showing that beliefs about career opportunities can stem from a sense of fatalism, plausibly rooted in cultural contexts.

3.3 Methodological issues

Concerned with flows, search and matching theory provides a basis for empirical specifications set in a survival analysis framework. Survival analysis relies on the survivor function $S(t)$ which designates the probability that a *failure event*—a transition between states in the labor market, for example—will not occur before t . Kaplan and Meier (1958) proposed an early but still much used non-parametric estimation of the survivor function when censoring occurs (i.e. such as in the case of labor market transitions studied using survey data). Duration models take as a dependent variable the hazard rate of individuals and as such seem more fitted to deal with transition phenomena than ‘static’ models. The hazard rate can be interpreted as the instantaneous probability of leaving a state in the labor market, conditional on not having left it thus far, and are estimated on samples of workers based on observed characteristics which can be time-varying or constant. In general, estimators of duration models fall into the parametric or the semi-parametric range. The commonly used *proportional hazards* model assumes a baseline hazard for the failure event, and lets variables affect this baseline hazard multiplicatively. Common choices for the baseline hazard include Weibull, Gompertz and Log-log distributions. Cox (1972) developed a semi-parametric estimator for the hazard rate that does not need an underlying assumption for the baseline hazard, relying on partial likelihood methods. As elsewhere, selection is an issue in duration models, and individual heterogeneity is usually modeled as a *frailty* component. The baseline hazard, which is constant across individuals, is multiplied by an individual-specific component. Since there are (in the case of inherently cross-sectional data) as many individuals as there are duration observations,

these models require an assumption for the distribution of the frailty term to be identified. Finally, survival models are no less subject to endogeneity than other econometric models. Fortunately, instrumental variable techniques can readily be introduced via a control function approach, as shown by Terza, Basu, and Rathouz (2008). All of the above mentioned models assume that all observations eventually end in failure, an assumption that might be unrealistic in some subject areas (some unemployed might drop out of the labor force and never find employment). Split-population models relax this assumption and estimate a proportion of the sample who will never experience failure; the remaining observations in the sample are used as a sample from which hazard ratios are estimated.

A sizable literature has studied state and duration dependence in labor markets and particularly in unemployment. These are related to theories of discrimination, stigma effects or scarring effects of remaining unemployed. However, duration dependence is difficult to distinguish from unobserved individual heterogeneity in the context of duration models (Lancaster and Nickell 1980). Van den Berg and Van Ours (1996) however showed that it is possible to non-parametrically estimate the two separately using aggregate time-series data. Heckman and Borjas (1980) study unemployment duration using four types of dependence. Firstly, Markovian state dependence, where transition probabilities differ solely based on the category the individual belongs to. They also test for occurrence dependence, duration dependence and lagged duration dependence, showing that identification criteria differ according to the type of dependence stipulated.

An important quality for a theoretical model is the possibility for it to be amply tested. Van den Berg (2001) examines the conditions under which duration models, and particularly mixed proportional hazard models, can be considered as reduced forms of a structural search model. Regarding a non-stationary job search model without anticipation; only under special cases requiring strong assumptions will the hazard rate implied by the theoretical model take a multiplicative structure. One such case arises if individuals' reservation wage is always lower than the lowest wage in the market. Similarly, if the wage distribution takes a Pareto form, and the non-work income (or social benefits, in the context of countries with unemployment benefit systems) is null, the hazard rate will be multiplicative in time and in the characteristics of individuals. Another strong assumption that would produce a multiplicative hazard rate is to set the discount rate at infinity, so that individuals do not care about the future¹⁰. When anticipation is considered, such as in Van den Berg (1990a), the assumptions become even

¹⁰This can also be achieved in a repeated search-model.

more restrictive. Despite the mixed proportional hazards specification not being derived directly from a theoretical model, it is without a doubt the most popular specification for duration data in economics. As pointed out by Van den Berg (2001), “*In practice, the empirical application at hand does not always dictate a natural theoretical framework, and sometimes the scope of the application does not warrant a full-blown theoretical or structural analysis. In such cases, the (M)PH model is a useful framework whose properties have been well studied in the literature.*”

While survival analysis accounts for the majority of non-static analyses of the school-to-work transition processes, other methods have been used. Defloor, Van Ootegem, and Verhofstadt (2010) consider the multidimensionality of the school-to-work transition. Using a distance function approach, they characterize the transition as a transformation of inputs into a multidimensional output, including job satisfaction and time spent unemployed before acquiring a first job. In this fashion, they are able to compute conversion efficiencies for individuals, relating those to socio-economic background variables of which education seems to be the most important. Another tool that has been used is sequence analysis, relying on optimal matching techniques. These have been used to obtain typologies of transitional paths for youth (Brzinsky-Fay 2007; McVicar and Anyadike-Danes 2002), on the (sound) basis that a single transition does not adequately capture the whole labor market integration process. McVicar and Anyadike-Danes (2002) also use a cluster sequence analysis to identify groups of sequences according to the distance between sequences. Criticisms of these methods include the fact that they rely on fairly *ad hoc* assumptions of the numbers of clusters to be defined (McVicar and Anyadike-Danes 2002), and on the cost matrix used for the optimal matching technique.

Summary

The DMP search and matching framework is a natural place to start the theoretical investigation of school-to-work transitions. The recent literature has provided several extensions to the theory that seemingly fit with the nature of labor markets and job search in developing countries. However, proportional hazards models, the most frequently used duration models in the literature, can only be considered as reduced forms of search and matching models under very strong assumptions. This does not, however, exclude empirical investigations into the SWT grounded in theory from being conducted in developing countries, such as in Serneels (2007) and Zenou (2008). Such studies are however scarce, something that pleads for increased development of statistical models that can be derived from a search and matching framework.

4 Individual factors and the school-to-work transition

The search and matching framework previously presented thus globally expresses the probability of a successful match as the probability of receiving a job offer (depending on age, productivity signals, search intensity, etc.) and the probability of accepting it (depending on reservation wages, queuing, etc.). In the matching environment, a key feature of the school-to-work transition process is asymmetry of information: with no previous job experience firms have to infer worker productivity from the little information they have. One important such piece of information is formal qualifications. The following subsection reviews the evidence available on the impact of various aspects of individuals' educational background on their labor market outcomes.

4.1 The importance of education in the labor market

The impact of education on subsequent labor market outcomes is one of the most researched themes in economics, with vast amounts of applied work done on developing and developed countries alike. Returns to education is perhaps the most covered area, and it is well established that education confers a wage return in the labor market (although the early conclusion of Psacharopoulos and Hinchliffe (1973), that the returns to education are decreasing in the level of education, is still debated). Unemployment durations are tightly linked to wage returns, since the evolution of the former give an indication of the evolution of the labor market tightness of particular labor market segments¹¹.

¹¹Cf. the “wage curve” (Blanchflower and Oswald 1994).

The multiple dimensions and interactions within what is generally just referred to as education however render any attempt at quick policy recommendations from research unfruitful. As Hanushek puts it: *“Some people suggest that educational policy could all be straightened out if we could just do one great study. I see no evidence that this is the case. My summary of the research is that we should learn to live with the fact that research will not be able to provide the definitive answer. Living with it to me implies finding policies that are built upon this fundamental ignorance”* (Hanushek 1995). Furthermore, educational decisions are not taken independently from other decisions in individuals’ lives. More importantly, they might often not be taken by the individual in isolation, but rather emerge as the result of a joint household decision. Likewise, the decision to leave school is endogenous, depending on perceived wages and the probability of finding a (good) job. Acknowledging the fact that most studies fail to account for these phenomena, the present subsection should be seen as indicative of correlations between various dimensions of education and subsequent transitional outcomes, refraining from causal interpretation except when warranted.

Various measures of educational qualifications are often introduced as explanatory variables in duration models applied to the transition from school-to-work, although they might not be the sole focus of the studies at hand. The results are mixed: for example, Matsumoto and Elder (2010) show that the time spent in transition¹² is strictly decreasing in the level of education in both Egypt and Mongolia. Calvès, Kobiané, and N’Bouké (2013) also find increasing hazard rates in the level of education using data from Burkina Faso. Galiani and Hopenhayn (2003) find that the relation between level of education and unemployment duration is not monotone in Argentina. A similar result is found by Serneels (2007) for urban Ethiopia, for Ghana by Sayre and Daoud (2010) and for Turkey in Tansel and Taşçı (2010). Descriptive evidence from Latin America (Bassi et al. 2012) also shows that there are no significant correlations between levels of education and employment durations, except for Panama where post-secondary graduates spend more time before finding a job than individuals with lower educational qualifications. Looking only at university graduates in Beijing, Kong and Jiang (2011) find that graduating from a four-year rather than a three-year college program increases the probability of finding a job quickly (and all the more so when the college is in the top tier). In Egypt, Assaad, Binzel, and Gadallah (2010) do not find a significant correlation between educational attainment and duration of the transition to first job. They do, however, find a positive

¹²Relying on the ILO concept of transitioned individuals, i.e. those who are in stable employment, or satisfactory temporary or self-employment.

correlation between education level and job satisfaction. Similarly, Boutin (2014) shows that Malian youth with a higher education on average spend more time (6 years) finding a first job than primary and secondary graduates (3 years), but need less time to find a satisfactory one (9 years versus 12 years). Fallon (1983) argues that job seekers in Delhi spend longer time in search when they are more highly educated, since the value of search is higher. The duration of unemployment is also longer when individuals are educated, but this is likely explained by personal and family characteristics rather than education itself.

As posited by search theory, the intensity of search will influence the probability of receiving job offers and thus smooth the transition from school to work. Using the number of channels of search as a measure of search intensity, Nyarko, Baah-Boateng, and Nketiah-Amponsah (2014) find that years of schooling and age positively influences the plurality of channels used for job seekers in Ghana, while previous job experience tends to reduce it. Tasci (2008) shows similar findings for Turkey. Evidence from Egypt suggests that education increases job search intensity for women, as does previous job experience (Abdel-Mowla 2011).

Dickens and Lang (1995) find that unemployed in Sri Lanka with completed O-levels or A-levels have a longer predicted unemployment duration than those with lower levels of schooling. Their study is indicative of a queuing phenomenon, where relatively educated youth with high expectations tend to wait for government jobs, eventually lowering their aspirations as time goes by. Kuchibhotla (2013) however explains this through an increased tendency of educated youth to engage in training, which is considered a ‘non-employment’ status. Queuing theory however does find support by Serneels (2007), who uses data from urban Ethiopia to argue that credit constraints explain why individuals don’t engage in self-employment, preferring to wait for a job opportunity in the public sector. Waiting for government sector jobs is a known feature of African labor markets, but the current generation faces a different labor market from that of their elders. Calvès and Schoumaker (2004) talk about a rupture between formal education and access to modern sector employment in Africa. While the well educated of previous generations had relatively easy access to public sector employment, the increase in their numbers coupled with economic crises and structural reforms has meant that this option is no longer efficient. Assaad, Binzel, and Gadallah (2010) however consider shorter durations to first job in Egypt as resulting from the same phenomenon: as public sector job opportunities diminish, it is no longer worthwhile to wait for such jobs, and individuals

will to a higher extent take up a job in the informal sector. Another explanation for higher unemployment rates of the well-educated is the *luxury* argument: only those with sufficient resources can afford to be unemployed. Basic survival implies that most youth in poorer regions of the world have no choice but to commit to work that they might deem to be overqualified for¹³. Kondylis and Manacorda (2008) study the Tanzanian labor market and argue that unemployment is by no means voluntary. Kingdon and Knight (2004) also reject the luxury hypothesis for unemployed in South Africa, arguing that they are worse off than the informally employed, when income, expenditure and well-being are considered.

Unemployment is often tentatively explained as resulting from skills mismatches. Several authors have investigated whether the unemployment duration is related to the major chosen at university level. This seems to be the case in China (Kong and Jiang 2011), where engineering and business degrees are associated with the shortest unemployment durations, while law and science graduates experience longer transitions. Science graduates also seem to experience relatively long transitions in Mauritius (Jaunky and Khadaroo 2007), as do social science graduates. Another explanation for complex transitions of relatively well educated youth are that their expectations are higher, both in terms of the nature of their subsequent work opportunities and the wages they can demand in the labor market. There is little evidence on reservation wages from developing and transition countries, except for South Africa where substantial unemployment rates have spurred a debate on the origins of youth unemployment. Levinsohn, McCrary, and Pugatch (2009) apply survey data to a job search model for South Africa. Applying reservation wages from survey data to the model suggests that the unemployed receive job offers relatively frequently, but that these are below their reservation wage. Natrass and Walker (2005) however conclude that reservation wages are not the cause of unemployment in Cape Town's Khayelitsa district. Distinguishing small and large firms, Rankin and Roberts (2011) find that between 70% and 80% of young South African males have higher wage expectations than what they are likely to earn by working in a small firm, suggesting that unemployment might be partly caused by young people waiting for employment in large firms.

Newhouse and Suryadarma (2011) find that male public vocational graduates in Indonesia are more likely to obtain a formal job than graduates from public general education, all the while being no more likely to be in unemployment. Calvès, Kobiané,

¹³This also implies that focusing only on unemployment in these contexts is insufficient at best, and misleading at worst.

and N’Bouké (2013) find that having been to a private institution during one’s schooling positively influences the hazard rate of transiting to a first paid job, although not when family background variables are introduced. Chuang (1999) looks at the determinants of Taiwanese job seekers unemployment duration; he shows that graduates from public universities fare better than those from private institutions, arguing that this reflects a signaling phenomenon (higher scores are needed to enter public universities). Pugatch (2014) looks at the role of vocational education in South Africa, finding it to be an alternative for those who fail in the general system, albeit conferring similar labor market returns. Pugatch (2012) also considers an often ignored component of the school-to-work transition, namely the dynamics of dropping out and re-enrolling. Using data from South Africa, he finds support for a model of schooling choice based on dynamic updating of the relative returns to pursuit of education.

4.2 Gender and ethnic discrimination

Women are generally worse off in the labor market than men. Being a woman is associated with a lower labor force participation rate, with higher shares of family work and informal employment, and with lower wages when in wage employment (United Nations 2015). It has furthermore been suggested that there is a link between a country’s stage of development, and gender inequality¹⁴. Morrisson and Jütting (2005), looking at gender inequalities in participation in economic activity, show that regional differences are important and that low income countries do not always fare worse than high income ones. Several theories of why discrimination arises and its economic consequences have been formulated¹⁵: different comparative advantages, human capital, discrimination by employers and employees alike, or cultural aspects rendering certain types of work unsuitable for women could all explain differential labor market outcomes (see Altonji and Blank (1999) for a survey). Tasci (2008) finds a lower job search intensity for women in Turkey, and suggests cultural obstacles and limited economic opportunities for women as potential reasons.

First, in terms of the school-to-work transition, it matters to know if women are as often as men destined for the labor market. Behrman and Wolfe (1984) study the labor force participation in Nicaragua, arguing that the detrimental labor market effect of

¹⁴E.g. Boserup (1990); or Eastin and Prakash (2013) for a recent empirical investigation.

¹⁵Some of the theories could also be used to explain differential outcomes between other groups, such as ethnic groups.

having small children is lower in a developing country setting, where childcare alternatives are more abundant. Around the world, women's labor market participation rates have remained relatively stable over the last two decades (United Nations 2015), while that of males has decreased slightly. This has meant that the gender gap has somewhat decreased, from 32% in 1980 to 28% in 2008 (Elder 2010). The latest *World's Women* report (United Nations 2015) shows that women are both prone to higher rates of unemployment and lower pay, across sectors and occupations, and that women work longer hours than men when both paid and unpaid work are taken into account.

A series of country reports¹⁶ by the ILO, based on the School-to-Work transition surveys, show that women are generally disadvantaged in the school-to-work transition. The contents of these reports indicate that in virtually all countries surveyed, the share of women in transition (that is, who are out of school and who have intentions to find work, either now or later) who have found stable or satisfactory work is lower than the equivalent share for men. Women also experience longer transitions in general, whether the transition to stable employment or to satisfactory self-employment be considered. It thus seems that the gender inequalities measured by higher unemployment and lower pay, manifest in many of the world's labor markets, carry on to the length of finding a job. Longer transitions for women are also found in Boutin (2014) for Mali. Furthermore, the effect seems not to be driven by educational discrepancies; in many of the reports, women experience more complicated transitions at all levels of education. It should however be noted that the above evidence is largely descriptive. Turning to the scant evidence from multivariate regressions; being a woman is associated with a decreased hazard rate in Argentina (Galiani and Hopenhayn 2003) and in Palestine (Sayre and Daoud 2010).

In much of the developing world, numerous ethnic groups coexist inside countries where borders often are of little cultural and ethnical relevance, leading to conflicts and fights for resources. Knight and Sabot (1982) show that racial discrimination is more important than discrimination by gender in Tanzanian manufacturing, non-Africans (primarily Asians) being privileged with respect to Africans. Decomposing the differences in mean wages they show that wage differentials are little explained by the higher education levels of non-Africans. Banerjee and Knight (1985) find a small but significant earnings differential between scheduled castes and non-scheduled castes

¹⁶See for example: Barcucci and Mryyan (2014), Barsoum, Ramadan, and Mostafa (2014), Elder (2014), Elder and Koné (2014), Elder, Novkovska, and Krsteva (2013), Libanova et al. (2014), Matsumoto and Elder (2010), Mel, Elder, and Vansteenkiste (2013), Mussa (2013), Serrière (2014), and Toufique (2014).

(untouchables) in India. No such effect is found by Deininger, Jin, and Nagarajan (2013). Moll (1991) decomposes discrimination into wage and job discrimination, showing that job discrimination against colored South Africans decreased between 1970 and 1980. Beyond the notion of discrimination, however, which is likely to affect individuals according to the ethnic composition of their local labor market, the terms fractionalization and polarization have been introduced into the literature. Barr and Oduro (2002) study the Ghanaean labor market and find evidence of ethnic fractionalization. There are substantial earnings differentials between ethnic groups, of which the authors attribute a large share to a strong tendency for workers to be employed by members of their own ethnic group, and to the fact that ethnic groups run different types of enterprises. Franck and Rainer (2012) look at African leaders' ethnicity and finds evidence of ethnic favoritism. When individuals share ethnicity with the leader, they are more likely to attend and complete primary education, and infant deaths are less likely to occur. If such ethnic favoritism occurs, it is likely to carry over to the school-to-work transition. While, to my knowledge, no study on ethnic penalties in the school-to-work transition exists for developing countries, studies have been carried out on migrants in high-income countries. Kalter and Kogan (2006) find evidence of ethnic penalties in Spain and Belgium: being a non-EU national is associated with longer transitions to professional, technical or managerial jobs in both countries.

4.3 Social networks

It has been established that an important share of workers find their jobs through personal contacts (Jackson 2010; Montgomery 1991b; Topa 2001). Bramoullé and Saint-Paul (2010) develop a model based on the hypothesis that a social tie between an employed and an unemployed worker increases the probability of finding a job of the latter. In their model, *inbreeding*, the probability of forming ties with persons of the same labor market status, explains why negative duration dependence occurs in the transition from unemployment to employment. Short-term unemployed have on average more employed ties, which are depleted with time. A similar result is theorized in Calvó-Armengol and Jackson (2004). Plausibly, this mechanism could also explain an increased efficiency of individuals who combined work and schooling in finding a first full-time job.

Recruitment within employees' social networks can be used to curb moral hazard problems or to try to circumvent the problem of unobservable characteristics by assuming that these are correlated inside an individual's network. Dhillon, Iversen, and Torsvik

(2013) look at employee referrals in India, finding evidence for a high prevalence of referral-based recruitment in Western Uttar Pradesh. Referral was used explicitly as a recruitment method by the British Army's Gold Coast Regiment in Ghana in the early 20th century, something explored by Fafchamps and Moradi (2015). Relying on army records, they find that rather than improving the unobserved efficiency of recruits, the referral process implied recruits that were more likely to desert or be declared as inefficient or unfit. Lassassi and Muller (2013) look at job search methods in Algeria, arguing that human capital seems to be an important factor determining the successful use of social networks to find employment. Contreras et al. (2007) reach a similar conclusion for women in Bolivia. Giulietti et al. (2010) find that jobs found through networks amongst Chinese rural to urban migrants are associated with higher wages, suggesting that networks not only facilitate getting a job, but also may have implications on the quality of the job found. Nordman and Pasquier-Doumer (2015) look at how labor market transitions in Ouagadougou are affected by social networks, measured by several indicators such as size, strength of ties and embedded resources. They do not find any effect of network size on the transition hazard from unemployment to employment, but find effects of the fragmentation of siblings and strength of ties. Finally, social networks might not only help in finding wage employment but also in the activities of the self-employed (Fafchamps and Minten 2002; Nordman and Vaillant 2015). The formation of social networks is sometimes conditional on ethnic affiliations. Gajigo and Foltz (2010) thus show that co-ethnicity and trade credit are related in the Gambia, arguing that denser ethnic networks enable the Serahule group to obtain credit with more ease than other groups, although facing a similar lack of formal institutions. Having ties to prominent local individuals influences success of West African traders, as shown by Kuépié, Tenikue, and Walther (2015). However, religion seems to be excluded as the authors find that ties to local religious leaders tend to decrease profits, contrary to ties to prominent administrative or political figures.

4.4 Cognitive and non-cognitive skills

Recently, and in an attempt to go beyond the traditional human capital theory framework, a lot of attention has been given to the role of cognitive and non-cognitive skills (NCS) as explanatory factors for various economic outcomes. In the labor market, cognitive skills have been associated with higher wages (Behrman, Ross, and Sabot 2008; Green and Riddell 2003), a higher incidence of employment and longer work experience (Carneiro, Crawford, and Goodman 2007) and a higher probability to leave unemployment in an

individual's first unemployment spell (Wondratschek 2010). Evidence on wage returns to cognitive skills in developing countries was summarized in Hanushek and Woessmann (2008) and includes a fairly low number of studies mostly carried out in African economies. They however in general show a positive impact of cognitive skills on wages. Gertler et al. (2013) find that an experiment consisting in giving psychosocial stimulation to disadvantaged toddlers in Jamaica produced significant wage differences between the test and the control group 20 years later (average earnings increased by 42%). Lee and Newhouse (2012) find using a large sample of developed and developing countries that higher test scores are associated with lower levels of unemployment, and suggest that these may also increase job quality in the medium term, an indicator of better school-to-work transitions.

Alongside of cognitive skills, non-cognitive skills or *personality traits* have been emphasized as important determinants of a range of socioeconomic outcomes (Heckman, Stixrud, and Urzúa 2006). The most commonly used classification is the so called Big Five-model, including five personality traits that are supposed to adequately resume personality differences in humans¹⁷. To understand the role of cognitive and non-cognitive skills it is important to investigate their evolution over time. While some studies argue that personality traits are rather stable by the onset of early adulthood, others suggest that personality traits continue to evolve over the life cycle (Almlund et al. 2011). Roberts, Walton, and Viechtbauer (2006) show in a meta-analysis that individuals become more socially dominant, conscientious and emotionally stable in young adulthood (from ages 20 to 40). The question whether environmental variables influence non-cognitive skills is important in terms of the school-to-work transition. If major life events such as finding a job influence personality traits, the time at which these are measured has implications on the possibility of inference from a regression analysis. Furthermore, schooling in itself might influence both cognitive and non-cognitive development, as shown by Heckman, Stixrud, and Urzúa (2006). Looking at the determinants of cognitive skill acquisition, Glick, Randrianarisoa, and Sahn (2011) find that mothers' education influences the learning process of Malagasy children more than fathers' education, suggesting that mothers spend more time with children's schoolwork than fathers. Finally, carrying out complex work also contributes to the development of cognitive skills through the life course (Schooler, Mulatu, and Oates 1999).

¹⁷These personality traits are openness to experience, conscientiousness, extraversion, agreeableness and neuroticism. Another personality trait that has been showed to significantly influence labor market outcomes is *grit*, capturing perseverance of effort toward long-term goals (Duckworth and Quinn 2009).

Studies on non-cognitive skills' influence on labor market outcomes in developing countries are scarce, although a recent survey run by the World Bank specifically focused on cognitive and non-cognitive skills and employability in a set of developing countries¹⁸. Acosta, Muller, and Sarzosa (2015) find no influence of non-cognitive skills on wages or job quality in Colombia, but find a positive association between NCS and labor market participation and educational outcomes. In urban Peru, Cunningham, Torrado, and Sarzosa (2016) find that grit is linked to several labor market outcomes among which wages, employment and probability of being a wage worker. Hilger, Nordman, and Sarr (2015) find positive effects of non-cognitive skills on several labor market outcomes in Bangladesh. Furthermore, they show that the effects differ depending on the hiring channel used, and that non-cognitive skills are associated with different probabilities of having obtained one's job through formal or informal channels.

4.5 Family background, household wealth and composition

The socio-economic context individuals are brought up within shapes their knowledge and their beliefs about present and future possibilities offered to them. As early as 1970, Backman carried out a longitudinal study on U.S. adolescents, showing that an indicator of socio-economic status¹⁹ was a good predictor of both intelligence and knowledge of job opportunities (Backman 1970). A sizable interdisciplinary literature has highlighted the importance of family background on individual success (e.g. Bynner (1998) and Staff and Mortimer (2008)), linked to the literature on intergenerational mobility. Behrman, Gaviria, and Székely (2001) show that intergenerational mobility in education and occupation in Latin America is much lower than in the US, and argue that mobility is tightly linked to school expansion. However, educational mobility may not be the only cause for the correlation between childhood and adult status. Parental occupations may shape the transition to employment if knowledge about opportunities is scarce and there are returns to parental experience in an occupation. Pasquier-Doumer (2013) partially confirms this, showing that while in general second generation self-employed in West Africa do not fare better than their parents, those who take up a trade in the family tradition do. Additional evidence from Cameroon (Mboutchouang et al. 2013) suggests

¹⁸STEP, or Skills Toward better Employment and Productivity (Pierre et al. 2014).

¹⁹Comprised of 6 equally weighted dimensions: father's occupational status, father's and mother's educational attainment, number of books in the home, number of rooms per person in the home, and a checklist of other possessions.

that second generation entrepreneurs do better than first generation ones, and confirms the finding of Pasquier-Doumer (2013) that returns are higher when the entrepreneur is engaged in the same branch of activity. In an interesting paper, Lambert, Ravallion, and Van de Walle (2014) study the determinants of educational mobility in Senegal. They find, perhaps contrary to intuition, that inheritance of land and assets does not account for much of the intergenerational correlations in consumption. Instead, parental occupation and education, and investment in children's education, play more important roles. Furthermore, these are significant determinants of the probability of transiting from farm to non-farm activities for men. No economic studies of the effects of parental characteristics on the subsequent transition to work have been carried out in developing countries, although such studies would be of high interest in determining to what extent the family network helps and/or restrains youth to take on specific career paths.

Family size and birth order effects have been shown to affect educational outcomes (Glick and Sahn 2000), with inequalities likely to persist in the labor market. In one of the earliest models Becker and Lewis (1973) famously suggested a quantity-quality trade-off in children, implying that larger families should have on average less educated children. This is partially confirmed in the literature from developing countries: Li, Zhang, and Zhu (2008), using twins as a source of exogenous variation in family size in China, find that children from larger families have worse educational outcomes. Also relying on twin births, Ponczek and Souza (2012) find negative impacts on education for both boys and girls in Brazil. Evidence from India (Kugler and Kumar 2015), using gender of the first child as an instrument for family size, and the Philippines (Dumas and Lefranc 2013), using the Manila ban on contraceptives, also confirm Becker's quantity-quality trade-off hypothesis in a developing country setting. The last paper uses grade repetition as an outcome, and thus provides evidence that the quality of the schooling experience (conditioned by inputs from the household level) decreases when youth come from larger families. If family size impacts learning, then this is likely to affect the transition to employment, both in terms of its nature (high achievers having access to better jobs), and the length of the transition (conditional on work destination, high achievers are likely to match faster with an employer). Birth order effects on schooling and other socio-economic outcomes have also been amply tested in the literature. The *confluence* model, by which the child's intellectual environment is decreasing in quality with each sibling born, predicts lower educational attainment of the latter born. Behrman and Taubman (1986) and Black, Devereux, and Salvanes (2005) have found negative birth order effects pointing in this direction. When the household is considered as a

production unit, siblings may also enter into direct competition with one another. In the framework set by Emerson and Souza (2008), older siblings may command higher wages in the market for child labor, and thus relax the household budget constraint and make it possible for younger siblings to attend school. Their work is thus a reminder of the importance of distinguishing economies with child labor from economies without child labor. To a larger extent, using the nuclear family as a basis for theoretical developments on the intra-household allocation of resources fails to account for a large number of family structures that characterize much of the developing world. In a polygamous society, for example, responsibilities of members often extend to children of other parents (Lloyd and Blanc 1996). More generally, extensive family networks imply that responsibilities extend to individuals not living under the same roof, such that the household as nucleus of decision-making loses in relevance. The fact that family background variables are important in the labor market has been argued based on the fact that their introduction lowers the coefficients of returns to education (as in Heckman and Hotz (1986), for Panama). Krishnan (1996) investigate this in the case of Ethiopia, accounting for a selection effect into the public sector. Her findings suggest that at least half of the family background effect on the estimated return to education in the public sector is due to selection bias. Lillard and Kilburn (1995) study intergenerational earnings mobility in Malaysia and find evidence of relatively strong earnings linkages between fathers and offspring. The effects appear to be both direct and indirect (through investment in education).

Summary

Education generally improves labor market prospects, but evidence from developing countries shows that the relationship may not be monotonic. Dual labor markets and queuing for high quality job can explain why tertiary education graduates stay long in unemployment. Men are generally favored in the transition to work, and ethnic relations and polarization may constitute barriers for minorities in accessing work. While social networks, cognitive and non-cognitive skills and family background have all been proven important determinants of labor market success in developing countries, studies linking them to the duration and shape of the school-to-work transitions are lacking.

5 Environmental factors and the School-to-work transition

The present section intends to review the evidence on the role played by environmental factors on the school-to-work transition. Using the term environmental factors is motivated by a willingness to change scales. While the previous section was concerned with individual or family-level characteristics and their impact on individuals' transitions, this section aims to evaluate how labor market policies and other features of the economic and social environment in which individuals live influence the average individual's transition.

5.1 The macroeconomic environment

The law of supply and demand remains an optimal starting point for the analysis of the time it takes for the labor market to absorb new graduates. In the canonical neo-classical model, the wage adjusts to achieve clearance in the labor market. In real life, the wage is not the only thing that might adjust to modifications of supply and demand of workers, and excess supply of workers might provoke anything from unemployment and unwanted part-time labor to lower quality jobs. This is illustrated in Banerjee et al. (2008), who examine the South African labor market since the end of apartheid. At the time, the country faced institutional constraints²⁰ preventing real wages from declining to adjust to the increased supply of labor (of black women, especially). This, in combination with a structural change implying an increased relative demand for more qualified labor, meant that unemployment soared, especially amongst lower educated South Africans.

Minimum wages are a good example of institutional (legislative) constraints that could theoretically impede labor market adjustments and reduce employment in the context of excess supply of labor. Margolis (2014) reflects on the conditions under which the introduction of minimum wages in developing countries can promote growth and reduce poverty. He argues that market frictions and monopsony conditions seem particularly important in developing countries, suggesting that minimum wages may come with positive employment effects. However, there are inherent risks of increasing the informal sector, and *in fine* the success of minimum wages hinges on the capacity of countries to enforce legislation, collect relevant data and ensure coverage. Empirical evidence from the introduction of minimum wages in Latin America suggests that the negative employment effect is all but uncertain. In a panel data study of Mexican and Colombian manufacture, Bell (1997) concludes on a negative effect in Colombia, but no effect in Mexico. She

²⁰Related to, among other things, scrutiny from international institutions.

argues that this is because the minimum wage is not binding in Mexico, while it is in Colombia. Maloney and Mendez (2004) point out that minimum wages distort labor markets differently in the presence of large shares of informal labor. Imposing a (binding) minimum wage in the formal sector might push workers into the informal segment of the labor market, where wages decrease, which results in some workers being worse off than before the introduction of the minimum wage. This mechanism does not seem to be operating in Latin America, however. The authors instead show that in virtually all countries, a *lighthouse effect* can be observed, *i.e.* the minimum wage in the formal sector acts as a signal of what constitutes a fair wage in the labor market. Thus, rather than decreasing, wages in the informal segment of the labor market actually increase. Lemos (2009) also finds evidence of a wage compression effect in both the formal and informal sector in Brazil, but concludes on no adverse employment effects. Gindling and Terrell (2007) on the contrary find an adverse employment effect on the covered sector in Costa Rica, but no change in the uncovered sector. Dinkelman and Ranchhod (2012) find no evidence of employment effects of the minimum wage introduced in South Africa. Lustig and McLeod (1996) explore a set of developing countries which have introduced minimum wages, and find that increases in the minimum wage have on average led to decreases in poverty rates. In a review of the literature, Betcherman (2015) states that the majority of the evidence from developing countries concludes on negative, but small adverse employment effects from the introduction of minimum wages. Studies further suggest that relatively vulnerable individuals such as youth, women, less skilled and more generally those on the lower end of the pay scale tend to be the ones suffering the worst employment effects. Focusing on the school-to-work transition specifically, but outside a developing country context, Neumark and Wascher (1995) look at the impact of minimum wages on youth transitions in the US. Their results suggest that while on the aggregate, the minimum wage might have low employment effects, transitions to and from enrollment and employment can be significant and “*should be of concern to policymakers.*”.

The shape of technical change also influences demand for labor, both aggregate labor and labor at various skill levels. Capital-augmenting productivity growth for example, will induce firms to substitute capital for labor, thereby creating downward pressure on wages and upward pressure on unemployment. Similarly, if technological change is labor-augmenting but skill-biased, such that the productivity increase is relatively stronger for skilled labor, firms are likely to substitute skilled labor for unskilled labor as labor inputs. In general, structural change, whether it be the result of terms of trade variations or productivity shocks, will through adjusting the overall capital intensity have

repercussions on the demand for labor and thus the transition patterns of young workers. Berman and Machin (2000) show evidence of pervasive skill-biased technological change in developing countries, something that would worsen prospects for relatively uneducated workers in these countries. The linkages between technical change and the labor market have been studied in Bolivia (De Franco and Godoy 1993), South Africa (Naudé and Coetzee 2004), in Sub-Saharan Africa (De Janvry and Sadoulet 2002; Ehui and Delgado 1999), in Latin America (De Janvry and Sadoulet 2002; Schady and Sánchez-Páramo 2003), in Asia (De Janvry and Sadoulet 2002; Marouani and Nilsson 2016).

On the supply side, demographics play an important role in the supply of labor and thus in the labor market equilibrium, something that has been taken into account by scholars working on youth employment. At constant labor demand, the arrival of a relatively large cohort in the labor market is doomed to be accompanied by increasing unemployment (so called *cohort crowding*). Korenman and Neumark (1997) estimate the elasticity of youth unemployment to the share of youth in the population, and find this to be around 0.5 in a set of 11 European economies. Similar figures for developing countries are found by O’Higgins (2003). From this angle it makes sense to be optimistic about world demographic trends from a labor market perspective: Lam (2007) shows that although the number of youth in the world has never been bigger, the share of youth to adult population has already peaked and is declining in most developing countries, implying more opportunities in the future for the world’s youth.

In Africa, Garcia and Farès (2008) show substantial heterogeneity in transition times of youth, ranging from one year of inactivity in Côte d’Ivoire to seven years in Mozambique. Guarcello et al. (2005), using the same data, find no evidence of correlations between the time spent in transition and a number of macroeconomic factors such as GDP growth, the share of industry or openness to trade. This might suggest that unobserved institutional factors, at the country, regional or local level, strongly affect transition patterns in individuals. For example, population density and infrastructures of one’s locality play a role in the amount and nature of viably accessible economic activities for individuals, as well as the potential size of their social networks and the possibility of extending those. Population density was linked to the probability of finding a job through one’s social network in Egypt (Wahba and Zenou 2005), and to the job search intensity in Turkey (Tasci 2008) and Russia (Smirnova 2003).

5.2 Labor market policies

Facing difficulties of some groups in the labor market, industrialized countries have implemented various labor market policies in order to address market failure and improve outcomes of workers risking to lose touch with the labor market (so called Active Labor Market Policies, or ALMPs). Escudero (2015) lists four objectives of ALMPs: 1) acting as a tool smoothing the matching process 2) keeping long-term unemployed and other outsiders close to the labor market 3) increasing the demand for labor 4) stimulate productivity of the labor force. International organizations such as the World Bank and the ILO have in recent years recognized the need to adequately evaluate active labor market programs in developing countries, since initial evidence suggested some of the programs (successfully) run in industrialized countries might not be suited for developing countries' labor markets (Kyloh 2004). Godfrey (2003) assesses a series of ALMPs carried out in transition and developing countries, arguing that a double criterion should exist for programs: a (favorable) cost-benefit analysis, and a high private rate of return for the disadvantaged youth that are the target populations of these programs. The World Bank's support in the area of youth employment was evaluated in 2012 (Independent Evaluation Group 2012). Regarding the school-to-work transition, improving information on the labor market is a feature of 70% of the Bank projects studied, although very little is known about its efficiency. The fact that the SWT is minimally covered whilst the education system is extensively covered is pointed out as a gap in the report. Some impact evaluations were carried out on other programs run by the World Bank. Seven are listed in the report, and a summary of their conclusions is provided. They indicate that entrepreneurship training might be efficient in rural areas in Uganda and Colombia (but negligible effect in Tunisia), that short-term training with internships seems to function in Colombia but not in the Dominican Republic (Card et al. 2011), and that men are more positively impacted by entrepreneurship training than women, who do better in skills training. A meta-analysis conducted by Card, Kluve, and Weber (2010) showed that interventions targeted at youth less often showed significant impacts than untargeted programs. More recent and extensive evidence on ALMPs targeting youth comes from Kluve et al. (2016). Covering 113 reports, their aggregate analysis shows that employment services and subsidized employment perform worse than interventions in skills training or entrepreneurship promotion.

Blattman and Ralston (2015) survey labor market and entrepreneurship programs in poor and fragile states. The evidence surveyed shows a small effect on employment and

earnings of training in business skills, technical and vocational skills. Furthermore, the relatively high costs of these interventions casts doubt on the returns. These conclusions echo those of more systematic reviews: McKenzie and Woodruff (2014) evaluate 16 randomized experiments providing business training, concluding on modest impacts in the adoption of business practices and henceforth on sales or profitability. They however find stronger effects on business creation. Tripney and Hombrados (2013) review 26 studies on the provision of technical and vocational education (TVET) to youth in low- and middle-income countries. Their overall finding is that of a statistically significant impact of TVET provision on paid employment and earnings, but they suggest caution in drawing any firm conclusion due to the relatively modest quantity of evidence coupled with the insufficient quality of some studies. Also interested in employment, Grimm and Paffhausen (2015) systematically review 53 studies of interventions targeting micro-entrepreneurs or small- or medium-sized firms. They find modest effects, especially when job creation in pre-existing firms is considered. Interestingly, they also find a difference according to the methodology used for the evaluation, randomized controlled trials finding smaller effects than quasi-experimental ones. The lack of focus on the cost-effectiveness of these interventions is also pointed out in their study. A similar concern was raised by Blattman and Ralston (2015), who claim that even a rather successful example of an adolescent girls employment program in Liberia (Adoho et al. 2014) would necessitate steady benefits for 3-4 years for benefits to outweigh costs. The lack of evidence on the medium- and long-term effects of interventions was also highlighted in the literature. Many evaluations lack a follow-up, focusing only on the immediate effects at program closure. Exceptions showing positive medium-term impacts do however exist. McKenzie, Assaf, and Cusolito (2016) evaluate an interesting scheme in Yemen, where firms interested in hiring interns were matched randomly to candidates fulfilling a certain number of criteria, and were given subsidies covering 50% of the internship cost. The authors find large and positive employment and earnings effects, still present 5 months after the program, suggesting that internships can work as springboards for youth at the start of their transition to working life. In India, Maitra and Mani (2017) find sustained positive employment effects of vocational training on poor women, 18 months after the end of the intervention. In Latin America, a series of evaluations of the *Jovenes* programs, providing job training in seven Latin American countries suggests positive employment impacts of active labor market programs in all seven countries, ranging from a 0 - 5% increase in employment. The target groups were youth, out of school and unemployed or underemployed individuals, and training was given for a few weeks, followed by an internship with a firm of the same length (Ibarrarán and Rosas Shady 2009). Among

the programs evaluated, the PROCAJOVEN in Panama is of particular interest, since it distinguished first-time job seekers from merely unemployed youth, focusing on longer internships and less training for the former. Interestingly, the estimated impacts were lower for first-time job seekers (and negative for men), but since this group is different from the second one, not much can be inferred about the relative efficiency of job readiness training versus internships. In a larger evaluation of job training programs, Urzúa and Puentes (2010) cite 34 evaluations from Latin America of varying scope and quality. Their summary casts doubt on the generalizability of the positive results from the Jovenes programs, since about half of the evaluations show no positive labor market impacts.

In their survey, Blattman and Ralston (2015) also summarize the (scarce) evidence on workforce programs, such as the NREG program in India, which provided 3.3 person-days of public employment per rural individual for three years. The efficiency of the program remains doubtful, and results from evaluations are inconclusive, partly due to the lack of an appropriate research design. Summing up, Blattman and Ralston (2015) argues that the most researched type of intervention is individual or household transfers in capital goods or cash. This is also the strand of the literature that has shown the most promising effects. Evidence from Uganda (Blattman, Fiala, and Martinez 2014; Blattman et al. 2016) shows that transferring cash and business skill training to the poor leads them to take up self-employment and increases earnings and work hours. In Bangladesh, Bandiera et al. (2013) show that transfers of assets and skills to poor women enable them to shift out of casual labor into self-employment. More generally, interventions equipping individuals with capital (physical or cash) have the best record in the literature and provide long-lasting positive impacts (Blattman and Ralston 2015). Overall, the success or failure of similar interventions with multiple components suggests that there may be synergies between program components, and that the provision of skills or cash alone is an imperfect way of putting the poorest on a path to stable employment. However, since local contexts vary, and the possibilities for promoting employment targeting disadvantaged youth are numerous, a solid body of evidence has yet to be constituted, in particular with regards to skills formation interventions and workforce programs. In this regard, with more and more randomized control trials emerging, learning by doing in the policy community might (hopefully) imply improved transitions for vulnerable categories of youth in the future.

Summary

Sparse evidence from Africa suggests the macroeconomic environment matters little in explaining individual transition times. However, macroeconomic studies of the long-term determinants of average transition rates are lacking and would be a welcome addition to the literature.

Active Labor Market Programs have had mitigated results on labor market entry. Systematic reviews tend to find evidence that entrepreneurship promotion and skills training work better than employment services or subsidies. However, employment creation in pre-existing firms may be more difficult to achieve. It is acknowledged that there is scope for more evidence on the long-term effects as well as the cost-effectiveness of interventions. Among intervention methods, cash or capital injections are the ones with the most successful track record.

6 Concluding remarks

In this article, I have attempted to paint a picture of the research on school-to-work transitions in developing countries, including theoretical foundations, methodological issues and empirical evidence. Concerned with flows between states in the labor market, search and matching theory constitutes a natural starting block for inquiry into labor market transitions. This literature has in recent years been extended to take into account some of the most salient features of developing countries' labor markets, such as a formal-informal segmentation. Producing theoretical hazard rates, search and matching theory also lays the ground for empirical analysis of transition that takes the shape of duration analysis. Among the estimators used in the literature, the proportional hazards model is by far the most commonly used tool. Despite it not being able to nest many structural models, its relative simplicity and incorporation into common statistical software makes it a good basis for extensive empirical study of the school-to-work transitions.

Empirical results suggest that many of the results found in static analyses concerning labor market status in developing countries are confirmed when transitions are the subject of investigation. Being a woman, for example, not only carries a penalty in terms of wages or unemployment, but also in terms of transition lengths. Education mostly shortens transition times, although this is not always the case. Queuing for good [public sector] jobs arises as a plausible explanation for the phenomenon. Social networks, cognitive skills and family background are all tied to employment outcomes,

but specific studies on transitions in developing countries are lacking. This pleads for the systematic inclusion of work and education history modules in future labor market surveys.

The macroeconomic environment seems to be of relatively little importance in individual school-to-work transitions in developing countries. Rather, the institutional setting and the nature of the local labor market arise as potential drivers of durations to first job. Public interventions have proven successful, in particular those who focus on cash or capital injections. Furthermore, skills training and entrepreneurship promotion have been more successful than interventions focusing on employment services or subsidies to employment. Some evidence also suggests that interventions targeting youth are less efficient than untargeted interventions. Overall, the evidence points to a lot of heterogeneity, plausibly due to differences in the local settings in which programs were implemented. This suggests a need to continue studying the determinants of successful interventions.

References

- Abdel-Mowla, S (2011). “Women’s Job Search Activity in a Transforming Labour Market: Determinants of Women’s Job Search Propensity in Egypt”. In: *International Proceedings of Economics Development and Research* 16.6, pp. 28–36.
- Abebe, G et al. (2016a). *All the Fun of the (Job) Fair. Matching Firms and Workers in a Field Experiment in Ethiopia*. Unpublished manuscript.
- Abebe, Girum et al. (2016b). *Curse of Anonymity or Tyranny of Distance? The Impacts of Job-Search Support in Urban Ethiopia*. National Bureau of Economic Research Working Paper 22409.
- Acemoglu, Daron (1996). “A Microfoundation for Social Increasing Returns in Human Capital Accumulation”. In: *The Quarterly Journal of Economics* 111.3, pp. 779–804.
- Acosta, Pablo, Noël Muller, and Miguel Alonso Sarzosa (2015). “Beyond Qualifications: Returns to Cognitive and Socio-Emotional Skills in Colombia”. World Bank Policy Research Working Paper 7430.
- Adoho, Franck et al. (2014). “The Impact of an Adolescent Girls Employment Program: The EPAG Project in Liberia”. World Bank Policy Research Working Paper 6832.
- Albrecht, James, Axel Anderson, and Susan Vroman (2010). “Search by committee”. In: *Journal of Economic Theory* 145.4, pp. 1386–1407.
- Albrecht, James, Pieter A Gautier, and Susan Vroman (2006). “Equilibrium Directed Search with Multiple Applications”. In: *The Review of Economic Studies* 73.4, pp. 869–891.
- Albrecht, James, Lucas Navarro, and Susan Vroman (2009). “The Effects of Labour Market Policies in an Economy with an Informal Sector”. In: *The Economic Journal* 119.539, pp. 1105–1129.
- Allen, Jim and Rolf Van der Velden (2007). “Transitions from Higher Education to Work”. In: *Careers of University Graduates*. Springer, pp. 55–78.
- Almlund, Mathilde et al. (2011). “Personality Psychology and Economics”. National Bureau of Economic Research Working Paper 16822.
- Altonji, Joseph G and Rebecca M Blank (1999). “Race and gender in the labor market”. In: *Handbook of Labor Economics* 3, pp. 3143–3259.
- Assaad, Ragui, Christine Binzel, and May Gadallah (2010). “Transitions to Employment and Marriage Among Young Men in Egypt”. In: *Middle East Development Journal* 2.01, pp. 39–88.
- Backman, JG (1970). *Youth in transition: The Impact of Family Background and Intelligence on Tenth-Grade Boys, Vol. 2*. Ann Arbor, Michigan: Institute for Social Research.
- Bandiera, Oriana et al. (2013). *Can Basic Entrepreneurship Transform the Economic Lives of the Poor?* IZA Discussion Paper No. 7386.
- Banerjee, Abhijit et al. (2008). “Why has unemployment risen in the New South Africa?” In: *Economics of Transition* 16.4, pp. 715–740.
- Banerjee, Biswajit and John B Knight (1985). “Caste discrimination in the Indian urban labour market”. In: *Journal of Development Economics* 17.3, pp. 277–307.
- Barcucci, Valentina and Nader Mryyan (2014). *Labour market transitions of young women and men in Jordan*. ILO, Geneva.
- Barr, Abigail and Abena Oduro (2002). “Ethnic fractionalization in an African labour market”. In: *Journal of Development Economics* 68.2, pp. 355–379.
- Barsoum, Ghada, Mohamed Ramadan, and Mona Mostafa (2014). *Labour market transitions of young women and men in Egypt*. ILO, Geneva.
- Bassi, Marina et al. (2012). *Desconectados: Habilidades, educacao e emprego na América Latina*. Banco Interamericano de Desenvolvimento.
- Becker, Gary S and H Gregg Lewis (1973). “On the Interaction between the Quantity and Quality of Children”. In: *Journal of Political Economy* 81.2, S279–S288.

- Becker, Sascha O (2006). “Introducing Time-to-Educate in a Job-Search Model”. In: *Bulletin of Economic Research* 58.1, pp. 61–72.
- Behrman, Jere R, Alejandro Gaviria, and Miguel Székely (2001). “Intergenerational Mobility in Latin America”. In: *Economía* 2.1, pp. 1–31.
- Behrman, Jere R, David Ross, and Richard Sabot (2008). “Improving quality versus increasing the quantity of schooling: Estimates of rates of return from rural Pakistan”. In: *Journal of Development Economics* 85.1, pp. 94–104.
- Behrman, Jere R and Paul Taubman (1986). “Birth Order, Schooling, and Earnings”. In: *Journal of Labor Economics* 4.3, S121–S145.
- Behrman, Jere R and Barbara L Wolfe (1984). “Labor force participation and earnings determinants for women in the special conditions of developing countries”. In: *Journal of Development Economics* 15.1, pp. 259–288.
- Bell, Linda A (1997). “The Impact of Minimum Wages in Mexico and Colombia”. In: *Journal of Labor Economics* 15.S3, S102–S135.
- Berman, Eli and Stephen Machin (2000). “Skill-Biased Technology Transfer: Evidence of Factor Biased Technological Change in Developing Countries”. Unpublished manuscript. Boston University.
- Betcherman, Gordon (2015). “Labor Market Regulations: What do we know about their Impacts in Developing Countries?” In: *The World Bank Research Observer* 30.1, pp. 124–153.
- Black, Sandra E., Paul J. Devereux, and Kjell G. Salvanes (2005). “The More the Merrier? The Effect of Family Size and Birth Order on Children’s Education”. In: *The Quarterly Journal of Economics* 120.2, pp. 669–700.
- Blanchflower, David G and Andrew J Oswald (1994). *The Wage Curve*. MIT press.
- Blattman, Christopher, Nathan Fiala, and Sebastian Martinez (2014). “Generating Skilled Self-Employment in Developing Countries: Experimental Evidence from Uganda”. In: *The Quarterly Journal of Economics* 129.2, pp. 697–752.
- Blattman, Christopher and Laura Ralston (2015). *Generating Employment in Poor and Fragile States: Evidence from Labor Market and Entrepreneurship Programs*. Columbia University Working Paper.
- Blattman, Christopher et al. (2016). “The Returns to Microenterprise Support among the Ultrapoor: A Field Experiment in Postwar Uganda”. In: *American Economic Journal: Applied Economics* 8.2, pp. 35–64.
- Blau, David M (1991). “Search for Nonwage Job Characteristics: A Test of the Reservation Wage Hypothesis”. In: *Journal of Labor Economics* 9.2, pp. 186–205.
- Blau, David M and Philip K Robins (1990). “Job Search Outcomes for the Employed and Unemployed”. In: *Journal of Political Economy* 98.3, pp. 637–655.
- Booth, Alison L and Melvyn Coles (2007). “A microfoundation for increasing returns in human capital accumulation and the under-participation trap”. In: *European Economic Review* 51.7, pp. 1661–1681.
- Boserup, Ester (1990). “Economic change and the roles of women.” In: *Persistent inequalities: women and world development*. Ed. by Irene Tinker. New York: Oxford University Press, pp. 14–24.
- Boutin, Delphine (2014). “De l’école à l’emploi: la longue marche de la jeunesse urbaine malienne”. In: *Formation emploi* 124.4, pp. 23–43.
- Bowers, N (1998). “Getting started, settling in: the transition from education to the labour market”. In: *1998 Employment Outlook*. OECD. Chap. 3, pp. 81–122.
- Bradley, Steve and Anh Ngoc Nguyen (2004). “13 The school-to-work transition”. In: *International Handbook on the Economics of Education*, p. 484.

- Bramoullé, Yann and Gilles Saint-Paul (2010). “Social networks and labor market transitions”. In: *Labour Economics* 17.1, pp. 188–195.
- Brzinsky-Fay, Christian (2007). “Lost in Transition? Labour Market Entry Sequences of School Leavers in Europe”. In: *European Sociological Review* 23.4, pp. 409–422.
- Bucher, Anne (2010). *The dynamics of youth labor market integration*. TEPP Working Paper 2010-16. TEPP.
- Bynner, John (1998). “Education and Family Components of Identity in the Transition from School to Work”. In: *International Journal of Behavioral Development* 22.1, pp. 29–53.
- Calvès, Anne E, Jean-François Kobiané, and Afiwa N’Bouké (2013). “Privatization of Education and Labor Force Inequality in Urban Francophone Africa: The Transition from School to Work in Ouagadougou”. In: *World Development* 47, pp. 136–148.
- Calvès, Anne-Emmanuèle and Bruno Schoumaker (2004). “Deteriorating Economic Context and Changing Patterns of Youth Employment in Urban Burkina Faso: 1980–2000”. In: *World development* 32.8, pp. 1341–1354.
- Calvó-Armengol, Antoni (2004). “Job contact networks”. In: *Journal of Economic Theory* 115.1, pp. 191–206.
- Calvó-Armengol, Antoni and Matthew O Jackson (2004). “The Effects of Social Networks on Employment and Inequality”. In: *The American Economic Review* 94.3, pp. 426–454.
- Calvó-Armengol, Antoni and Yves Zenou (2005). “Job matching, social network and word-of-mouth communication”. In: *Journal of Urban Economics* 57.3, pp. 500–522.
- Campbell, Duncan and Ishraq Ahmed (2012). “The labour market in developing countries”. In: *Perspectives on Labour Economics for Development*. ILO, Geneva.
- Card, David, Jochen Kluge, and Andrea Weber (2010). “Active Labour Market Policy Evaluations: A Meta-Analysis”. In: *The economic journal* 120.548, F452–F477.
- Card, David et al. (2011). “The Labor Market Impacts of Youth Training in the Dominican Republic”. In: *Journal of Labor Economics* 29.2, pp. 267–300.
- Carneiro, Pedro, Claire Crawford, and Alissa Goodman (2007). *The Impact of Early Cognitive and Non-Cognitive Skills on Later Outcomes*. Centre for the Economics of Education Discussion Paper 92.
- Charlot, Olivier and Bruno Decreuse (2005). “Self-selection in education with matching frictions”. In: *Labour Economics* 12.2, pp. 251–267.
- (2010). “Over-education for the rich, under-education for the poor: a search-theoretic micro-foundation”. In: *Labour Economics* 17.6, pp. 886–896.
- Chuang, Hwei-Lin (1999). “Estimating the determinants of the unemployment duration for college graduates in Taiwan”. In: *Applied Economics Letters* 6.10, pp. 677–681.
- Cling, Jean-Pierre et al. (2007). *Youth and Labour Markets in Africa: A critical review of literature*. AFD Working Paper no. 49.
- Coles, Melvyn G and Eric Smith (1998). “Marketplaces and Matching”. In: *International Economic Review* 39.1, pp. 239–254.
- Coles, Melvyn G et al. (1994). *Understanding the Matching Function: The role of newspapers and job agencies*. CEPR Discussion Paper 939.
- Contreras, Dante et al. (2007). *The Role of Social Networks in the Economic Opportunities of Bolivian Women*. IADB Latin American Research Network Working Paper #R-540.
- Cox, David R (1972). “Regression Models and Life-Tables”. In: *Journal of the Royal Statistical Society. Series B (Methodological)* 34.2, pp. 187–220.
- Cunningham, Wendy and Javier Bustos Salvagno (2011). *Youth employment transitions in Latin America*. World Bank Policy Research Working Paper 5521.

- Cunningham, Wendy, Mónica Parra Torrado, and Miguel Sarzosa (2016). *Cognitive and Non-Cognitive Skills for the Peruvian Labor Market: Addressing Measurement Error Through Latent Skills Estimations*. World Bank Policy Research Working Paper 7550.
- De Franco, Mario and Ricardo Godoy (1993). “Potato-led growth: The macroeconomic effects of technological innovations in Bolivian agriculture”. In: *Journal of Development Studies* 29.3, pp. 561–587.
- De Janvry, Alain and Elisabeth Sadoulet (2002). “World Poverty and the Role of Agricultural Technology: Direct and Indirect Effects”. In: *Journal of Development Studies* 38.4, pp. 1–26.
- Defloor, Bart, Luc Van Ootegem, and Elsy Verhofstadt (2010). *A distance function approach to school-leavers? efficiency in the school-to-work transition*. Working Paper 2010/682, Ghent University, Faculty of Economics and Business Administration.
- Deininger, Klaus, Songqing Jin, and Hari Nagarajan (2013). “Wage Discrimination in India’s Informal Labor Markets: Exploring the Impact of Caste and Gender”. In: *Review of Development Economics* 17.1, pp. 130–147.
- Dhillon, Amrita, Vegard Iversen, and Gaute Torsvik (2013). *Employee referral, social proximity and worker discipline: Theory and Evidence from India*. CESifo Working Paper Series No. 90.
- Dickens, William T and Kevin Lang (1995). “An analysis of the nature of unemployment in Sri Lanka”. In: *The Journal of Development Studies* 31.4, pp. 620–636.
- Dinkelmann, Taryn and Vimal Ranchhod (2012). “Evidence on the impact of minimum wage laws in an informal sector: Domestic workers in South Africa”. In: *Journal of Development Economics* 99.1, pp. 27–45.
- Duckworth, Angela Lee and Patrick D Quinn (2009). “Development and Validation of the Short Grit Scale (GRIT-S)”. In: *Journal of Personality Assessment* 91.2, pp. 166–174.
- Dumas, Christelle and Arnaud Lefranc (2013). *‘Sex in Marriage is a Divine Gift’: For Whom? Evidence from the Manila Contraceptive Ban*. IZA Discussion Paper No. 7503.
- Eastin, Joshua and Aseem Prakash (2013). “Economic Development and Gender Equality: Is there a Gender Kuznets Curve?” In: *World Politics* 65.01, pp. 156–186.
- Ebrahimi, Ehsan and Robert Shimer (2010). “Stock–flow matching”. In: *Journal of Economic Theory* 145.4, pp. 1325–1353.
- Ehui, Simeon, Christopher Delgado, et al. (1999). *Economy-Wide Impacts of Technological change in the Agro-food Production and Processing Sectors in Sub-Saharan Africa*. International Food Policy Research Institute. Markets and Structural Studies Division Discussion Paper No. 38.
- Ek, Susanne and Bertil Holmlund (2010). “Family Job Search, Wage Bargaining, and Optimal Unemployment Insurance”. In: *The BE Journal of Economic Analysis & Policy* 10.1.
- Elder, Sara (2014). *Labour Market Transitions of Young Women and Men in Asia and the Pacific*. ILO, Geneva.
- Elder, Sara and Koko Siaka Koné (2014). *Labour market transitions of young women and men in sub-Saharan Africa*. ILO, Geneva.
- Elder, Sara, Blagica Novkovska, and Violeta Krsteva (2013). *Labour market transitions of young women and men in the former Yugoslav Republic of Macedonia*. ILO, Geneva.
- Elder, Sara et al. (2010). *Women in labour markets: measuring progress and identifying challenges*. ILO, Geneva.
- Emerson, Patrick M. and André Portela Souza (2008). “Birth Order, Child Labor, and School Attendance in Brazil”. In: *World Development* 36.9, pp. 1647–1664.
- Escudero, Verónica et al. (2015). *Are active labour market policies effective in activating and integrating low-skilled individuals?: An international comparison*. ILO Research Department Working Paper No. 3.
- Fafchamps, Marcel and Bart Minten (2002). “Returns to social network capital among traders”. In: *Oxford Economic Papers* 54.2, pp. 173–206.

- Fafchamps, Marcel and Alexander Moradi (2015). “Referral and Job Performance: Evidence from the Ghana Colonial Army”. In: *Economic Development and Cultural Change* 63.4, pp. 715–751.
- Fallon, Peter R (1983). “Education and the duration of job search and unemployment in urban India: An empirical analysis based on a survey of Delhi jobseekers”. In: *Journal of Development Economics* 12.3, pp. 327–340.
- Fields, Gary S (2011). “Labor market analysis for developing countries”. In: *Labour Economics* 18, S16–S22.
- Flinn, Christopher and James Heckman (1982). “New methods for analyzing structural models of labor force dynamics”. In: *Journal of Econometrics* 18.1, pp. 115–168.
- Flórez, Luz Adriana (2015). “The Search and Matching Equilibrium in an Economy with an Informal Sector: A Positive Analysis of Labor Market Policies”. In: *Desarrollo y Sociedad* 75, pp. 51–99.
- Franck, Raphael and Ilia Rainer (2012). “Does the Leader’s Ethnicity Matter? Ethnic Favoritism, Education, and Health in Sub-Saharan Africa”. In: *American Political Science Review* 106.02, pp. 294–325.
- Gajigo, Ousman and Jeremy D Foltz (2010). “Ethnic Networks and Enterprise Credit: The Serahules of The Gambia”. In: *Agricultural & Applied Economics Association’s 2010 annual meeting, July*, pp. 25–27.
- Galenianos, Manolis and Philipp Kircher (2009). “Directed search with multiple job applications”. In: *Journal of Economic Theory* 144.2, pp. 445–471.
- Galiani, Sebastian and Hugo A Hopenhayn (2003). “Duration and risk of unemployment in Argentina”. In: *Journal of Development Economics* 71.1, pp. 199–212.
- Garcia, Marito and Jean Farès (2008). *Youth in Africa’s Labor Market*. World Bank Publications.
- García-Belenguier, Fernando and Julián Moral Carcedo (2011). *Education Signalling and the School-to-work Transition*. Universidad Autónoma de Madrid Economic Analysis Working Paper Series 2/2011.
- Gertler, Paul et al. (2013). *Labor Market Returns to Early Childhood Stimulation: A 20-year Followup to an Experimental Intervention in Jamaica*. National Bureau of Economic Research Working Paper No. 19185.
- Gindling, Tim H and Katherine Terrell (2007). “The effects of multiple minimum wages throughout the labor market: the case of Costa Rica”. In: *Labour Economics* 14.3, pp. 485–511.
- Giulietti, Corrado et al. (2010). *Social Networks and the Labour Market Outcomes of Rural to Urban Migrants in china*. Unpublished manuscript.
- Glick, Peter, Jean Claude Randrianarisoa, and David E Sahn (2011). “Family background, school characteristics, and children’s cognitive achievement in Madagascar”. In: *Education Economics* 19.4, pp. 363–396.
- Glick, Peter and David E Sahn (2000). “Schooling of girls and boys in a West African country: the effects of parental education, income, and household structure”. In: *Economics of education review* 19.1, pp. 63–87.
- Godfrey, Martin (2003). *Youth Employment Policy in Developing and Transition countries: Prevention as well as Cure*. World Bank Social Protection Discussion Paper Series No. 0320.
- Green, David A and W Craig Riddell (2003). “Literacy and earnings: an investigation of the interaction of cognitive and unobserved skills in earnings generation”. In: *Labour Economics* 10.2, pp. 165–184.
- Gregg, Paul and Barbara Petrongolo (2005). “Stock-flow matching and the performance of the labor market”. In: *European Economic Review* 49.8, pp. 1987–2011.

- Grimm, Michael and Anna Luisa Paffhausen (2015). “Do interventions targeted at micro-entrepreneurs and small and medium-sized firms create jobs? A systematic review of the evidence for low and middle income countries”. In: *Labour Economics* 32, pp. 67–85.
- Groh, Matthew et al. (2015). “Testing the importance of search frictions and matching through a randomized experiment in Jordan”. In: *IZA Journal of Labor Economics* 4.1, pp. 7–27.
- Guarcello, Lorenzo et al. (2005). *School-to-Work Transitions in Sub-Saharan Africa: an overview*. Understanding Children’s Work Project Working Paper Series 43933.
- Guler, Bulent, Fatih Guvenen, and Giovanni L Violante (2012). “Joint-search theory: New opportunities and new frictions”. In: *Journal of Monetary Economics* 59.4, pp. 352–369.
- Hanushek, Eric A (1995). “Interpreting Recent Research on Schooling in Developing Countries”. In: *The World Bank Research Observer* 10.2, pp. 227–246.
- Hanushek, Eric A and Ludger Woessmann (2008). “The Role of Cognitive Skills in Economic Development”. In: *Journal of Economic Literature* 46.3, pp. 607–668.
- Heckman, James J and George J Borjas (1980). “Does unemployment cause future unemployment? Definitions, questions and answers from a continuous time model of heterogeneity and state dependence”. In: *Economica* 47.187, pp. 247–283.
- Heckman, James J and V Joseph Hotz (1986). “An Investigation of the Labor Market Earnings of Panamanian Males Evaluating the Sources of Inequality”. In: *Journal of Human Resources* 21.4, pp. 507–542.
- Heckman, James J, Jora Stixrud, and Sergio Urzúa (2006). “The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior”. In: *Journal of Labor Economics* 24.3, pp. 411–482.
- Hilger, Anne, Christophe J Nordman, and Leopold R Sarr (2015). *Non-cognitive skills, social networks and labor market outcomes in Bangladesh*. Unpublished manuscript.
- Ibarrarán, Pablo and David Rosas Shady (2009). “Evaluating the impact of job training programmes in Latin America: evidence from IDB funded operations”. In: *Journal of Development Effectiveness* 1.2, pp. 195–216.
- Independent Evaluation Group (2012). *Youth Employment Programs: An Evaluation of World Bank and International Finance Corporation Support*. Washington DC: World Bank.
- Jackson, Matthew O (2010). “An Overview of Social Networks and Economic Applications”. In: *The Handbook of Social Economics* 1, pp. 511–85.
- Jaunky, Vishal Chandr and Ahmad Jameel Khadaroo (2007). “The School-to-Work Transition for University Graduates in Mauritius: A Duration Model Approach”. In: *The Empirical Economics Letters* 7.1, pp. 25–36.
- Jensen, Peter and Niels C Westergård-Nielsen (1987). “A Search Model Applied to the Transition from Education to Work”. In: *The Review of Economic Studies* 54.3, pp. 461–472.
- Jensen, Robert (2012). “Do Labor Market Opportunities Affect Young Women’s Work and Family Decisions? Experimental Evidence from India”. In: *The Quarterly Journal of Economics* 127.2, pp. 753–792.
- Kalter, Frank and Irena Kogan (2006). “Ethnic inequalities at the transition from school to work in Belgium and Spain: Discrimination or self-exclusion?” In: *Research in Social Stratification and Mobility* 24.3, pp. 259–274.
- Kaplan, Edward L and Paul Meier (1958). “Nonparametric Estimation from Incomplete Observations”. In: *Journal of the American Statistical Association* 53.282, pp. 457–481.
- Kerr, Andrew (2011). *A Matching Model of the Tanzanian Labour Market*. Unpublished manuscript. Center for the Study of African Economies, University of Oxford.
- Khan, Tasnim and Fatima Yousaf (2013). “Unemployment Duration of First Time Job Seekers: A Case Study of Bahawalpur”. In: *Asian Journal of Economic Modelling* 1.1, pp. 8–19.

- Kingdon, Geeta Gandhi and John Knight (2004). “Unemployment in South Africa: The Nature of the Beast”. In: *World development* 32.3, pp. 391–408.
- Kitao, Sagiri, Lars Ljungqvist, and Thomas Sargent (in press). “A life cycle model of trans-atlantic employment experiences”. In: *Review of Economic Dynamics*.
- Kluge, Jochen et al. (2016). *Do Youth Employment Programs Improve Labor Market Outcomes? A Systematic Review*. IZA Discussion Paper No. 10263.
- Knight, John B and Richard H Sabot (1982). “Labor market discrimination in a poor urban economy”. In: *Journal of Development Studies* 19.1, pp. 67–87.
- Kondylis, Florence and Marco Manacorda (2008). “Youth in the Labor Market and the Transition from School to Work in Tanzania”. In: *Youth in Africa’s Labor Market*. Ed. by Marito H. Garcia and Fares Jean. The World Bank, p. 225.
- Kong, Jun and Fan Jiang (2011). “Factors Affecting Job Opportunities for University Graduates in China—the Evidence from University Graduates in Beijing”. In: *Research in World Economy* 2.1, p24.
- Korenman, Sanders and David Neumark (1997). *Cohort Crowding and Youth Labor Markets: A Cross-National Analysis*. National Bureau of Economic Research Working Paper No. 6031.
- Krishnan, Pramila et al. (1996). “Family Background, Education and Employment in Urban Ethiopia”. In: *Oxford Bulletin of Economics and Statistics* 58.1, pp. 167–83.
- Kuchibhotla, Murali (2013). “Three essays in development economics”. PhD thesis. Iowa State University.
- Kuépié, Mathias, Michel Tenikue, and Olivier J Walther (2015). “Social networks and small business performance in West African border regions”. In: *Oxford Development Studies* 44.2, pp. 1–18.
- Kugler, Adriana D and Santosh Kumar (2015). *Preference for Boys, Family Size and Educational Attainment in india*. National Bureau of Economic Research Working Paper No. 21138.
- Kyloh, Robert (2004). “Tackling the Dilemma of Disadvantaged Youth: Priorities and Policies for International Action”. In: *Workers Education* 136.
- Laing, Derek, Theodore Palivos, and Ping Wang (1995). “Learning, Matching and Growth”. In: *The Review of Economic Studies* 62.1, pp. 115–129.
- Lam, David (2007). “Economics of Youth Demography in Developing Countries”. In: *Development and the Next Generation*. Ed. by Gudrun Kochendörfer-Lucius and Boris Pleskovic. World Bank Publications, pp. 27–38.
- Lambert, Sylvie, Martin Ravallion, and Dominique Van de Walle (2014). “Intergenerational mobility and interpersonal inequality in an African economy”. In: *Journal of Development Economics* 110, pp. 327–344.
- Lancaster, Tony and Stephen Nickell (1980). “The Analysis of Re-Employment Probabilities for the Unemployed”. In: *Journal of the Royal Statistical Society. Series A (General)* 143.2, pp. 141–165.
- Lassassi, Moundir and Christophe Muller (2013). “Réseaux sociaux et insertion sur le marché du travail en Algérie”. Working Paper No. 756. Economic Research Forum.
- Lee, Jean N and David Newhouse (2012). *Cognitive Skills and Youth Labor Market Outcomes*. Background report for the World Development Report 2013. Washington DC: The World Bank.
- Lemos, Sara (2009). “Minimum wage effects in a developing country”. In: *Labour Economics* 16.2, pp. 224–237.
- Levinsohn, James, Justin McCrary, and Todd Pugatch (2009). *The Role of Reservation Wages in Youth Unemployment in Cape Town, South Africa: A Structural Approach*. Unpublished manuscript. University of Michigan.

- Li, Hongbin, Junsen Zhang, and Yi Zhu (2008). “The Quantity-Quality Trade-Off of Children in a Developing Country: Identification Using Chinese Twins”. In: *Demography* 45.1, pp. 223–243.
- Libanova, Ella et al. (2014). *Labour market transitions of young women and men in Ukraine*. ILO, Geneva.
- Lillard, Lee A, M Rebecca Kilburn, et al. (1995). *Intergenerational Earnings Links: Sons and Daughters*. Rand Labor and Population Program Working Paper Series 95-17.
- Lloyd, Cynthia B and Ann K Blanc (1996). “Children’s Schooling in sub-Saharan Africa: The Role of Fathers, Mothers, and Others”. In: *Population and Development Review* 22.2, pp. 265–298.
- Lustig, Nora, Darryl McLeod, et al. (1996). “Minimum Wages and Poverty in Developing Countries: Some Empirical Evidence”. In: *Labor Markets in Latin America*. Ed. by Sebastian Edwards and Nora Lustig. Brookings Institution Press, Washington DC.
- Lynch, Lisa M (1985). “State dependency in youth unemployment: A lost generation?” In: *Journal of Econometrics* 28.1, pp. 71–84.
- Maitra, Pushkar and Subha Mani (2017). “Learning and earning: Evidence from a randomized evaluation in India”. In: *Labour Economics* 45, pp. 116–130.
- Maloney, William and Jairo Mendez (2004). “Measuring the Impact of Minimum Wages. Evidence from Latin America”. In: *Law and Employment: Lessons from Latin America and the Caribbean*. University of Chicago Press, pp. 109–130.
- Margolis, David N (2014). “Introducing a statutory minimum wage in middle and low income countries”. In: *IZA World of Labor*, pp. 1–10.
- Marouani, Mohamed A and Björn Nilsson (2016). “The labor market effects of skill-biased technological change in Malaysia”. In: *Economic Modelling* 57, pp. 55–75.
- Matsumoto, Makiko and Sara Elder (2010). *Characterizing the school-to-work transitions of young men and women: Evidence from the ILO school-to-work transition surveys*.
- Mboutchouang, Vincent De Paul et al. (2013). *Transmission Intergénérationnelle de l’Entrepreneuriat et Performance des Unités de Production Informelles au Cameroun*. Unpublished manuscript.
- McKenzie, David, Nabila Assaf, and Ana Paula Cusolito (2016). “The Demand for, and Impact of, Youth Internships: Evidence from a Randomized Experiment in Yemen”. In: *IZA Journal of Labor & Development* 5.1.
- McKenzie, David and Christopher Woodruff (2014). “What Are We Learning from Business Training and Entrepreneurship Evaluations around the Developing World?” In: *The World Bank Research Observer* 29.1, pp. 48–82.
- McVicar, Duncan and Michael Anyadike-Danes (2002). “Predicting successful and unsuccessful transitions from school to work by using sequence methods”. In: *Journal of the Royal Statistical Society: Series A (Statistics in Society)* 165.2, pp. 317–334.
- Mel, Sajith de, Sara Elder, and Marc Vansteenkiste (2013). *Labour market transitions of young women and men in Liberia*. ILO, Geneva.
- Mendolicchio, Concetta, Dimitri Paolini, and Tito Pietra (2012). “Investments in education and welfare in a two-sector, random matching economy”. In: *Journal of Mathematical Economics* 48.6, pp. 367–385.
- Moen, Espen R (1997). “Competitive Search Equilibrium”. In: *Journal of Political Economy* 105.2, pp. 385–411.
- Moll, Peter G (1991). “The decline of discrimination against colored people in South Africa, 1970 to 1980”. In: *Journal of Development Economics* 37.1, pp. 289–307.
- Montgomery, James D (1991a). “Equilibrium Wage Dispersion and Interindustry Wage Differentials”. In: *The Quarterly Journal of Economics* 106.1, pp. 163–179.
- (1991b). “Social Networks and Labor-Market Outcomes: Toward an Economic Analysis”. In: *The American Economic Review* 81.5, pp. 1408–1418.

- Morrisson, Christian and Johannes P Jütting (2005). “Women’s discrimination in developing countries: A new data set for better policies”. In: *World Development* 33.7, pp. 1065–1081.
- Mortensen, Dale T (1970). “Job Search, the Duration of Unemployment, and the Phillips Curve”. In: *The American Economic Review* 60.5, pp. 847–862.
- (1986). “Job search and labor market analysis”. In: *Handbook of Labor Economics* 2, pp. 849–919.
- Mortensen, Dale T and Christopher A Pissarides (1999). “New developments in models of search in the labor market”. In: *Handbook of Labor Economics* 3, pp. 2567–2627.
- Mussa, Richard (2013). “Labour market transitions of young women and men in Malawi”. Work4Youth Publication Series No. 4.
- Nattrass, Nicoli and Richard Walker (2005). “Unemployment and Reservation Wages in Working-class Cape Town”. In: *South African Journal of Economics* 73.3, pp. 498–509.
- Naudé, Willem and Rian Coetzee (2004). “Globalisation and inequality in South Africa: modelling the labour market transmission”. In: *Journal of Policy Modeling* 26.8, pp. 911–925.
- Neal, Derek (1999). “The Complexity of Job Mobility among Young Men”. In: *Journal of Labor Economics* 17.2, pp. 237–261.
- Neumark, David and William Wascher (1995). “Minimum-Wage Effects on School and Work Transitions of Teenagers”. In: *The American Economic Review* 85.2, pp. 244–249.
- Newhouse, David and Daniel Suryadarma (2011). “The value of Vocational Education: High School Type and Labor Market Outcomes in Indonesia”. In: *The World Bank Economic Review* 25.2, pp. 296–322.
- Nordman, Christophe J and Laure Pasquier-Doumer (2015). “Transitions in a West African labour market: The role of family networks”. In: *Journal of Behavioral and Experimental Economics* 54, pp. 74–85.
- Nordman, Christophe Jalil and Julia Vaillant (2015). “Jeunes entrepreneurs et réseaux sociaux: revue de littérature et regard croisé sur les cas malgache et vietnamien”. In: *Autrepart* 71, pp. 77–95.
- Nyarko, Christopher Opoku, William Baah-Boateng, and Edward Nketiah-Amponsah (2014). “Determinants of Job Search Intensity in Ghana”. In: *Margin: The Journal of Applied Economic Research* 8.2, pp. 193–211.
- OECD (1998). “Transition from School to Work”. In: *Education at a glance*. OECD. Chap. 3, pp. 14–53.
- O’Higgins, Niall (2003). *Trends in the Youth Labour Market in Developing and Transition Countries*. World Bank Social Protection Discussion Paper Series 0321.
- (2008). *Guide to the School-to-Work Transition*. Unpublished manuscript.
- Pasquier-Doumer, Laure (2013). “Intergenerational Transmission of Self-Employed Status in the Informal Sector: a Constrained Choice or Better Income Prospects? Evidence from Seven West African Countries”. In: *Journal of African Economies* 22.1, pp. 73–111.
- Petrongolo, Barbara and Christopher A Pissarides (2001). “Looking into the Black Box: A Survey of the Matching Function”. In: *Journal of Economic Literature* 39.2, pp. 390–431.
- Pierre, Gaëlle et al. (2014). *STEP Skills Measurement Surveys*. Methodological note. The World Bank.
- Pissarides, Christopher A (2011). “Equilibrium in the Labor Market with Search Frictions”. In: *The American Economic Review* 101.4, pp. 1092–1105.
- Ponczek, Vladimir and Andre Portela Souza (2012). “New Evidence of the Causal Effect of Family Size on Child Quality in a Developing Country”. In: *Journal of Human Resources* 47.1, pp. 64–106.
- Psacharopoulos, George and Keith Hinchliffe (1973). *Returns to Education: An International Comparison*. Vol. 2. Jossey-Bass.

- Pugatch, Todd (2012). *Bumpy Rides: School to Work Transitions in South Africa*. IZA Discussion Paper No. 6305.
- (2014). “Safety valve or sinkhole? Vocational schooling in South Africa”. In: *IZA Journal of Labor & Development* 3.1, pp. 1–31.
- Quintini, Glenda and Sébastien Martin (2014). *Same Same but Different: School-to-work Transitions in Emerging and Advanced Economies*. OECD Social, Employment and Migration Working Papers No. 154.
- Rama, Martin (1998). “How Bad is Unemployment in Tunisia? Assessing labor market Efficiency in a Developing Country”. In: *The World Bank Research Observer* 13.1, pp. 59–77.
- Rankin, Neil A and Gareth Roberts (2011). “Youth unemployment, firm size and reservation wages in South Africa”. In: *South African Journal of Economics* 79.2, pp. 128–145.
- Roberts, Brent W, Kate E Walton, and Wolfgang Viechtbauer (2006). “Patterns of mean-level change in personality traits across the life course: a meta-analysis of longitudinal studies.” In: *Psychological Bulletin* 132.1, pp. 1–25.
- Rust, John Philip (1992). *Do people behave according to Bellman’s principle of optimality?* Working Papers in Economics E-92-10. Stanford University.
- Ryan, Paul (2001). “The School-to-Work Transition: A Cross-National Perspective”. In: *Journal of Economic Literature* 39.1, pp. 34–92.
- (2003). “The school-to-work transition: problems and indicators”. In: *Youth, learning and society*. Ed. by A.-N Perret-Clermont et al. Cambridge University Press, Cambridge.
- Satchi, Mathan and Jonathan Temple (2009). “Labor markets and productivity in developing countries”. In: *Review of Economic Dynamics* 12.1, pp. 183–204.
- Sayre, Edward and Yousef Daoud (2010). *Labor Market Regulations and Unemployment Duration in Palestine*. ERF Working Paper Series No. 579.
- Schady, Norbert and Carolina Sánchez-Páramo (2003). *Off and Running? Technology, Trade, and the Rising Demand for Skilled Workers in Latin America*. World Bank Policy Research Working Paper Series No. 3015.
- Schooler, Carmi, Mesfin Samuel Mulatu, and Gary Oates (1999). “The continuing effects of substantively complex work on the intellectual functioning of older workers.” In: *Psychology and Aging* 14.3, pp. 483–506.
- Serneels, Pieter (2007). “The Nature of Unemployment among Young Men in Urban Ethiopia”. In: *Review of Development Economics* 11.1, pp. 170–186.
- Serrière, Nicolas et al. (2014). *Labour market transitions of young women and men in Nepal*. ILO, Geneva.
- Smirnova, Natalia V (2003). *Job search behavior of unemployed in Russia*. BOFIT Discussion Papers No. 13.
- Staff, Jeremy and Jeylan T Mortimer (2008). “Social class background and the school-to-work transition”. In: *New Directions for Child and Adolescent Development* 2008.119, pp. 55–69.
- Tansel, Aysit and H Mehmet Taşçı (2010). “Hazard Analysis of Unemployment Duration by Gender in a Developing Country: The Case of Turkey”. In: *Labour* 24.4, pp. 501–530.
- Tasci, Haci Mehmet (2008). “Search and determinants of job search intensity in Turkey”. In: *METU Studies in Development* 35.2, pp. 399–425.
- Terza, Joseph V, Anirban Basu, and Paul J Rathouz (2008). “Two-stage residual inclusion estimation: addressing endogeneity in health econometric modeling”. In: *Journal of Health Economics* 27.3, pp. 531–543.
- Topa, Giorgio (2001). “Social Interactions, Local Spillovers and Unemployment”. In: *Review of Economic Studies* 68.2, pp. 261–295.
- Toufique, Kazi Ali (2014). *Labour market transitions of young women and men in Bangladesh*. ILO, Geneva.

- Tripney, Janice S and Jorge G Hombrados (2013). “Technical and vocational education and training (TVET) for young people in low-and middle-income countries: a systematic review and meta-analysis”. In: *Empirical Research in Vocational Education and Training* 5.1, pp. 1–14.
- Tunali, Insan and Ragui Assaad (1992). “Market structure and spells of employment and unemployment: evidence from the construction sector in Egypt”. In: *Journal of Applied Econometrics* 7.4, pp. 339–367.
- UNESCO (2000). *The Dakar Framework for Action: Education for All: Meeting Our Collective Commitments: Including Six Regional Frameworks for Action*. UNESCO.
- United Nations (2015). *The World’s Women 2015: Trends and Statistics*. New York: United Nations, Department of Economic and Social Affairs, Statistics Division.
- Urzúa, Sergio and Esteban Puentes (2010). *La evidencia del impacto de los programas de capacitación en el desempeño en el mercado laboral*. Notas Técnicas IDB-TN-268.
- Van den Berg, Gerard J (1990a). “Nonstationarity in Job Search Theory”. In: *The Review of Economic Studies* 57.2, pp. 255–277.
- (1990b). “Search Behaviour, Transitions to Non-participation and the Duration of Unemployment”. In: *The Economic Journal* 100.402, pp. 842–865.
- (2001). “Duration Models: Specification, Identification and Multiple Durations”. In: *Handbook of Econometrics* 5, pp. 3381–3460.
- Van den Berg, Gerard J and Jan C Van Ours (1996). “Unemployment Dynamics and Duration Dependence”. In: *Journal of Labor Economics* 14.1, pp. 100–125.
- Wahba, Jackline and Yves Zenou (2005). “Density, social networks and job search methods: Theory and application to Egypt”. In: *Journal of Development Economics* 78.2, pp. 443–473.
- Wolpin, Kenneth I (1987). “Estimating a Structural Search Model: the Transition from School to Work”. In: *Econometrica* 55.4, pp. 801–817.
- Wondratschek, Verena (2010). *The Importance of Cognitive and Social Skills for the Duration of Unemployment*. ZEW Discussion Papers 10-104.
- Zenou, Yves (2008). “Job search and mobility in developing countries. Theory and policy implications”. In: *Journal of Development Economics* 86.2, pp. 336–355.

Chapter 2

The labor market effects of skill-biased technological change in Malaysia

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1 Introduction

Many countries have experienced sharp increases of enrollment in tertiary education²¹ in the last decades, with varying economic and social outcomes. The massification of higher education is sometimes a deliberate policy tool, and sometimes the result of a laissez-faire attitude from policy makers facing increased demand for higher education. Should increased educational attainment, especially at the tertiary level, always be encouraged? Will an exogenous increase in the numbers of tertiary educated be followed by increased demand from firms, in some sort of skills-driven structural change? What is the likely impact of increased enrollment on returns to education and on graduate unemployment?

In the presence of an increasing supply of educated labor, labor market outcomes of educated workers are conditional on the evolution of their demand. An underlying issue here is that of the substitutability between labor categories with different educational attainment. Several authors argue (Caselli and Coleman 2006; Goldin and Katz 1998) that this substitutability is imperfect, some countries being better at taking advantage of their skilled workers than others. Caselli and Coleman (2006) argue that countries more abundant in skilled labor will choose technologies best suited to skilled labor, while countries abundant in unskilled labor will choose technologies best suited to unskilled labor, barriers to technology adoption explaining why some countries are unable to make efficient use of their skilled labor. While it would be a stretch to argue that there is consensus on the issue, skill-biased technological change (SBTC) has often been suggested as one of the drivers behind simultaneously rising wage premia and share of skilled workers in the US (Autor, Katz, and Krueger 1998). Empirical evidence has also suggested this is the case in other developed countries. There is some scarce evidence of skill-biased technological change in developing countries (Berman and Machin 2000), but not many country-specific studies have been carried out. To our knowledge, no one has attempted to study skill biased technical change in Malaysia. We choose to study Malaysia since its spectacular increase in educational attainment has not been accompanied by falling wage premia of tertiary graduates, as might have been expected.

The other major labor market adjustment to rising relative quantities of skilled labor

²¹Gross enrolment rates in tertiary education for Upper Middle Income countries have increased from 8% to 30% in the period 1990-2010. In Malaysia, they have increased from 7% to 37% during the same period.

is increased unemployment of skilled workers. High public investment in education has been shown to increase unemployment in some contexts, high-skilled unemployment sometimes even being higher than that of low and medium-skilled²². The MENA region, which has heavily invested in education over four decades²³ serves as a good example of an unsuccessful absorption of young graduates into the labor market (Marouani and Robalino 2012; Marouani 2010). However, not only do employment figures matter in their own; it is also important to consider the type of employment facing young graduates. The suggested theoretical links between educational accumulation and growth have sometimes been hard to demonstrate empirically. The arguments put forward range from quality of education to a mis-allocation problem. Pritchett (1996) argues that one of the reasons education has not been positive for growth is due to inefficient use of graduates, who end up in low productivity sectors such as State-owned enterprises. This could particularly be the case in those contexts where the State acts as a *de facto* employer of last resort.

An increase in educational attainment implies two things: first of all, a steadily increasing demand for education. Secondly, that this increased demand has been met by an increased supply, either from the government or from private actors. The question is whether this expansion of supply is a deliberate policy choice, or just an expansion to cover what is called the *social demand* for education. Blaug (1967) reflects on this in an early paper, arguing that the spontaneous increase of educational supply faced with increasing demand could find its origin in a belief that something akin to Say's Law operates in the market for professional manpower, i.e. that supply of skilled labor will create its own demand. Thus planners need not fear increasing educational supply in the sense that labor market constraints are unlikely to operate. The topic is however difficult to apprehend: first of all, without a precise picture of the demand for education, it is impossible to know whether supply has been a constraint or not in the evolution of educational attainment. That is, have all those who wished to go into tertiary education been able to do so? If this is the case, have there not been shadow costs associated with the increase, such as increasing rates of exam failure?

Methodological differences and accuracy problems render educational projection exercises notoriously difficult. Blaug (1967) describes the three major methods of forecasting

²²This is the case for Morocco, (Kabbani and Kothari 2005)

²³MENA countries spent around 5% of GDP on education over the period. At similar levels of educational attainment, the MENA region boasts significantly higher unemployment rates of graduates (World Bank 2008) than other emerging regions. The equivalent figure for two groups of Asian and Latin American countries respectively is around 3%

skill requirements, all relying on a number of assumptions and restrictions. Firstly, manpower-forecasts attempt to project sectoral quantities of skilled labor needed to attain certain GDP targets. They rely on labor-output coefficients and education - occupation matrices that are difficult to estimate. Secondly, social demand methods attempt to project the private demand for education, given fixed direct and indirect costs. Finally, rate of return methods, which are perhaps the most well-known method used by educational planners. *Ceteris paribus*, the evolution of the rate of return to a certain skill gives an indication of the value the market places on the skill. If this rate is increasing, it means that employers' demand for this particular skill is rising faster than its supply. Rates of return could thus be used by planners as an indicator of skill gaps to be filled. All three methods however have their weaknesses. In particular manpower planning, which has been largely abandoned in academia since its less than desirable track record was unveiled in Blaug and Ahamad (1974).

Glytsos (1990) argues that severe imbalances between supply and demand for certain skills have been a feature of developed and developing countries alike during the 1970s and 1980s, which tends to confirm the mediocre track record of educational planning before and during this period²⁴. Interestingly, he argues that these imbalances have not only been a feature of countries with open enrollment policies, *i.e.* where quantitative restrictions on the number of students do not exist (perhaps due to social concerns such as equality of access), but also in those countries where admission controls are a fact. We contend that a general equilibrium approach to educational planning permits to overcome some of the most obvious drawbacks of the main methods used to project or forecast educational needs. Notably, manpower forecasts and social demand estimates both consider educational dynamics from one side: that of employers' demand in the case of manpower-forecasts, and that of individuals' supply in the case of the "social" demand for education. The evolution, however, is determined jointly by supply and demand factors. Furthermore, the demand and supplies are derived using a constant price-hypothesis. A general equilibrium approach permits prices to vary according to relative supply and demand, but also according to productivity and international demand trend differentials. Also, while manpower forecasting and social demand gives target figures, our model permits a simulation of the labor market impacts of educational policy designed to achieve such target figures. Our focus in doing this is on wage premia and

²⁴An alternative to educational planning could have been to let the market regulate supply and demand of educational services, requiring that the total cost of educational services is covered by students. Such a system would however have obvious drawbacks in terms of equality of opportunities.

unemployment figures.

In this article, we thus study the case of Malaysia in the context of a massification of higher education. Relying on decomposition techniques, we argue that it is thanks to skill biased technological change that expected wage premia have been relatively stable in Malaysia, maintaining a strong social demand for higher education, thereby perpetuating the educational dynamics. We also develop a dynamic general equilibrium model in which we run a retrospective simulation, looking at how unemployment and wages would have reacted had skill biased technological change not been prevalent. Furthermore we simulate the effects of a restriction in the supply of education to understand the impact of recent educational policy in Malaysia. The results are fed to a microsimulation module, addressing distributional concerns. This exercise highlights the important and opposite effects of educational policy and skill-biased technological change on wage inequality.

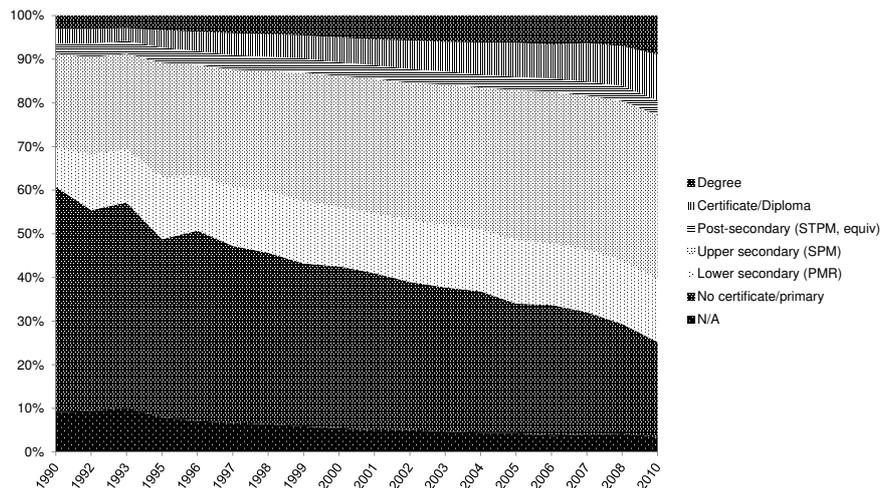
The rest of the article is organized as follows. Section 2 describes the Malaysian educational expansion of the last two decades and the accompanying labor market adjustments. Section 3 lays out the various blocks of the model, with a particular emphasis on the accumulation of skilled labor. Section 4 presents the data and the calibration of the model. Section 5 lays out the microsimulation module used to analyze wage inequalities. Section 6 presents the simulations and their results. Section 7 concludes.

2 The Evolution of Malaysians' Educational Attainment

Educational attainment in Malaysia has increased remarkably in the last two decades. The two main features of this increase are a big drop in the number of Malaysians with a Primary education or less, coupled with a strong increase in the number of secondary and tertiary educated. The second feature has been a clear policy target for the Malaysian government, desirous to see enrollment rates in higher education of 40% by 2010 (Guan 2012). The increase in supply of higher education has taken two forms. Firstly, private universities were established in the 1990s (the number of private universities in Malaysia increased from 0 in 1990 to 21 in 2009). Secondly, the number of public universities increased from 7 in 1990 to 20 in 2009. The expansion of tertiary education has not only been a general higher education phenomenon. The creation of *Community Colleges* and the expansion of *Polytechnic* establishments have increased enrollment in vocational degrees. Figure 5 shows the evolution of educational attainment of Malaysians over

the last two decades, and shows how the share of highly educated Malaysians has risen sharply and continuously since the early 1990s.

Figure 5: Educational distribution of the Malaysian Labor Force, 15-64 years old



Source: Labor Force Surveys 1990-2010. *Note:* N/A corresponds to individuals who never went to school.

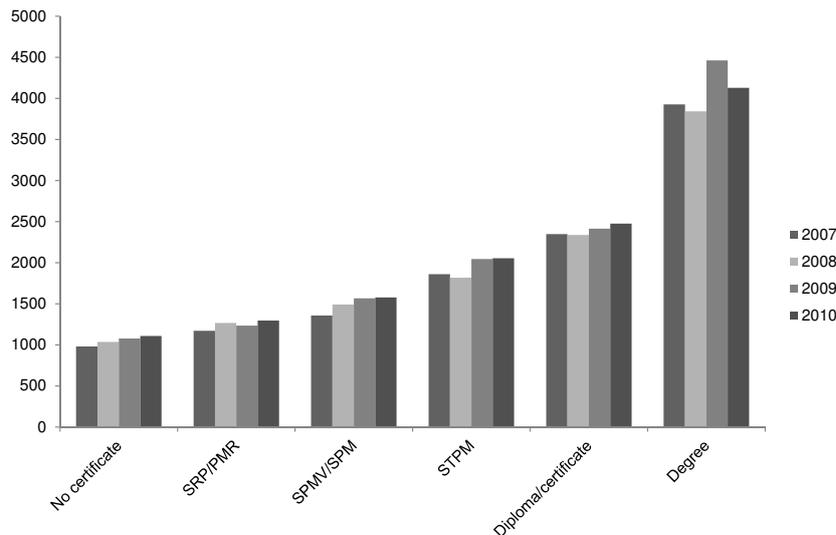
Standard economic theory holds that this important shift in relative quantities should be accompanied *-ceteris paribus-* by a decrease in the wage premium for educated employees. Figure 6 shows that average wages in Malaysia have remained relatively constant between 2007 and 2010²⁵. An indicator of wage premia can be obtained from studies on returns to education in Malaysia. Chung (2003) looks at the returns to education in Malaysia using a dataset from 1997, and finds that the returns to secondary education are 12% and 15.7% for male and female respectively, while the returns to higher education are 18.1% and 16.4%. Kenayathulla (2013) recently revisited those figures, using Household Income Survey figures from 2007. She finds evidence of a return to secondary education of 16.5% and 27.2% for males and females; the corresponding figures for higher education being 15.5% and 16.1%. This anecdotal evidence thus suggests the presence of some mechanism favorable to skilled labor during the last two decades in Malaysia.

Fully noting that the concept of skill is a multidimensional and complex one, we

²⁵Unfortunately we do not have wage data from before 2007.

choose to define skilled labor categories in terms of various levels of education and fields of study. We hereby ignore any skills acquired in the workplace, or any skill endowments independent of schooling.

Figure 6: Average wage by educational attainment, Malaysian employees (RM -Malaysian Ringgit)



Source: Labor Force Surveys from 2007 to 2010. Wages represent average nominal wages for 15-64 year old Malaysian out-of-school wage earners.

From Figure 5, it can be seen that the share of educated Malaysians in the workforce has risen steadily since the early 1990s. The situation is analogous to the US one in the 1980s-1990s, and merits a closer look. At the aggregate level, a standard CES production function yields the following relative wage when profits are maximized (Sanders and Weel 2000):

$$\omega = \frac{w_S}{w_U} = \left[\frac{\theta_S}{\theta_U} \right]^\rho \left[\frac{L_U}{L_S} \right]^{1-\rho} \quad (3)$$

Where w_S , w_U and L_U , L_S are wages and employment of skilled and unskilled workers respectively, θ_S and θ_U the productivity parameters associated with skilled and unskilled

labor, and $\frac{1}{1-\rho}$ is the elasticity of substitution between productivity-corrected labor bundles. It thus becomes apparent that in presence of increasing relative quantities of skilled workers, a decrease in the wage premium of skilled labor can only be avoided if there is an increase in the relative technological efficiency of this labor category. Figures 5 and 6 would thus suffice to argue for the presence of skill-biased technological change in Malaysia. However, when one considers a sectorally disaggregated production structure, it becomes apparent that sector-biased technological change—if favoring skill-intensive sectors—might in the same fashion increase the demand for skills, counteracting the supply shift and ensuring stable wage premia. Several authors have used translog cost functions to investigate the presence of skill-biased technological change (Autor, Katz, and Krueger 1998; Machin and Reenen 1998; Sanders and Weel 2000). Since we were unable to find R&D data at the industry level in Malaysia, we do not follow this approach. Table 6 however shows the evolution of industry labor shares and industry skilled labor concentrations between 2007 and 2010. Decomposing the aggregate change in the proportion of skilled labor into changes *between* and *within* sectors (Berman, Bound, and Machin 1998; Machin and Reenen 1998)²⁶ for Malaysia shows that the lion’s share of the upskilling has occurred within industries (74%) rather than between industries (26%), which leads us to believe that the simultaneous stability of wage premia and high increase of the skill share are associated with skill-biased technical change, rather than a structural change due to a Stolper-Samuelson effect, or any other industry-biased demand alteration. The same analysis was carried out for a period of 20 years (1990 to 2010) at the 3-digit industry level, with the within component of upskilling being equal to 73%. An analysis of labor at the firm level, using the 2005 and 2010 rounds of the Economic census is carried out in World Bank (Forthcoming), and shows that significant upskilling has occurred at the firm level.

Instead of affecting wages, which might be prevented from falling by union activities, it could be that the labor market adjusts to the increase of skilled workers through an increase in unemployment. Looking at unemployment, we see that unemployment of individuals with post-secondary education has only increased slightly (Tables 4 & 5). Degree holders have seen their rate of unemployment increase from 2.1 percent to 3.6 percent. The unemployment rate of diploma holders has risen from 2.5 percent to 3.5 percent. The *certificates* category, which did not exist in 1990 and corresponds to

²⁶Following these authors, we decompose the change in the aggregate skill proportion into two components: $\Delta S = \sum_i \Delta S_i \bar{E}_i + \sum_i \bar{S}_i \Delta E_i$, where S_i is the share of skilled labor at the industry level, and E_i the employment share of each industry in total employment.

Table 4: Labor Force in 1990, by highest certificate obtained

Degree	Employed	Unemployed	Total Labor Force
SRP/PMR	92.7%	7.3%	100.0%
SPMV	89.6%	10.4%	100.0%
SPM	93.4%	6.6%	100.0%
STPM	93.2%	6.8%	100.0%
Diploma	97.5%	2.5%	100.0%
Degree	97.9%	2.1%	100.0%
Not applicable	97.9%	2.1%	100.0%
No certificate	96.2%	3.8%	100.0%
Missing	100.0%	0.0%	100.0%
Total	95.5%	4.5%	100.0%

Source: 2011 Labor Force Survey. *PMR/SPR*: lower secondary schooling; *SPMV*: upper secondary education (vocational); *SPM*: upper secondary education (academic); *STPM*: pre-university; *Diploma*: three years of higher prof. educ.; *Tertiary degree*: Bachelor's degree, Master's degree or Doctorate.

Table 5: Labor Force in 2011, by highest certificate obtained

Degree	Employed	Unemployed	Total Labor Force
USPR or similar	97.5%	2.5%	100.0%
PMR/SPR or similar	97.3%	2.7%	100.0%
SPM or similar	96.7%	3.3%	100.0%
STPM or similar	96.2%	3.8%	100.0%
Certificate	94.9%	5.1%	100.0%
Diploma	96.5%	3.5%	100.0%
Tertiary degree	96.4%	3.6%	100.0%
No degree	98.4%	1.6%	100.0%
Not applicable	95.8%	4.2%	100.0%
Total	96.9%	3.1%	100.0%

Source: 2011 Labor Force Survey. *USPR*: Lower primary school; *PMR/SPR*: lower secondary schooling; *SPM*: upper secondary education; *STPM*: pre-university; Certificate: two years of higher prof. educ.; *Diploma*: three years of higher prof. educ.; *Tertiary degree*: Bachelor's degree, Master's degree or Doctorate.

low-level diplomas representing one year of post-secondary education, is the most severely affected category by unemployment with a 5 percent unemployment rate in 2011. The variations are thus minor, relative to the increases in quantities: between 1990 and 2011, the labor force increased by 81 percent. At the same time, the number of diploma holders increased by 400 percent and that of degree holders by 654 percent. The possibility of unemployment increases as the primary mechanism preserving wage premia facing constant demand thus seems highly unlikely.

Table 6: Evolution of industry labor shares and proportion of skilled labor by industry, 2007-2010

Industry	Δ (labor share)	Δ (skills proportion)
Agriculture	-4%	203%
Oil & Gas	67%	54%
Manufacturing food, beverages, tobacco	38%	127%
Manufacturing textile	-26%	92%
Manufacturing wood	-22%	33%
Manufacturing paper & furniture	-3%	13%
Manufacturing chemicals rubber	6%	-3%
Metals, machinery, equipment NEC	-6%	18%
Electronics & electrical	-11%	11%
Manufacturing & transport equipment	-15%	48%
Utilities	4%	34%
Construction	8%	16%
Wholesale & retail	18%	20%
Accommodation & restaurants	15%	4%
Logistics	14%	13%
Post and telecoms	22%	11%
Finance	11%	-2%
Real estate	58%	34%
Business services	-3%	7%
Education	35%	8%
Health	32%	9%
Other services	-2%	63%
Public administration	20%	32%

Source: Labor Force Surveys from 2007 to 2010.

3 The Model

We develop a dynamic general equilibrium model with a detailed description of the labor market, taking into account jobs across sectors and workers with different ages (youth and non-youth) and levels of education (Marouani and Robalino 2012). The model also formalizes educational choices and immigration flows. The following section will lay out the main equations of the model. The economy is disaggregated into 23 sectors²⁷, with 21 different factors of production, corresponding to labor of 20 different skill types, and physical capital. At the sectoral level, value added is a nested constant elasticity of substitution (CES) function of Capital and Labor. The Labor aggregate is disaggregated into three bundles: a High skilled labor bundle, a Medium skilled labor bundle and a Low skilled labor bundle. The nested production structure allows for differentiated elasticities of substitution between various factors of production. The parameters and variables of the model are listed in tables 10 to 12 (Appendix).

3.1 The production structure

Value added is a constant elasticity of substitution function of capital and a labor aggregate L ²⁸:

$$X_t = (\alpha_K K_t^{1-\frac{1}{\sigma_1}} + \alpha_L L_t^{1-\frac{1}{\sigma_1}})^{\frac{1}{1-\frac{1}{\sigma_1}}} \quad (4)$$

The first order conditions imply the following factor demands:

$$K_t = X_t \left(\frac{\alpha_K P V A_t}{R_t} \right)^{\sigma_1} \quad (5)$$

$$L_t = X_t \left(\frac{\alpha_L P V A_t}{P L_t} \right)^{\sigma_1} \quad (6)$$

At the following nest, L is decomposed into three bundles containing workers with academic degrees, vocationally trained, and secondary school graduates or lower:

$$L_t = A_t (\alpha_{HS} H S_t^{1-\frac{1}{\sigma_2}} + \alpha_{MS} M S_t^{1-\frac{1}{\sigma_2}} + \alpha_{LS} L S_t^{1-\frac{1}{\sigma_2}})^{\frac{1}{1-\frac{1}{\sigma_2}}} \quad (7)$$

²⁷The sectors are identical to the industries in table 6.

²⁸Sectoral indices have been omitted in this section for readability.

Each labor bundle is a CES aggregate of workers of different skill types. The HS bundle contains degree holders of 8 different types, corresponding to eight broad fields of study. The MS bundle contains vocationally trained, in the same 8 broad fields of study. Finally, the LS bundle contains workers of 4 educational categories: primary and less, lower secondary, upper secondary, and pre-university.

$$HS_t = A_{HS,t} \left[\sum_f \beta_f LD_{HS,f,t}^{1-\frac{1}{\sigma_3}} \right]^{\frac{1}{1-\frac{1}{\sigma_3}}} \quad (8)$$

$$MS_t = A_{MS,t} \left[\sum_g \beta_g LD_{MS,g,t}^{1-\frac{1}{\sigma_4}} \right]^{\frac{1}{1-\frac{1}{\sigma_4}}} \quad (9)$$

$$LS_t = A_{LS,t} \left[\sum_l \beta_l LD_{LS,l,t}^{1-\frac{1}{\sigma_5}} \right]^{\frac{1}{1-\frac{1}{\sigma_5}}} \quad (10)$$

Each of the 20 skill types is composed of local and migrant labor:

$$LDL_{lf,t} = \left(\alpha_{loc} LDL_{lf,t}^{1-\frac{1}{\sigma_6}} + \alpha_{mig} MIG_{lf,t}^{1-\frac{1}{\sigma_6}} \right)^{\frac{1}{1-\frac{1}{\sigma_6}}} \quad (11)$$

And local labor of skill type s is made up of *young* and *old* workers:

$$LDL_{lf,t} = \left(\alpha_y LDLA_{y,lf,t}^{1-\frac{1}{\sigma_7}} + \alpha_{ny} LDLA_{ny,lf,t}^{1-\frac{1}{\sigma_7}} \right)^{\frac{1}{1-\frac{1}{\sigma_7}}} \quad (12)$$

3.2 Labor supply

Each year, workers leave the labor force through death and retirement²⁹. New workers enter from the educational system, upon finishing an educational cycle and on deciding not to pursue further education. A skill-specific percentage of graduates (estimated from LFS data) do not enter the labor force and move directly into inactivity.

3.2.1 Educational dynamics

Facing the above demands for workers of various skill types, origin and age, the evolution of supply of workers is determined in an educational module calibrated from data from past years. Students move between educational cycles depending on dropout rates, and the willingness to join the labor market at the end of each cycle. For low skill

²⁹The mortality and retirement rates are obtained from UNESCO data.

content-cycles, these rates are calculated as averages from the period 2009-2010. The dropout rates are calculated using the following formula:

$$dropout_c = \frac{enrolled_{c,2009} + entrants_{c,2010} - grad_{c,2009} - enrolled_{c,2010}}{enrolled_{c,2009}} \quad (13)$$

For each cycle, the dropout rate is calculated as a residual. It corresponds to disappearances from the stock of enrolled between 2009 and 2010, which are not accounted for, relative to the stock of enrolled in 2009. We make the assumption that repetition rates (for which we have only incomplete information) are negligible³⁰. Graduates deciding not to pursue further education are captured by the parameter *exdip*:

$$exdip_c = \frac{grad_{c,2009} - \sum_{c2}(entrants_{c2,2010} \times transmap_{c,c2}) \times \frac{grad_{c,2009}}{\sum_{c2}(equiv_{c,c2} \times grad_{c2,2009})}}{grad_{c,2009}} \quad (14)$$

Where *transmap* is a mapping parameter between different educational cycles and *equiv* a parameter mapping cycles that are equivalent, in the sense that they can both precede *c2*. Note that *c2* is a set containing the same elements as *c*, and is used in the code to sum over a set that is already controlled. Thus, graduates who choose not to pursue into the next cycles is the residual of the graduates from cycle *c*, less entrants into the next cycle weighted by the importance of cycle *c* as a cycle of origin. As such, *exdip* refers to the percentage of graduates who leave a given cycle in 2009 less those who choose to continue into any of the next possible cycles.

$$NEWENR_{c,t} = popent_{c,t} + \sum_{c2} GRAD_{c2,t-1} * transmap_{c,c2} * (1 - exdip_{c,t-1}) \quad (15)$$

Newly enrolled are equal to children arriving at school age (*popent*) for the primary cycle, plus last year graduates from preceding cycles, less those who choose not to pursue further studies. Thus, the number of enrolled is simply equal to the number of enrolled of the previous year, less graduates and dropouts, plus newly enrolled in the current year.

$$ENR_{c,t} = ENR_{c,t-1} \times (1 - dropout_c) - GRAD_{c,t-1} + NEWENR_{c,t} \quad (16)$$

Furthermore, we assume a stable share of graduates:

³⁰This assumption is comforted by figures for the primary and secondary cycles, where dropout is virtually inexistent for primary education, and less than 3% for secondary education (Patel 2014).

$$GRAD_{c,t} = gradrate_c \times ENR_{c,t} \quad (17)$$

Students hence move through the educational system cycle by cycle, depending on drop out rates and the willingness to pursue further education; a willingness that is determined by preferences and the expected rate of return to education. At the end of Form 5, students who choose to pursue higher education make a choice of entering pre-university education or seeking vocational training.

3.2.2 Educational choices

The hypothesis that expected wages orient the demand for a certain level of education has been confirmed in numerous studies (e.g. Canton and Jong (2005) and McIntosh (2001)). Average wages by skill type and field of study have been found to be positively correlated with relative demand for education of a particular skill type and in a particular field of study (Befy, Fougère, and Maurel 2012; Freeman and Hirsch 2008; Montmarquette, Cannings, and Mahseredjian 2002). In Belgium, Duchesne and Nonneman (1998) find some support for relative wages driving enrollment choices both in university and non-university higher education. The choice between pre-university education and vocational training is thus modeled through a constant elasticity of transformation function (CET) where the first order conditions render the following demands for vocational training and academic degrees respectively³¹:

$$NEWENR_{voc,t} = \alpha_{voc} \times TOTNEWENR_t \times \left[\frac{\frac{\sum_g (LD_{g,t} \times (1-Ur_{g,t}) \times avfw_{g,t})}{\sum_g (LD_{g,t})}}{\frac{\sum_f (LD_{f,t} \times (1-Ur_{f,t}) \times avfw_{f,t})}{\sum_f (LD_{f,t})}} \right]^{\sigma_{10}} \quad (18)$$

$$NEWENR_{deg,t} = \alpha_{deg} \times TOTNEWENR_t \times \left[\frac{\frac{\sum_f (LD_{f,t} \times (1-Ur_{f,t}) \times avfw_{f,t})}{\sum_f (LD_{f,t})}}{\frac{\sum_g (LD_{g,t} \times (1-Ur_{g,t}) \times avfw_{g,t})}{\sum_g (LD_{g,t})}} \right]^{\sigma_{10}} \quad (19)$$

The demand for vocational training thus increases according to the expected relative mean wage of vocationally trained and degree holders respectively; and with an elasticity of σ_{10} . The total number of students having decided to pursue education after finishing

³¹See the Appendix for the initial CET functions.

secondary school is thus broken down into two categories: students who continue to vocational training, and students who go on to university. For medium and high skilled, newly enrolled choose different fields of study based on preferences and expected wages in each fields. This choice is again modeled through a constant elasticity of transformation function (CET) which gives an optimal allocation of demand for skills given expected wages. We here assume that workers are have myopic expectations and believe the wage distribution by skill to remain constant and equal to that of the previous year. The first order conditions imply the following demand for educational services of type f , for vocational and university students respectively:

$$NEWENRFIELD_{g,t} = \gamma_g \times NEWENR_{voc,t} \times \left[\frac{avfw_{g,t-1}(1 - Ur_{g,t-1})}{avfw_{tot_{voc,t-1}}} \right]^{\sigma_{11}} \quad (20)$$

$$NEWENRFIELD_{f,t} = \gamma_f \times NEWENR_{deg,t} \times \left[\frac{avfw_{f,t-1}(1 - Ur_{f,t-1})}{avfw_{tot_{deg,t-1}}} \right]^{\sigma_{12}} \quad (21)$$

Where $avfw_{tot_{edu,t-1}}$ is the average expected wage of diploma- and degree holding non-youth on the labor market, with $voc, deg \subset edu$. Each year, $NEWENR_{edu,t}$ is fixed and equal to the demand for vocational and university studies respectively. These blocks of equations thereby give us educational demand by skill. These demands are confronted with supply in a sequential fashion: first, fields of study are ranked according to the wage premium associated with each one. Then, desired entrants into that field are confronted with the number of available places in the field. Students not accepted are regrouped with those desiring to enter the second rank field. A second cutoff is carried out, with leftovers going into the third ranked field of study. The mechanism is repeated throughout the list of fields of study, for vocationally trained and degree holders respectively. Any students cut off from the eighth field of study are considered to be secondary school graduates of which a fraction will enter the labor force.

3.2.3 Labor Force evolution

Graduates from lower cycles are added to the youth labor force in the following fashion:

$$\begin{aligned}
LSTA_{lf,y,t} = & LSTA_{lf,y,t-1} \times (1 - transage_{lf}) + \sum_c (GRAD_{c,t-1} \times exdip_c \times edumap_{c,lf} \times (1 - inact_{lf})) \\
& + \sum_{c2} (ENR_{c,t} \times dropout_c \times (1 - inact_{lf})) \times \sum_c (transmap_{c,c2} \times edumap_{c,lf})
\end{aligned} \tag{22}$$

That is, the local labor force of skill lf equals the previous year's local labor force of skill lf , less those workers who flow from the *young* to the *not young* category. Graduates from cycle c who choose not to continue their studies are mapped to a labor skill, and a percentage of them are added to the labor force according to their labor force participation rate (Löfgren, Cicowiez, and Diaz-Bonilla 2013). Finally, dropouts from cycles above c are added to the relevant labor force category using mapping parameter $transmap$, denoting passages between cycles. For vocational and university students, the logic is the following:

$$LSTA_{lf,y,t} = LSTA_{lf,y,t-1} \times (1 - transage_{lf}) + Min(CANDID_{lf,t-n}, places_{lf,t-n}) \times inact_{lf} \tag{23}$$

The labor force holding diplomas and degrees is thus equal to diploma and degree graduates in the labor force the previous year, less those who transit to the *not young* category. Students who were accepted into their desired field of study are added, a percentage being removed depending on the labor participation rate of the category in question. The index n reflects the time it takes to complete a given cycle. We have set n to equal 4 years for all degree students, and 2 years for all vocational degrees, reflecting the average duration of these cycles in Malaysia. The inclusion of a delay between entrance in a given field and labor market participation has important implications. During the time of studies, workers are effectively immobilized, such that any increase in the number of students is likely to carry an initial negative impact on growth. In short, instead of being potential low skilled workers these individuals do not contribute directly to production. We thus include a temporal dimension of the efficiency of education policy in the model.

Finally, the evolution of older workers depends on the transit rate between age groups, and the mortality and retirement rates of old workers:

$$LSTA_{lf,ny,t} = LSTA_{lf,ny,t-1} \times (1 - mort_{lf,t} - retir_{lf,t}) + transage_{lf} \times LSTA_{lf,y,t-1} \quad (24)$$

3.3 The migrant block

Immigration in Malaysia has increased substantially over the last decades, potentially influencing labor market dynamics. These migrants tend to be low educated, arriving in Malaysia from primarily Indonesia and the Philippines. Various push and pull factors explain the supply of migrants in Malaysia. We model the total supply of migrants using a CET function, where the evolution of the migrant stock of a given skill level depends on the relative wage premium of migration in a given year compared to the relative wage premium in the base year.

$$SMIG_{lf,t} = \sum_{AC} IMMIG_{AC,lf,2005} \times \left(\frac{\frac{avfw_{lf,t}}{w_{dom_{lf,t}}}}{\frac{avfw_{lf,2005}}{w_{dom_{lf,2005}}}} \right)^{\sigma_8} \quad (25)$$

Furthermore, migrants move between sectors according to relative wages and initial preferences:

$$SMIG_{lf,t} = \sum_{AC} \left[\gamma_{AC,lf} \times IMMIG_{AC,lf,t}^{1+\frac{1}{\sigma_9}} \right]^{\frac{1}{1+\frac{1}{\sigma_9}}} \quad (26)$$

Migrants thus make their decision sequentially. First, the decision to migrate is taken based on expected wages and the elasticity of substitution. Once immigrated, they will reallocate between sectors depending on the wage rate and the elasticity of the migrant sectoral supply.

3.4 Labor Market Adjustments

Migrants and local workers' wages are assumed to be different due to an imperfect substitution by employers (Özden and Wagner 2013). It is assumed that the local wage does not clear the labor market, such that there is unemployment among locals. The wage is modeled using a wage curve, reflecting the often observed empirical relationship between wage and unemployment. The local average wage by skill is thus given by:

$$\log afw_{lf,t} = \beta_{1_{lf}} + \beta_{2_{lf}} \times \log Ur_{lf,t} \quad (27)$$

Sectoral wages are then equal to the average wage, plus an exogenous wage differential:

$$wf_{AC,l,t} = afw_{l,t} \times fdist_{AC,l,t} \quad (28)$$

Initially, the migrant wage clears the migrant labor market. We thus make the assumption that there is no migrant unemployment. Furthermore, reasonably in line with the regulatory framework, we assume that migrants do not pay social security. Following the minimum wage law passed in Malaysia in 2012, restrictions are imposed on the market wage from 2013. It follows that wages no longer clear the migrant labor market. Since there is no migrant unemployment, the introduction of a minimum wage -supposing it is binding -implies rationing of migrants in Malaysia. The level of the minimum wage is set according to the actual minimum wage introduced, deflated to reflect 2005 prices (since the model is exempt from inflation). The minimum wage is introduced sequentially. First, market wages below the minimum wage level are fixed at the minimum wage rate. The model is then resolved to allow for sectoral adjustments to take place. Any market wage having fallen below the minimum wage rate is fixed at the minimum wage, and the procedure is repeated. The sequence stops when all wages are equal to or above the minimum wage rate.

3.5 Closure and dynamics

The model has five closures: a macro closure, a government closure, an external balance closure, a labor market closure and a closure of the social security accounts. Concerning the macro closure, it is savings driven (households' marginal propensity to save is exogenous), which means that the level of investment is determined by the level of total available savings in the economy (including foreign savings). Hence as savings increase, the stock of capital and output increase. The government closure chosen consists in fixing government expenditures as a constant share of GDP and tax rates and leaving the government budget balance endogenous. The social security account is modeled separate from the Government budget. It earns its income from employers' pay-roll taxes and pays benefits that are distributed to households. The social security balance is endogenous. The foreign balance closure consists of fixing the exchange rate and leaving the current account balance endogenous. The formal labor market closure consists of a joint determination of unemployment and average local wages through the wage curve described above and no unemployment for foreign workers (wages clear the market).

Model dynamics are of the sequential type. Capital accumulation is sectoral. Each year the stock of capital in each sector corresponds to last year's stock plus new invest-

ment, minus the depreciation of capital. Sectoral investment has been modeled as a function of the sectoral stocks of capital, sectoral rates of return to capital and capital acquisition costs. As already mentioned, the evolution of the active population by skill is modeled within the education block, which relies on the actual performance rates of the education system and endogenous educational choices in Malaysia. Government and foreign debts increase (decrease) with the yearly level of the net deficit (surplus) of Government and foreign savings.

4 Data and calibration

4.1 The Database

We build a social accounting matrix using an input-output table of 2005, the base year for the simulations. A Social security contributions account has been added, with a fixed percentage of employer and worker contributions being drawn from labor income. Total employment is taken from the 2007 LFS, the first survey for which wages are available. It represents wage earners in each sector, with the exception of the agricultural sector where employment refers to all employed due to the particular nature of this sector (hosting many informally employed workers)³² and health (where employment corresponds to the estimated amount of wage earners for 2005).

Total value-added (including social security benefits) in each sector is taken from the 2005 Input-Output (I-O) table. Wage related data come from the LFS. In the agriculture, health and education sectors, aggregate wage bills are those of the 2005 I-O tables. In the remaining sectors, wage bills are taken from the LFS 2007 by multiplying mean wages by skill and industry with the number of workers of that skill and industry (the difference between these and the original wage bill is imputed from capital remuneration). Thus, mean wages and wage earners are kept in accordance with the LFS in all except the three sectors mentioned. For those three sectors the standard methodology could not be used since the imputed wage bill would necessitate a negative capital remuneration. The original wage bill is thus kept, and wages are imputed and not equal to those of the LFS.

Investment by origin is taken from the 2005 I-O table and is portioned out to des-

³²The LFS survey does not include workers in communal housing, which is common among migrant agricultural workers, who are thus likely to be underrepresented in the LFS.

tinuation sectors. Information from a report titled “National Accounts Capital Stock Statistics” by the Department of Statistics proved very useful for this exercise. Since the data reflect a higher aggregation than the one used for the estimation we assume that investment is equally distributed among our sub-sectors. Ideally, an investment origin-destination matrix would have been used, but such a matrix was not available. Current results will thus fail to accurately capture some sub-sector dynamics that are due to relatively high or low investment with respect to sector size. World and local growth rates are taken from the World Bank Data bank. Data on enrollment, intake and graduates for each cycle were available for 2009 and 2010. This data is used to calculate (for each cycle) the drop out-rates and the share of graduates who move to the next cycle. Enrollment data for the base year are estimated from a dynamic calibration exercise, retracing the evolution of educational outcomes between 2005 and 2010.

Using production and LFS data from 2005 through 2011, we dynamically calibrate the main parameters of the model through an iterative process. The result from this exercise is that the reference scenario is reasonably in line with the Labor Force Survey figures and the evolution of the main variables at the macro and sectoral levels.

4.2 Calibration

Model parameters include initial values of endogenous variables, as well as exogenous parameters. The Social Accounting Matrix provides such values for production and consumption, exports, imports etc. Labor Force Surveys provide us with information on wages and employment status of migrants and locals. Some unobservable parameters can be calculated using initial values obtained from these sources. Others, such as elasticities of substitution, have to be estimated. When possible, we have attempted to estimate these elasticities. When impossible, reasonable values from the literature have been used.

As for the demand elasticity of substitution between high-skilled labor and capital, we follow Card and Lemieux (2001) and derive elasticities of substitution between workers of different age groups, education levels, fields of study as well as elasticities of different labor aggregates of these worker categories. The limited number of years for which we have data on wages sharply limits the regression results, and significant coefficients were not obtained for the full production structure. There are however indications of elasticities decreasing as we move up the production structure. The price-elasticities of

demand for migrants with respect to locals have been estimated from LFS data³³.

We consider current macroeconomic trends to prevail. As such, the savings rate and the rate of increase of foreign direct investment have been set to values producing reasonable figures, in line with IMF data for the period 2005-2011. Furthermore, we are assuming the government deficit to continue its downward trend, declining to 3% of GDP in 2015, and completely absorbed in 2020³⁴.

5 A microsimulation module

A microsimulation module is added to the CGE framework in order to study distributional impacts of SBTC and educational rationing. Since we are focusing on wage inequalities, a micro accounting approach is used, linking model outcomes to micro level data. The LFS survey contains information on wage earners only, which is why we exclude interest rate variations from our analysis.

We use the most recent exhaustive LFS data set, that of 2010, to implement factor price variations. Since our simulations produce effects that are likely to be important only in the medium- long-term framework (especially considering educational rationing), we seek to examine the alternative effects by 2020 from our reference scenario and our simulated scenarios. In a sense, we are comparing two counterfactuals. The variation in real wage income between 2010 and 2020 for an individual in industry AC , of skill f and age group a is thus:

$$\Delta W_{2020/2010,AC,f,a} = W_{AC,f,a,2010} \times C_{Scen,AC,f,a} \quad (29)$$

where C is a vector of factor payment variations issued from the various macro model scenarios. Thus, the individual wage impact of a simulation simply amounts to:

$$\Delta W_{AC,f,a} = W_{AC,f,a,2010} \times (C_{Sim,AC,f,a} - C_{Ref,AC,f,a}) \quad (30)$$

Since our interest in doing this exercise is to examine how skill-biased technological change and educational policy affects distribution of wage incomes, we look at Gini

³³We thank Caglar Ozden and Mathis Wagner for providing us with these elasticities.

³⁴As by the objectives of PEMANDU, the *Performance Management & Delivery Unit*, which answers to the Malaysian Prime Minister's Department and oversees the implementation and progress of Malaysia's two medium-term transformation programmes: the Government Transformation Programme (GTF) and the Economic Transformation Programme (ETF).

coefficients and decile ratios, included along with macro results in the following section.

6 Simulations and results

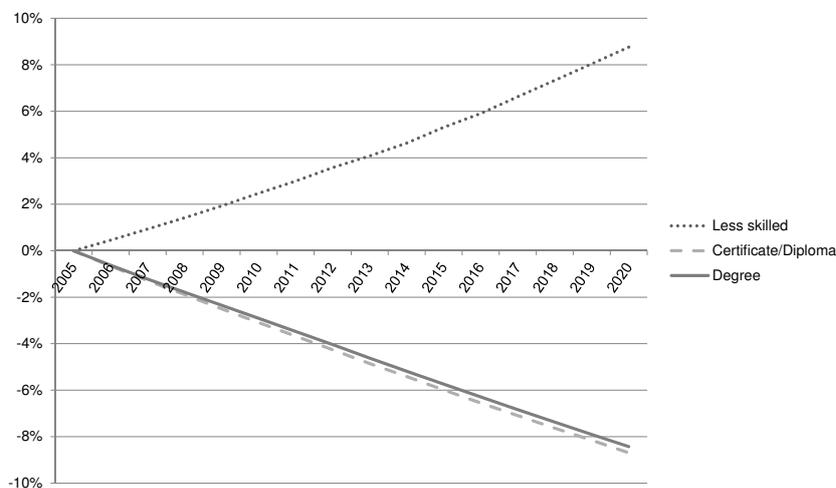
The following section presents the simulations run and their results. Our first simulation assumes the skill-bias of technological change to be zero, *i.e.* that the overall rate of technological progress, calibrated from the dynamic calibration exercise using exogenous productivity growth rates, is affecting skilled and unskilled labor alike. Secondly, we simulate a rationing in the number of places at institutes of higher learning. For simplicity's sake, we compare an *open-door* policy, considered to be our benchmark scenario, with a scenario where the number of places available is equal to that of 2005, our base year.

6.1 Malaysia without skill-biased technological change

What would have been the absorption of graduates by the labor market if technological progress in Malaysia were not biased toward skilled labor? How would the wage premia have reacted? We run a two-fold reference scenario, one with and one without skill-biased technological progress, both calibrating overall productivity growth given exogenous sectoral productivity growths and GDP growth rates (using historical figures, then assumed to be 5%). The reference scenario has been calibrated in order to reproduce as closely as possible the evolution of wages, unemployment and other endogenous variables between 2005 and 2011. We have settled on a skill bias of 4% annually for two reasons. Firstly, an estimation of the residual $A = \Delta \frac{\theta_S}{\theta_U}$ from only four data points (the ones for which we have wages) gives us an upper limit of skill-biased technological change of 9%. Choosing roughly half this figure makes us reasonably sure we are not overestimating the effect of SBTC. Furthermore, this figure gives us a reference scenario reasonably in line with the evolution of some main macro and sectoral variables.

Our first simulation assumes neutral technological change. Since the global productivity coefficient is calibrated to sectoral productivity growth rates and a GDP target figure, this means that removing the skill bias does not imply modifying aggregate productivity growth. Furthermore, the skill-biased technological change was applied to all tertiary educated, *i.e.* certificate, diploma and degree holders. As can be seen from Figure ??, in the absence of skill-biased technological change, less skilled workers would have had a higher wage growth than in the reference scenario. On the other hand, tertiary

Figure 7: Evolution of wages of Malaysian wage earners without SBTC



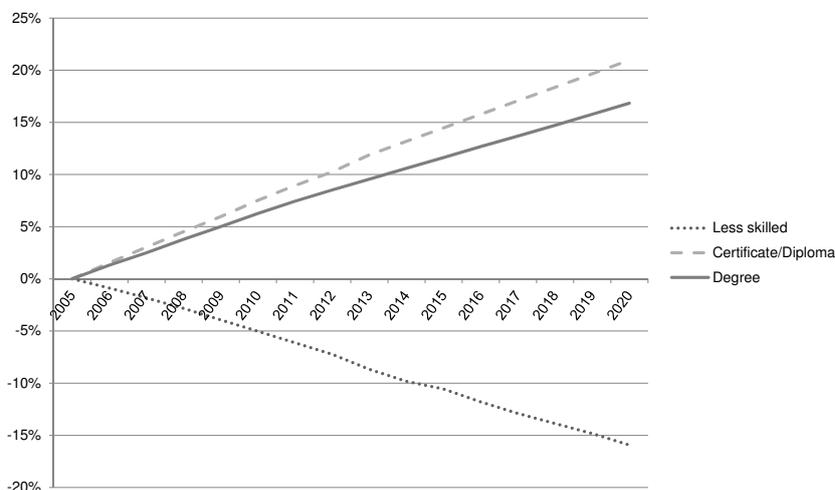
Source: Authors' calculations using results from the model. The x-axis shows the yearly percentage difference in average wages for various skill categories under neutral technological change, as opposed to a SBTC of 4%.

educated—vocationally and academic alike—would have seen their wages decrease, thus eroding returns to education. Detailed breakdowns by field of study for Diploma holders and degree holders, and by level of education for less skilled can be found in the appendix. They show that for Diploma holders, the biggest winners from SBTC are engineers. For degree holders, those with degrees in Agriculture have benefited the most. Table 6 shows that the Agricultural sector is the sector who has known the highest upskilling in the period 2007-2010. This large sector has the highest ratio (more than 95%) of unskilled to skilled labor, implying that an important substitution of skilled for unskilled labor needs to take place, significantly affecting wages of the high skilled.

Looking at unemployment (Figure 8), we see that the tendency is the same as for wages. Had skill-biased technological change not been present, the unemployment rates of tertiary educated would have been around 15-20% higher, while those of less skilled workers would have been 15% lower. Thus, SBTC has clearly had a positive impact on the labor market outcomes of graduates in Malaysia.

The macroeconomic impacts over the period are minor (mainly since the model is

Figure 8: Evolution of unemployment of Malaysian wage earners without SBTC



Source: Authors' calculations using results from the model. The x-axis represents yearly percentage differences for various skill categories' average wages under neutral technological change, as opposed to 4% SBTC.

calibrated to the same GDP target figures). Unemployment would however have been slightly lower during the period but returning to a very close figure (3.1%) by 2020. Results also show that immigration would have been higher had SBTC not prevailed. Malaysia's immigration in recent years has been important, important enough to spark a concern among the government about its economic and social impact. Our results however show that the numbers could have been higher. Had productivity increases been unbiased, the migrant stock would have been 14% higher by 2020. Unbiased technological progress, relatively more favorable to low-skill intensive sectors, can thus be seen as increasing the pull factor in the Malaysian context, where the main migration pool is made up of low-skilled Indonesians and Filipinos³⁵.

Table 7 shows the production growth differentials from 2010 to 2020 in the absence of skill-biased technological change. It suggests that SBTC has led to structural change, benefiting sectors such as Business services, Finance and certain types of Manufacturing,

³⁵ According to the 2010 Labor Force Survey, the proportion of employed migrants with at least a diploma or certificate in 2010 stood at less than 4.5%. The equivalent figure for Malaysians is 22%. The bulk of Malaysia's immigrants being low-skilled immigrants, migration responds strongly to variations in low-skilled wages, which are related to the skill bias of technological progress.

Table 7: Sectoral production growth differentials 2010-2020 without SBTC (private sectors)

Agriculture	11%
Oil & Gas	3%
Manufacturing food, beverages, tobacco	10%
Manufacturing textile	2%
Manufacturing wood	12%
Manufacturing paper & furniture	3%
Manufacturing chemicals rubber	-1%
Metals, machinery, equipment NEC	0%
Electronics & electrical	-2%
Manufacturing & transport equipment	-1%
Utilities	1%
Construction	1%
Wholesale & retail	8%
Accommodation & restaurants	5%
Logistics	4%
Post and telecoms	0%
Finance	-1%
Real estate	0%
Business services	-10%

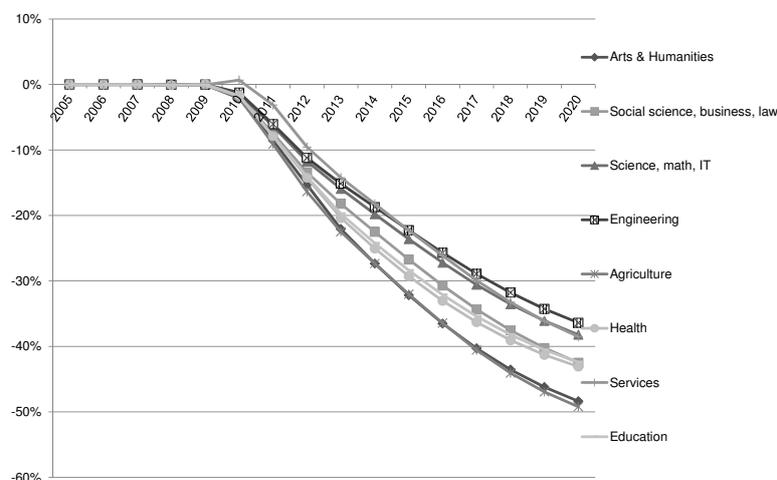
Source: Authors' calculations using results from the model.

the common denominator of which is a large share of skilled labor. Symmetrically, it has played a role in the relative decline of sectors such as Wood or Wholesale & Retail. Thus, the recent evolution of Malaysia toward a more skill-intensive economy, a policy target, has been facilitated by technical progress biased toward skilled labor.

6.2 Constraining the supply of higher education

Our reference scenario supposes no rationing of supply of educational services in Malaysia. Demand factors alone thus determine the evolution of skilled labor. In this simulation, we restrain the supply of educational services to that of the base year, 2005. Every year, the number of places in each field of study is thus equal to the number of places available in 2005³⁶. We here assume the cycle of diploma studies to be two years, and that of degree studies to be four years. An increased enrollment in degree studies would therefore only create an increase in high skilled labor four years later.

Figure 9: Evolution of unemployment of degree holding wage earners with a restriction in places



Source: Authors' calculations using results from the model. The x-axis shows percentage evolutions of degree holders' wages (by field of study) under rationing, as compared to an *open-door* educational policy.

³⁶An important caveat here is that we do not actually know the number of places in 2005, only the number of enrolled in each field of study. It is possible that more places were available in some fields.

Table 8: Sectoral production growth differentials 2010-2020 with rationing (private sectors)

Agriculture	3.6%
Oil & Gas	1.4%
Manufacturing food, beverages, tobacco	3.0%
Manufacturing textile	1.1%
Manufacturing wood	4.5%
Manufacturing paper & furniture	1.4%
Manufacturing chemicals rubber	-0.1%
Metals, machinery, equipment NEC	0.1%
Electronics & electrical	0.1%
Manufacturing & transport equipment	-0.5%
Utilities	0.5%
Construction	0.4%
Wholesale & retail	4.8%
Accommodation & restaurants	2.2%
Logistics	1.9%
Post and telecoms	0.2%
Finance	-0.4%
Real estate	0.1%
Business services	-5.1%

Source: Authors' calculations using results from the model.

Figure 9 shows the evolution of unemployment of various high-skilled categories when places are kept constant. Unsurprisingly, by 2009, as the effects translate into a lower amount of degree holders than in the reference scenario the unemployment of degree holders starts to decrease. At the end of the period, unemployment rates are 35% to 50% lower than in the reference scenario. The effect is also felt on wages, which would have been up to 20% higher by the end of the period (See Appendix). By constraining access to higher education, a rent is created and awarded to those in possession of a tertiary education. For diploma holders, there is more variation in unemployment decreases and wage increases (See Appendix). Some fields of study experience large increases while others get relatively minor ones. In particular, diploma holders in health do not benefit much from the rationing. This is partially due to the fact that the demand for health diplomas was falling in the reference scenario. Rationing actually creates a slight increase in the long term supply of health diploma graduates, since some of those diploma students that are cut out from more desirable fields due to rationing end up joining health programs as a fall back option.

Looking at sectoral production growth differentials over the decade 2010-2020, we find disparate results across sectors. Several mechanisms are at play. Firstly and most intuitively, rationing increases the relative cost of skilled labor. Sectors who are relatively intensive in unskilled labor will thus benefit. The most unskilled labor-intensive sectors (Agriculture, Wood, Wholesale & Retail Trade) are therefore those where production increases the most. Symmetrically, the most skill-intensive sectors (Business services, Finance and Manufacturing of transport equipment) see their production decrease. Secondly, a variation of wage costs affects most those sectors who are relatively labor intensive. This explains why Manufacturing of wood benefits more than Agriculture from the rationing, Agriculture being more capital-intensive. Among the relatively skill-intensive sectors, the most capital-intensive sectors such as Finance are less hurt by the rationing than relatively labor-intensive ones such as Business services.

Looking at figures 19-22 in the Appendix provides insight into the determinants of wage shifts and their sensitivity to variations in these determinants. Skill-biased technological change is indeed a strong one, as has been shown in the previous results. However, the magnitude of the bias sharply correlates to the subsequent wage loss (gain) of more (less) skilled workers. Furthermore, the elasticity of substitution between the three main labor bundles is also a strong determinant of the distributional effects of skill-biased technological change and educational rationing. We feel that our main hypotheses are reasonable. Our main variable, the skill shifter, is at 4% although the

residual estimated stood at 9%. The elasticity of substitution between skilled labor bundles is also conservatively set at 1.5. As a matter of comparison, Katz and Murphy (1992) find an elasticity of supply between high school and college labor of 1.4 for the United States. They do not however implicitly account for substitutability within these two labor aggregates. When doing so, Card and Lemieux (2001) find estimates ranging between 2 and 2.5 in the UK and US.

6.3 Distributional results

The micro accounting exercise shows that the scenarios considered have substantially different impacts on Gini coefficients and interdecile ratios. Overall, however, the massification of higher education together with SBTC bring about a decrease in overall wage inequality, as confirmed by the decrease in the Gini coefficient in our reference scenario. The same holds true for the interdecile measures, which are lower than in the 2010 LFS, and the Atkinson index. The Atkinson index allows inequality at the lower end of the distribution to affect the index more than inequality at the upper end, and the more so the higher the inequality aversion parameter e ³⁷.

As stated above, the reference scenario corresponds to skill-biased technological change and an open-door educational policy. This is what we consider to be the path Malaysia is currently on. The increased educational attainment of Malaysians will lead to a wage compression, substantially reducing wage inequality (almost a 3 point drop in the Gini coefficient).

When comparing the reference scenario with a situation without SBTC (Simulation 1), maintaining the educational policy, the corresponding drop in the Gini is about 1.1. Skill-biased technological change thus prevented a reduction in wage inequality over the period. Similarly, both interdeciles ratios would have been lower, had SBTC not been present.

Source: Authors' calculations using results from the model.

Turning to educational policy, the second simulation shows the counterfactual Gini coefficient and interdecile ratios in a situation with SBTC and with educational rationing.

³⁷As long as $e > 0$, the sensitivity to inequality in the lower end of the distribution is increasing in e . We have chosen to set $e = 1$ in the simulation.

Table 9: Summary of distributional indices from micro accounting exercise

	2010 LFS	Ref.	Sim. 1	Sim. 2	Sim. 3
		SBTC, no rationing	No SBTC, no rationing	SBTC, rationing	NO SBTC, rationing
Gini coefficient	0.40743	0.3782	0.36686	0.39393	0.38078
Atkinson index	0.24532	0.2143	0.20306	0.23019	0.21683
p90/p10	6.415	5.66	5.458	6.133	5.695
p90/p50	2.52	2.399	2.301	2.559	2.425

Thus, the Gini coefficient would have been 1.6 points higher had the number of educational places been maintained at their 2005 level. The open-door policy of the Malaysian government has thus contributed to a decrease in wage inequality. It should be noted that even in this scenario, the counterfactual Gini coefficient for 2020 is 1.3 points lower than the one computed from the 2010 LFS data. This is due to two other things: firstly, demographic factors (older workers are more often of lower skill, such that the rate of destruction of the lower skilled category is higher than the rate of destruction of other skill categories) push the share of skilled labor upwards even in the presence of educational rationing. Secondly, the minimum wage introduced in 2013 is inequality-reducing in itself. Thus far empirical evidence of the minimum wage effects in Malaysia is scant, but Saari et al. (2016) who investigate the impact of the minimum wage on poverty across ethnic groups in Malaysia, find that it reduces poverty in all ethnic groups, but that the effect on Indians is substantially higher than that of other ethnic groups. They however do not consider employment effects. The latest available time series data for Malaysia clearly shows that if any adverse employment effects were to result from the introduction of the minimum wage, they have yet to manifest themselves: the labor force participation rate is steadily increasing from 2010 through 2014, and increased even after the introduction of the minimum wage act of January 2013. Furthermore, unemployment is decreasing from 3.3% to 2.9% over the same period, decreasing by 0.2 p.p. following the year of introduction of the minimum wage. We thus believe that a secular decrease in wage inequality is a reasonable result for Malaysia even in the absence of SBTC and with educational rationing.

Turning to simulation 3 (No SBTC, rationing), it shows that the impact of rationing is lower, but not far from that of SBTC. It thus seems that the open-door educational policy has counteracted the inequality-maintaining effect of skill-biased technological change in Malaysia.

The full story of educational impacts on inequality should mention social returns to education. While private returns have largely been the focus of the literature (although a sizable literature on social returns to education exists), externalities of educational accumulation might impact the distribution of income in indirect ways. Primarily, there is an evident link between education and the innovation process, likely to impact technical progress directly. The impact of this nexus on the relative productivity bias is however uncertain and we therefore assume the absence of such an effect. Secondly, spillover effects in worker productivity might be expected. It is plausible that an individual in training will increase not only his or her productivity, but also that of his or her coworkers, for example by introducing new ideas or forms of organization of the workplace. This is perhaps the most relevant type of externality for our purposes. Acemoglu and Angrist (1999) try to estimate social returns using variations in compulsory schooling laws in U.S. states. They find little evidence of a higher social than a private return. Furthermore, to our knowledge there are no studies trying to estimate the social returns to education in Malaysia. Again, we are unable to ascertain any impact on the skill bias of technological change from these mechanisms.

6.4 The hypothesis of exogenous SBTC

A major drawback of the canonical model of skill-biased technological change (Acemoglu and Autor 2011) is that it says nothing about the origin of SBTC. Could it not be that the increase of skilled labor has provoked the direction taken by technical bias? Acemoglu (1998, 2002) creates a model in which a marketplace for innovation exists, and firms can choose to develop technologies suited to one factor of production rather than the other. He shows that whatever the elasticity of substitution between factors, an increase in the relative abundance of one creates some amount of technical change biased toward that factor. This however relies on profit incentives as the main source of the direction of technological bias. While arguing that innovation might indeed not be driven by profits, the direction of innovation somehow is. No clear explanation is given as to why this would be the case.

If SBTC results from firm responses to modifications of factor proportions, then this type of mechanism should be the most prevalent in countries which carry out a lot of innovation domestically, such as high-income economies. To our knowledge, only one paper has tested for endogeneity of SBTC, in the German context (Bogliacino and Lucchese 2015). Using the influx of East Germans as a source of exogenous variation in the

proportion of skilled labor, they conclude on the absence of a demand pull effect on skill biased technological change. The experience of MENA countries and their record-high unemployment rates for tertiary graduates can also be raised as an argument for the absence of a demand pull effect. The considerable increases in quantities witnessed by these countries have not been followed by job creation suited to their qualifications.

In an era of openness and globalization, innovation travels fast. Berman, Bound, and Machin (1998), using data from 12 countries, show that skill-biased technological change such as the one observed in the US has been pervasive, occurring simultaneously in all countries. Berman and Machin (2000) further show that this pervasiveness extends to middle-income countries (of which Malaysia is one) in the 1980s, whose skill upgrading is correlated with that of the US. Since the world has not ceased to be a globalized place, it is likely that the same kind of pervasiveness of SBTC is at least as evident today as three decades ago. The hypothesis of SBTC through imports of goods which embody skill bias has been tested by Conte and Vivarelli (2011), who find evidence of such a mechanism on a set of 23 low- and middle income countries in the period 1980-1991. Eaton and Kortum (2001) show that the production of capital goods is highly concentrated among seven OECD countries which provide the main source of imports of capital goods for the rest of the world.

Cross-country regressions and the little evidence testing directly the demand-pull hypothesis thus suggests that SBTC is at least partly unrelated to the proportion of skilled labor in the economy. In the Malaysian case in particular, being a middle-income country relying on imports of capital goods to a larger extent than high income countries (and in particular, high technology countries such as Germany), there is reason to believe that much of the technological bias experienced is embodied in imported technology.

If SBTC is to a large extent exogenous with respect to skill proportions, the results of our simulations are valid. Should a significant share of SBTC be due to the increase in skilled labor, this would nuance some of the results obtained, but would not change their rank order. Simulation 1 would slightly overestimate the drop in the skill premia and subsequently the reduction in the inequality measures. Simulation 2 would slightly underestimate the increase in skill premia and subsequently the reduction in the inequality measures.

7 Conclusion

This article has looked at the labor market impacts of two alternative scenarios; a neutral technological change, and a rationing of places available in tertiary education. We develop a dynamic general equilibrium framework in which we extensively model educational choices both on the demand and the supply side, while taking into account immigration decisions. We are thus able to fully endogenize labor supply dynamics in the Malaysian context.

Our results show that in the absence of skill-biased technological change, relatively skilled wage earners should have expected lower wages and higher unemployment, while unskilled labor would have been able to expect higher wages and lower unemployment. The absence of SBTC would also have meant increased migration. We also show that skill-biased technological change has led to structural change, benefiting sectors with a large share of skilled labor, such as Business services. Furthermore, our model does not take into account geography. A limitation of the study is thus that territorial inequalities or geographical shifts of production linked to internal migration of relatively more/ less demanded skills across administrative divisions is ignored.

With rationing of the supply of higher education, we find that rents are created for high skilled workers, who would have seen their wages increase and unemployment decrease. At the sectoral level, we identify two mechanisms affecting sectoral production growth. Relatively less expensive unskilled labor, benefiting low skill-intensive sectors; and substitution effects among high skill-intensive sectors favoring the more capital-intensive sectors. These macro effects translate into distributional effects in the micro accounting module. We show that skill-biased technological change and rationing of educational services both have adverse effects on wage inequalities in the medium-term, although even with both mechanisms in play we would expect wage inequalities to drop. It seems therefore that the expansive educational policy adopted in Malaysia has counteracted some of the increase in inequalities expected from skill-biased technological change. The presence of skill-biased technological change in Malaysia thus constitutes a case for continued open enrollment policies to reduce wage inequalities.

In this paper we assume that total factor productivity and skill-bias are unrelated, to be able to isolate the effect of skill bias on the evolution of skill-specific unemployment and wage rates. Further research should be aimed at understanding in depth the linkages

between skill-biased technological change and total factor productivity.

References

- Acemoglu, Daron (1998). “Why Do New Technologies Complement Skills? Directed Technical Change and Wage Inequality”. In: *Quarterly journal of economics* 113.4, pp. 1055–1089.
- (2002). “Directed Technical Change”. In: *Review of Economic Studies* 69.4, pp. 781–809.
- Acemoglu, Daron and Joshua Angrist (1999). “How Large are the Social Returns to Education? Evidence from Compulsory Schooling Laws”. In: *NBER Macroeconomics Annual 2000*. Vol. 15. MIT Press, pp. 9–74.
- Acemoglu, Daron and David Autor (2011). “Skills, Tasks and Technologies: Implications for Employment and Earnings”. In: *Handbook of labor economics* 4, pp. 1043–1171.
- Autor, David H., Lawrence F. Katz, and Alan B. Krueger (1998). “Computing Inequality: Have Computers Changed The Labor Market?” In: *The Quarterly Journal of Economics* 113.4, pp. 1169–1213.
- Beffy, Magali, Denis Fougère, and Arnaud Maurel (2012). “Choosing the Field of Study in Postsecondary Education: Do Expected Earnings Matter?” In: *Review of Economics and Statistics* 94.1, pp. 334–347.
- Berman, Eli, John Bound, and Stephen Machin (1998). “Implications Of Skill-Biased Technological Change: International Evidence”. In: *The Quarterly Journal of Economics* 113.4, pp. 1245–1279.
- Berman, Eli and Stephen Machin (2000). “Skill-Based Technology Transfer around the World”. In: *Oxford Review of Economic Policy* 16.3, pp. 12–22.
- Blaug, M and B Ahamad (1974). *The Practice of Manpower Forecasting*. Amsterdam: Elsevier.
- Blaug, Mark (1967). “Approaches to Educational Planning”. In: *The Economic Journal* 77.306, pp. 262–287.
- Bogliacino, Francesco and Matteo Lucchese (2015). “Endogenous Skill Biased Technical Change: Testing for Demand Pull Effect”. In: *Industrial and Corporate Change* 25.2, pp. 227–243.
- Canton, Erik and Frank de Jong (2005). “The demand for higher education in The Netherlands, 1950–1999”. In: *Economics of Education Review* 24.6, pp. 651–663.
- Card, David and Thomas Lemieux (2001). “Can Falling Supply Explain The Rising Return To College For Younger Men? A Cohort-Based Analysis”. In: *The Quarterly Journal of Economics* 116.2, pp. 705–746.
- Caselli, Francesco and Wilbur John Coleman (2006). “The World Technology Frontier”. In: *American Economic Review* 96.3, pp. 499–522.
- Chung, T. P. (2003). “Returns to education: updates for Malaysia”. In: *Applied Economics Letters* 10.13, pp. 837–841.
- Conte, Andrea and Marco Vivarelli (2011). “Imported Skill-Biased Technological Change In Developing Countries”. In: *The Developing Economies* 49.1, pp. 36–65.
- Duchesne, I and W Nonneman (1998). “The Demand for Higher Education in Belgium”. In: *Economics of Education Review* 17.2, pp. 211–218.
- Eaton, Jonathan and Samuel Kortum (2001). “Trade in capital goods”. In: *European Economic Review* 45.7, pp. 1195–1235.
- Freeman, James A and Barry T Hirsch (2008). “College majors and the knowledge content of jobs”. In: *Economics of Education Review* 27.5, pp. 517–535.
- Glytsos, Nicholas P (1990). “Modelling future higher education-labor market imbalances: A multi-scenario approach”. In: *Economics of Education Review* 9.1, pp. 1–23.
- Goldin, Claudia and Lawrence F. Katz (1998). “The Origins Of Technology-Skill Complementarity”. In: *The Quarterly Journal of Economics* 113.3, pp. 693–732.

- Guan, Lee Hock (2012). “Racial Citizenship and Higher Education in Malaysia”. In: *The New Economic Policy in Malaysia*. Ed. by Edmund Terence Gomez and Johan Saravanamuttu. Singapore: NUS Press.
- Kabbani, Nader and Ekta Kothari (2005). *Youth Employment in the MENA Region: A Situational Assessment*. Washington, DC: World Bank SP Discussion Paper 534.
- Katz, Lawrence F and Kevin M Murphy (1992). “Changes in Relative Wages, 1963-1987: Supply and Demand Factors”. In: *The Quarterly Journal of Economics* 107.1, pp. 35–78.
- Kenayathulla, Husaina Banu (2013). “Higher levels of education for higher private returns: New evidence from Malaysia”. In: *International Journal of Educational Development* 33, pp. 380–393.
- Löfgren, Hans, Martin Cicowiez, Carolina Diaz-Bonilla, et al. (2013). “MAMS—a Computable General Equilibrium model for Developing Country Strategy Analysis”. In: *Handbook of Computable General Equilibrium Modeling*. Vol. 1, pp. 159–276.
- Machin, Stephen and John Van Reenen (1998). “Technology And Changes In Skill Structure: Evidence From Seven OECD Countries”. In: *The Quarterly Journal of Economics* 113.4, pp. 1215–1244.
- Marouani, Mohamed A. and David A. Robalino (2012). “Assessing interactions among education, social insurance and labour market policies in Morocco”. In: *Applied Economics* 44.24, pp. 3149–3167.
- Marouani, Mohamed Ali (2010). “More jobs for university graduates: some policy options for Tunisia”. In: *Applied Economics Letters* 17.10, pp. 933–937.
- McIntosh, Steven (2001). “The Demand for Post-Compulsory Education in Four European Countries”. In: *Education Economics* 9.1, pp. 69–90.
- Montmarquette, Claude, Kathy Cannings, and Sophie Mahseredjian (2002). “How do young people choose college majors?” In: *Economics of Education Review* 21.6, pp. 543–556.
- Özden, Çağlar and Mathis Wagner (2013). *Immigrants versus Natives? Displacement and Job Creation*. Unpublished manuscript.
- Patel, Tamanna (2014). *Dropping out of school in Malaysia: What we know and what needs to be done*. Policy Ideas No. 14, Institute for Democracy and Economic Affairs.
- Pritchett, Lant (1996). *Where Has All the Education Gone?* Policy Research Working Paper Series 1581. The World Bank.
- Saari, M Yusof et al. (2016). “Estimating the impact of minimum wages on poverty across ethnic groups in Malaysia”. In: *Economic Modelling* 54, pp. 490–502.
- Sanders, Mark and Bas ter Weel (2000). *Skill-Biased Technical Change Theoretical Concepts, Empirical Problems and a Survey of the Evidence*. DRUID Working Papers 00-8. DRUID, Copenhagen Business School, Department of Industrial Economics and Strategy/Aalborg University, Department of Business Studies.
- World Bank (2008). *The Road Not Traveled: Education Reform in the Middle East and Africa*. Tech. rep.
- (Forthcoming). *Developing Skills for Innovation and High Income Economy in Malaysia*. Tech. rep.

8 Appendix

Table 10: Variables used in the CGE model

$X_{AC,t}$	Composite production by sector AC in year t
$K_{AC,t}$	Capital stock by sector
$L_{AC,t}$	Aggregate labor bundle
$PVA_{AC,t}$	Value added price
$R_{AC,t}$	Interest rate
$PL_{AC,t}$	Price of aggregate labor bundle
$HS_{AC,t}$	High-skilled labor bundle
$MS_{AC,t}$	Medium-skilled labor bundle
$LS_{AC,t}$	Low-skilled labor bundle
$LD_{AC,f,t}$	High-skilled labor bundle of type f
$LD_{AC,g,t}$	Medium-skilled labor bundle of type g
$LD_{AC,l,t}$	Low-skilled labor bundle of type l
$LDL_{AC,lf,t}$	Local labor bundle of skill type lf
$MIG_{AC,lf,t}$	Migrant labor of skill type lf
$LDL_{Aa,lf,t}$	Local labor of age a and skill type lf
$ENR_{c,t}$	Enrolled by educational cycle
$GRAD_{c,t}$	Graduates by educational cycle
$NEWENR_{edu,t}$	Newly enrolled in cycles voc or deg
$TOTNEWENR_t$	Newly enrolled in tertiary education
$NEWENRFIELD_{lf,t}$	Newly enrolled in tertiary education
$avfw_{lf,t}$	Average wage of labor of skill type lf
$Ur_{lf,t}$	Unemployment rate of labor of skill type lf
$CANDID_{lf,t-n}$	Successfully accepted candidates by labor skill type
$avfwm_{lf,t}$	Average wage of migrant labor of skill type lf
$SMIG_{lf,t}$	Total migrant supply by skill type
$IMMIG_{AC,lf,t}$	Sectoral demand for migrant labor of skill type lf
$wf_{AC,lf,t}$	Sectoral wage of local labor of skill type lf
$afw_{lf,t}$	Average wage of local labor of skill type lf

Table 11: Parameters used in the CGE model

$A_{AC,t}$	Labor Augmenting Productivity Parameter
$\alpha_{AC,K}$	Share parameter of capital
$\alpha_{AC,L}$	Share parameter of Labor
$\alpha_{AC,HS}$	Share parameter of high-skilled labor
$\alpha_{AC,MS}$	Share parameter of medium-skilled labor
$\alpha_{AC,LS}$	Share parameter of low-skilled labor
$A_{HS,AC,t}$	High-skilled labor productivity parameter
$A_{MS,AC,t}$	Medium-skilled labor productivity parameter
$A_{LS,AC,t}$	Low-skilled labor productivity parameter
β_s	Share parameter of high-skilled labor type f
β_g	Share parameter of medium-skilled labor type g
β_l	Share parameter of low-skilled labor type l
$\alpha_{AC,loc,lf}$	Share parameter of local labor
$\alpha_{AC,mig,lf}$	Share parameter of migrant labor
$\alpha_{y,lf}$	Share parameter of young local labor
$\alpha_{ny,lf}$	Share parameter of older local labor
$dropout_c$	Dropout rate by educational cycle
$enrolled_{c,t}$	Enrolled by educational cycle (historical figure used in calculations)
$entrants_t$	New entrants by educational cycle (historical figure used in calculations)
$grad_{c,t}$	Graduates by educational cycle (historical figure used in calculations)
$exdip_c$	Share of graduates pursuing further studies, by cycle
$transmap_{c,e2}$	Mapping parameter relating different educational cycles
$equiv_{c,e2}$	Equivalence parameter denoting cycles similar in the educational hierarchy
$gradrate_c$	Graduation rate, by cycle
α_{voc}	Share parameter of vocational students
α_{deg}	Share parameter of academic students
γ_f	Share parameter of field of study f in academic degrees
γ_g	Share parameter of field of study g in vocational degrees
$transage_{lf}$	Transition rate between age categories, by skill type
$edumap_{c,lf}$	Mapping parameter between educational cycles and labor skill types
$inact_{lf}$	Inactivity rate by skill type
$places_{lf,t}$	Number of places by field of study (tertiary cycles only)
$mort_{lf}$	Mortality rate by labor skill type
$retir_{lf}$	Retirement rate by labor skill type
$wdom_{lf,t}$	Domestic country wage rate by skill type
$\beta_{1,lf}$	Wage curve intercept parameter
$\beta_{2,lf}$	Wage curve elasticity parameter
$fwdist_{AC,lf}$	Exogenous sectoral wage differentials by skill type

Table 12: Elasticity parameters used in the CGE model

$\sigma_{1,AC}$	Elasticity of substitution between aggregate labor and aggregate capital
$\sigma_{2,AC}$	Elasticity of substitution between high-skilled, medium-skilled and low skilled labor
$\sigma_{3,AC}$	Elasticity of substitution between high-skilled labor bundles
$\sigma_{4,AC}$	Elasticity of substitution between medium-skilled labor bundles
$\sigma_{5,AC}$	Elasticity of substitution between low-skilled labor bundles
$\sigma_{6,AC,lf}$	Elasticity of substitution between migrant and local labor
$\sigma_{7,AC}$	Elasticity of substitution between younger and older labor
$\sigma_{8,lf}$	Elasticity of transformation of migrant supply
$\sigma_{9,lf}$	Elasticity of transformation of migrants between sectors
$\sigma_{10,lf}$	Elasticity of transformation between vocational and academic studies
$\sigma_{11,lf}$	Elasticity of transformation between vocational degrees
$\sigma_{12,lf}$	Elasticity of transformation between academic degrees

Figure 10: CET equations used to derive educational demands

$$TOTNEWENR_t = \left[\alpha_{voc} \times NEWENR_{voc,t}^{\rho_{10}} + \alpha_{deg} \times NEWENR_{deg,t}^{\rho} \right]^{\frac{1}{\rho}} \quad (31)$$

$$NEWENR_{voc,t} = \left[\gamma_g \times \sum_g NEWENRFIELD_{g,t}^{\rho_{11}} \right]^{\frac{1}{\rho_{11}}} \quad (32)$$

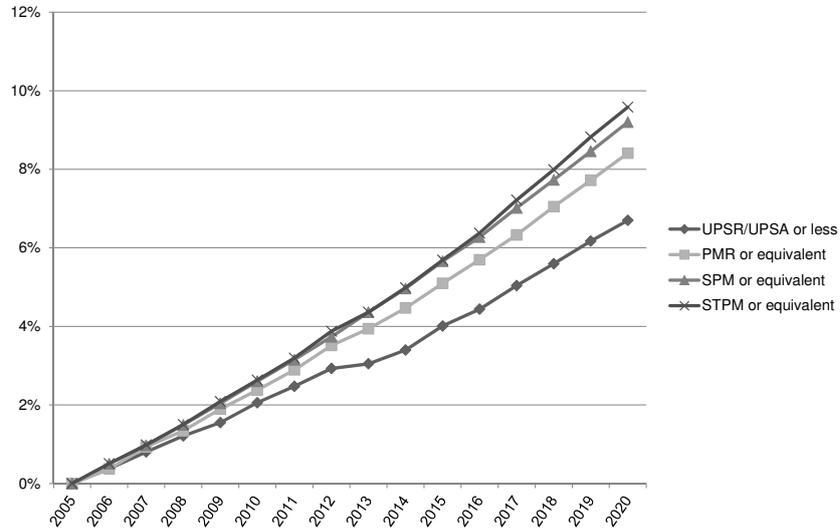
$$NEWENR_{deg,t} = \left[\gamma_f \times \sum_f NEWENRFIELD_{f,t}^{\rho_{12}} \right]^{\frac{1}{\rho_{12}}} \quad (33)$$

Table 13: Evolution of industry labor shares and proportion of skilled labor by industry, 1990-2011

Industry	$\Delta(\text{laborshare})$	$\Delta(\text{skillshare})$
Agriculture	-13.6%	2.1%
Oil & Gas	0.0%	27.0%
Manufacturing food, beverages, tobacco	-0.2%	8.9%
Manufacturing textile	-2.3%	7.0%
Manufacturing wood	-0.4%	2.7%
Manufacturing paper & furniture	0.4%	10.7%
Manufacturing chemicals rubber	0.4%	16.2%
Metals, machinery, equipment NEC	-0.1%	12.3%
Electronics & electrical	4.1%	16.5%
Manufacturing & transport equipment	0.4%	16.0%
Utilities	-1.5%	23.2%
Construction	2.9%	11.2%
Wholesale & retail	2.1%	10.3%
Accommodation & restaurants	2.1%	6.3%
Logistics	1.4%	11.7%
Post and telecoms	0.9%	59.6%
Finance	0.7%	33.7%
Real estate	0.2%	30.6%
Business services	3.8%	15.8%
Education	0.7%	20.9%
Health	0.9%	44.0%
Other services	-2.3%	6.8%
Public administration	-0.6%	23.0%

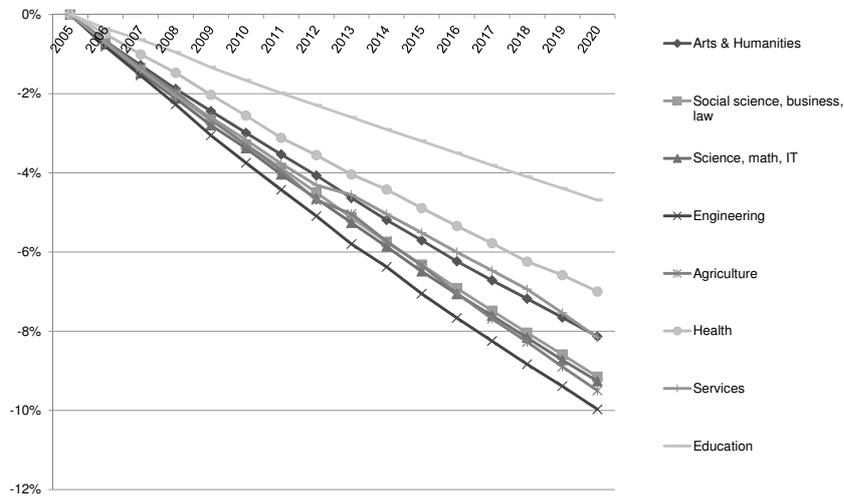
Source: Authors' calculations using results from the model.

Figure 11: Evolution of wages of low-skilled Malaysians without SBTC



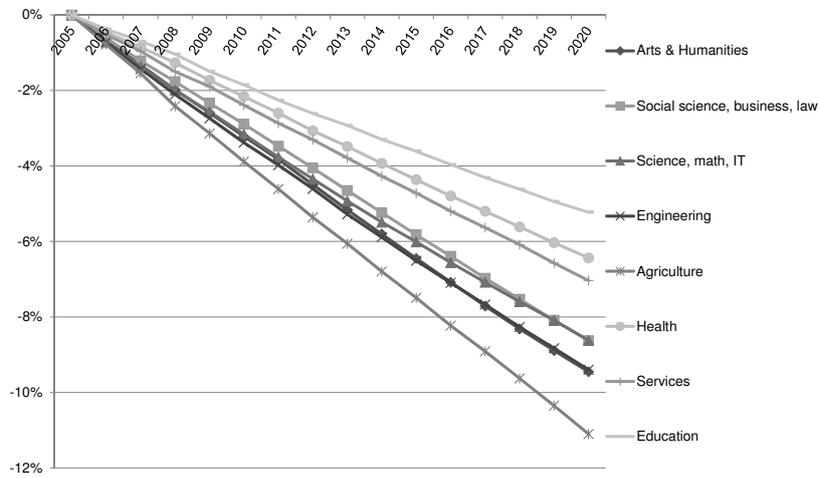
Source: Authors' calculations using results from the model. The x-axis shows the evolution of lesser skilled workers' wages under the hypothesis of neutral technological change, as compared to a situation with 4% SBTC.

Figure 12: Evolution of wages of diploma holders without SBTC



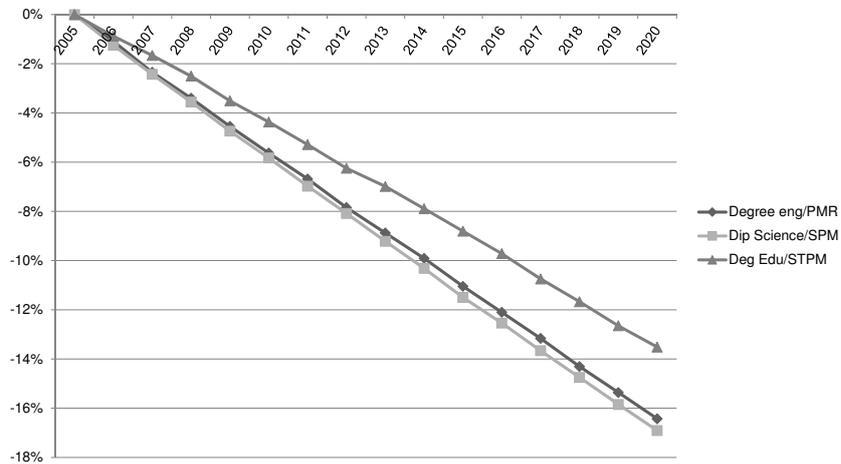
Source: Authors' calculations using results from the model. The x-axis shows the evolution of diploma holders' wages under the hypothesis of neutral technological change, as compared to a situation with 4% SBTC.

Figure 13: Evolution of wages of degree holders without SBTC



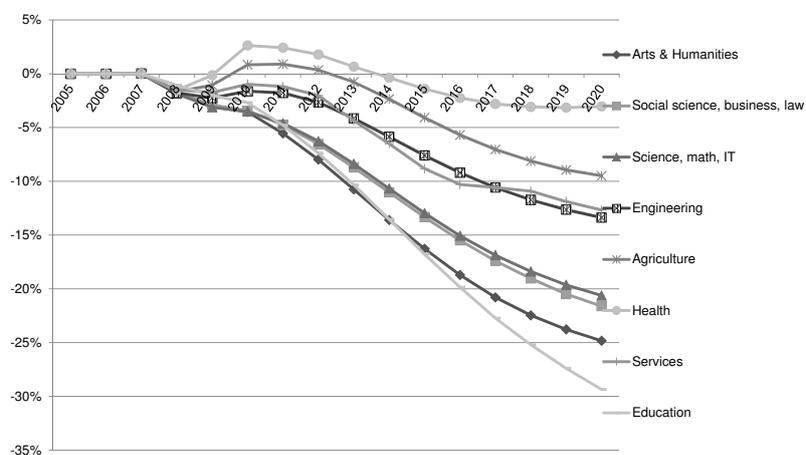
Source: Authors' calculations using results from the model. The x-axis shows the evolution of degree holders' wages under the hypothesis of neutral technological change, as compared to a situation with 4% SBTC.

Figure 14: Evolution of selected wage differentials without SBTC



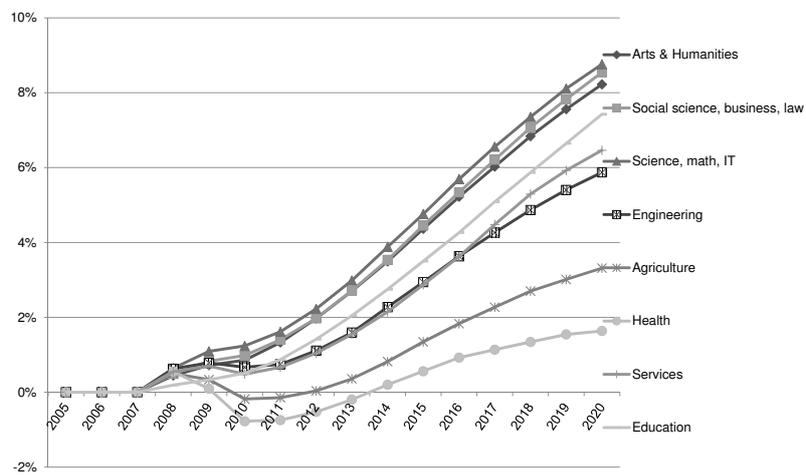
Source: Authors' calculations using results from the model. The x-axis shows the evolution of selected wage premia under the hypothesis of neutral technological change, as compared to a situation with 4% SBTC.

Figure 15: Evolution of unemployment of diploma holding wage earners with rationing



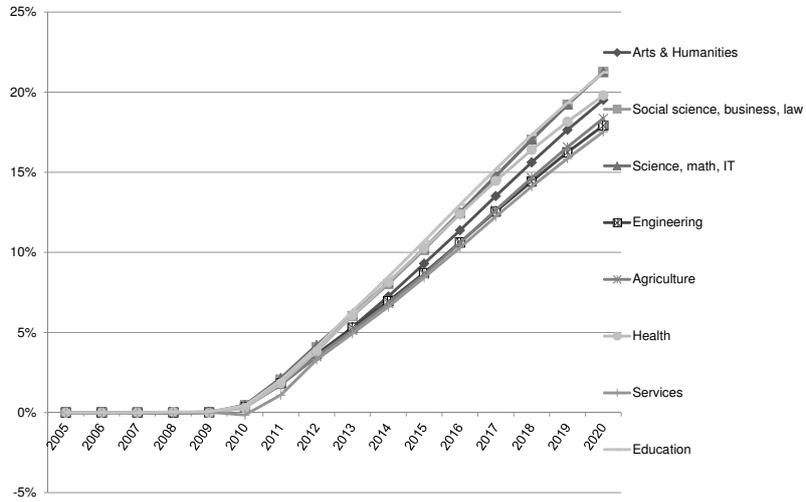
Source: Authors' calculations using results from the model. The x-axis shows the percentage evolution of diploma holders' unemployment by field of study and under rationing, as opposed to an open-door educational policy.

Figure 16: Evolution of wages of diploma holders with rationing



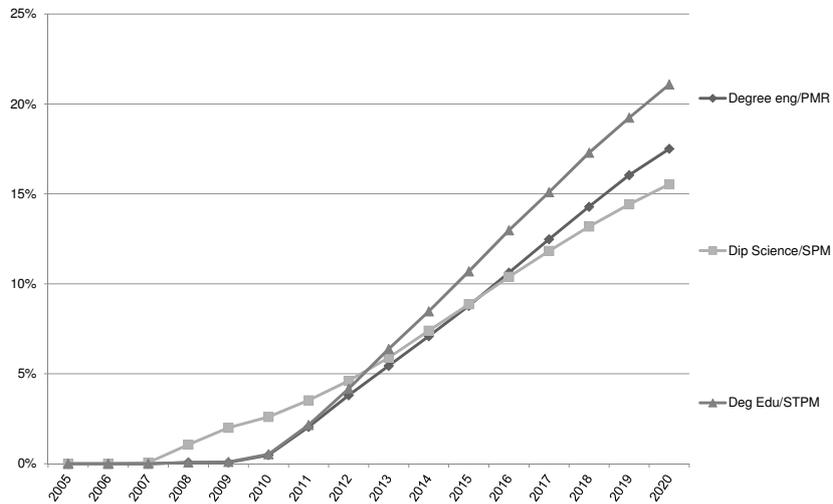
Source: Authors' calculations using results from the model. The x-axis shows the evolution of diploma holders' wages by field of study and under rationing, as opposed to an open-door educational policy.

Figure 17: Evolution of wages of degree holders with rationing



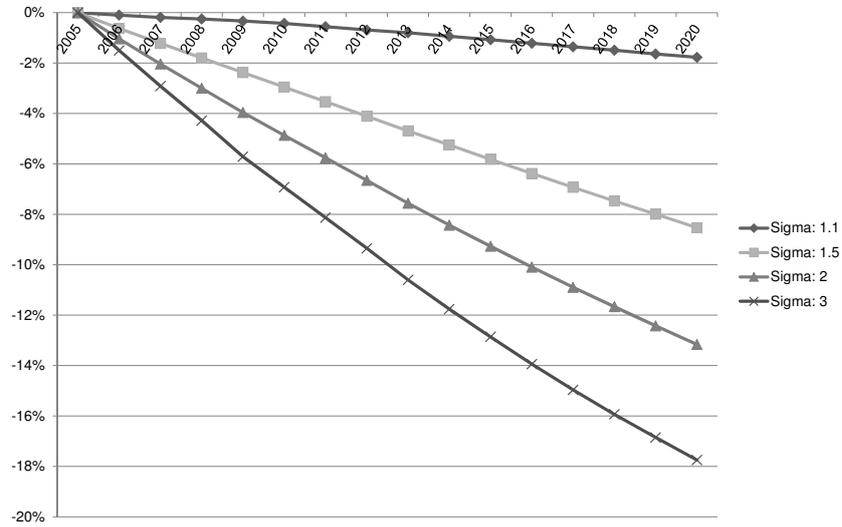
Source: Authors' calculations using results from the model. The x-axis shows the evolution of degree holders' wages by field of study and under rationing, as opposed to an open-door educational policy.

Figure 18: Evolution of selected wage differentials with rationing



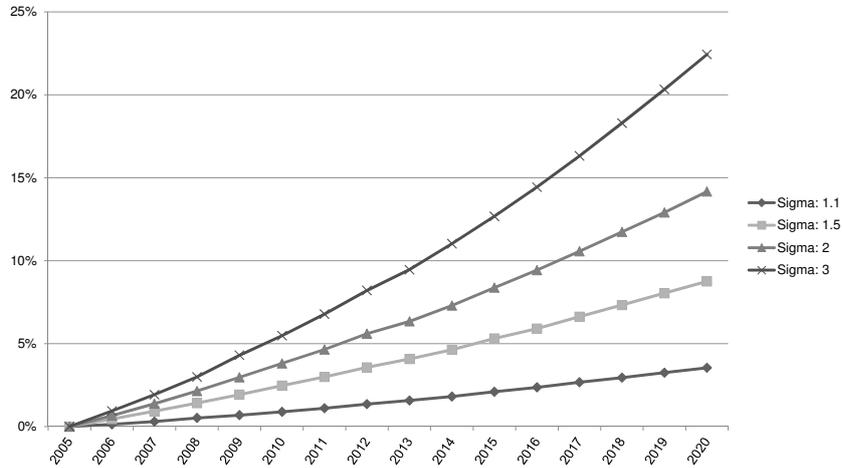
Source: Authors' calculations using results from the model. The x-axis shows the evolution of various wage premia under rationing, as opposed to an open-door educational policy.

Figure 19: Evolution of degree holders' wages without SBTC (4%) for various elasticities of substitution



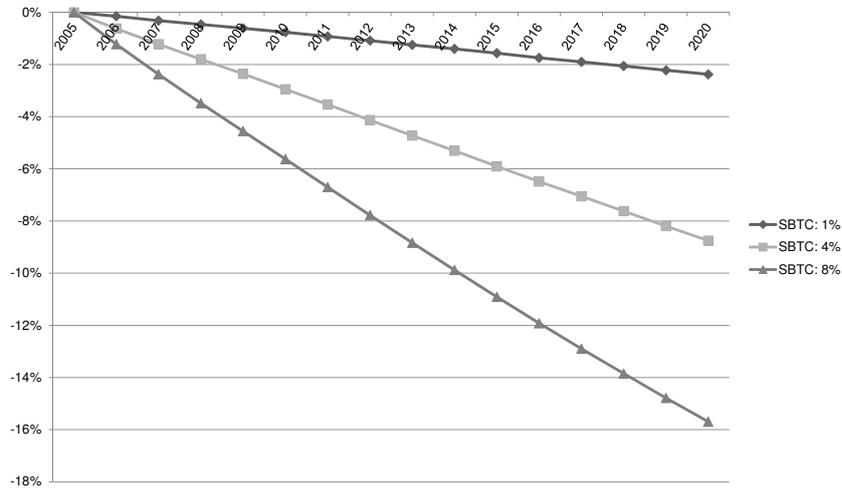
Source: Authors' calculations using results from the model. The x-axis refers to yearly percentage variations in wages for various elasticities of substitution between skill bundles, holding SBTC constant.

Figure 20: Evolution of wages of less skilled workers without SBTC (4%) for various elasticities of substitution



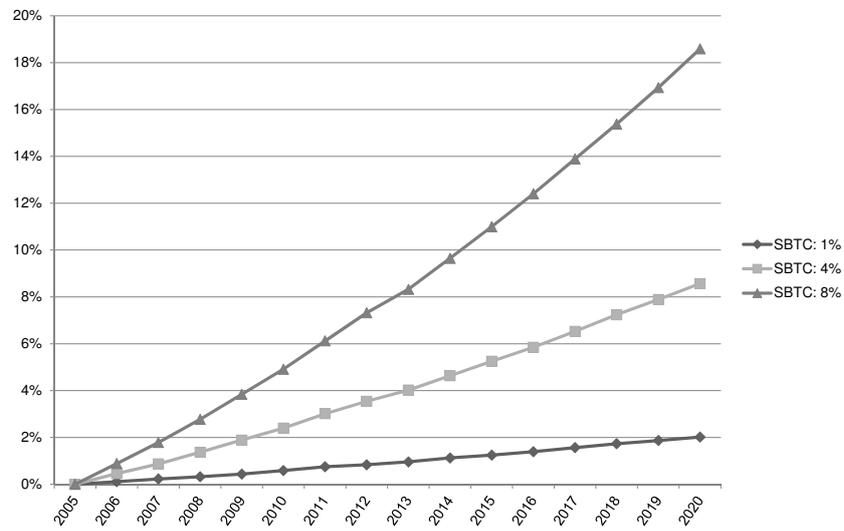
Source: Authors' calculations using results from the model. The x-axis refers to yearly percentage variations in wages for various elasticities of substitution between skill bundles, holding SBTC constant.

Figure 21: Evolution of degree holders' wages for various levels of SBTC (σ : 1.5)



Source: Authors' calculations using results from the model. The x-axis refers to yearly percentage variations in wages for various values of SBTC, holding the elasticity of substitution between skill categories constant.

Figure 22: Evolution of wages of less skilled workers for various levels of SBTC (σ : 1.5)



Source: Authors' calculations using results from the model. The x-axis refers to yearly percentage variations in wages for various values of SBTC, holding the elasticity of substitution between skill categories constant.

Chapter 3

Occupational spillover effects of younger siblings' education

1 Introduction

Sibling correlations in education and occupations can result from similar endowments, a shared family environment, parental strategies attempting to equal earnings potential, income or status of their children, or social network effects. Sibling divergence can arise when parents reinforce initial endowment inequalities, or when idiosyncratic shifts in the returns to activities occur. Static models of household allocation usually assume that parents maximize lifetime utility by allocating education and occupations to children based on their ability. Depending on their degree of altruism and their preferences for equality between children, intra-household transfers can then redistribute resources in order to maximize the household's utility according to some sharing rule. The static setting however ignores the fact that due to age differences, decisions for different children are not made at the same time, and that the cost of education may not be constant during the interval. The present article explores this in a developing country setting, and seeks to understand what happens when there is an exogenous shock to the price of education and the educational attainment decision has already been made for the older sibling. By isolating the allocation effects of a price change intervening at the optimum, some features of household behavior can be studied.

Intra-household resource allocation has been broadly examined in the literature, and this article connects to at least two strands of that literature: First, it connects to the theoretical models of spousal labor supply and household specialization, but focuses on sibling allocations instead of spousal allocation. Second, it relates to empirical studies on sibling rivalry, the competition for resources between siblings living in the same household. Furthermore, it adds to the literature on peer effects in the labor market, by looking at a particular peer group: siblings. Because of inherent endogeneity issues in social networks, which particularly apply at the household level due to of resource pooling and centralized decisions, estimating sibling effects is plagued with a number of empirical challenges to identification. Manski (1993) conveniently distinguishes three types of peer effects that can be translated to the intra-household context. *Exogenous* effects refer to the effects of individuals' characteristics on the outcomes of their siblings, while *endogenous* effects reveal the direct impact of an individual's outcome on the outcome of his/her siblings. These *real social effects* (Bramoullé, Djebbari, and Fortin 2009) further need to be distinguished from *correlated* effects, which refer to shared environmental factors. In this paper, I am interested in the net real effects of younger siblings' schooling on their elders. Specifically, I estimate the impact of a change in

younger siblings' educational attainment on their older siblings' occupational status. Although household labor allocation as well as sibling rivalry have previously been studied in the literature, these studies have a different focus from the present one. In household allocation studies, education is either measured as a household average (Fafchamps and Quisumbing 1999; Jolliffe 2004; Micevska and Rahut 2008), or the education of a single member is used (Jogo and Hassan 2010). Moreover, studies of sibling rivalry tend to focus on explaining educational attainment through sibship composition. In contrast, this article focuses on occupational allocation, measured through the change in labor market outcomes among older siblings following an increase in educational attainment of their younger brothers and sisters. To the best of my knowledge, this is the first article to attempt to identify sibling occupational spillover effects in a developing country setting.

I make use of a subsample of the 1980 census data which comes from the Indonesian statistical institute (Badan Pusat Statistik, BPS). The size of the sample implies that I can revisit the empirical strategy used by Duflo (2001), who showed evidence of returns to education from a large school construction program in Indonesia. The time period in which the program was implemented signifies that siblings born before 1963 can be used as a control group. I thus look at the impact of younger siblings' education on older siblings' outcomes, an approach that may be considered less "natural" than the opposite—looking at the influence of the latter on the former. There is however no reason for spillover effects not to operate in the direction of younger to older siblings. Rather, through this approach, it is possible to estimate an occupation³⁸ effect that is distinctly free from effects driven by educational mimicking between siblings. Using the *partial-population* approach (Moffitt 2001) to identify direct sibling effects, I find that an exogenous increase in education of younger siblings displaces housekeeping for their older siblings, increasing their probability of taking up market work. Although the mechanisms are hard to disentangle, subsequent analysis suggests that positive spillover effects are the main channel at work. The next section discusses the mechanisms that may allow for sibling education to have an impact on the occupation on their older siblings. Section 3 presents some of the related literature. Section 4 discusses family life in Indonesia and presents the data used. Section 5 lays out the econometric framework. Section 6 presents the results, and the last section concludes.

³⁸In the following, I refer to occupation in the sense of "any activity in which a person is engaged", rather than "job" or "profession".

2 Conceptual framework

Despite extensive study in the past decades, we are still far from precisely understanding how households allocate resources between children, and the number of determinants of schooling found in the literature suggests that the decision is a complex one. The natural starting point is Becker (1965, 1981) who defined a human capital investment model according to which parents invest in their children's human capital until the marginal return equals the marginal cost. In the absence of credit constraints, this implies that parents continue to invest in children as long as their return exceeds the market interest rates. With credit constraints, the market interest rate is replaced by the interest rate at which parents can borrow. The early versions of the investment model assumed that all children in a household faced equal returns to education, and therefore received equal shares of educational resources from parents. Even with different endowments but under child-neutral preferences, as long as costs of quality improvements (increased educational attainment) are linear, parents will adopt compensating behavior so as to equalize educational attainment among children. The focus on parental preferences was intensified in later work by Behrman, Pollak, and Taubman (1982). They develop two models, one *separable earnings-bequest* model where parents' preferences over children's earnings distribution are supposed to be independent from their preferences over bequest. An alternative, the *wealth* model, instead worries about final future income and bequests are a way of compensating for earnings differentials. The wealth model therefore explicitly supposes transferable utility over the lifetime. In that case, even with perfect access to credit, it makes sense for parents to educate their children according to ability, maximizing total household income and then distributing it between children according to preferences.

Both of the above frameworks however assume that child earnings are separable from parental consumption in parental utility functions, a somewhat problematic assumption in the context of a low-income country with extended family living together, and where every member is contributing to household income. In situations where households are constrained to choose between schooling and child labor, the choice of sending children to school directly affects parental consumption. The investment in a child's education implies foregone consumption in the present, since it reduces the time the child can allot to work. Low-income countries also differ from high-income countries in another important aspect: formal social safety nets are to a larger extent missing, and households often rely on market labor and domestic production simultaneously. When ability differs between children, parents can opt for specialization (as long as the cost of education is linear),

having the most educated and able children do market work, and the least educated ones stay in the household. Increasing returns to occupations has been used to rationalize the labor division within couples. Becker's model of couple's labor supply (Becker 1981) for example argues that these increasing returns suffice to make two identical household members specialize in opposite occupations (such as home production and market work). If any member has an innate comparative advantage in one activity, that member should specialize in that activity. Becker somewhat controversially argued that biological differences cause women to have a comparative advantage in home production—a comparative advantage that is amplified by investments in home production skills that are rewarded in the marriage market (Altonji and Blank 1999). Gronau (1977) develops a model in which a one-person household chooses between leisure, market work and home production according to exogenous parameters such as the wage. In his general model, an increase in wages is always associated with a decrease in home production, since through a wage increase the time cost of market goods decreases, as does the value of home production. Wage increases are thus associated with shifts from domestic production to market work. Extending this model to a multi-person household would imply that two adjustments operate if education indeed increases the return to market work but not to work in the family business: households should decrease the share of work in family business, and relatively educated members should dedicate less time to the family business and more to market work. The opposite should be true for the relatively uneducated members.

In general, when markets are imperfect and resources limited, siblings compete for resources within households. Such sibling rivalry has been studied empirically in several developing countries, focusing on birth order, family size and gender. Garg and Morduch (1998) study child health outcomes in Ghana from the perspective of sibling rivalry, arguing that in pro-male bias societies, there are gains to having relatively many sisters rather than brothers. This gender gap may increase or decrease with income, depending on the shapes of the gender-specific health return curves. If the functional form is such that marginal returns converge, the gender gap is bound to close as income rises.

In fine, the theoretical predictions from a scenario in which there is an exogenous increase in the education of one child hinge on assumptions about: parental preferences, which can be egoistic or altruistic (if altruistic, they can be child-neutral, or exhibit preferences for specific children, such as boys); credit constraints: in the presence of credit constraints, scarce resources may imply that low birth rank children may have been able to get educated, while younger children may not, since the older children were relatively

Table 14: Potential impacts of an exogenous shock to younger siblings' (A) education

Channel	Effect on older siblings' (B) market work	Mechanism
Specialization	Decrease	The relative market return of sibling B is decreasing in sibling A's educational attainment. The household resorts to occupational specialization and lowers B's amount of market work in favor of work in the household.
Income effect	Decrease	Sibling A's earnings suffice for the family and B does no longer need to work.
Rivalry	Increase/decrease	Sibling A's education improves his/her bargaining power, leading him/her to choose what occupation he/she is affected to.
Spillover effects	Increase	Sibling A's education brings beneficial job opportunities for B, shifting B into the labor force.
Resource constraints	Increase	Sibling B is induced to work to finance sibling A's education. Once at work, sunk costs may lead him/her to stay there.

fewer to share the household's resources. This relationship may also be non-linear, since when older siblings grow old enough their market work may allow for younger siblings to stay in school (Emerson and Souza 2008). Finally, parents may be concerned with equality in different outcomes. Whether what matters is the ultimate wealth (or, even more vaguely, utility) or rather the earnings capability of siblings also has implications on the predictions³⁹.

While it would be reductive to ignore household allocation effects in the analysis of occupational destinies, assuming that it is the only mechanism at play would surely be as reductive. When social networks act as information conduits and/or a basis for referral, employment prospects can be improved for network members. Sidestepping household specialization effects, having a more educated sibling could then be associated with better labor market outcomes. According to Kuzubas and Szabo (2016), who rely on data from the Indonesian Family Life Survey, 85% of unemployed in Indonesia in 2007 used family and friends in their job search, and 55% used only this method. Referrals are an important channel through which vacancies are filled, since it theoretically provides a

³⁹As an additional side note, the hypothesis of no child bargaining is most likely unrealistic, especially when children are adults. Yet, few studies have taken into account children's utility (a notable exception is Lundberg, Romich, and Tsang (2009))

possibility for employers to uncover unobservable information on quality that is shared within members of the social network. Di Gropello, Kruse, and Tandon (2011) conclude that 80% of Indonesian firms use private networks to fill vacancies, followed by 50% using employee recommendations. The multitude of potential channels between sibling education and occupations does not dictate a single theoretical framework, and as many previous studies (Garg and Morduch 1998; Morduch 2000; Ota and Moffatt 2007), this article takes an empirical stance. Table 14 sums up the potential channels through which an increase in younger siblings' education can modify the occupation of his/her older siblings.

3 Related literature

3.1 Sibling rivalry and household resource allocation

A strand of the household allocation literature focuses on sibling rivalry: the idea that siblings compete for resources in the household, and that the allocations depend on gender, sibship size and birth order. Rivalry in education is perhaps the most studied topic: Ota and Moffatt (2007), using data from a field survey in Andhra Pradesh, investigate the explanatory factors in the intra-household schooling decision. Focusing on sibling composition, they show that birth order and gender are important determinants of schooling; as important as other household characteristics such as household income. Interestingly, parental educational attainment does not play a significant role— a finding that might suggest bias in many studies of educational demand that do not take into account the relative position of children in the household. Morduch (2000) compares the impact of sibship sex composition on educational attainment in Tanzania and South Africa, finding evidence that conditionally on birth order and household size, the share of older sisters is positively correlated with education in the first country, although not in the second. Parish and Willis (1993) also report a positive correlation between the share of older sisters and education using data from Taiwan. Drawing on household surveys from Sri Lanka, on the other hand, Himaz (2010) somewhat surprisingly finds that parents spend more on education for girls than boys in the Sri Lankan context.

Another strand of the intra-household resource allocation literature focuses on the allocation of labor between farm and non-farm activities. Jolliffe (2004) looks at farm returns to education in Ghana, and the correlation between education and farm work. His results indicate that returns to education are lower for farm work than for work

outside the farm, and that higher educated household members have a higher probability of working outside the farm. Fafchamps and Quisumbing (1999) study the allocation of labor in Pakistan, and similarly find that an increase in education leads to higher productivity in off-farm activities, and causes households to divert resources away from farm production. Micevska and Rahut (2008) report an analogous finding for rural households in the Indian Himalayas. Another source of consistent evidence comes from Jogo and Hassan (2010), who report that education in rural Limpopo, South Africa, has led to increased activity in the non-farm sector, which has had the beneficial externality of decreasing pressure on local wetlands ecosystems. Klasen, Priebe, and Rudolf (2013) apply a labor allocation model in the spirit of Jolliffe (2004) to Indonesian households in Central Sulawesi, studying crop choice. Although not the central result of their paper, they find that education is positively correlated with non-agricultural wage labor and negatively correlated with agricultural wage labor. Pitt and Rosenzweig (1990) investigate how changes in infant morbidity modifies the time allocation in Indonesian households. They conclude that infant morbidity exacerbates the gender-specific allocation of resources: it leads teenage girls, to a larger extent than boys, to devote time to household activities, drop out of the labor force and of school.

The household labor allocation literature does not explicitly take into account sibling trade-offs, but rather uses averages to explain transformations of the household labor force. Furthermore, despite numerous studies of rivalry in educational attainment, and of intergenerational sibling correlations in wealth, wages and other outcomes, little is known about the influence siblings exert on each other in time allocation. Due to endogeneity, sibling effects are hard to distinguish from *correlated effects* (Manski 1993), and finding suitable instruments for individual family members is a difficult task.

3.2 Estimating sibling effects

The difficulty in estimating sibling effects emanates from at least two sources: first, as in any social network, *homophily* is likely to characterize the network, with between-member similarities in behavior, attitudes and socioeconomic status. Such similarities are likely to be especially strong between siblings, since shared environmental and genetic components are an inherent feature of sibships. Methods that do not control for selection into the network thus fail to produce consistent estimates of peer effects. Second, more than in other social networks, siblings carry out numerous economic transactions with one another since they are part of the same household, in which decisions on resource allocations are taken

jointly (at least to some extent). Studying sibling interactions thus requires exogenous sources of variation in specific sibling outcomes unrelated to household decision-making. Generally, such instruments originate from outside the household. The partial population approach advocated by Moffitt (2001) has been used to identify peer effects, and makes use of the fact that a subset of the peer group is affected by an exogenous event modifying their probability to achieve an outcome. Relying on this method, Aparicio-Fenoll and Oppedisano (2015) make use of the introduction of a Spanish rental subsidy targeting youth in the age range 22-29 and find a positive spillover effect between siblings in leaving their parents and setting up independent households. Similarly, Nielsen and Joensen (2015) make use of a short-term policy scheme in Denmark that permitted young adults to choose math and science trajectories in college at a lower cost. Their results conclude that having an older sibling choose math and sciences increases the probability of younger siblings to do so by 2-3 percentage points. In Norway, Monstad, Propper, and Salvanes (2011) make use of an educational reform to identify a causal relationship between siblings in teenage motherhood. Specifically, they use a modification in the school-leaving age as an instrument for older sisters' teenage motherhood, on the grounds that staying in education tends to delay the birth of a first child. They find evidence of direct sibling influence, especially when siblings are close in age and for women from poor households. The effect is quite large. An older sister being a teenage mother increases the probability of the younger sister to be a teen mother by 24 percentage points.

The partial overlapping peers strategy (De Giorgi, Pellizzari, and Redaelli 2010) makes use of the fact that individuals usually belong to multiple groups, which imperfectly overlap. In an example drawn from educational influence this corresponds to the fact that siblings and schoolmates are two distinct (non-overlapping) peer groups, and relies on the assumption that a given sibling may be influenced by his school mates' achievement, but that his school mates' achievement has no direct effect on the achievement of his siblings. This methodology was used by Nielsen and Joensen (2015) to test for spillover effects in school achievement using English administrative data. They find evidence of spillover effects from older to younger siblings, but not the other way around. Furthermore, these effects are higher for siblings from low-income backgrounds. A similar method to identify peer effects has been termed multiple reference groups. Both methods are interesting since the membership of several groups permits separate identification of *endogenous* and *exogenous* peer effects. Laschever (2009) looks at the impact of unemployment of World War I veterans on the unemployment of members of their military unit, finding large positive endogenous effects. Lee (2007) also relies on group structure for identification,

and shows that variable group sizes can allow for identification under certain conditions. Bramoullé, Djebbari, and Fortin (2009) develop a more general model that nests many previous models, such as Lee (2007), Manski (1993), and Moffitt (2001). Finally, Brutti (2013) also studies sibling influence on cognitive skills using the National Longitudinal Survey of Youth, finding positive effects on both verbal reasoning and mathematics test scores. Her method is an alternative one, using system GMM to achieve identification of a dynamic model of cognitive skill production.

4 Data & context

4.1 Family life in Indonesia

As in other developing countries with high growth rates, fertility rates in Indonesia have decreased while life expectancy has increased in the last decades (Frankenberg, Chan, and Ofstedal 2002). Intergenerational linkages are strong (according to *adat*, traditional law, children are required to care for their parents), and coresidence is common, especially when parents are not working. Since the social security system is underdeveloped, elder parents rely on their children as they grow older. Johar and Maruyama (2011) study coresidence in Indonesia and find that family decisions are often driven by the gains and costs of children. They show, using data from the Indonesian Family Life Survey, that the proportion of elderly parents living with a child has dropped from approximately 65% in the 1990s to slightly above 50% in 2007. However, the authors find no evidence of adverse economic events affecting the probability of cohabitation. Instead, cohabitation correlates positively with having a large number of children, and parents more often live with their married daughters than with their married sons. Nonetheless, the extreme ethnic diversity of Indonesia makes any attempt at generalization difficult. Buttenheim and Nobles (2009) study marriage behavior in Indonesia from an ethnic lens. Depending on the ethnic group, a newly wed couple might adopt virilocal (living with the husband's parents), uxorilocal (living with the wife's parents), ambilocal (living with either or both spouses' parents) or neolocal (forming a new household) practices. The length of coresidency and the conditions under which it ends also vary between ethnic groups. That being said, on Indonesia's largest island, Java, nuclear households seem to be the norm (Buttenheim and Nobles 2009), at least in the last decade. Kevane and Levine (2003) make use of the area-specific post-marriage residence patterns to examine whether virilocality correlates with low investment patterns in girls (since girls in these areas are moving off after marriage, parents may be less inclined to invest in them). They find that

although virilocal regions have other norms unfavorable toward women, the women in these regions do not display any significant disadvantages in terms of education, height or weight. Witoelar (2006) studies home leave in Indonesia from the remaining household's perspective and finds that household size and the maximum education of a member are important determinants of household division.

Hsin (2007) looks at the time allocation of children in Indonesia using time diary data. She finds that girls of all birth ranks and all sibship sizes work in some kind of activity (market or household), and dedicate more than twice the amount of time to work relative to boys. Complementary qualitative evidence from focus group discussions in a rural village in Java suggests that parents want similar education for their children, and rarely substitute school for work. Thomas et al. (1999) compare Indonesian households before and after the economic crisis that hit the country in 1997-1998, showing that although a significant negative impact was felt throughout the wealth distribution, the largest increase in food consumption as a share of the budget was found in the poorest families. Furthermore, the decline of health and education in consumption shares was particularly large in households with relatively more children in ages 10 to 14.

Finally, the "missing daughters" problem prevalent in other regions of Asia does not seem to exist in Indonesia. Kevane and Levine (2000) document past and present gender favoritism in Indonesia, and contend, looking at birth spacing and nutrition allocations from 1940 to 1990, that there has been no son preference in Indonesia during this period. They argue that there has been a slight gender difference in educational attainment and inheritance, but that the gaps have narrowed in recent times (and disappeared altogether for primary education). Furthermore, in their article on post-marriage residency, they present evidence that son preference does not exist in virilocal areas. Using the 2010 census, Guilmoto (2015) nuances these results, showing that in some regions, patterns of son preference do emerge.

4.2 The 1980 census data

I rely on a sample of the 1980 Indonesian census to investigate the relationship between educational outcomes and older siblings' occupational status. A subsample of the census data, gathered every 10 years, is made available online through the IPUMS project hosted at the University of Minnesota. Furthermore, intercensal data is available for 1985, 1995, 2005. The subsample fraction is 5%, and consists of 7 234 577 records for

Table 15: Descriptive statistics, 1980 census survey sample

	Full sample	>14 years old.	>17 years old
Age	13.3	17.84	20.3
Female	0.478	0.464	0.45
Married	0.04	0.10	0.17
Ever school	0.91	0.91	0.90
Currently in school	0.66	0.35	0.21
Years schooling	3.85	5.98	6.57
Employed*	0.49	0.55	0.58
Unemployed*	0.03	0.04	0.04
Inactive*	0.48	0.41	0.38
Days worked last week‡	5.9	5.9	6.0
Hours worked last week‡	37.3	38.6	40.1
Self-employed‡	0.31	0.31	0.33
Unpaid family work‡	0.38	0.35	0.31
Employee‡	0.30	0.33	0.36
Idle‡	0.64	0.57	0.54
Housework‡	0.33	0.41	0.44
Years schooling older sibling	5.16	6.2	6.51
Age older sibling	17.1	21.1	23.4
Older sibling female	0.457	0.427	0.417
Older sibling married	0.12	0.24	0.31
Mean age difference	3.76	3.3	3.2
Sibship size	4.2	4.5	4.6
Older sibling in school	0.418	0.178	0.095
		<i>Older sibling activity</i>	
Employed*	0.57	0.63	0.64
Self-employed‡	0.33	0.34	0.35
Employee‡	0.31	0.35	0.38
Unpaid family work‡	0.35	0.30	0.26
Second job‡	0.08	0.08	0.08
Services sector‡	0.18	0.24	0.30
Inactive*	0.40	0.34	0.32
Housework‡	0.41	0.47	0.48
Idle‡	0.57	0.51	0.49
Observations	1 061 779	368 049	165 855

Sample: 1 061 779 Individuals between 6 and 30 years old, with at least one older sibling (12-30 y.o.) living in the household. *: Of out-of-school individuals more than 10 y.o..

‡: out of employed individuals; ‡: out of inactive out-of-school individuals.

the 1980 sample. While the strong point of the census data is its size, this comes with the drawback of a relatively modest number of questions in the questionnaire. Since the census and intercensal data are cross-sectional, any siblings out of the household are unaccounted for in my estimates, and the data does not provide any information on such out-of-household members. I therefore choose to use 1980 data, since the exogenous source of variation that I will exploit, the INPRES program of school construction, was implemented nationally from 1974 through 1978. I thus aim to keep the number of siblings lost to migration and establishment of independent households to a minimum.

The IPUMS subsample is composed by households who answered a longer questionnaire, containing information on dwelling characteristics, local infrastructure and assets. The individuals of those households answered an individual form with brief information on fertility, education, activity status, occupation, health and migration. No information on income or consumption was gathered. I restrict the sample used to children of the household head, from 6 to 30 years old and who have at least one older sibling in the same age range living in the household. This reduced sample amounts to 1 061 779 observations of sibling pairs. The choice of 30 was made to include as many sibling pairs as possible. However, in practice, children of the household head still living in the household at the age of 30 are relatively rare, as can be seen in the skewed age distribution in Table 30 (Appendix). The population of older siblings is not representative of the general population in the same age range, since it excludes all individuals who have moved away from their parents. Table 15 shows some descriptive statistics from the sample. The average age difference between siblings is 3.8 years, which is somewhat reassuring since this ensures that on average, sufficient time has run between births for children to be differently exposed to the school construction program. It also indicates rather low schooling levels in Indonesia in 1980. On average children over 18 years of age in 1980 have been to school 6.5 years, which corresponds to an elementary school level.

The sample of out-of-school younger siblings is roughly partitioned in half into inactive and employed individuals (Table 16). I consider as *inactive* those individuals aged 10 years or more who are out of school, and who are not working or looking for work⁴⁰. They come in two main categories: those who declare doing *housework* (domestic chores) as their main occupation, and those who are inactive for other reasons, which I classify as *idle*. Remaining inactive persons belong to the category "unable to work/disabled",

⁴⁰This thus corresponds to individuals who are NLFET—not in the labor force, nor in education or training.

Table 16: Composition of the sample of out-of-school children more than 10 years old

	Employed	Unemployed	Inactive
Self-employed	49 787		Housework 52 437
Employees	49 567		Unable to work/disabled 5 109
Unpaid family workers	62 424		Idle 100 350
Unknown	914		
Total	162 692	9 600	157 896

Source: 330 188 census observations of out-of-school individuals 10-30 years old.

which represents a small share of the population. The class of active individuals contains those who are 10 years or above, out of school, and either work or look for a job. Among workers, three categories (similar in size) are distinguished: employees, self-employed and family workers.

5 Econometric specification

I am interested in the influence of younger siblings' educational attainment on the labor market destinies of their older siblings. Since siblings influence each other mutually, I first consider a two-sibling model as in Oettinger (2000) or Moffitt (2001), where a younger sibling y and an older sibling o each live in household j :

$$\begin{aligned}
 Y_{o(j),t} &= \beta_{11}Y_{y(j),t} + \beta_{12}X_{j,t} + \beta_{13}E_{o,t} + \beta_{14}E_{y,t} + \gamma_j + \delta_t + \epsilon_{o,t} \\
 Y_{y(j),t} &= \beta_{21}Y_{o(i),t} + \beta_{22}X_{j,t} + \beta_{23}E_{y,t} + \beta_{24}E_{o,t} + \gamma_j + \delta_t + \epsilon_{y,t}
 \end{aligned}
 \tag{34}$$

In this formulation, the older sibling's outcome Y_o depends on the younger sibling's outcome Y_y , on a vector of observed family characteristics X_j , on vectors of observed characteristics of the older and younger siblings E_o , E_y (years of schooling in the estimations), on unobserved time and household-specific effects common to the siblings, and on an idiosyncratic error term. The parameter β_{i1} corresponds to the *endogenous* (Manski 1993) or direct sibling effect, while the parameter β_{i4} refers to the *exogenous* sibling effect. The *correlated* effects are summed up in the parameter γ_j and in the assumption that $Cov(\epsilon_o, \epsilon_y) \neq 0$.

We can simplify the above two-equation model by substituting $Y_{y(j)}$ into $Y_{o(j)}$. By substituting in Equation 34 the following reduced form expression can be obtained for older siblings' outcomes:

$$Y_{o(j),t} = \theta X_{j,t} + \lambda E_{y(j),t} + \rho E_{o(j),t} + \tau_j + \zeta_t + \sigma_{y(j),t} \quad (35)$$

Where $\theta = (\frac{\beta_{11}\beta_{22}+\beta_{12}}{1-\beta_{11}\beta_{21}})$, $\lambda = (\frac{\beta_{11}\beta_{23}+\beta_{14}}{1-\beta_{11}\beta_{21}})$, $\rho = (\frac{\beta_{11}\beta_{24}+\beta_{13}}{1-\beta_{11}\beta_{21}})$, $\tau_j = (\frac{1+\beta_{11}}{1-\beta_{11}\beta_{21}})\gamma_j$, $\zeta_t = (\frac{1+\beta_{11}}{1-\beta_{11}\beta_{21}})\delta_t$ and $\sigma_{y(j),t} = \frac{\beta_{11}\epsilon_{y,t}+\epsilon_{o,t}}{1-\beta_{11}\beta_{21}}$. Estimating this model amounts to estimating an individual fixed effects model on the older sibling, and does not permit the parameters of interest β_{11} and β_{14} , to be recovered. As pointed out by Moffitt (2001), and earlier Manski (1993), this model can however tell us whether or not any social effects (endogenous or exogenous) are present, since if $\beta_{11} = 0$ and $\beta_{14} = 0$, then $\lambda = 0$, and neither younger siblings' characteristics nor their outcomes have any impact on older siblings. If, in equation 35, however, λ is significant, we can affirm that some sort of social effect is present⁴¹. That is, the characteristics of younger siblings are related to the outcome of older siblings either directly, (via the exogenous effect) or indirectly through their impact on younger siblings' outcomes (the endogenous effect). However, the assumption of conditional independence of errors is unlikely to hold, even in the reduced form specification. If $Cov(E_y, \epsilon_y) \neq 0$ or $Cov(E_y, \epsilon_o) \neq 0$, the estimator is biased and $\hat{\lambda}$, the net social effect on the older sibling from younger sibling's education, is not identified.

I will, in the following section, estimate equation 35, *i.e.* the reduced form of equation 34. The estimated effect, $\hat{\lambda}$, is thus a scaled sum of the *direct* effect β_{14} from younger siblings' education on their older siblings' occupational status, and an *indirect* effect (involving β_{23} and β_{11}) of education passing through the younger sibling's own occupational status. Such reduced forms in the sibling effects literature have previously been estimated by Monstad, Propper, and Salvanes (2011) and Nielsen and Joensen (2015). Identification relies on finding an exogenous source of variation for the younger sibling's educational attainment in equation 35. In the following section, the increase in school availability

⁴¹Although, strictly, we could be confronted with the improbable case that $\beta_{11}\beta_{23} = -\beta_{14}$. In this case, $\lambda = 0$ does not imply that no social effects are present.

due to the INPRES construction program is used as an instrument for younger siblings' education.

6 Evidence from the INPRES program

The INPRES program of primary school construction is one of the most studied public schooling interventions in developing countries. The most famous account of the program's success comes from Duflo (2001), showing that the school construction program increased educational attainment of a generation of Indonesians, and that wage returns resulted from this increase in schooling. I here use census data from 1980 to examine the link between education and sibling occupations in Indonesia. Although cross-sectional, the size of the samples and the amplitude of the program imply that there is power enough for a parsimonious specification to be set. The choice of 1980 was motivated by a willingness to ensure that most of the individuals who were affected by the program still live in their original households as children of the household head. Since there is evidence that educational attainment precipitates household division in Indonesia (Witoelar 2006), minimizing bias due to sample selectivity is important as those who leave the household may compensate for any effect found on remaining siblings.

The INPRES program was an ambitious school construction program, carried out in Indonesia between 1974 and 1978. More than 60 000 primary schools were built across the country, improving educational attainment of millions of Indonesians. The program was designed to first target areas with little endowment in educational structures, but by the end of the program, the whole country was covered. The school construction data contains information on the number of primary schools built between 1974 and 1978, and is defined at the regency (*kabupaten*) level, a subdivision of provinces. There are 286 kabupaten in the 1980 census dataset—an average of 11 per province. The impact of the program on an individual is thus related to his/her age in 1974, and the intensity of the program in the kabupaten in which he/she lives. Following Duflo (2001), I assume that those aged 13 or older in 1974 were too old to benefit from the program, that those aged 7-12 in 1974 partially benefited from the program, and that those aged 0-6 in 1974 fully benefited from the program. The educational attainment equation in Duflo (2001) is written as follows:

$$E_{i,r,k} = \alpha + c_k + \beta_r + \sum_{k=6}^{17} (P_r \times d_{i,k}) \gamma_k + \sum_{k=6}^{17} (C_r \times d_{i,k}) \delta_k + \epsilon_{i,r,k} \quad (36)$$

With $E_{i,r,k}$ being the educational attainment of individual i living in regency r , and who is of age k in 1980. c_k is thus an age dummy, β_r a regency dummy, $\sum_{k=6}^{17} (P_r \times d_{i,k}) \gamma_k$ a set of interactions between program intensity and age, $\sum_{k=6}^{17} (C_r \times d_{i,k}) \delta_k$, a set of interactions between age and regency-specific infrastructure, and $\epsilon_{i,r,k}$, an error term. As shown by Duflo, interactions between program intensity and birth year are strong predictors of educational attainment in the 1995 intercensal data she uses. Table 17 shows that the program intensity \times age dummy interaction is a strong predictor of years of schooling in the 1980 intercensal data as well, when the sample is restricted to individuals below 18 years (thus being in birth cohorts 1 (fully affected) and 2 (partially affected), and who have a closest older sibling aged 18 years or more (thus being in birth cohort 3 (unaffected)). The reference group for the instruments is the interaction between the dummy for being 17 years and program intensity, measured as the regency-specific number of schools constructed between 1974 and 1978 per 1000 children. Given the nature of the program—school construction—the increases in educational attainment most likely reflect children not intended for school being induced to go to school. If the effect reflected an increase in the number of years of schooling, at constant initial enrollment, a positive effect should not have been found for ages as young as 6 or 7. The coefficients show that each additional school built per 1000 children increased average educational attainment with less years the older the child. At 10 years old in 1974 (16 in 1980) the coefficient is close to 0 and the effect is only statistically significant at the 10% level.

My identification strategy is analogous to the partial populations approach previously used to estimate sibling effects (Monstad, Propper, and Salvanes 2011; Nielsen and Joensen 2015). The aim is to use the INPRES school construction program as an exogenous source of variation of schooling within sibling pairs, reducing the sample to siblings of different birth cohorts, with different exposures to the program. Hence, I estimate the impact of program-induced schooling increases of younger siblings on occupational outcomes of siblings too old to have been affected by the program. In the second stage, various variables reflecting older siblings' labor market status are used as outcome variables, and a set of characteristics of the younger and older siblings as

dependent variables. The sample is then restricted to include only sibling pairs where the older sibling was too old to have benefited from the program, and the younger one was sufficiently young to have been able to benefit. Furthermore, only those sibling pairs where the older sibling is out of school are kept for the estimations. Since the unit of observation is a sibling pair with no siblings in between them, and I restrict sibling pairs to be of different cohorts, the number of pairs per household is restricted to one. This implies that a household fixed effect cannot be added to the model and the household fixed effect is contained in the error term. However, in presence of a strictly exogenous variation in schooling, the addition or removal of household dummies should not modify the coefficients obtained in the first stage. The coefficient of interest is γ_2 , which gives the total effect of younger siblings' education on older siblings occupational status:

$$Y_{o,r,k} = \alpha + c_{y,k} + c_{o,k} + \beta_r + \gamma_1 E_o + \gamma_2 E_y + \delta_1 X_y + \delta_2 X_o + \sum_{k=18}^{30} (C_r \times d_{o,k}) \delta_k + \sum_{k=18}^{30} (P_r \times d_{o,k}) \gamma_k + \epsilon_{i,r,k} \quad (37)$$

In this regression, $Y_{o,r,k}$ refers to the labor market outcome of an older sibling, living in regency r and who is of age k . α is a constant, $c_{j,k}$ are age dummies for the younger and older sibling alike (thus, the age gap effect is accounted for), β_r is a regency dummy, E_j the years of schooling of both siblings, X_j other characteristics of both siblings (sex, school status, birth order), $\sum_{k=18}^{30} (C_r \times d_{o,k})$ an interaction between the older sibling's age and area-specific water and sanitation expenditure, $\sum_{k=18}^{30} (P_r \times d_{o,k})$ an interaction between the older sibling's age and program intensity, and $\epsilon_{i,r,k}$ an error term. The choice of age dummies over birth cohorts was motivated by a willingness to finely capture the effect of age, which is likely to be a strong predictor of labor market outcomes for youth in our age range. The inclusion of interactions between program intensity, water and sanitation expenditure and older sibling's age as controls is motivated by the necessity to ensure that local labor market effects from the program did not drive the effects on the older sibling. Finally, through including age dummies for both siblings, as well dummies for the size of sibships and number of younger siblings, exhaustive information on the birth rank, sibling pair age difference and sibship composition is included. Given that birth order and gender have been highlighted as significant determinants of education in studies on sibling rivalry (*e.g.* Ota and Moffatt (2007)), the inclusion of exhaustive sibship information as controls is relevant. Summing up, I thus regress the outcomes of

siblings too old to have been affected by the program on the educational outcomes of their younger siblings, controlling for regency effects, cohort effects, sibling sex composition, older sibling education, the age difference between siblings and interactions between older sibling age and program intensity and water and sanitation expenditure. Using the interaction between program intensity and younger siblings' age as an instrument for younger siblings' education in equation 37, I interpret γ_2 as the causal effect of an additional year of younger siblings' schooling on older siblings' occupational outcomes. As previously mentioned, this includes both a direct effect of younger siblings' education, and an indirect effect passing through any variation in the younger sibling's occupational status induced by his/her educational attainment.

Table 17: Estimates of younger siblings' years of education (First stage)

Variables	Coeff.	S.E.	t-stat	95% confidence interval
<i>Age (years)</i>				
7	0.194	(0.125)	1.547	-0.0517 - 0.439
8	0.943***	(0.123)	7.638	0.701 - 1.185
9	1.528***	(0.111)	13.81	1.311 - 1.745
10	2.351***	(0.107)	21.94	2.141 - 2.561
11	3.115***	(0.109)	28.59	2.902 - 3.329
12	3.802***	(0.103)	37.02	3.600 - 4.003
13	4.368***	(0.103)	42.45	4.167 - 4.570
14	5.003***	(0.102)	49.17	4.803 - 5.202
15	5.250***	(0.100)	52.31	5.053 - 5.447
16	5.579***	(0.100)	55.58	5.382 - 5.775
17	5.812***	(0.101)	57.36	5.613 - 6.011
<i>Ref: 6 years old</i>				
Female	-0.342***	(0.00811)	-42.20	-0.358 - -0.326
Older sibling female	0.394***	(0.00823)	47.86	0.378 - 0.410
Yrs. school older sib	0.367***	(0.00156)	235.0	0.364 - 0.370
<i>Age (older sibling)</i>				
19	0.0918***	(0.0332)	2.762	0.0267 - 0.157
20	0.0307	(0.0334)	0.919	-0.0347 - 0.0961
21	0.108**	(0.0481)	2.250	0.0139 - 0.202
22	0.247***	(0.0509)	4.841	0.147 - 0.346
23	0.122*	(0.0641)	1.901	-0.00379 - 0.248
24	0.180**	(0.0752)	2.390	0.0323 - 0.327
25	0.109	(0.0691)	1.575	-0.0266 - 0.244
26	0.180	(0.122)	1.473	-0.0595 - 0.420
27	0.423***	(0.123)	3.428	0.181 - 0.664

28	0.295**	(0.147)	2.010	0.00739 - 0.583
29	0.301	(0.200)	1.502	-0.0917 - 0.693
30	0.342**	(0.169)	2.026	0.0112 - 0.674

Ref: 18 years old

Instrument: Age × program intensity

6 x prog intensity	0.497***	(0.0484)	10.27	0.402 - 0.592
7 x prog intensity	0.542***	(0.0417)	12.98	0.460 - 0.624
8 x prog intensity	0.457***	(0.0408)	11.19	0.377 - 0.537
9 x prog intensity	0.443***	(0.0300)	14.78	0.384 - 0.502
10 x prog intensity	0.346***	(0.0271)	12.74	0.293 - 0.399
11 x prog intensity	0.295***	(0.0294)	10.01	0.237 - 0.352
12 x prog intensity	0.238***	(0.0223)	10.65	0.194 - 0.282
13 x prog intensity	0.214***	(0.0224)	9.545	0.170 - 0.258
14 x prog intensity	0.153***	(0.0211)	7.269	0.112 - 0.194
15 x prog intensity	0.0760***	(0.0193)	3.939	0.0382 - 0.114
16 x prog intensity	0.0345*	(0.0192)	1.797	-0.00313 - 0.0722

Ref: 17 × prog. intensity

Older sibling age × program intensity

18 x prog intensity	0.0688	(0.0785)	0.876	-0.0850 - 0.223
19 x prog intensity	0.0682	(0.0790)	0.862	-0.0867 - 0.223
20 x prog intensity	0.0464	(0.0789)	0.588	-0.108 - 0.201
21 x prog intensity	0.111	(0.0809)	1.367	-0.0480 - 0.269
22 x prog intensity	0.0765	(0.0816)	0.937	-0.0834 - 0.236
23 x prog intensity	0.119	(0.0844)	1.415	-0.0460 - 0.285
24 x prog intensity	0.0562	(0.0860)	0.653	-0.112 - 0.225
25 x prog intensity	0.0663	(0.0839)	0.790	-0.0981 - 0.231
26 x prog intensity	0.0331	(0.0972)	0.340	-0.157 - 0.224
27 x prog intensity	-0.0361	(0.102)	-0.355	-0.236 - 0.163
28 x prog intensity	0.0353	(0.105)	0.335	-0.171 - 0.242
29 x prog intensity	0.0476	(0.128)	0.373	-0.203 - 0.298

Ref: 30 x prog. Intensity

Other dummies

Kabupaten (<i>regency</i>)	Yes
No. younger siblings	Yes
Sibship size	Yes
O.S. age × water/san. exp.	Yes

Constant	-2.627***	(0.194)	-13.53	-3.008 - -2.247
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Observations 212,282

R-squared 0.482

F-stat for *Age * Program intensity*: 60.9.

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

From the first-stage estimation in Table 17, it can be seen that younger siblings' education is positively correlated with their age, as expected. For their older siblings, no clear relationship between age and schooling of the younger sibling appears. Being a female is associated with less schooling, as commonly observed in many developing countries. In general, if females are destined for the marriage market, and if this entails leaving the household or the labor market, their job marketable skills are of less relative value than those of boys. However, this argument somewhat fails to hold for this sample, where the share of girls married and living with their parents is higher than that of boys. The results also show a correlation between siblings in terms of schooling attainment, with an additional year of schooling for the older sibling implying 0.37 additional years of schooling for the individual. Finally, of most interest, the program intensity \times age interaction shows that children aged less than 4 years in 1974 (thus aged less than 10 in 1980) were the ones who benefited the most from the program. Relatively to them, a 17-year-old, who was 9 years old when the program started, gained almost half a year less of education per school built for 1000 children⁴². As expected, the coefficient decreases continuously with age, such that exposure to the program indeed seems to have contributed to shift children into school. Finally, we see that the age of the older sibling interacted with program intensity has no bearing on the school attainment of the younger sibling. The interactions of older sibling age and program intensity or water and sanitation expenditure are included since they are used as controls in the second stage, ensuring that labor market impacts of elders were not driven by macroeconomic effects related to the impact of school construction on local labor markets.

Table 18 shows the results of a set of regressions run on variables related to the older sibling's occupational status. All columns exclude older siblings who are still in school, such that the effects found should be interpreted as conditional on having left school. The regressions in columns 1, 2 and 6 are run on all individuals with older siblings above 17 years of age and who are out of school. Those in columns 3 and 4 are run on individuals with older out-of-school siblings who are employed. In column 5, the sample consists of individuals with employed older siblings excluding those who work in services in private households. Some results are quite unsurprising. Female older siblings are clearly less destined for the labor force, and more often inactive doing housework. When they do work, they are less likely to be employees or to hold a second

⁴²This probably does not reflect the final educational gap, since children have not yet finished education. It may also pick up differences in entry age, resulting from a willingness to delay school start when the school is located far away from the family home.

Table 18: Main results: Older sibling labor market outcomes

	Older sibling outcomes					
	(1)	(2)	(3)	(4)	(5)	(6)
	Labor force	Housework	Employee	Second job	Services	Married
Yrs. school (IV)	0.0209** (0.00918)	-0.0164** (0.00715)	-0.0144 (0.00968)	0.00811 (0.00745)	-0.0108 (0.00887)	-0.00465 (0.00849)
Female	0.0107*** (0.00367)	-0.0149*** (0.00285)	-0.00235 (0.00454)	0.00193 (0.00333)	-0.00343 (0.00414)	-0.00911*** (0.00336)
Older sib. female	-0.376*** (0.00411)	0.357*** (0.00325)	0.00953** (0.00437)	-0.0185*** (0.00315)	0.0471*** (0.00395)	0.335*** (0.00377)
older sib. yrs. school	-0.0205*** (0.00339)	0.00641** (0.00264)	0.0170*** (0.00369)	-0.00318 (0.00283)	0.0352*** (0.00338)	-0.00917*** (0.00313)
Constant	0.814*** (0.0306)	0.0551** (0.0251)	0.0251 (0.0329)	0.145*** (0.0283)	-0.0220 (0.0317)	0.570*** (0.0269)
Observations	212,282	212,282	131,114	131,095	119,935	212,282
R-squared	0.181	0.227	0.146	0.025	0.138	0.284
First stage <i>F-stat</i> :	60.0	60.0	45.5	45.5	44.0	60.0
Sample mean:	0.65	0.17	0.31	0.08	0.18	0.29

Robust standard errors in parentheses. Additional dummies: Age, sibling age, cohort* water/san. expenditure, regency, older sib. * prog intensity, sibship size, younger sibs.

*** p<0.01, ** p<0.05, * p<0.1

job, and more likely to work in services (rather than industry or agriculture). Finally, they are more likely to be married, which can be interpreted as a prevalence of uxori-local marriage arrangements in the sample⁴³. The coefficient of interest, the one for younger siblings' years of schooling, is positive and significant for labor force participation while the coefficient for housework is negative and significant. The increase in educational attainment of younger siblings thus displaced their elders from inactivity (housework) towards more market work. However, for those already employed, no significant impact on the nature of their job or the propensity to hold a second one was found. Neither did younger siblings' educational attainment influence marriage prospects of older siblings. In terms of size, the coefficients show quite large effects. A child going through a full cycle of elementary school instead of not going to school at all increases the probability that his/her older sibling participates in the labor market by 13.1 percentage points (6×0.0218). Meanwhile, the same child reduces the probability of the elder sibling doing housework as a main occupation by 10.4 percentage points (6×-0.0174). A first glance

⁴³Young women, when married, would to a larger extent live with their own parents than with the husband's parents. Indeed, the proportion of older siblings who are married is only 7% for men while it is 19% for women (not shown). However, the presence of relatively more married girls could also reflect an age phenomenon, where men to a larger extent marry after 30 years of age.

at these results does not suggest that Indonesian households specialize, i.e. divide their children between occupations according to their relative returns in the labor market. Had this been the case, the increase in educational attainment of younger siblings, which decreases the relative return to market labor of older siblings, would have been associated with the opposite movement; a movement towards more housework and less market work.

We can add a relevant dimension to the previous results by taking into account the gender distribution between sibling pairs. Tables 19 and 20 show results from the regressions run above on the four possible gender typologies (the first word denotes the younger sibling): male - male, male- female, female - female, female - male. From the study of the two tables, it can be seen that the labor force displacement effect does not seem to occur when the younger sibling is female. For the case of younger male siblings, both older male and older female siblings increase their labor force participation as the educational attainment of their younger brothers increase. However, only elder sisters significantly reduce their housework time (older male siblings hardly ever do housework). Older girls thus seem to transit from housework into the labor market, while older boys transit from being idle into the labor market. Coefficients, when significant, are larger than the population coefficient, as one would expect if a subset of the population is driving the results. Looking at the female - female combination, we see that coefficients are much smaller, and far from significant, suggesting that no displacement effect occurs when the younger sibling is a girl.

As previously suggested, these adjustments may be temporary, if for example credit constraints require market work to contribute to household income during the period in which children are in school, but that once children are out of school, the older sibling ceases to do market work and goes back to his/her previous occupation. To test this hypothesis, I run the same regression as above, but this time restricting the sample to sibling pairs where both siblings are out of school. The younger siblings in this subsample are thus older than in the previous one, and plausibly less affected by the INPRES program. This may lead to a weak instrument concern. However, the F-statistic of the excluded instruments is reasonably high, even in this subsample.

Table 21 shows these results for the restricted sample, where both younger and older siblings are out of school. The displacement effect previously found is reinforced with coefficients both larger and more significant. The increased labor market participation thus persists (or arises) once both siblings are out of school. This strongly disfavors the temporary credit constraint effect: it could of course be that the temporary cost of sending

Table 19: Gender-specific results (younger sibling is male)

	Older sibling outcomes					
	Labor force	Housework	Employee	Second job	Services	Married
	<i>Male- male</i>					
Yrs. school (IV)	0.0279* (0.0167)	-0.00566 (0.00493)	-0.00821 (0.0200)	0.00914 (0.0145)	-0.0123 (0.0178)	-0.00966 (0.0150)
Older sib. yrs. school	-0.0257*** (0.00600)	0.00250 (0.00177)	0.0128* (0.00739)	-0.00358 (0.00534)	0.0317*** (0.00660)	-0.00423 (0.00536)
Constant	0.934*** (0.0546)	-0.00645 (0.0148)	0.0301 (0.0623)	0.159*** (0.0510)	-0.0390 (0.0538)	0.616*** (0.0463)
Observations	60,773	60,773	47,494	47,489	43,767	60,773
First stage F-stat	14.7	14.7	14.4	14.4	13.2	14.7
Sample mean:	0.81	0.01	0.31	0.09	0.18	0.14
	<i>Male - female</i>					
Yrs. school (IV)	0.0412* (0.0241)	-0.0548** (0.0242)	-0.0228 (0.0212)	0.0155 (0.0181)	0.00359 (0.0199)	-0.0221 (0.0226)
Older sib. yrs. school	-0.0205** (0.00808)	0.0181** (0.00813)	0.0202*** (0.00744)	-0.00519 (0.00628)	0.0368*** (0.00695)	-0.00672 (0.00757)
Constant	0.314*** (0.0602)	0.505*** (0.0676)	0.0566 (0.0844)	0.127* (0.0671)	0.0341 (0.0824)	0.801*** (0.0562)
Observations	50,882	50,882	21,148	21,140	18,988	50,882
First stage F-stat	11.5	11.5	8.3	8.4	9.3	11.5
Sample mean:	0.44	0.37	0.30	0.08	0.18	0.48

Robust standard errors in parentheses. Additional dummies: Age, sibling age, older sib. cohort* water/san. expenditure, sibship size, younger sibs, older sib age * prog intensity.

*** p<0.01, ** p<0.05, * p<0.1

Table 20: Gender-specific results (younger sibling is female)

	Older sibling outcomes					
	Labor force	Housework	Employee	Second job	Services	Married
	<i>Female- female</i>					
Yrs. school (IV)	0.00262 (0.0174)	-0.00621 (0.0171)	0.00491 (0.0160)	-0.00188 (0.0145)	-0.00238 (0.0165)	-0.0126 (0.0161)
Older sib. yrs. school	-0.0100 (0.00728)	0.00248 (0.00717)	0.0111 (0.00712)	-0.000556 (0.00637)	0.0402*** (0.00732)	-0.00888 (0.00677)
Constant	0.410*** (0.0637)	0.422*** (0.0650)	0.0851 (0.0742)	0.0934 (0.0629)	-0.0137 (0.0697)	0.869*** (0.0585)
Observations	45,167	45,167	19,721	19,720	17,627	45,167
First stage F-stat	20.9	20.9	13.3	13.3	12.8	20.9
Sample mean:	0.46	0.35	0.31	0.07	0.19	0.45
	<i>Female - male</i>					
Yrs. school (IV)	0.0224 (0.0150)	-0.00167 (0.00419)	-0.0249 (0.0170)	0.00888 (0.0125)	-0.0180 (0.0149)	0.0196 (0.0132)
Older sib. yrs. school	-0.0263*** (0.00568)	0.00128 (0.00157)	0.0214*** (0.00657)	-0.00317 (0.00484)	0.0361*** (0.00575)	-0.0145*** (0.00498)
Constant	0.910*** (0.0607)	-0.00733 (0.0151)	0.0282 (0.0599)	0.135*** (0.0496)	-0.0386 (0.0563)	0.651*** (0.0541)
Observations	55,460	55,460	42,751	42,746	39,553	55,460
First stage F-stat	16.6	16.6	14.5	14.5	13.4	16.6
Sample mean:	0.80	0.01	0.32	0.09	0.18	0.13

Robust standard errors in parentheses. Additional dummies: Age, sibling age, cohort* water/san. expenditure, sibship size, younger sibs, older sib age * prog intensity.

*** p<0.01, ** p<0.05, * p<0.1

Table 21: Main results: Older sibling labor market outcomes (younger sibling out of school)

	Older sibling outcomes					
	Labor force	Housework	Employee	Second job	Services	Married
Yrs. school (IV)	0.0585*** (0.0192)	-0.0443*** (0.0148)	-0.0144 (0.0184)	0.0120 (0.0157)	-0.00736 (0.0161)	0.00407 (0.0180)
Female	0.0229*** (0.00713)	-0.0265*** (0.00550)	-0.00198 (0.00793)	0.00353 (0.00655)	0.00113 (0.00704)	-0.0105 (0.00666)
Older sib. female	-0.394*** (0.00808)	0.360*** (0.00633)	0.00618 (0.00787)	-0.0203*** (0.00640)	0.0276*** (0.00685)	0.347*** (0.00756)
Older sib. yrs. school	-0.0375*** (0.00864)	0.0233*** (0.00668)	0.00970 (0.00852)	-0.00536 (0.00727)	0.0230*** (0.00748)	-0.00673 (0.00813)
Constant	0.913*** (0.0477)	-0.0790** (0.0364)	0.00617 (0.0434)	0.158*** (0.0416)	0.00942 (0.0425)	0.531*** (0.0415)
Observations	108,986	108,986	72,308	72,300	66,526	108,986
R-squared	0.128	0.176	0.140	0.023	0.101	0.295
First stage <i>F-stat</i>	15.0	15.0	10.9	10.9	10.9	15.0
Sample mean	0.69	0.16	0.30	0.09	0.15	0.29

Robust standard errors in parentheses. Additional dummies: Age, sibling age, sibship size, younger sibs, older sib. age * water/san. expenditure, older sib age * prog intensity., older sib. cohort* fiscal capacity. *** p<0.01, ** p<0.05, * p<0.1

a younger sibling to school was what induced their older siblings to engage in the labor market and disengage from housework, and that they simply remain in their occupation after the younger sibling has left school. This should however have reduced the size of coefficients in the restricted sample, instead of increasing them. Another explanation for increased participation is a positive spillover effect from the younger sibling's education. Educating a family member could provide improved labor market possibilities for other siblings, and increase the market wage available to them should they engage in the labor market. The specific nature of the spillover effect can only be hypothesized at this stage, but it could include an enlargement of the younger siblings' social circle, or learning about labor market opportunities from friends in school. It could also reflect inter-sibling transmission of knowledge, with the older sibling benefiting from the knowledge gained by the younger sibling and being able to put this knowledge to use in the labor market. Finally, the improved labor market prospects of younger siblings out of school, rather than education itself, could be associated with positive spillover effects. This fits well with the use of referrals in Indonesia. Younger siblings at better jobs acquired through schooling can possibly achieve better labor market prospects for their elders through referrals and the provision of contacts, as laid out in Di Gropello, Kruse, and Tandon (2011). We would also expect stronger impacts through this channel for younger siblings of higher

ages. While it seems implausible that a 10-year-old can provide work opportunities for his older siblings, a 15-year-old might more reasonably do so. Since I use closest-in-age sibling pairs on both sides of an age threshold (18 years old), both age distributions are skewed toward this threshold. Table 30 (Appendix) shows the age distribution of younger and older siblings for those sibling pairs who meet the sample inclusion criteria. As can be seen, before restricting the sample to out-of-school younger siblings, the median age is already close to 15 years old. While improved labor market prospects may have seemed an unlikely channel for the very youngest out of school, it is less difficult to imagine such an effect for 15-17 year olds, which make up the chief part of out-of-school youth in the sample.

What would we expect OLS results of the years of education on older sibling outcomes to show? It is unclear. Recall from equation 35 that the threat to identification of λ results from $\text{Cov}(E_y, \epsilon_y)$ and $\text{Cov}(E_y, \epsilon_o)$ being non-zero. The educational attainment of younger siblings thus needs to be independent from unobserved factors explaining either his/her own occupation, or the occupation of his/her older sibling. It is not difficult to think of reasons why the first of the two conditions may not hold. Household income and younger siblings' ability for example are likely to be correlated with both educational attainment and the occupational choices of youth once they leave school. Thus, if ability and income are positively associated with labor market participation, there would be an upward bias on OLS coefficients. Regarding the second condition, its interpretation is less straightforward. On the one hand, one can adopt a "family average" argument: if household income and average ability in the family are correlated with younger siblings' educational attainment, and ability and income are positively linked to labor market participation, then the OLS estimates would still be upward-biased. On the other hand, a sibling rivalry argument would imply that if the younger sibling is well educated, the older sibling probably is not, and should thus be less destined for the labor market. This would create a downward bias on the OLS estimates. Finally, it is possible that education is not associated with increased labor market participation, but instead lowers it. The aforementioned biases would then be inversed. Gender-specific effects may also bias OLS estimates. First of all, in the case of housework, if boys are favored over girls in terms of educational investment, which seemed to have been the case in the period considered (see Table 18; However, this inequality has since disappeared (Kevane and Levine 2000)), then the coefficient of housework is likely to be downward biased since girls are more likely to be less educated and also more likely to be doing housework as their primary occupation. As shown in Table 26 in the Appendix, the coefficients of housework and labor force participation are inversed with respect to those in Table 18, suggesting that

the OLS coefficient of housework is upward biased while the coefficient of labor force participation is downward biased.

An interesting but somewhat curious result in Table 21 is that of a negative effect of older siblings' educational attainment on their probability to work, and a positive effect on housework. If education raises the market return of older siblings, this should push them towards more market work. However, the variable is endogenous, and is thus not a good control variable. Its interpretation is therefore difficult. When regressing younger siblings' outcomes on their own schooling (Table 29), we actually see that the effect of educational attainment is similar to that on older siblings. More education leads to more labor market participation, and less housework for women. It thus seems that individuals do move into the labor market to a larger extent when they are educated, potentially creating positive spillover effects for their elders.

The results so far do not disentangle the mechanisms behind the positive effect of younger siblings' education on their elders' labor market participation. Since the effect on elders' labor market participation is positive, an income effect reducing labor supply does not seem to be the primary driver of the results. Additionally, since when focusing on younger siblings who left school the impact on elders is stronger in significance and magnitude, there is not much scope to interpret the finding as one induced by a credit constraint at school start (A mechanism suggested in Emerson and Souza (2008)). A first glance at the results does not either seem to plead in favor of specialization, but additional analysis is required. The potential of parental reallocations in the household to confound pure peer effects has been highlighted by Nicoletti and Rabe (2014) and Nielsen and Joensen (2015). Indeed, policy instruments used to identify peer effects may not be exogenous to allocation of resources. What is being estimated then is thus not a pure peer effect, but a sum of reallocation and spillover effects. In the Indonesian context, this amounts to the household deciding on a reallocation of household labor resources following the sudden availability of schooling for younger siblings. The following section will discuss the potential of the data to investigate reallocation in the Indonesian context.

6.1 Can we refute specialization?

Although the previous results do not indicate that older individuals shift out of the labor market when younger siblings increase their labor market value, this does not formally contradict specialization, since we do not know at this stage to what extent individuals

spend time in multiple activities (only their main activity), nor the total amount of time spent by the household in these activities. Becker (1981) and later Pollak (2013) have shown that efficiency in the household implies specialization⁴⁴ whenever spouses are perfect substitutes in the household production, or whenever the household technology is additive with constant returns to scale. This formal definition of specialization considers the dichotomy market/household work and refers to one of the spouses concentrating all his/her efforts in one of the two domains. In general, economists incorporate children only as inputs to parental utility functions, and derive Pareto efficiency rules thereby. It has been (justly) argued that children are more than goods in the household, and that their preferences and endowments should be taken into account, for a more inclusive treatment of Pareto efficiency (Folbre 2004). It is therefore unclear how the specialization hypothesis extends to larger families where children are considered as decision makers, and also how the concept of specialization would be defined in such a case.

Table 22: Impact of younger siblings' education on household shares of work

	Share of out-of-school household members doing:			
	Any work	Unpaid family work	Agricultural work	Nothing
Yrs. school (IV)	0.0319*** (0.0120)	0.00256 (0.0103)	0.0198 (0.0141)	-0.00793 (0.00852)
Female	-0.0258*** (0.00445)	-0.0222*** (0.00380)	-0.0360*** (0.00520)	-0.00474 (0.00316)
Older sib. female	-0.0650*** (0.00503)	-0.0238*** (0.00431)	-0.0590*** (0.00590)	0.0142*** (0.00358)
Older sib. school	-0.0224*** (0.00542)	-0.00436 (0.00463)	-0.0240*** (0.00638)	0.00750* (0.00385)
Constant	0.812*** (0.0406)	0.260*** (0.0375)	0.579*** (0.0459)	0.0122 (0.0306)
Observations	108,986	108,986	108,986	108,986
R-squared	0.136	0.136	0.249	0.075
First-stage <i>F-stat</i>	15.3	15.3	15.3	15.3

Regressions are run on sibling pairs where both siblings are out of school.

Ideally, an investigation of the specialization hypothesis would be based on time allocation data. Unfortunately, such data, rarely gathered in large scale surveys, is not

⁴⁴In the sense that one of the two spouses dedicates all his/her time to either market work or domestic work.

available with the 1980 census⁴⁵. Several elements from the census data can however be mobilized to appreciate whether or not Indonesian households appear to allocate occupations between siblings according to specialization. Upon an increase in the average educational attainment of the family, the household should theoretically shift its resources away from non-market activities. This however requires households to engage in multiple activities. The data shows that not all households resort to multiple activities. Out of households with at least two children, 21% combine unpaid family work and paid work (however, 89% of households with some family work have at least one member doing other paid work). Again out of households with at least two children, 15% combine agricultural and non-agricultural work (26% of agricultural households have at least one member doing other work). Regarding households with members declaring to be inactive doing housework (76% of all households), 89% also have at least one member working. Table 22 shows how the allocation of members to occupations varies with younger siblings' educational attainment. The results indicate that while the increased educational attainment does seem to increase the share of working members in the household, it does not modify the shares of those doing unpaid family work or who work in agriculture. The coefficients are neither significant, nor of the correct sign. Since the shares do not seem significantly related to younger siblings' education, constant shares of the workforce dedicated to specific occupations does not seem to be a completely irrelevant work hypothesis. Under this hypothesis, and assuming that the educational return to outside work is higher than to family work (as in Fafchamps and Quisumbing (1999) and Jolliffe (2004)) for the household to be efficient (in the sense of income maximization), older siblings should carry out relatively less market work and more housework, work in the family business or on the farm. Table 23 gives us an idea of the magnitude of these adjustments.

First of all, younger siblings' schooling does not seem to significantly influence the probability that older siblings work in the family business. Rather, the coefficient is negative (but not significantly different from zero). For agriculture, the coefficient is positive but not significant, and its magnitude is low. Furthermore, neither do the results suggest that the older sibling works less, providing additional domestic work. In light of these results, the evidence for occupational specialization among siblings in Indonesian households is at best very weak.

⁴⁵A time use survey was administered on a small rural sample by the BPS in 1998, and in 2004-5, but its quality has been questioned and this author has not succeeded in obtaining it.

Table 23: Additional results on older siblings' occupations

	Idle	Unpaid family work	Agriculture	Days worked	Hrs. worked
Yrs. school (IV)	-0.00925 (0.0148)	-0.0209 (0.0226)	0.00316 (0.0200)	0.00794 (0.0867)	0.371 (0.921)
Female	0.00579 (0.00552)	-0.0121 (0.00957)	-0.00353 (0.00857)	-0.00802 (0.0363)	0.0998 (0.387)
Older sib. female	0.0340*** (0.00623)	0.0267*** (0.00944)	-0.0990*** (0.00843)	-0.253*** (0.0359)	-5.557*** (0.383)
Older sib. yrs. school	0.0136** (0.00666)	0.00760 (0.0105)	-0.0257*** (0.00926)	-0.00274 (0.0401)	-0.0372 (0.426)
Constant	0.104** (0.0433)	0.324*** (0.0646)	0.874*** (0.0629)	5.913*** (0.247)	37.21*** (2.600)
Observations	108,986	72,308	71,878	71,822	71,355
R-squared	0.044	0.116	0.222	0.078	0.094
First stage <i>F-stat</i>	16.9	12.0	11.9	11.9	11.8

Robust standard errors in parentheses. Additional dummies: Age, sibling age, sibship size, younger sibs, older sib. age * water/san. expenditure, older sib age * prog intensity., older sib. cohort* fiscal capacity.
 *** p<0.01, ** p<0.05, * p<0.1

6.2 Robustness checks

Although the specification outlined above controls both for older siblings' educational attainment, and the interaction between program intensity and their age, one might be worried that the instrumented schooling measures for younger siblings are picking up a correlation between siblings in educational attainment or in exposure to the program. To see if this is the case, I run a falsification test on older siblings' educational attainment. Table 24 in the Appendix shows a regression run on two outcomes related to the older sibling: having ever been to school, and years of schooling. Since the choice of having the older sibling go to school is most likely taken before that of the younger one, an exogenous variation of the younger sibling's schooling should not impact the probability of his/her elders going to school. As shown in the table, the coefficient is not significantly different from zero (indeed, the P-value is close to 0.9). Considering years of schooling, it might seem more plausible that part of the effect of young siblings' education passes through an induced return-to-school effect, where the experiences of younger siblings in newly built schools induced older siblings to go back to school. However, this does not seem to be the case. The coefficient is far from significant (the P-value is close to 0.7),

and small in magnitude.

Table 24: Estimates of older sibling's education (falsification test)

	Ever school	Years of schooling
Yrs. school (IV)	0.0192 (0.148)	0.0477 (0.114)
Female	0.0160** (0.00699)	0.213*** (0.0329)
Older sib. female	-0.109*** (0.00252)	-0.837*** (0.0157)
Constant	0.735*** (0.0486)	3.588*** (0.295)
Observations	109,025	108,986
R-squared	0.161	0.160

Robust standard errors in parentheses. Additional dummies:

Age, sibling age, sibship size, younger sibs, older sib. age *

water/san. expenditure, older sib age * prog intensity.,

older sib. cohort* fiscal capacity.

*** p<0.01, ** p<0.05, * p<0.1

What about older siblings out of the household? The census data is, like all census data, cross-sectional in nature and does not contain any information about out-of-household family members. Thus, external validity hinges on younger siblings' education being orthogonal to older siblings having left the household. This will not be the case if going to school induces older siblings to leave the household (or inversely, if leaving the household meant that younger siblings could go to school). Since no information is available on out-of-household siblings, there is no way of testing directly for this. However, by way of an assumption on fertility, we can test whether older siblings leaving the household is a likely outcome of the program. If we make a strong assumption, that fertility and birth spacing are exogenous to schooling decisions, in the absence of an effect on the probability of leaving the household for older siblings we should not find any significant association between the average year gap between older siblings for individuals of varying educational attainment, nor any difference in the number of older siblings.

The results in Table 25 show that the number of older siblings is not significantly lower when their younger siblings' educational attainment increases. On the other hand, the average age gap decreases significantly, with 0.3 years of age difference less per year

Table 25: Impacts on the composition and number of older siblings

	Age difference	No. older siblings
Yrs. school (IV)	-0.317*** (0.114)	-0.0207 (0.0245)
Female	-0.113*** (0.0396)	0.00447 (0.00923)
Older sib. female	0.118*** (0.0454)	0.0363*** (0.0106)
Older sib. yrs. school	0.143*** (0.0512)	0.0169 (0.0110)
Constant	22.80*** (0.215)	1.978*** (0.0632)
Observations	108,986	108,986
First-stage <i>F-stat</i>	16.8	16.8

Robust standard errors in parentheses. Additional dummies: Age, sibling age, sibship size, younger sibs, older sib. age * water/san. expenditure, older sib age * prog intensity.
 *** p<0.01, ** p<0.05, * p<0.1

of schooling of the younger sibling. Older siblings are thus less inclined to leave the household when their younger siblings are relatively more educated. Witoelar (2006), in his study, suggests that education can be a motive of leave for mobile youth in rural areas. The above result would be consistent with a context where households send their most educated members away to work in other cities. An older sibling who has become relatively less educated might thus see his probability of being designated for migration drop.

7 Conclusion

In this article, focusing on sibling pairs, I have estimated the causal impact of younger siblings' education on older siblings' occupation. The main finding is a displacement effect, where increased education leads to a decrease in housekeeping for women, and an increase in the labor market participation for older siblings of both sexes. The increase in labor market participation is significant for the full sample, but seems to be mainly driven by the subsample where the younger sibling is a boy. The results lend little support to occupational specialization at the household level, since the relative earning potentials of

individuals do not seem to orient their occupations in a direction consistent with revenue maximization at the household level. Furthermore, the household does not decrease its share of laborers in family business or agriculture upon an increase in the educational attainment of the younger sibling. A positive sibling spillover effect of education therefore arises as the most plausible explanation for this finding.

Further research should try to evaluate the extent to which these findings are modified when looking at other levels of education. The exogenous source of variation exploited in this paper mostly induces children to go to primary school. It might be that positive knowledge externalities prevail only at higher levels of education, which is why no significant effect is found in terms of the nature of the job. Given the lack of studies on sibling peer effects from developing countries, future research should aim to constitute a broader evidence base. Distinguishing endogenous and exogenous peer effects through multiple reference groups also arises as a fruitful research agenda, but requires detailed information on multiple peer groups outside the household.

References

- Altonji, Joseph G and Rebecca M Blank (1999). “Race and gender in the labor market”. In: *Handbook of Labor Economics* 3, pp. 3143–3259.
- Aparicio-Fenoll, Ainhoa and Veruska Oppedisano (2015). “Fostering Household Formation: Evidence from a Spanish Rental Subsidy”. In: *The BE Journal of Economic Analysis & Policy* 15.1, pp. 53–84.
- Becker, Gary S (1965). “A Theory of the Allocation of Time”. In: *The Economic Journal* 75.299, pp. 493–517.
- (1981). *A Treatise on the Family*. Harvard University Press, Cambridge, MA.
- Behrman, Jere R, Robert A Pollak, and Paul Taubman (1982). “Parental Preferences and Provision for Progeny”. In: *Journal of Political Economy* 90.1, pp. 52–73.
- Bramoullé, Yann, Habiba Djebbari, and Bernard Fortin (2009). “Identification of peer effects through social networks”. In: *Journal of Econometrics* 150.1, pp. 41–55.
- Brutti, Zeldia (2013). *Sibling Effects in Cognitive Achievement: Are Smart Brothers and Sisters Good for You?* Unpublished manuscript.
- Buttenheim, Alison M and Jenna Nobles (2009). “Ethnic diversity, traditional norms, and marriage behaviour in Indonesia”. In: *Population Studies* 63.3, pp. 277–294.
- De Giorgi, Giacomo, Michele Pellizzari, and Silvia Redaelli (2010). “Identification of Social Interactions through Partially Overlapping Peer Groups”. In: *American Economic Journal: Applied Economics* 2.2, pp. 241–275.
- Di Gropello, Emanuela, Aurelien Kruse, and Prateek Tandon (2011). *Skills for the labor market in Indonesia: trends in demand, gaps, and supply*. World Bank Publications.
- Duflo, Esther (2001). “Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment”. In: *The American Economic Review* 91.4, pp. 795–813.
- Emerson, Patrick M and Andre Portela Souza (2008). “Birth Order, Child Labor, and School Attendance in Brazil”. In: *World Development* 36.9, pp. 1647–1664.
- Fafchamps, Marcel and Agnes R Quisumbing (1999). “Human Capital, Productivity, and Labor Allocation in Rural Pakistan”. In: *Journal of Human Resources* 34.2, pp. 369–406.
- Folbre, Nancy (2004). “A theory of the misallocation of time”. In: *Family Time: The Social Organization of Care*. Ed. by Nancy Folbre and Michael Bittman. Psychology Press, pp. 7–24.
- Frankenberg, Elizabeth, Angelique Chan, and Mary Beth Ofstedal (2002). “Stability and change in living arrangements in Indonesia, Singapore, and Taiwan, 1993-99”. In: *Population Studies* 56.2, pp. 201–213.
- Garg, Ashish and Jonathan Morduch (1998). “Sibling rivalry and the gender gap: Evidence from child health outcomes in Ghana”. In: *Journal of Population Economics* 11.4, pp. 471–493.
- Gronau, Reuben (1977). “Leisure, Home Production, and Work—the Theory of the Allocation of Time Revisited”. In: *Journal of Political Economy* 85.6, pp. 1099–1123.
- Guilmoto, Christophe Z (2015). “Mapping the diversity of gender preferences and sex imbalances in Indonesia in 2010”. In: *Population Studies* 69.3, pp. 299–315.
- Himaz, Rozana (2010). “Intrahousehold Allocation of Education Expenditure: The Case of Sri Lanka”. In: *Economic Development and Cultural Change* 58.2, pp. 231–258.
- Hsin, Amy (2007). “Children’s Time Use: Labor Divisions and Schooling in Indonesia”. In: *Journal of Marriage and Family* 69.5, pp. 1297–1306.
- Jogo, Wellington and Rashid Hassan (2010). “Determinants of rural household labour allocation for wetland and other livelihood activities: the case of the Limpopo wetland in Southern Africa”. In: *Agrekon* 49.2, pp. 195–216.

- Johar, Meliyanni and Shiko Maruyama (2011). “Intergenerational cohabitation in modern Indonesia: filial support and dependence”. In: *Health Economics* 20.S1, pp. 87–104.
- Jolliffe, Dean (2004). “The impact of education in rural Ghana: examining household labor allocation and returns on and off the farm”. In: *Journal of Development Economics* 73.1, pp. 287–314.
- Kevane, Michael and David I Levine (2000). *The Changing Status of Daughters in Indonesia*. Unpublished manuscript. Institute for Research on Labor and Employment.
- (2003). “Are Investments in Daughters Lower When Daughters Move Away? Evidence from Indonesia”. In: *World Development* 31.6, pp. 1065–1084.
- Klasen, Stephan, Jan Priebe, and Robert Rudolf (2013). “Cash crop choice and income dynamics in rural areas: evidence for post-crisis Indonesia”. In: *Agricultural Economics* 44.3, pp. 349–364.
- Kuzubas, Tolga Umut and Andrea Szabo (2016). *Job Search Through Weak and Strong Ties: Theory and Evidence from Indonesia*. Unpublished manuscript.
- Laschever, Ron (2009). *The Doughboys Network: Social Interactions and the Employment of World War I veterans*. Unpublished manuscript. Northwestern University.
- Lee, LF (2007). “Identification and estimation of spatial econometrics models with group interactions, contextual factors and fixed effects”. In: *Journal of Econometrics* 140.2, pp. 333–374.
- Lundberg, Shelly, Jennifer L Romich, and Kwok Ping Tsang (2009). “Decision-making by children”. In: *Review of Economics of the Household* 7.1, pp. 1–30.
- Manski, Charles F (1993). “Identification of Endogenous Social Effects: The Reflection Problem”. In: *The Review of Economic Studies* 60.3, pp. 531–542.
- Micevska, Maja and Dil Bahadur Rahut (2008). “Rural Nonfarm Employment and Incomes in the Himalayas”. In: *Economic Development and Cultural Change* 57.1, pp. 163–193.
- Moffitt, Robert A et al. (2001). “Policy Interventions, Low-Level Equilibria, and Social Interactions”. In: *Social Dynamics* 4.45-82, pp. 6–17.
- Monstad, Karin, Carol Propper, and Kjell G Salvanes (2011). *Is Teenage Motherhood Contagious? Evidence from a Natural Experiment*. CEPR Discussion Paper No. DP8505.
- Morduch, Jonathan (2000). “Sibling Rivalry in Africa”. In: *The American Economic Review* 90.2, pp. 405–409.
- Nicoletti, Cheti and Birgitta Rabe (2014). “Sibling Spillover Effects in School Achievement”. In: Nielsen, Helena and Juanna Joensen (2015). *Peer Effects in Math and Science*. 2015 Meeting Papers 1343. Society for Economic Dynamics.
- Oettinger, Gerald S (2000). “Sibling Similarity in High School Graduation Outcomes: Causal Interdependency or Unobserved Heterogeneity?” In: *Southern Economic Journal* 66.3, pp. 631–648.
- Ota, Masako and Peter G Moffatt (2007). “The within-household schooling decision: a study of children in rural Andhra Pradesh”. In: *Journal of Population Economics* 20.1, pp. 223–239.
- Parish, William L and Robert J Willis (1993). “Daughters, Education, and Family Budgets Taiwan experiences”. In: *Journal of Human Resources* 28.4, pp. 863–898.
- Pitt, Mark M and Mark R Rosenzweig (1990). “Estimating the Intrahousehold Incidence of Illness: Child Health and Gender-Inequality in the Allocation of Time”. In: *International Economic Review* 31.4, pp. 969–989.
- Pollak, Robert A (2013). *Allocating Household Time: When Does Efficiency Imply Specialization?* National Bureau of Economic Research Working Paper No. 19178.
- Thomas, Duncan et al. (1999). *Household budgets, household composition and the crisis in Indonesia: Evidence from longitudinal household survey data*. Population Association of America Meetings. March.

Witoelar, Firman (2006). “Intra-household Differences in Education and Home Leaving in Indonesia”. In: *ASEAN Economic Bulletin* 23.1, pp. 75–97.

8 Appendix

Table 26: Main results INPRES: Older sibling labor market outcomes (OLS)

	Older sibling outcomes					
	Labor force	Housework	Employee	Second job	Services	Married
Yrs. school	-0.00938*** (0.000507)	0.00260*** (0.000387)	-0.00444*** (0.000644)	-0.00104** (0.000405)	0.00839*** (0.000566)	-0.00393*** (0.000451)
Female	0.000323 (0.00188)	-0.00836*** (0.00145)	0.00161 (0.00239)	-0.00172 (0.00153)	0.00433** (0.00207)	-0.00886*** (0.00167)
Older sib. female	-0.364*** (0.00196)	0.349*** (0.00160)	0.00590** (0.00260)	-0.0152*** (0.00163)	0.0401*** (0.00232)	0.335*** (0.00175)
Older sib. yrs. school	-0.00943*** (0.000394)	-0.000540* (0.000284)	0.0132*** (0.000520)	0.000267 (0.000317)	0.0279*** (0.000480)	-0.00943*** (0.000332)
Constant	0.728*** (0.0427)	0.0537 (0.0350)	0.138*** (0.0503)	0.0883** (0.0377)	-0.0923** (0.0468)	0.112*** (0.0427)
Observations	212,282	212,282	131,114	131,095	119,935	212,282
R-squared	0.195	0.236	0.148	0.029	0.147	0.284

Robust standard errors in parentheses. Additional dummies: Age, sibling age, cohort* water/san. expenditure, household fixed effects. Standard errors are clustered at the household level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 27: Main results INPRES: Older sibling labor market outcomes (OLS)

-Younger siblings out of school						
Older sibling outcomes						
	Labor force	Housework	Employee	Second job	Services	Married
Yrs. school	-0.00446*** (0.000666)	0.00156*** (0.000509)	-0.00603*** (0.000834)	-0.000479 (0.000538)	0.00456*** (0.000701)	-0.00304*** (0.000609)
Female	0.00114 (0.00255)	-0.0107*** (0.00196)	0.00131 (0.00320)	-0.00143 (0.00208)	0.00597** (0.00262)	-0.0129*** (0.00234)
Older sib. female	-0.369*** (0.00273)	0.341*** (0.00228)	0.00301 (0.00356)	-0.0155*** (0.00226)	0.0230*** (0.00299)	0.350*** (0.00251)
Older sib. yrs. school	-0.00914*** (0.000614)	0.00265*** (0.000442)	0.00586*** (0.000784)	0.000418 (0.000499)	0.0175*** (0.000692)	-0.00353*** (0.000538)
Constant	0.771*** (0.0631)	-0.0219 (0.0514)	-0.0324 (0.0602)	0.129** (0.0553)	-0.122** (0.0612)	-0.0307 (0.0637)
Observations	108,986	108,986	72,308	72,300	66,526	108,986

Robust standard errors in parentheses. Additional dummies: Age, sibling age, cohort* water/san. expenditure.
Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.1

Table 28: Descriptive statistics by (younger sibling) sex, 1980 census

	Full sample	Boys	Girls
Age	13.3	13.4	13.2
Married	0.04	0.02	0.06
Ever school	0.91	0.93	0.90
Currently in school	0.66	0.68	0.64
Years schooling	3.9	4.0	3.7
Employed*	0.49	0.62	0.36
Unemployed*	0.03	0.04	0.03
Inactive*	0.48	0.34	0.61
Days worked last week†	5.9	6.0	5.8
Hours worked last week†	37.3	39.0	34.7
Self-employed†	0.31	0.31	0.29
Unpaid family work†	0.38	0.38	0.39
Employee†	0.30	0.30	0.32
Idle‡	0.64	0.89	0.50
Housework‡	0.33	0.07	0.48
Years schooling older sibling	5.16	5.15	5.18
Age older sibling	17.1	17.2	17.0
Older sibling female	0.46	0.46	0.46
Older sibling married	0.12	0.13	0.12
Mean age difference	3.76	3.77	3.76
Sibship size	4.2	4.2	4.2
Older sibling in school	0.42	0.41	0.43
	<i>Older sibling activity</i>		
Employed*	0.57	0.57	0.57
Self-employed†	0.33	0.33	0.33
Employee†	0.31	0.32	0.31
Unpaid family work†	0.35	0.35	0.36
Second job†	0.08	0.08	0.08
Services sector†	0.18	0.19	0.18
Inactive*	0.40	0.40	0.40
Housework‡	0.41	0.42	0.39
Idle‡	0.57	0.56	0.58

Sample: 1 061 779 Individuals between 6 and 30 years old, with at least one older sibling (12-30 y.o.) living in the household. *: Of out-of-school individuals more than 10 y.o..

†: out of employed individuals; ‡: out of inactive out-of-school individuals.

Table 29: Estimation of younger siblings' occupational outcomes

	OLS			IV		
	Idle	Housework	Labor force	Idle	Housework	Labor force
Yrs school	-0.0142*** (0.000363)	-0.00374*** (0.000264)	0.0147*** (0.000368)	0.0162 (0.0157)	-0.0453*** (0.0101)	0.0287** (0.0140)
Female	0.00157 (0.00158)	-0.242*** (0.00114)	0.236*** (0.00162)	0.00801** (0.00371)	-0.251*** (0.00245)	0.239*** (0.00338)
Constant	1.376*** (0.00421)	2.045*** (0.00268)	1.647*** (0.00385)	1.327*** (0.0253)	2.112*** (0.0162)	1.624*** (0.0224)
Observations	324,500	324,500	324,500	324,139	324,139	324,139
R-squared	0.114	0.135	0.162	0.109	0.135	0.158
Male						
Yrs school	-0.0157*** (0.000532)	-0.000205 (0.000152)	0.0128*** (0.000459)	-0.0390 (0.0315)	-0.00311 (0.0109)	0.0535* (0.0291)
Constant	1.364*** (0.00596)	1.970*** (0.00160)	1.714*** (0.00413)	1.399*** (0.0469)	1.977*** (0.0162)	1.671*** (0.0433)
Observations	153,314	206,606	206,606	153,114	153,114	153,114
R-squared	0.130	0.007	0.130	0.124	0.009	0.144
Female						
Yrs school	-0.0128*** (0.000498)	-0.00656*** (0.000467)	0.0162*** (0.000497)	0.0388** (0.0173)	-0.0800*** (0.0142)	0.0348** (0.0149)
Constant	1.387*** (0.00570)	1.868*** (0.00455)	1.807*** (0.00485)	1.310*** (0.0262)	1.977*** (0.0213)	1.780*** (0.0224)
Observations	171,186	171,186	171,186	171,025	171,025	171,025
R-squared	0.109	0.057	0.115	0.106	0.056	0.109

Robust standard errors in parentheses. Additional dummies: Age, sibship size, younger siblings.
Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.1

Table 30: Age distribution of siblings in primary sample

Younger siblings			
Age	Frequency	Percentage	Cumulative %
6	1 660	0.7	0.7
7	3 036	1.2	1.8
8	4 068	1.6	3.4
9	5 980	2.3	5.8
10	9 290	3.6	9.4
11	9 381	3.7	13.1
12	18 796	7.4	20.4
13	18 763	7.4	27.8
14	26 665	10.4	38.2
15	47 591	18.6	56.9
16	56 370	22.1	78.9
17	53 777	21.1	100.0
Older siblings			
Age	Frequency	Percentage	Cumulative %
18	88 715	34.7	34.7
19	51 562	20.2	54.9
20	51 411	20.1	75.1
21	17 473	6.8	81.9
22	14 092	5.5	87.4
23	8 355	3.3	90.7
24	5 535	2.2	92.9
25	8 740	3.4	96.3
26	2 747	1.1	97.4
27	2 282	0.9	98.3
28	1 677	0.7	98.9
29	963	0.4	99.3
30	1 825	0.7	100.0
Observations	255 377	100	100

Sample younger siblings: individuals with a closest older sibling out of school, and at least 18 years old.

Sample older siblings: The older siblings of the above.

Chapter 4

When solidarity fails: heterogenous effects on children from adult deaths in Senegalese households

Co-written with Philippe De Vreger.

1 Introduction

The Western literature of the nineteenth century is full of novels in which orphans face a terrible destiny. Cosette in Victor Hugo's famous novel *Les Misérables* is entrusted to an innkeeper and his wife, the Thénardiens, who abominably exploit her and treat her no better than a dog. Oliver Twist in Charles Dickens' eponym novel lives in a workhouse where he and other orphaned boys are forced to work and fed very little. Charlotte Brontë's *Jane Eyre*, following the death of her parents from typhus, lives with her aunt who dislikes her and treats her as a burden. And Charles Perrault's famous fairy tale *Cinderella* tells the story of a young girl who has lost her mother and who is enslaved by her stepmother and her daughters. The western African oral tradition is also full of tales about children who lost their mother and who are abused by their step mother (see Leguy and Diarra (2015)). All these novels convey the idea that the loss of a parent, when it occurs at a young age and in poor households, is likely to be an event with terrible consequences.

In Africa orphanhood has received much attention in recent years following the spread of the AIDS epidemic and the multiplication of armed conflicts. It is widely assumed that the extended family network normally provides a fairly efficient safety net where institutions fail to assist people in need (Foster 2000; UNICEF 2001). However, in countries badly struck by the AIDS epidemic, the system may have found its limits, being overwhelmed by the number of people, especially orphans, in need of assistance (see Chirwa (2002) and Kuo and Operario (2010) for opposing views on this issue). Often, adult members of an extended family may share the task of running the day-to-day life of the household, including a shared responsibility for childcare. As such they should be able to expect that their children will be cared for by other adult members, should they not be in a position to do so themselves. Even if this is indeed the case, this does not mean that children are all treated in the same way, and in particular that those who have lost one or both of their parents have the same access to resources as others. Concerning for instance educational investment, it could be that for some reason orphaned children have a lower return to education than others (Case, Paxson, and Ableidinger (2004)), inducing a lower level of schooling attainment. This could occur if parental investment (help with homework, accompanying the child to school) is an input into the human capital production function, and thus linked to the actual human capital gain from schooling. It may also be the case that orphaned children are discriminated against, like *Jane Eyre* because her genetic relatedness is too weak with her aunt, who then prefers to reserve her

love and caring capacity for her own children. This conforms to the so-called *Hamilton hypothesis* (Hamilton 1964) implying that altruistic behavior between two individuals is closely related to their genetic proximity, so that one prefers one's own children to one's grand-children and nephews or nieces who are in turn preferred to cousins etc. More generally, the concept of *kin selection* (Smith 1964) suggests that evolutionary success might not necessarily imply a maximization of the number of offspring of an individual. Instead, investing in other individuals carrying the same genes also increases their spread and might thus be the optimal behavior, even at the cost of one's own reproductive success. Since the common genetic endowment of two individuals is related to their genetic proximity, altruistic behavior should be positively associated with the tightness of blood links ⁴⁶. Kazianga and Wahhaj (2017) study the intra-household allocation of resources in Burkina Faso from this angle, finding support for the Hamilton hypothesis.

If either of these mechanisms (discrimination, differential returns) are at play one could expect to observe that in extended families, and outside the context of an epidemic or a civil war that puts a heavy strain on informal social safety nets, children who have lost one or both of their parents are not treated in the same way as other children, receiving a lower level of human capital and being asked to contribute more to the household income or to take on a higher share of domestic chores. This is what we examine in this paper. Using data from an unusually rich household panel survey in Senegal, we examine whether children whose main care giver dies receive a lower level of educational investment, work more or provide more domestic work. We also check whether these children are more likely to be fostered out. Through this lens, our work also provides an opportunity to examine the extent of intra-household solidarity in the Senegalese context.

Our paper is in line with the work that Case, Paxson, and Ableidinger (2004) have conducted, analyzing the impact of a parent's death on children's schooling, using data from eleven DHS surveys. We differ from it in three ways: first, as mentioned, while Case, Paxson and Ableidinger have limited their analysis to school enrollment, we also examine labor market participation, hours of domestic work and the probability of being fostered out as outcomes likely to be impacted by the death of a parent; second, we do not limit our analysis to parents' death. Rather, in the first part of the empirical section we examine the impact of the death of any member (adult, youth, elderly, men

⁴⁶On a related note, evolutionary psychology speaks of the *Cinderella effect* when referring to the fact that the risk of child abuse is higher when the child lives with a step-parent (Daly and Wilson 1998).

or women) in the household. In the second part, we focus on caregivers (in the sense of having a budgetary responsibility for the child), and distinguish between children under the responsibility of the deceased caregiver and children under the responsibility of another caregiver; third, as we have individual panel data, we are able to check that our results are not driven by unobserved heterogeneity, through the use of child- and household fixed effects estimates.

Our first set of results shows rather modest associations between death and work patterns of children, and no association between death and education or being fostered out. When we take into account the position of the child, focusing on caregivers, we find negative impacts on school enrollment and positive impacts on market and domestic work and on the probability of being fostered, that are much larger and significant when the adult who dies is the main caregiver of the child. The rest of the paper is organized as follows: in the next section we provide a review of the related literature. Section 3 presents the data and our empirical strategy. Section 4 shows some descriptive statistics regarding our main variables of interest. Results are presented in section 5, and section 6 concludes.

2 Related literature

The seminal model of allocation of educational investment to children was laid out in Becker and Tomes (1976). This model shows that, under a number of strong assumptions—nuclear family, perfect capital markets, parents caring equally about each child and education being valued solely for its future income generative properties—the investment in a child’s education is unaffected by income shocks to the household, such as the death of a parent (Gertler, Levine, and Ames 2004). In the context of developing countries, many—if not all—of these assumptions are questionable.

In West Africa large households and extended family systems often prevail, and multiple spouses often live under the same roof. In a polygamous society, the responsibilities of members extend to children of other partners, even when these do not live in the same household (Lloyd and Blanc 1996). In such contexts, allocative theories based on the nuclear family are less relevant and intra-household decisions must be conceptualized taking this into account. This is not the case in the unitary household model, which assumes one decision maker and the pooling of income from different household members.

An important result of the unitary model is that a change in the distribution of income between household members does not affect household spending patterns, something that has been strongly questioned in the literature (Hoddinott, Alderman, and Haddad 1997; Hoddinott and Haddad 1995; Vermeulen 2002). In a polygamous setting, the rationale for income pooling is arguably even weaker. In our context, polygamy is widespread. According to Tabutin and Schoumaker (2004), 46% of women between 15 and 49 years of age were in polygamous unions in Senegal in 1999. Of the 29 African countries for which they have data, only Guinea and Burkina Faso exceed this rate. More recent data show that 32.4% of women between 15-49 years and who are in some form of union have at least one co-wife⁴⁷. Anthropologists and economists alike have noted that rivalry exists among wives in polygamous unions, and that this rivalry is primarily related to fecundity. Using the same data as this paper, Rossi (2016) explores co-wife rivalry in the Senegalese context, finding evidence of strategic birth behavior among co-wives. Using the same data as we, she argues that in a polygamous setting, fertility decisions are a way of establishing and maintaining bargaining power among co-wives. Given the Senegalese context, there is hence a rationale for testing the hypothesis that adjustments to household deaths (in particular maternal deaths) are distributed equally among remaining members. This is what we do in this paper.

Household responses to health and income shocks in developing countries

It is well known that households resort to a number of coping mechanisms in the case of income and health shocks. Evidence however also suggests that these mechanisms are not always sufficient, and shocks are associated with consumption decreases even in the medium term (Beegle, De Weerd, and Dercon 2008; Dercon, Hoddinott, and Woldehanna 2005). Income and health shocks constrain households in several ways: first and foremost, through a tightening of the budget constraint, leading households to eventually withdraw children from school and increase the labor supply of household members (Grimm 2011; Jacoby and Skoufias 1997); second, health shocks not only affect income directly, through medical expenses and reduced labor supply, but also since other household members might be mobilized as caregivers. Yamauchi, Buthelezi, and Velia (2008) find support for such coping mechanisms in South Africa, where death of prime-age adults in the household are associated with accelerated transitions from school to work for adolescents. Furthermore, female school attendance drops prior to death, suggesting that girls bear the burden of AIDS care in the household. Beegle, Dehejia, and Gatti (2006), using panel

⁴⁷Enquête Démographique et de Santé Continue, 2014. Agence Nationale de la Statistique et de la Démographie (ANSD), Dakar, Sénégal.

data from Tanzania, find that agricultural shocks are mitigated through an increase in child labor and sales of assets. Guarcello, Mealli, and Rosati (2010) also find that shocks are associated with increased child labor in Guatemala, and Duryea, Lam, and Levison (2007) find that unemployment shocks on male household heads increase child labor in Brazil. However, looking at adult deaths in the Kagera region of northwestern Tanzania, Beegle (2005) does not find any evidence of increased labor supply of surviving members.

The issue of adult death impacts on child outcomes has received much attention during and after the height of the AIDS epidemic. Much of the work has focused on children's school enrollment. Ainsworth and Filmer (2006) examine enrollment rates of orphans versus non-orphans in 51 countries, 35 of which are located in Sub-Saharan Africa. They show that the difference in enrollment rates between orphans and non-orphans varies considerably across countries and across orphanhood (paternal, maternal or both). In Namibia and the Dominican Republic, a statistically significant positive relationship is even found between enrollment and orphanhood. Their analysis is cross-sectional, however, and some of the enrollment differentials seem to be due to household income being endogenous with respect to orphanhood. The heterogeneity of findings is less present when one looks at country-specific studies, a negative effect of orphanhood being found in most studies of African countries. Moreover, attention has been drawn to the magnitude of the effect and its concentration among specific sub-groups of individuals. For example, Bennell (2005) argues that the direct effect of orphanhood on educational outcomes has been overstated, the overwhelming part of the explanation being poverty. Similarly, Ainsworth and Filmer (2002) claim that although enrollment differentials between orphans and non-orphans are statistically significant, they are small compared to those between poor and non-poor households. Yamano and Jayne (2005) find adverse school attendance effects from the death of working age adults in Kenya for the lower half of the income distribution, and Kobiané, Calvès, and Marcoux (2005) find especially strong effects of orphanhood in rural areas of Burkina Faso. It thus seems crucial to account for the household's situation before the occurrence of a death, since unobserved heterogeneity of initial circumstances is likely to influence child outcomes upon death. This is noted by Evans and Miguel (2007), who use a large panel data set to study the impact of orphanhood on school participation in a high HIV prevalence area in Western Kenya, taking unobserved individual heterogeneity into account. Their results show that the estimated coefficients of orphanhood on schooling increase when they add individual fixed effects to their specification and suggest that parental death does reduce school participation, with maternal death orphans, weak students and young girls being

particularly affected. They explain the somewhat counterintuitive downward bias of OLS coefficients by initial socioeconomic status. As found both in their data and in earlier studies, AIDS victims in Africa tend to be of higher socioeconomic status than non-victims, something that could be explained through a correlation between wealth and high-risk occupations such as truckers, soldiers or teachers. Other panel data studies finding a negative impact on schooling include Beegle, De Weerdt, and Dercon (2006), Senne (2014), and Yamano and Jayne (2005). The latter study distinguishes short-run and long-run impacts, affirming that not only is dropping out of school an immediate and short-term household coping mechanism in case of adult deaths; the effects linger on and translate into lower educational attainment at adulthood. The present study contributes to this literature by focusing on a country that differs from the majority of the previously studied ones in at least two dimensions: Senegal, along with other Western African countries, is relatively lightly affected by the AIDS epidemic. Second, the prevalence of polygamy and the large household sizes suggest a different household organization from that of countries in other parts of Africa.

Gertler et al. (2003) lay out some of the theoretical reasons which might affect educational decisions in case of parental death. Firstly, in developing countries, when credit or insurance markets fail, informal insurance mechanisms often prevail, especially within the extended family. Such mechanisms rely on expected reciprocity, which may decline upon the death of a family member. Secondly, the optimal investment in a child might change if there are changes in preferences, or in the educational production function. For example, it has been suggested that mothers value education more than fathers, and stronger effects from maternal deaths are found by Ardington and Leibbrandt (2010), Beegle, De Weerdt, and Dercon (2006), Case and Ardington (2006), Evans and Miguel (2007), and Ueyama (2007). Ardington and Leibbrandt (2010) find support for this "preference" channel using a series of cross-sectional datasets from South Africa. They find that fathers' deaths are associated with revenue losses and lower enrollment, but that the enrollment impact of mothers' deaths is stronger, while the revenue effect is absent. This suggests that the orphanhood-schooling nexus operates not only through the channels associated with a deterioration of households' economic situation. Finally, parental time might be an input into the educational production function. A decrease in available time might thus modify the optimal educational investment for children.

Child fostering is another possible adjustment mechanism in case of income shocks to the household. The practice is well known in many parts of the world, but according

to Isiugo-Abanihe (1985) it is perhaps nowhere as institutionalized as in West Africa, and “unique to West African fostering are both its prevalence and the very early age at which children are boarded out”. DHS reports from 11 countries in the region show that the proportion of fostered children younger than 14 years old varies from 7% in Burkina Faso to 16.8% in Liberia, standing at about 10% in Senegal (Beck et al. 2015). Looking only at children between 10 and 14 years of age, Eloundou-Enyegue and Kandiwa (2007) find a fostering prevalence rate of 19.5% for Senegal. Fostering fills several functions: it provides opportunities for educational investment in children when parents are unable to provide it, be it due to financial, geographical or infrastructure reasons; it provides caring possibilities for elderly people in the fostering household; it permits households to cope with financial difficulties. Finally it is a possibility to establish or strengthen ties between households. Vandermeersch and Chimere-Dan (2002) look at fostering of children below the age of 6 in Senegal, and find that mothers likely to out-foster are those who have experienced the dissolution of a union, or those who have many children. The households likely to receive children are those with older or sub-fecund women, suggesting that fostering of very young children might be a way of adjusting demographic imbalances between households. Beck et al. (2015) find evidence of selection among fostered children in Senegal, consistent with several motives for fostering. Fostered boys are relatively more educated than their siblings who are not fostered out, and are being sent to families with a higher propensity to educate their children. Girls are being sent to households where children undertake relatively more domestic work. They however conclude that, on average, fostered children do not seem to be treated differently than the other children of the host family⁴⁸.

The strict interpretation of the results we are about to present hinges on the type of behavior adopted by households facing a shock. Currie and Almond (2011) discuss parental behavior in a two period childhood model, where investment in children’s human capital is decomposed into a component in the early childhood, and a component in later childhood. Whether or not it is optimal for parents to compensate for a negative shock in early childhood, or on the contrary, reinforce the effects of the negative shock, essentially depends on the substitutability between investment in the two periods. When investments are relatively complementary (such that mitigating a shock to early investment in the second period is hard), it might be optimal for parents to reinforce the impact of shocks and defer resources to personal consumption in the second period. In general, ignoring

⁴⁸Earlier empirical evidence of the effects of fostering in West Africa includes Ainsworth (1995) and Akresh (2007).

parental utility or household responses might overstate or understate the true effect of a shock in models with household fixed effects (Currie and Almond (2011)). In the specific case of a death in the household, however, what is being estimated is essentially the parental (or household head) response to a shock that is multi-level in nature, modifying not only resource inputs into the utility function (such as market and domestic work), but the utility function itself. If the polygamous household head's utility function is a nested one, depending on the utility of all other household members, and the utility of co-wives depends on investments made to their children, the household head's marginal utility of investing into the child decreases upon the death of its caregiver. A final channel explaining why children may be less inclined to go to school is mourning. When children are saddened by the loss of their caregiver, they may opt to stay out of school.

As previously stated, the nuclear family model is likely to be of little relevance in Sub Saharan Africa. Yet, studies taking into account differential impacts within the household are few, and mainly restricted to the distinction between boys and girls. It seems that girls are generally more affected than boys by a death in the family (Evans and Miguel 2007; Operario et al. 2008; Senne 2014). Perhaps closest in spirit to us, Case, Paxson, and Ableidinger (2004) revisit the *Hamilton* hypothesis from evolutionary biology, namely that altruistic behavior amongst individuals is an increasing function of their genetic proximity. Thus, parents should care more about their children than grand-parents, who should care more than cousins. Using cross-sectional data from 10 countries, they conclude that, within households, orphans are worse off than non orphans in terms of enrollment figures, and find support for the Hamilton hypothesis. Our contribution extends their test to a panel setting, studying a context where HIV/AIDS does not account for the majority of orphans.

3 Data and empirical specification

3.1 Data

The data come from an original individual panel survey entitled "Pauvreté et Structure Familiale" (Poverty and Family Structure, henceforth PSF), conducted in Senegal in 2006-2007 for the first wave and in 2010-2012 for the second. The PSF survey results from cooperation between a team of French researchers and the National Statistical Office of

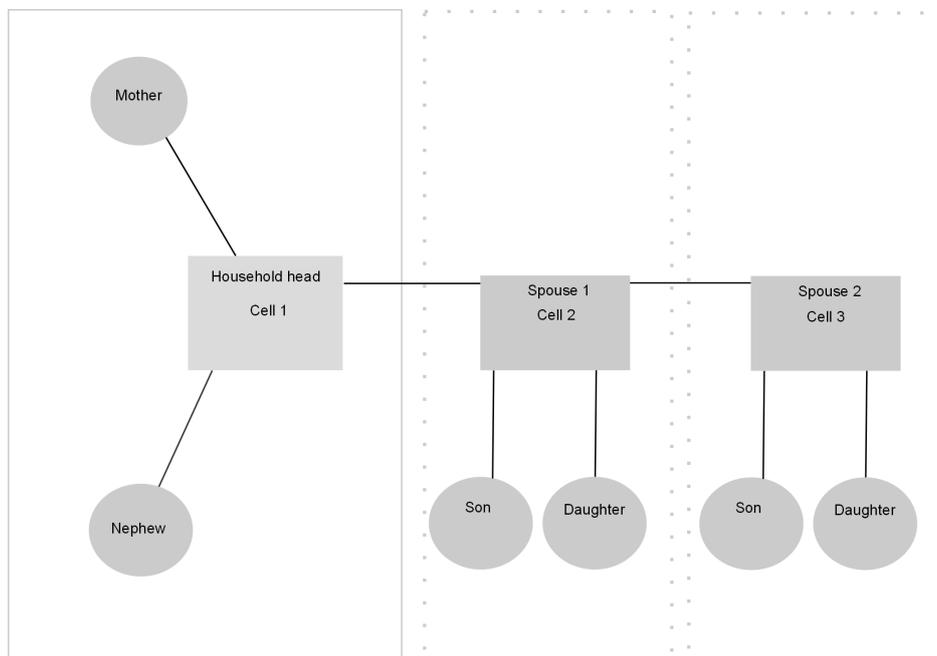
Senegal (See De Vreyer et al. (2008) for details.)⁴⁹. It is a nationally representative survey covering 1 800 households in the first wave, spread over 150 clusters drawn randomly from the census districts so as to ensure a nationally representative sample. This sample will be referred to as the primary sample in what follows. To these households are added 220 supplementary households identified as being households of nonresident spouses of primary sample household heads. They are called secondary households. This special feature results from the observation that in Senegal, polygyny is very much widespread and that it sometimes occurs for all spouses in a polygamous marriage to not reside together. Including secondary households in the survey allows us to better study households' living standards and how they adapt to their changing environment. In the second wave, every single individual that was observed in the first wave was tracked and re-interviewed, together with her current household if found in Senegal. A total of 16 152 individuals belonging to primary (14 379 individuals in 1 781 households) and secondary (1 773 individuals in 220 households) households were tracked, 83.6% (13 506 individuals) of whom were found and re-interviewed. They live in 2 964 households, making up a total sample of 28 312 individuals in the second wave. In our analysis, we were able to use 1726 households that were successfully tracked and for which information was not missing.

The PSF survey was designed to allow for a more precise measurement of individual access to resources than traditional consumption surveys. Interviews conducted at the early stages of the PSF project showed that within Senegalese households, it is possible to distinguish sub-groups of household members (henceforth referred to as *cells*) that are at least partly autonomous in their budget management. Consumption common to various cells in the household appeared clearly defined, as well as the responsibilities for paying for that consumption, and cells' own resources turned out to be not entirely pooled in the household.

The survey collects the usual information on individual characteristics, as well as a detailed description of the household structure and budgetary arrangements. Households are divided into cells according to the following rule: the head of household (a man most of the time) and unaccompanied dependent members, such as his widowed parent or children whose mother does not live in the same household, are grouped together. Then, each wife and her children and, potentially any other dependent under her care, make

⁴⁹Momar Sylla and Matar Gueye of the Agence Nationale de la Statistique et de la Démographie of Senegal (ANSD), and Philippe De Vreyer (University of Paris-Dauphine and IRD-DIAL), Sylvie Lambert (Paris School of Economics-INRA) and Abla Safir (now with the World Bank) designed the survey. The data collection was conducted by the ANSD.

Figure 23: Example of a 3-cell Senegalese household



up a separate group. Finally, any other family nucleus such as a married child of the household head with his/her spouse and children also form separate groups. Polygamous men other than the household head are treated in the same way as the head, with the husband and each wife in separate cells. This decomposition emerged from field interviews as being the relevant way to split the households into components. It corresponds well to the organization of households in Senegal (Diop 2012) and in the field it was never difficult to master, neither by the enumerators who found it fairly natural, nor by the households themselves.

In the PSF sample, more than a third of households contain at least three cells. The grouping of household members in distinct cells allows for the collection of consumption expenditures made to benefit members of a given cell. For children, it also allows us to identify who is taking care of them aside from the household head. This feature will be used to identify within households the differential impacts of adult deaths on children according to their relationship to the deceased person. Household may undergo restructuring in between waves: the possibilities of rapid transformation of Senegalese households (through, for example, subsets of the extended family moving between households) were described by Diop (2012), who quotes the death of the house-

hold head as one situation in which the *Wolof*⁵⁰ household will be divided into as many entities as there are co-wives. We do not make explicit the restructuring of households upon death, but focus on what happens to individual children’s outcomes between rounds.

3.2 Empirical specification

In this paper we estimate the impact of adult deaths on several outcomes pertaining to children: current school enrollment, current and past labor market work, participation in domestic chores and fostering. The empirical strategy relies on the linear probability model and makes use of the panel dimension of the data and of the grouping of cells within households.

Two kinds of regressions are estimated. First, keeping all households with children in age of being affected, the definition of which varies with the outcome of interest, we compare outcomes of children who have experienced a death in their household between the two waves of the survey with outcomes of those who have not. The basic model is a treatment model, so that our estimator is a double difference:

$$Y_{c,t} = \alpha + \beta_1 X_{c,t} + \beta_2 T_{c,t} + \gamma_t + \delta_c + \epsilon_{c,t} \quad (38)$$

$Y_{c,t}$ is the outcome of child c in year t , $X_{c,t}$ are child time variant characteristics, $T_{c,t}$ is the treatment effect (equal to one in wave 2 if the child lives in a household that suffered a death), γ_t and δ_c are time and child fixed effects, and $\epsilon_{c,t}$ an idiosyncratic error term. This specification does not distinguish between children, and estimates the impact of a death on the average child. Second, we draw benefit from the identification of budgetary independent cells within households to compare outcomes between children of different cells : we thus identify the differential impact of a cell head death between the two waves, depending on whether the child belonged to the impacted cell in the first wave or not.

$$Y_{c,t} = \alpha + \beta_1 X_{c,t} + \beta_2 T_{c,t} + \beta_3 T_{c,t} \times indT_{c,t} + \gamma_t + \delta_c + \epsilon_{c,t} \quad (39)$$

⁵⁰Main ethnic group in Senegal, accounting for roughly half of the population.

The explanatory variable in this section is reduced to cell head deaths, and in equation 39, the impact of a cell head death on the children of that cell is captured by β_3 , an interaction between the household level treatment effect, and an indicator $indT_{c,t}$ equal to one if child c is part of the cell whose head died.

To emphasize our results, we then restrict the sample to households that have experienced a cell head death and apply household fixed effects rather than child fixed effects. Furthermore, since the head of the household (who is also a cell head) plays a specific role in the intra-household allocation of resources between cells, and since the death of the household head is likely to result in the household breaking up, we choose to restrict all samples to households in which the household head himself did not die. Hence, we compare impacts between cells that are fully comparable. The household fixed effects model amounts to estimating equation 39 on our reduced sample, replacing the child fixed effects δ_c with household fixed effects δ_h .

Estimates of death impacts may be biased by two different sources of unobserved heterogeneity. First, deaths are unlikely to be random, and the probability of a death in a household has good chances of being linked to unobserved characteristics correlated with child outcomes, even when controlling for household size, total expenditure, adult education levels and any other relevant and observable characteristics. Such unobserved heterogeneity would probably upwardly bias estimates of the magnitude of the effects, as those households that *ceteris paribus* are more likely to experience deaths may also be more likely to underinvest in children's education and to need their work inputs (although, as seen in the case of AIDS-related deaths, coefficients could also be downward-biased (Evans and Miguel 2007)). To minimize this potential source of endogeneity we use the panel dimension of the data to produce child fixed effects estimates and check that they are not significantly different from those obtained in a random effects model. The results from the Random effects (not shown) and Fixed effects models are remarkably similar, leading us to conclude that the total bias associated with selection of individuals likely to experience death is close to zero. Second, since we evaluate impacts by double differences—that is, comparing time changes in outcomes between impacted and non impacted individuals—we need to make the assumption that deaths are unpredictable events, such that adjustments in the allocation of household resources do not precede death. While this might be true when death results from crime or accidents, the majority

of recorded deaths among prime-age adults were due to illness, and one might reasonably expect that a share of them were at least partly anticipated at the date of the first survey round. Falling ill might imply loss of labor capacity, and the need for care at home, and adjustment of child labor and schooling are thus likely to set in before death. For our purpose however, it suffices that death was unpredictable at the date of the first survey. This is likely to be all the more true the later the death occurred. Since some deaths probably occurred shortly after the first survey round, we cannot however definitely claim that all recorded deaths were unpredictable events in 2005-2006. When death is anticipated, adjustments are likely to precede actual death and part of the adjustment process might already have begun when individuals were interviewed for the first time. As such, there is a bias towards zero on estimated coefficients which should therefore be considered as lower bounds of the true effect of illness and death on households' allocation of time and resources.

In order to further investigate the assumption regarding predictability of death, we turn to two other sources of information: epidemiological data, and self-assessed health. The global burden of disease survey provides data on causes of death by country and age-range. Table 52 (Appendix) shows the main causes of death in Senegal for individuals between 15 and 49 years of age. While some causes are clearly associated with long-term illnesses (such as HIV and some forms of cancer), the majority are associated with rather abrupt deaths. Furthermore, self-assessed health is known to be a good predictor of mortality (Idler and Benyamini 1997), and by definition an even better predictor of an individual's belief regarding his or her probability of dying. Looking at self-assessed health in the first round of the PSF survey, by subsequent mortality status in round 2, gives us an idea on whether or not death seemed to be anticipated. Table 53 shows that while individuals who died in between panel rounds did indeed give a worse assessment of their health situation than individuals who survived, some 79% still believed that they were in average or above average health. We interpret this finding as another sign of death being—in a large majority of cases—an unanticipated shock to the household.

4 The evolution of Senegalese households between 2006 and 2012

Table 31 shows some characteristics of individuals from the two waves of the PSF survey. It should be noted that although the first wave data are representative of the Senegalese

population, the second wave data are not⁵¹. However, a look at the gender and age composition of our two samples shows that they are not significantly different. Looking at the proportion of children ever enrolled in school for those between 4 and 9 years old⁵², or currently in school for those between 4 and 17, it seems that current school enrollment made some progress between the two waves. This is reflected in aggregate data, where the gross primary intake increased from 67.3% to 96.4% in the period 1999-2014 (UNESCO 2016) and mirrors efforts made by the government to increase both the quantity and the quality of schooling in accordance with the millennium development goals. However, at the same time, labor market work increased among children between 6 and 17, while participation in household domestic chores and the hours of domestic work carried out diminished. The proportion of fostered children rose from 8% to 10%. Thus, school participation and labor market work seem to have increased over the period at the expense of domestic work. This could be good news if those at school or at work accumulate human capital or labor market experience that could increase their incomes in the future. Our data, however, does not allow us to investigate this.

Table 31: Evolution of child characteristics in Senegal between 2006 and 2012 (all observations)

		Sample selection criteria		All observations			
				Wave 1		Wave 2	
				N	Mean	N	Mean	Diff. (S.E.)
Males	All individuals less than 18	7622	0.5	13373	0.49	-0.01 (0.01)	
Age	All individuals less than 18	7622	7.97	13373	7.74	-0.23 (0.07)	
Went to school	Children from 4 to 9	2382	0.43	4435	0.44	0.01 (0.01)	
Currently at school	Children from 4 to 17	5315	0.49	9488	0.54	0.05 (0.01)***	
Ever worked	Children from 6 to 17	4754	0.26	8131	0.28	0.02 (0.01)***	
Currently working	Children from 6 to 17	4754	0.18	8131	0.24	0.06 (0.01)***	
Is doing domestic work	Children from 6 to 17	4754	0.53	8131	0.48	-0.05 (0.01)***	
Hours of domestic work	Children from 6 to 17	4754	8.17	8131	5.7	-2.5 (0.26)***	
Fostered	Children less than 15	6319	0.08	11337	0.10	0.012 (0.00)***	

Source: PSF survey, waves 1 and 2, authors' calculations

In the next table (Table 32) we examine the same outcomes, but this time only for children that are observed in the two waves. Here we see that amongst children aged between 4 and 9 in the first wave and who had never been to school at that time (55%) only 51% $((0.73-0.45)/0.55)$ entered school during the four and a half years (on average) separating the two surveys, leaving 27% of these children out of school. As

⁵¹All members of split-off households were interviewed in the second round.

⁵²In Senegal primary school normally starts at 6. Children may however go to pre- or nursery school before that age. On the opposite, a significant number of children delay their entry at school. For those that ever go to school, most of them enter before ten.

school entry generally occurs before ten (though the official age of entry is 6), one can expect that very few of them will start studying later. Consistent with the previous results we observe that the proportion of children that were between 4 and 17 at the time of the first wave and who are currently at school increases from 51% to 57%. The proportion of children between 6 and 17 who are working or have been working in the past also increases from 26% to 40%, while that of those currently working rises from 18% to 33%. We also observe an increase in the proportion of children doing domestic work and in the number of hours spent working on household chores. Finally, we observe a small increase in the proportion of fostered children. These results are all in line with what could be expected when looking at a sample of children over a four and a half year span: school enrollment increases together with market and domestic work.

Table 32: Evolution of child characteristics in Senegal between 2006 and 2012 (panel observations)

	Sample selection criteria	Panel sample			
		Wave 1		Wave 2	
		N	Mean	Mean	Diff. (S.E.)
Males	Children less than 18 in wave 1	6496	0.49	0.49	-
Age	Children less than 18 in wave 1	6486	7.91	12.4	4.44 (0.09)***
Went to school	Children between 4 and 9 in wave 1	2033	0.45	0.73	0.29 (0.01)***
Currently at school	Children between 4 and 17 in wave 1	4480	0.51	0.57	0.06 (0.01)***
Ever worked	Children between 6 and 17 in wave 1	4025	0.26	0.4	0.14 (0.01)***
Currently working	Children between 6 and 17 in wave 1	4025	0.18	0.33	0.15 (0.01)***
Is doing domestic work	Children between 6 and 17 in wave 1	4025	0.53	0.64	0.11 (0.01)***
Hours of domestic work	Children between 6 and 17 in wave 1	4025	8.35	10.74	2.40 (0.39)***
Fostered	Children less than 15 in wave 1	5378	0.08	0.12	0.04 (0.01)***

Source: PSF survey, waves 1 and 2, authors' calculations

Table 33 sums up our main explanatory variables, namely deaths occurring in the households. Frequencies given are those of the affected children, and categories are not mutually exclusive. A child who lost both his mother and his younger brother will thus appear both in the “Any young member” and “Any adult female” categories. In the vast majority of household, however, only one death occurred in between waves (87% of children in affected households lost one member; 10% two members). The affected children are all present in both rounds of the panel, and the deaths occurred sometime in between the two waves. The most prevalent cause of death is sickness, followed by old age. Violent crime and accidents account for very few deaths.

Table 33: Identity of the deceased and number of bereaved children, by sex

Deceased	Both genders		Girls		Boys	
	<i>Freq.</i>	<i>% of sample</i>	<i>Freq.</i>	<i>% of sample</i>	<i>Freq.</i>	<i>% of sample</i>
Any member	1293	19.9%	653	19.8%	640	20.0%
Any adult (15-64)	558	8.6%	275	8.4%	283	8.9%
Household head	413	6.4%	211	6.4%	202	6.3%
Any head of cell	742	11.4%	355	10.8%	387	12.1%
Cell head (except HH)	329	5.1%	144	4.4%	185	5.8%
Any young member (<15)	316	4.9%	165	5.0%	151	4.7%
Any old member (>64)	561	8.6%	281	8.5%	280	8.8%
Any adult male (15-64)	278	4.3%	142	4.3%	136	4.3%
Any adult female (15-64)	299	4.6%	137	4.2%	162	5.1%
Individual's cell head	83	1.3%	41	1.2%	42	1.3%
Individual's cell head (except HH)	57	0.9%	25	0.8%	32	1.0%

Source: PSF survey, waves 1 and 2, authors' calculations.

Population: Children less than 18 years old.

5 Consequences of a death in the household

5.1 Impacts by deceased individual

We first set out to investigate the impact of deaths of different members on children in the household, regardless of their relationship to the deceased. This way, we can estimate an average effect of losing a particular household member. All models in this subsection use child fixed effects⁵³. In the next subsection, the division of households into cells will be made use of in order to identify the relative impacts among children in a given household. The following tables show estimated coefficients from an individual panel regression model. Each column refers to the death of a specific individual (categories are not mutually exclusive). Overall, results show that deaths in the household do not seem to influence schooling significantly when the relationship between members is ignored. Deaths do to a larger extent influence the decision to send children to work, or have them increasingly participate in domestic work.

Two variables capture schooling adjustments: “currently at school”, and “ever enrolled”. Table 34 shows that being currently at school is not significantly correlated with household deaths. The same holds for “ever enrolled” (not shown). This suggests that households do not respond to deaths neither through having children dropping out from school, nor by preventing younger children from entering school (although we will show

⁵³A random effects model has also been run for each regression, and results remain qualitatively unchanged.

Table 34: Death impact on current schooling - Individual fixed effects - Children aged between 4 and 17 in first wave

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2 nd round	0.06*** (0.009)	0.06*** (0.009)	0.06*** (0.009)	0.06*** (0.009)	0.06*** (0.009)	0.06*** (0.009)	0.06*** (0.009)
<i>Identity of the deceased:</i>							
Household head	0.04 (0.027)						
Cell head (not HH)		-0.03 (0.044)					
Adult (15-64) member			0.02 (0.033)				
Member less than 15				0.00 (0.032)			
Member more than 64					-0.00 (0.029)		
Male adult (15-64) member						0.06 (0.039)	
Female adult (15-64) member							-0.03 (0.048)
Constant	0.45*** (0.013)	0.44*** (0.013)	0.45*** (0.013)	0.45*** (0.013)	0.45*** (0.013)	0.45*** (0.013)	0.45*** (0.013)
Observations	8,958	8,958	8,958	8,958	8,958	8,958	8,958
R-squared	0.02	0.02	0.01	0.01	0.01	0.02	0.02
Number of individuals	4,479	4,479	4,479	4,479	4,479	4,479	4,479

Standard errors clustered at the household level.
 *** p<0.01, ** p<0.05, * p<0.10
 Source: PSF survey, waves 1 and 2, authors' calculations

that the effect on children is conditional on their relationship to the deceased). When distinguishing between sex and area of residence (Tables 54 and 55), two coefficients come up as significant at the 10% level: the death of a male adult in rural areas, and the death of a female adult for girls. The death of a male adult increases participation of boys in schooling; a somewhat counterintuitive finding which may be explained by a preference channel. If, as commonly found in the literature, women have stronger education preferences than men, then the disappearance of a male decision maker might enable mothers to send children to school (this is supported by the fact that we indeed find a negative impact on girls from the death of an adult woman). On the whole, however, schooling outcomes for the average child appear rather unaffected by death in the household. Turning to market and household work, the again few significant associations that are found suggest that households' losses are mitigated by increases in child labor (tables 35 to 37): both current market work and domestic chores of children⁵⁴ rise when households lose certain adult members. In particular, the loss of a male adult is associated with an increase in current market work (table 36), while the loss of a female adult is associated with an increase in the hours of household chores carried out by children (table 37). Distinguishing effects by sex, table 58 in the appendix shows an increased probability of market work for girls upon the death of their cell heads or of old age household members, while boys' probability of working increases with the death of a male adult⁵⁵.

Appendix Table 60 shows that girls carry the load of an increased charge of domestic chores upon death of several household members. Regressions run on the extensive margin (not shown) however suggest that boys' participation in domestic work increases, although their number of hours of help does not. Inversely, girls' participation is not affected. The fact that girls adjust in the intensive margin only might stem from the fact that conventionally girls participate in domestic chores, while boys do not, unless under exceptional circumstances such as the death of an adult woman in the household. In the case of a loss of a female adult, girls need on average to carry out an additional 9.1 hours of domestic work per week. This echoes results in Evans (2014), who finds that girls among the *Serer* people in Senegal carry out unpaid caregiving work upon maternal deaths.

⁵⁴The adjustment takes place both at the extensive and intensive margins; however, only the number of hours of work is reported here.

⁵⁵This result is robust to the exclusion of children belonging to the cell whose cell head is deceased, such that girls from all cells in the household are found to increase domestic chores upon the death of a household head.

Table 35: Death impact on the probability of having ever worked on the market - Individual fixed effects - Children aged between 6 and 17 in first wave

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2 nd round	0.14*** (0.013)	0.13*** (0.013)	0.13*** (0.013)	0.14*** (0.013)	0.13*** (0.013)	0.14*** (0.013)	0.14*** (0.013)
<i>Identity of the deceased:</i>							
Household head	0.01 (0.039)						
Cell head (not HH)		0.06 (0.052)					
Adult (15-64) member			0.03 (0.036)				
Member less than 15				-0.02 (0.045)			
Member more than 64					0.05 (0.039)		
Male adult (15-64) member						0.03 (0.058)	
Female adult (15-64) member							0.03 (0.038)
Constant	0.13*** (0.019)	0.13*** (0.019)	0.13*** (0.019)	0.13*** (0.019)	0.13*** (0.019)	0.13*** (0.019)	0.13*** (0.019)
Observations	8,038	8,038	8,038	8,038	8,038	8,038	8,038
R-squared	0.06	0.07	0.07	0.06	0.07	0.06	0.06
Number of individuals	4,019	4,019	4,019	4,019	4,019	4,019	4,019

Standard errors clustered at the household level.
 *** p<0.01, ** p<0.05, * p<0.10

Table 36: Death impact on current market work - Individual fixed effects - Children aged between 6 and 17 in first wave

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2 nd round	0.15***	0.15***	0.15***	0.15***	0.15***	0.15***	0.15***
<i>Identity of the deceased:</i>							
Household head	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Cell head (not HH)	0.04 (0.041)						
Adult (15-64) member		0.04 (0.062)					
Member less than 15			0.05 (0.042)				
Member more than 64				-0.05 (0.044)			
Male adult (15-64) member					0.06 (0.038)		
Female adult (15-64) member						0.11* (0.063)	
Constant	0.03 (0.019)	0.03 (0.019)	0.03 (0.019)	0.02 (0.019)	0.03 (0.019)	0.03 (0.019)	-0.01 (0.045) 0.02 (0.019)
Observations	8,038	8,038	8,038	8,038	8,038	8,038	8,038
R-squared	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Number of individuals	4,019	4,019	4,019	4,019	4,019	4,019	4,019

Standard errors clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Concerning fostering, Table 38 shows that a death in the household increases the probability of being fostered, although the effect is only significant for the death of the household head, and at the 10% level. Looking at the breakdown by sex (Appendix, Table 62) the effect is significant for boys only. There is also a significant association between the death of a young member of the household and girl fostering. The urban/rural breakdown (Appendix, Table 63) shows that this is a rural phenomenon: the death of a household member increases the probability that a rural child is fostered, whereas in the urban setting coefficients are never significant.

Summing up, at best a weak impact is found on the average child's schooling following the death of an adult in a household. This only applies to girls when adult women die, and goes in the opposite direction for boys when adult men die. The disappearance of an adult woman would decrease the probability of the average girl to be in school by 9 percentage points. However, the coefficients are only significant at the 10% level and we

Table 37: Death impact on hours of household chores - Individual fixed effects - Children aged between 6 and 17 in first wave

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2 nd round	2.30*** (0.398)	2.30*** (0.392)	2.22*** (0.398)	2.38*** (0.393)	2.27*** (0.401)	2.39*** (0.390)	2.25*** (0.390)
<i>Identity of the deceased:</i>							
Household head	1.77 (1.336)						
Cell head (not HH)		2.05 (1.600)					
Adult (15-64) member			2.23* (1.328)				
Member less than 15				0.76 (1.569)			
Member more than 64					1.71 (1.269)		
Male adult (15-64) member						0.52 (1.878)	
Female adult (15-64) member							3.72** (1.663)
Constant	6.04*** (0.585)	6.04*** (0.579)	6.13*** (0.582)	5.96*** (0.581)	6.07*** (0.587)	5.95*** (0.577)	6.10*** (0.577)
Observations	8,038	8,038	8,038	8,038	8,038	8,038	8,038
R-squared	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Number of individuals	4,019	4,019	4,019	4,019	4,019	4,019	4,019

Standard errors clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 38: Death impact on probability to be fostered - Individual fixed effects - Children less than 15, not fostered in first wave

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2 nd round	0.03*** (0.005)	0.03*** (0.005)	0.03*** (0.005)	0.03*** (0.005)	0.03*** (0.005)	0.03*** (0.005)	0.03*** (0.005)
<i>Identity of the deceased:</i>							
Household head	0.03* (0.020)						
Cell head (not HH)		0.01 (0.029)					
Adult (15-64) member			0.02 (0.016)				
Member less than 15				0.04 (0.026)			
Member more than 64					0.02 (0.020)		
Male adult (15-64) member						0.01 (0.019)	
Female adult (15-64) member							0.02 (0.023)
Constant	-0.01* (0.007)	-0.01** (0.007)	-0.01* (0.007)	-0.01* (0.007)	-0.01* (0.007)	-0.01** (0.007)	-0.01** (0.007)
Observations	9,518	9,518	9,518	9,518	9,518	9,518	9,518
R-squared	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Number of individuals	4,759	4,759	4,759	4,759	4,759	4,759	4,759

Standard errors clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

are therefore cautious about interpreting them as robust effects of death. Concerning work, we find positive effects on the probability of having worked or currently working for girls when cell heads or old age members die. For boys, a positive and slightly stronger effect is found upon the death of adult males. A strong impact is found on girls' hours of domestic work following the death of an adult woman, and fostering out a child is found to be part of coping strategies in rural areas. These results are obtained comparing children in impacted households with children from other households, making use of child fixed effects to account for unobserved heterogeneity.

Thus far, we have neglected the links between children and deceased individuals. While an adult death does not seem to strongly impact the average child's schooling and market work, it is not unlikely that effects are conditional on the relationship between the deceased and the child, such that children whose main caregiver dies are more impacted than others in the same household. This will be explored in the next section, where we shall focus on the death of a cell head.

5.2 The penalty of losing a cell head

We now turn our attention to the impact of the death of a cell head, focusing on children belonging to the impacted cell. When not taking into account the relationship between the deceased adult and the child, the death of a cell head did not give rise to significant change in children's schooling or fostering in the first set of regressions. We did however find impacts on market and domestic work, that were mainly driven by girls. In this section, we explore another dimension: whether the child belonged to the cell whose head died or not. First, we compare children who lost their cell head to others who did not, whether or not they live in the same household ; second, we compare impacted children to other children of the same household, but belonging to a different cell. Throughout this section, we exclude the first cell of each household, since the household head's cell is a particular one and the death of its head usually leads to the household splitting up.

5.2.1 Child fixed effects

In these regressions, the control sample is made up of children who did not lose their cell head, whether or not they belong to the same household. Results in Table 39 show that being the child of a deceased cell head is significantly and negatively associated with school attendance and positively associated with having worked. The magnitude of the effect is large. Losing a cell head leads to a 25 percentage point drop in the probability of

being in school, and a 24 percentage point increase in the probability of having worked. Interestingly, we observe that the effects seem to be limited to children of the impacted cell, since children who live in a household where a cell head died, but whose own cell head is still alive do not seem to be impacted. The channels of household coping are thus primarily defined within cells, rather than within households, although as previously shown, all children in the household might adjust to some extent in case of death of other members, especially through market and domestic work. This adjustment is likely to be sex-specific, as the previous section showed.

Table 39: Cell head death impact on various outcomes - Individual fixed effects

	<i>Curr. in school</i>	<i>Ever worked</i>	<i>Curr. working</i>	<i>Doing dom. work</i>	<i>Hours dom. work</i>	<i>Fostered</i>
2 nd round	0.08*** (0.011)	0.13*** (0.015)	0.15*** (0.015)	0.12*** (0.016)	2.16*** (0.482)	0.03*** (0.005)
Cell head death*Wave	0.02 (0.066)	0.04 (0.075)	0.03 (0.090)	-0.01 (0.068)	3.24 (2.244)	0.00 (0.013)
Own cell head death*Wave	-0.25* (0.127)	0.24** (0.108)	0.11 (0.159)	0.11 (0.146)	-0.86 (4.666)	0.17 (0.105)
Constant	0.41*** (0.016)	0.13*** (0.023)	0.03 (0.023)	0.40*** (0.024)	6.34*** (0.710)	-0.01* (0.007)
Observations	6,484	5,690	5,690	5,690	5,690	7,948
R-squared	0.02	0.07	0.08	0.04	0.01	0.02
Number of individuals	3,242	2,845	2,845	2,845	2,845	3,974

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Samples differ from one regression to the other. School enrolment: 4 to 9 years old in first wave ;

Current schooling: 4 to 17; Currently working, Domestic work, Ever worked: 6 to 17;

Fostered: 0 to 14 and not fostered in first wave.

The fact that children who are not directly impacted adjust in some outcomes finds support from the fact that the coefficient "Own cell head death*2nd round" for the column "Hours of domestic work" in Table 39 is not significant, suggesting that children under the care of the deceased do not have to help out in the case of death; a look at Table 64 (Appendix) however provides a slightly different picture. Similar to the results in section 5.1, this table shows that the death of a cell head (usually a woman) implies that all girls in the household need to work 10 more domestic hours. However, the girls that belonged to the affected cell are not disproportionately called upon. In other words, while girls as a group do need to increase their contribution in the household in the event of a cell head

death, the burden falls equally on all girls, regardless of their relation to the cell head. For boys, this is not true. The average boy does not need to put in more hours in domestic work, nor is he expected to engage in these activities to a larger extent. However, boys in the affected cell have an increased probability of being called upon to do domestic work.

Regarding market work, the non-significant coefficients indicate that cell head deaths are not associated with increased labor for the individuals inside or outside the affected cell. For the probability of having ever worked the coefficient is however significant. It is thus plausible that children whose head of cell dies are more frequently mobilized in the short term but that eventually other coping mechanisms are put in place. Table 64 also shows that the schooling and work outcomes are driven by boys. Girls' coefficients are smaller in magnitude (although not close to zero) but are not significant.

5.2.2 Household fixed effects

In the preceding analysis we were comparing children whose cell head died with children whose cell head stayed alive, regardless of the household they belonged to. Since individual fixed effects are accounted for, we can expect these results to be robust estimates of the impact of a cell head death on children's outcomes in the average population. However, they do not show whether or not, within the affected household, all children are treated equally. In order to answer this question, we now turn to within-household estimates. We run the same regressions with household fixed effects, decomposing results by sex and by area of residence. Results are shown in tables 40 to 44. They show that being the child of the cell head who died has adverse effects larger than those on other children in the household, suggesting that the extended family does not provide as good an insurance as may have been argued.

Table 40 shows results for current school attendance.⁵⁶ Again, the effects are quite big: being under the care of the individual who died reduces the probability of going to school by 27% to 36%, compared to the average school attendance in the household, which one can assume to be close to the population average in the second wave, that is 54%. Surprisingly, the impact is only significant for boys, though the coefficient for girls has the same size. Tables 41 and 42 show that the reduction in school attendance is mirrored in the increase in labor market work in urban areas. Once again compared to the household

⁵⁶Sample size in tables 10 to 14 is reduced since households in which no cell head died do not contribute to the estimation. Keeping them in the sample does not significantly change the results

mean, the probability of working increases by 31% in urban areas for children whose cell head died (Table 41). Similar effects are found for the probability of ever having worked. However no impact is found on domestic work (Table 43), suggesting along the previous results that when an adult dies her load of household chores is redistributed among all children (at least all girls). Finally, Table 44 shows, contrary to the individual fixed effects results, that fostering is another way of adjusting to the death of an adult, particularly for girls.

To sum up, when it comes to children of deceased cell heads, the negative impacts seen in the previous regressions (section 5.2.1) are confirmed. In a given household that has seen the death of a cell head, the boys under the care of the person are less likely to go to school, and more likely to work, while the girls are more likely to be fostered. Dropping out of school seems to be the main channel of adjustment in rural areas, whereas child labor seems to be dominant in urban areas.

Table 40: Cell head death impact on current schooling - Household fixed effects - Children between 4 and 17 in first wave

	Full sample	Girls	Boys	Urban	Rural
Male	-0.06 (0.065)			-0.14 (0.139)	-0.03 (0.076)
Age (years)	-0.01* (0.007)	-0.03** (0.012)	0.00 (0.013)	-0.01 (0.017)	-0.02* (0.008)
Own cell head death	0.14* (0.086)	0.15 (0.215)	0.19 (0.135)	0.17 (0.174)	0.15 (0.089)
2 nd round	0.15** (0.063)	0.27*** (0.081)	0.06 (0.081)	0.03 (0.071)	0.22** (0.082)
Own cell head death*2 nd round	-0.27** (0.124)	-0.26 (0.212)	-0.29** (0.133)	-0.13 (0.134)	-0.36* (0.177)
Constant	0.58*** (0.125)	0.64*** (0.103)	0.43** (0.212)	0.83*** (0.141)	0.42** (0.180)
Observations	368	164	204	138	230
R-squared	0.42	0.46	0.53	0.34	0.43

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Comparing the results of the “Full sample” column from the household fixed effects regressions shown in tables 40-44 to the results in the child fixed effects regressions shown in table 39 shows qualitatively similar results (the coefficients for schooling and fostering are slightly bigger, and the one associated with ever having done market work smaller). This confirms our previous results on schooling, where we found that belonging to a household that experienced a death had no significant impact. Rather, it is being in a cell

that experiences a death that matters. Finally, running the regressions on school presence by consumption quartile (not shown) shows that our effects are driven by the lower half of the income distribution, in line with results from previous literature (Yamano and Jayne 2005).

Table 41: Own cell head death impact on current market work - Household fixed effects - Children between 6 and 17 in first wave

	Full sample	Girls	Boys	Urban	Rural
Male	0.08* (0.046)			0.14* (0.069)	0.05 (0.060)
Age (years)	0.02*** (0.008)	0.02 (0.014)	0.03** (0.011)	0.03** (0.010)	0.02** (0.010)
Own cell head death	-0.00 (0.103)	-0.03 (0.242)	0.04 (0.138)	-0.17 (0.128)	0.08 (0.136)
2 nd round	0.08 (0.111)	0.12 (0.137)	0.06 (0.130)	-0.07 (0.044)	0.17 (0.158)
Own cell head death* 2 nd round	0.06 (0.173)	0.04 (0.159)	0.07 (0.232)	0.31** (0.120)	-0.07 (0.254)
Constant	-0.25 (0.149)	-0.20 (0.184)	-0.21 (0.207)	-0.19 (0.150)	-0.26 (0.208)
Observations	336	144	192	120	216
R-squared	0.42	0.37	0.52	0.58	0.36

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 42: Own cell head death impact on the probability of having ever worked on the market - Household fixed effects - Children between 6 and 17 in first wave

	Full sample	Girls	Boys	Urban	Rural
Male	0.06 (0.046)			0.08 (0.080)	0.09 (0.056)
Age (years)	0.04*** (0.008)	0.04*** (0.014)	0.06*** (0.012)	0.02 (0.011)	0.05*** (0.009)
Own cell head death	-0.06 (0.086)	0.07 (0.127)	-0.03 (0.100)	-0.19 (0.132)	-0.02 (0.108)
2 nd round	-0.01 (0.077)	-0.02 (0.106)	-0.04 (0.096)	-0.01 (0.049)	0.01 (0.114)
Own cell head death*2 nd round	0.20 (0.121)	0.16 (0.163)	0.21 (0.141)	0.29** (0.119)	0.16 (0.172)
Constant	-0.21 (0.142)	-0.18 (0.216)	-0.29* (0.145)	-0.12 (0.137)	-0.24 (0.180)
Observations	336	144	192	120	216
R-squared	0.58	0.57	0.65	0.49	0.54

Standard errors are clustered at the household level.
 *** p<0.01, ** p<0.05, * p<0.10

Table 43: Own cell head death impact on hours of domestic work - Household fixed effects - Children between 6 and 17 in first wave

	Full sample	Girls	Boys	Urban	Rural
Male	-13.21*** (2.300)			-13.17** (4.990)	-13.36*** (2.808)
Age (years)	1.64*** (0.290)	3.10*** (0.794)	0.33 (0.299)	1.66** (0.724)	1.63*** (0.320)
Own cell head death	-2.88 (2.535)	-9.89 (9.991)	-2.23 (1.655)	1.83 (2.110)	-4.69 (3.226)
2 nd round	-1.88 (2.175)	-0.97 (3.281)	-3.01 (3.314)	-2.43 (3.300)	-1.58 (2.978)
Own cell head death*2 nd round	-0.25 (4.761)	-1.38 (10.576)	3.96 (2.754)	-3.27 (3.680)	1.44 (7.168)
Constant	-3.22 (3.272)	-24.36*** (8.268)	3.63 (2.557)	-7.53 (5.618)	-0.97 (4.469)
Observations	336	144	192	120	216
R-squared	0.37	0.54	0.33	0.39	0.35

Standard errors are clustered at the household level.
 *** p<0.01, ** p<0.05, * p<0.10

Table 44: Own cell head death impact on probability of being fostered - Household fixed effects - Children less than 15 not fostered in first wave

	Full sample	Girls	Boys	Urban	Rural
Male	0.01 (0.019)			-0.00 (0.023)	0.02 (0.024)
Age (years)	-0.00 (0.002)	0.00 (0.003)	-0.00 (0.004)	0.00 (0.003)	-0.00 (0.004)
Own cell head death	0.06 (0.042)	0.01 (0.046)	0.19 (0.117)	0.04 (0.071)	0.07 (0.050)
2 nd round	0.04** (0.016)	0.02 (0.028)	0.06** (0.026)	0.03 (0.017)	0.05* (0.026)
Own cell head death*2 nd round	0.18 (0.120)	0.27* (0.155)	0.11 (0.120)	0.15 (0.148)	0.21 (0.181)
Constant	-0.04 (0.025)	-0.03 (0.032)	-0.05 (0.044)	-0.04 (0.040)	-0.04 (0.034)
Observations	384	174	210	150	234
R-squared	0.23	0.33	0.22	0.27	0.22

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

5.3 Robustness checks

The previous models have all used individual or household fixed effects in order to establish a relationship between bereaved children and various outcomes. In particular, we have shown that when a cell head dies, the children belonging to this cell suffer heavy adjustments. Fixed effects ensure that this result is not driven by selection at the household level. However, it could be that within a household, cells differ on some observable or unobservable characteristic which leads them to be more exposed to death while also having children at a higher risk of dropping out of school, being fostered or joining the labor market. Appendix Tables 49-51 show that the affected cells are indeed different on some sociodemographic characteristics, such as the average age and sex of the cell head. However, it is unclear if this would lead to a bias in the results, and what direction the bias would take. A first test for cell selection is to estimate the same regressions that we did in tables 34 to 39, but without adding child fixed effects. If estimates are unchanged, this supports the hypothesis that cell fixed effects are not explaining our results. We carried out this exercise (results not shown) and it turned out that keeping or removing individual fixed effects from the regressions yields very similar results in terms of coefficients size, sign, and significance. The second test is to keep the same samples as in tables 40 to 44—that is, households who experienced the death of a cell head—but this time using child fixed effects instead of household fixed effects. As shown in the table below, this hardly modifies the coefficients obtained in the household fixed effects regressions.

Table 45: Cell head death impact on various outcomes - Individual fixed effects - Impacted households only

	<i>Curr. in school</i>	<i>Ever worked</i>	<i>Curr. working</i>	<i>Doing dom. work</i>	<i>Hours dom. work</i>	<i>Fostered</i>
Age (years)	-0.02 (0.030)	0.00 (0.023)	-0.01 (0.033)	0.05* (0.024)	3.18* (1.754)	-0.02 (0.011)
2 nd round	0.20 (0.127)	0.17 (0.108)	0.23* (0.137)	-0.10 (0.150)	-8.93 (7.795)	0.10* (0.055)
Own cell head death* 2 nd round	-0.27** (0.113)	0.20* (0.115)	0.06 (0.161)	0.13 (0.128)	-0.11 (4.330)	0.18 (0.113)
Constant	0.63*** (0.228)	0.07 (0.208)	0.03 (0.302)	0.04 (0.151)	-21.88* (12.771)	0.00 (0.022)
Observations	368	336	336	336	336	384
R-squared	0.05	0.20	0.13	0.06	0.14	0.16
Number of individuals	184	168	168	168	168	192

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Samples differ from one regression to the other. School enrolment: 4 to 9 years old in first wave ;

Current schooling: 4 to 17; Everworked, Currently working; Domestic work: 6 to 17;

Fostered: 0 to 14 and not fostered in first wave.

Although no static selection effects seem to prevail, this does not necessarily imply that our units of observation would have followed similar trends in the absence of a shock. Ideally, to thoroughly justify the parallel trends assumption, we would need a longer panel with observations in time preceding the first round. Since we only have two waves in the panel, we interact the time variable with a set of individual and cell head characteristics. This is done on the individual fixed effects estimates in Table 39. Specifically, we interact the time variable with child age and sex, and with cell head age and sex. The results are shown in Table 46 below. Again, they are consistent with the previous results, suggesting that the former were not just picking up trends for specific characteristics that could be correlated with seeing a cell head decease.

Table 46: Cell head death impact on various outcomes -Individual fixed effects -Trends added

	<i>Curr. in school</i>	<i>Ever worked</i>	<i>Curr. working</i>	<i>Doing dom. work</i>	<i>Hours dom. work</i>	<i>Fostered</i>
2 nd round	0.70*** (0.050)	-0.16** (0.072)	-0.23*** (0.071)	0.40*** (0.076)	5.28** (2.243)	0.00 (0.025)
Cell head death × 2 nd round	0.05 (0.051)	0.05 (0.080)	0.06 (0.093)	-0.01 (0.076)	4.17* (2.464)	0.00 (0.014)
Own cell head death × 2 nd round	-0.22** (0.092)	0.23* (0.122)	-0.07 (0.182)	0.36*** (0.111)	-0.43 (3.254)	0.20* (0.119)
Girl × 2 nd round	-0.01 (0.018)	0.07*** (0.022)	0.12*** (0.022)	-0.12*** (0.027)	-4.74*** (0.796)	-0.00 (0.008)
CH female × 2 nd round	-0.04 (0.030)	0.06 (0.040)	0.09** (0.040)	0.03 (0.046)	0.46 (1.344)	0.03** (0.012)
Cell head age × 2 nd round	-0.00*** (0.001)	0.00*** (0.001)	0.00*** (0.001)	0.00 (0.001)	0.04 (0.051)	0.00 (0.001)
Child age × 2 nd round	-0.04*** (0.002)	0.00 (0.003)	0.01** (0.003)	-0.02*** (0.003)	-0.30** (0.133)	-0.00** (0.001)
Constant	-0.21*** (0.052)	0.42*** (0.075)	0.41*** (0.073)	0.12 (0.077)	3.31 (2.268)	0.01 (0.025)
Observations	6,241	5,472	5,472	5,472	5,472	7,637
R-squared	0.15	0.08	0.10	0.07	0.03	0.02
Number of individuals	3,242	2,845	2,845	2,845	2,845	3,974

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Samples differ from one regression to the other. School enrolment: 4 to 9 years old in first wave ;

Current schooling: 4 to 17; Everworked, Currently working; Domestic work: 6 to 17;

Fostered: 0 to 14 and not fostered in first wave.

Finally, although displaying decent attrition rates (recall that 84% of all individuals were found in both waves), there could be a concern that attrition biases coefficients.

Failure to relocate individuals has three origins. Either the individual is deceased, and logically disappears from the sample. Or, he or she is not to be found. In the second case, this can reflect move to a foreign country. If there were indications of this, no tracking in the foreign country was attempted. Remaining unfound individuals thus correspond to failed attempts at tracking. Table 88 shows the outcome means from two samples: the attrited from the first round, and the panel observations.

Table 47: Attrition analysis

	1 st round		Both rounds		Difference
	<i>Freq.</i>	<i>[%]</i>	<i>Freq.</i>	<i>[%]</i>	
Individuals <15 ans	927	14%	5581	86%	
In school	654	38%	4057	48%	-0.109***
Ever worked	927	11%	5581	12%	-0.013
Currently working	927	9%	5581	8%	0.008
Domestic chores	927	25%	5581	27%	-0.025
Hours of domestic chores	927	3	5581	3.4	-0.4
Fostered	879	12%	5440	8%	0.037***
	<i>Freq.</i>	<i>[%]</i>	<i>Freq.</i>	<i>[%]</i>	
Individuals <18 ans	1126	15%	6496	85%	
In school	841	38%	4944	48%	-0.10***
Ever worked	1126	16%	6496	16%	-0.003
Currently working	1126	12%	6496	11%	0.014
Domestic chores	1126	31%	6496	33%	-0.02
Hours of domestic chores	1126	4.6	6496	5.2	-0.6
Fostered	1069	13%	6347	8%	0.05***

Sample: All individuals less than 15 (18) years old and present in the first wave.

*,p<0.1,**,p<0.05,***:p<0.01.

Shares of working children, whether in the market or in the household, are not significantly different for attriters. School presence however is, with attriters being significantly less likely to be in school. If one interprets this as attriters being a more vulnerable subset of the population with respect to schooling, it seems reasonable to argue that they would at least suffer as strong adjustments as individuals in our main sample. Their exclusion from the second round would then, if anything, bias coefficients downward. The same argument can be put forward for fostering. Since the missing children from the first round were to a larger extent fostered, their response to a cell head death may to an even larger extent be fostering than in the panel sample. In any case, it seems very unlikely that their inclusion would bias coefficients towards zero, although we have no formal way of affirming this.

6 Concluding remarks

In this article, we have attempted to shed light on the linkages between death and children's outcomes in Senegal. Our dataset allows to take into account the complex structure of extended and polygamous households. Within households, relatively independent budgetary units, cells, can be identified, and children assigned to these cells. We look at the impacts of adult deaths on children, paying special attention to the relationship between the child and the deceased. First, we find that for the average child in the household, a death does not lead to a decrease in schooling, but does lead to an increased probability of doing market work as well as domestic chores, depending on the sex and age of the deceased. Second, when we zoom in on heads of cells—most commonly co-wives in a polygamous household—we find that their death is associated with strong and significant adverse effects on schooling for the children belonging to that cell. These adverse effects do not concern other children in the household. We also find that girls who lose their cell heads are significantly more likely to be fostered out, whereas boys are more likely than other children in the household to have had to do market work.

Through these results we contribute to the literature on adult mortality and children's welfare, showing along the lines of Case, Paxson, and Ableidinger (2004) that the burden of adult deaths is not homogeneously shared among children in affected households. In particular, we show that in Senegal, a West African country with frequent polygamy and large extended households, withdrawal from school or fostering is a very likely outcome for children whose main caregiver dies. Policies targeting orphans at the household level are therefore likely to be inefficient.

References

- Ainsworth, Martha (1995). "Economic aspects of child fostering in Cote d'Ivoire." In: *Research in Population Economics* 8, pp. 25–62.
- Ainsworth, Martha and Deon Filmer (2002). *Poverty, AIDS, and children's schooling: A targeting dilemma*. Vol. 2885. World Bank Publications.
- (2006). "Inequalities in children's schooling: AIDS, orphanhood, poverty, and gender". In: *World Development* 34.6, pp. 1099–1128.
- Akresh, Richard (2007). *School Enrollment Impacts of Non-traditional Household Structure*. Unpublished manuscript, University of Illinois at Urbana–Champagne.
- Ardington, Cally and Murray Leibbrandt (2010). "Orphanhood and Schooling in South Africa: Trends in the Vulnerability of Orphans between 1993 and 2005". In: *Economic development and cultural change* 58.3, p. 507.
- Beck, Simon et al. (2015). "Child Fostering in Senegal". In: *Journal of Comparative Family Studies*, pp. 57–73.
- Becker, Gary S and Nigel Tomes (1976). "Child Endowments and the Quantity and Quality of Children". In: *Journal of Political Economy* 84.4, Part 2, S143–S162.
- Beegle, Kathleen (2005). "Labor Effects of Adult Mortality in Tanzanian Households". In: *Economic Development and Cultural Change* 53.3, pp. 655–683.
- Beegle, Kathleen, Joachim De Weerd, and Stefan Dercon (2006). "Orphanhood and the Long-Run Impact on Children". In: *American Journal of Agricultural Economics* 88.5, pp. 1266–1272.
- (2008). "Adult Mortality and Consumption Growth in the Age of HIV/AIDS". In: *Economic Development and Cultural Change* 56.2, pp. 299–326.
- Beegle, Kathleen, Rajeev H Dehejia, and Roberta Gatti (2006). "Child labor and agricultural shocks". In: *Journal of Development Economics* 81.1, pp. 80–96.
- Bennell, Paul (2005). "The Impact of the AIDS Epidemic on the Schooling of Orphans and Other Directly Affected Children in Sub-Saharan Africa". In: *The Journal of Development Studies* 41.3, pp. 467–488.
- Case, Anne and Cally Ardington (2006). "The impact of parental death on school outcomes: Longitudinal evidence from South Africa". In: *Demography* 43.3, pp. 401–420.
- Case, Anne, Christina Paxson, and Joseph Ableidinger (2004). "Orphans in Africa: Parental death, poverty, and school enrollment". In: *Demography* 41.3, pp. 483–508.
- Chirwa, Wiseman C. (2002). "Social Exclusion and Inclusion: Challenges to Orphan Care in Malawi". In: *Nordic Journal of African Studies* 11.1, pp. 93–113.
- Currie, Janet and Douglas Almond (2011). "Human capital development before age five". In: *Handbook of labor economics* 4, pp. 1315–1486.
- Daly, Martin and Margo Wilson (1998). *The truth about Cinderella: A Darwinian view of parental love*. Yale University Press.
- De Vreyer, Philippe et al. (2008). "Pauvreté et Structure Familiale : pourquoi une nouvelle enquête ?" In: *STATECO* 102, pp. 261–275.
- Dercon, Stefan, John Hoddinott, and Tassew Woldehanna (2005). "Shocks and Consumption in 15 Ethiopian Villages, 1999–2004". In: *Journal of African Economies* 14.4, pp. 559–585.
- Diop, Abdoulaye-Bara (2012). *La famille wolof*. Karthala Editions.
- Duryea, Suzanne, David Lam, and Deborah Levison (2007). "Effects of economic shocks on children's employment and schooling in Brazil". In: *Journal of Development Economics* 84.1, pp. 188–214.
- Eloundou-Enyegue, Parfait and Vongaï Kandiwa (2007). "Évolution de la concentration du confiage en Afrique: l'exemple du Ghana et de la Zambie". In: *Sociologie et sociétés* 39.2, pp. 101–118.

- Evans, David K and Edward Miguel (2007). "Orphans and schooling in Africa: a longitudinal analysis". In: *Demography* 44.1, pp. 35–57.
- Evans, Ruth (2014). "Parental death as a vital conjuncture? Intergenerational care and responsibility following bereavement in Senegal". In: *Social & Cultural Geography* 15.5, pp. 547–570.
- Foster, Geoff (2000). "The capacity of the extended family safety net for orphans in Africa". In: *Psychology, Health & Medicine* 5.1, pp. 55–62.
- Gertler, Paul, David I Levine, and Minnie Ames (2004). "Schooling and Parental Death". In: *Review of Economics and Statistics* 86.1, pp. 211–225.
- Gertler, Paul et al. (2003). *Losing the Presence and Presents of Parents: How Parental Death Affects Children*. Unpublished manuscript. Berkeley, CA: Haas School of Business.
- Grimm, Michael (2011). "Does household income matter for children's schooling? Evidence for rural Sub-Saharan Africa". In: *Economics of Education Review* 30.4, pp. 740–754.
- Guarcello, Lorenzo, Fabrizia Mealli, and Furio Camillo Rosati (2010). "Household vulnerability and child labor: the effect of shocks, credit rationing, and insurance". In: *Journal of population economics* 23.1, pp. 169–198.
- Hamilton, W.D. (1964). "The Genetical Evolution of Social Biology". In: *Journal of Theoretical Biology* 7, pp. 1–16.
- Hoddinott, John, Harold Alderman, and Lawrence Haddad (1997). "Testing Competing Models of Intrahousehold Allocation". In: *Intrahousehold Resource Allocation in Developing Countries: Models, Methods and Policy*. John Hopkins University Press. Chap. 8, pp. 129–141.
- Hoddinott, John and Lawrence Haddad (1995). "Does Female Income Share Influence Household Expenditures? Evidence from Côte d'Ivoire". In: *Oxford Bulletin of Economics and Statistics* 57.1, pp. 77–96.
- Idler, Ellen L and Yael Benyamini (1997). "Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies". In: *Journal of Health and Social Behavior*, pp. 21–37.
- Isiugo-Abanihe, Uche C (1985). "Child Fosterage in West Africa". In: *Population and Development Review* 11.1, pp. 53–73.
- Jacoby, Hanan G. and Emmanuel Skoufias (1997). "Risk, Financial markets, and Human Capital in a Developing Country." In: *Review of Economic Studies* 64.3, p. 311.
- Kazianga, Harounan and Zaki Wahhaj (2017). "Intra-household resource allocation and familial ties". In: *Journal of Development Economics* 127, pp. 109–132.
- Kobiané, Jean-François, Anne-Emmanuèle Calvès, and Richard Marcoux (2005). "Parental death and children's schooling in Burkina Faso". In: *Comparative Education Review* 49.4, pp. 468–489.
- Kuo, Caroline and Don Operario (2010). "Caring for AIDS-orphaned children: an exploratory study of challenges faced by carers in KwaZulu-Natal, South Africa". In: *Vulnerable Child Youth Studies* 5.4, pp. 344–352.
- Leguy, Cecile and Joseph Tanden Diarra (2015). "Bonne ou mauvaise mère ? Des figures maternelles dans les contes de tradition orale : A partir d'un corpus de 39 contes bwa (Mali)." In: *La femme dans la littérature orale africaine. Persistance des clichés ou perception de la modernité*. Ed. by Abomo-Maurin Marie-Rose and Ugochukwu Françoise. L'Harmattan.
- Lloyd, Cynthia B and Ann K Blanc (1996). "Children's Schooling in sub-Saharan Africa: The Role of Fathers, Mothers, and Others". In: *Population and Development Review* 22.2, pp. 265–298.
- Operario, Don et al. (2008). "Orphanhood and Completion of Compulsory School Education Among Young People in South Africa: Findings From a National Representative Survey". In: *Journal of Research on Adolescence* 18.1, pp. 173–186.
- Rossi, Pauline (2016). *Strategic Choices in Polygamous Households: Theory and Evidence from Senegal*. PSE Working Papers No. 2016-14.

- Senne, Jean-Noël (2014). “Death and schooling decisions over the short and long run in rural Madagascar”. In: *Journal of Population Economics* 27.2, pp. 497–528.
- Smith, J Maynard (1964). “Group Selection and Kin Selection”. In: *Nature* 201, pp. 1145–1147.
- Tabutin, Dominique and Bruno Schoumaker (2004). “La démographie de l’Afrique au sud du Sahara des années 1950 aux années 2000”. In: *Population* 59.3, pp. 521–622.
- Ueyama, Mika (2007). *Mortality, Mobility, and Schooling Outcomes among orphans: Evidence from Malawi*. International Food Policy Research Institute (IFPRI) Discussion Paper 00710.
- UNESCO, Institute for Statistics (2016). *New entrants to primary education, Senegal, 1999-2014*.
- UNICEF (2001). *Care and support for orphans and children made vulnerable by HIV/AIDS*. United Nations Children’s Emergency Fund (UNICEF).
- Vandermeersch, Céline and O Chimere-Dan (2002). “Child Fostering under Six in Senegal in 1992-1993”. In: *Population (english edition)* 57.4, pp. 659–685.
- Vermeulen, Frederic (2002). “Collective Household Models: Principles and Main Results”. In: *Journal of Economic Surveys* 16.4, pp. 533–564.
- Yamano, Takashi and Thomas S Jayne (2005). “Working-Age Adult Mortality and Primary School Attendance in Rural Kenya”. In: *Economic Development and Cultural Change* 53.3, pp. 619–653.
- Yamauchi, Futoshi, Thabani Buthelezi, and Myriam Velia (2008). “Impacts of Prime-age Adult Mortality on Labour Supply: Evidence from Adolescents and Women in South Africa*”. In: *Oxford Bulletin of Economics and Statistics* 70.3, pp. 375–398.

7 Appendix

Table 48: Household composition

	Mean	St. Dev.	Min	Max
Number of cells	2.63	1.31	1	11
HH Size	9.41	6.81	1	47
No of men	4.31	3.46	0	26
No of women	5.11	3.97	0	24
No of children	3.91	3.43	0	21
No of adults	5.13	3.89	0	26
No of old age	0.38	0.64	0	4
Female head	0.25	0.44	0	1
Head can read	0.48	0.50	0	1
Head can write	0.91	0.29	0	1

Sample: 1 726 households from the first wave of PSF.

Table 49: Descriptive statistics by cell status (cells in affected households)

	No death of cell head	Death of cell head	Difference	
Cell size		3.7	2.1	1.6 ***
Cell head can write		0.34	0.40	-.06
Cell head can read		0.66	0.71	-.05
Cell head age		43.3	55.7	-12.4 ***
Cell head woman		0.684	0.476	0.21 ***
Cell head education: <i>none</i>		0.49	0.39	0.1
Cell head education: <i>primary 1-3</i>		0.04	0.01	0.03
Cell head education: <i>primary 4-5</i>		0.13	0.18	-0.05
Cell head education: <i>secondary 1-4</i>		0.04	0.04	0
Cell head education: <i>high school or above</i>		0.03	0.06	-0.03
Cell head education: <i>islamic</i>		0.20	0.27	-0.07
Percentage of children 6-12 in school		0.61	0.80	-0.19 **
Percentage of children 13-15 in school		0.59	0.75	-0.16
Cell has lowest consumption in HH		0.30	0.37	-0.07
Cell has highest consumption in HH		0.29	0.45	-0.16 ***
Per capita spending (total, excluding rent)	315 971		381 805	-65 834
Per capita spending on food	144 169		158 387	-14 218
Increasing expenditure on food		0.19	0.15	0.04
Decreasing investment expenditure		0.10	0.12	-0.02
Member permanently left for work		0.02	0.01	0.01
Frequency		341	91	

Sample: All cells in households where at least one cell head died between panel rounds and containing at least one panel individual. Information was gathered from the first wave of PSF.

*** p<0.01, ** p<0.05, * p<0.10

Table 50: Descriptive statistics by cell status (all cells)

	No death of cell head	Death of cell head	Difference	
Cell size	3.2	2.1	-1.1	***
Cell head can read	0.386	0.405	-0.02	
Cell head can write	0.613	0.714	-0.1	*
Cell head age	43.0	55.7	-12.8	***
Cell head woman	0.587	0.476	0.111	***
Cell head education: <i>none</i>	0.44	0.39	0.05	
Cell head education: <i>primary 1-3</i>	0.04	0.01	0.03	
Cell head education: <i>primary 4-5</i>	0.11	0.18	-0.07	*
Cell head education: <i>secondary 1-4</i>	0.06	0.04	0.02	
Cell head education: <i>high school or above</i>	0.06	0.06	0	
Cell head education: <i>islamic</i>	0.22	0.27	-0.05	
Percentage of children 6-12 in school	0.64	0.80	-0.16	*
Percentage of children 13-15 in school	0.58	0.75	-0.17	
Cell has lowest consumption in HH	0.41	0.37	0.04	
Cell has highest consumption in HH	0.41	0.45	-0.04	
Per capita spending (total, excluding rent)	392 405	381 805	10 600	
Per capita spending on food	171 753	158 387	13 366	
Increasing expenditure on food	0.16	0.15	0.01	
Decreasing investment expenditure	0.10	0.12	-0.02	
Member permanently left for work	0.02	0.01	0.01	
Frequency	4104	91		

Sample: All cells in the first round of PSF containing at least one panel individual.

*** p<0.01, ** p<0.05, * p<0.10

Table 51: Descriptive statistics by household status

	No death of CH in HH	Death of CH in HH	Difference	
Household size	7.58	9.27	-1.69	***
Household head can read	0.48	0.45	-0.03	
Household head can write	0.45	0.45	0	
Household head age	50.5	59.4	-8.9	***
Household head female	0.25	0.18	0.07	*
Household head education: <i>none</i>	0.36	0.36	0	
Household head education: <i>primary 1-3</i>	0.04	0.01	0.03	
Household head education: <i>primary 4-5</i>	0.10	0.13	-0.03	
Household head education: <i>secondary 1-4</i>	0.07	0.09	-0.02	
Household head education: <i>high school and above</i>	0.08	0.03	0.05	**
Household head education: <i>islamic</i>	0.28	0.31	-0.03	
Percentage of children 6-12 in school	0.65	0.62	0.03	
Percentage of children 13-15 in school	0.58	0.62	-0.04	
Per capita spending (total, excluding rent)	434 656	367 134	67 521	
Per capita spending on food	189 260	177 056	12 204	
Increasing expenditure on food	0.14	0.16	-0.02	
Decreasing investment expenditure	0.10	0.10	0	
Member permanently left for work	0.16	0.13	0.03	
Frequency	1570	156		

Sample: All cells in the first round of PSF containing at least one panel individual.

*** p<0.01, ** p<0.05, * p<0.10

Table 52: Causes of death, male and female, 15-49 y.o., Senegal, 2010

Cause of death or injury	%
Accidents (including drug use, self-harm)	13.1
Maternity- related deaths	12.2
Tuberculosis	11.3
Cancer	7.7
HIV/AIDS	8.3
Malaria	5.4
Lower respiratory infections	4.9
Diarrheal diseases	4.5
Cerebrovascular diseas	3.8
Meningitis	3.6
Ischemic heart disease	2.7
Other causes	22.5

Source: Global Burden of Disease Study, 2015.

Table 53: Inter-wave mortality and self-assessed health in PSF1

Self-assessed health status	Frequency			Percentage	
	Survivors	Deceased	Total	Survivors	Deceased
Both sexes					
<i>Very good health</i>	2 025	24	2 049	15%	8%
<i>Good health</i>	9 180	157	9 337	67%	54%
<i>Average health</i>	2 067	50	2 117	15%	17%
<i>Bad health</i>	358	52	410	3%	18%
<i>Very bad health</i>	38	8	46	0%	3%
Total	13 668	291	13 959	100%	100%
Male					
<i>Very good health</i>	1 035	15	1 050	16%	10%
<i>Good health</i>	4 367	89	4 456	67%	57%
<i>Average health</i>	924	23	947	14%	15%
<i>Bad health</i>	143	24	167	2%	15%
<i>Very bad health</i>	25	5	30	0%	3%
Total	6 494	156	6 650	100%	100%
Female					
<i>Very good health</i>	990	9	999	14%	7%
<i>Good health</i>	4 813	68	4 881	67%	50%
<i>Average health</i>	1 143	27	1 170	16%	20%
<i>Bad health</i>	215	28	243	3%	21%
<i>Very bad health</i>	13	3	16	0%	2%
Total	7 174	135	7 309	100%	100%

Source: Authors' calculations using observations from PSF1 with nonmissing health and mortality status.

Table 54: Death impact on current schooling - Individual fixed effects - Children aged between 4 and 17 in first wave - by sex

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
2 nd round	0.06*** (0.011)	0.05*** (0.012)	0.07*** (0.011)	0.06*** (0.012)	0.07*** (0.011)	0.05*** (0.012)	0.07*** (0.011)	0.05*** (0.012)	0.06*** (0.011)	0.06*** (0.012)	0.06*** (0.011)	0.05*** (0.012)	0.07*** (0.011)	0.06*** (0.012)
<i>Identity of the deceased</i>														
Household head	0.07 (0.043)	0.01 (0.047)												
Cell head (not HH)			-0.00 (0.050)	-0.08 (0.047)										
Adult (15-64) member					-0.00 (0.038)	0.03 (0.040)								
Member less than 15							-0.03 (0.049)	0.08 (0.056)						
Member more than 64									0.02 (0.039)	-0.03 (0.040)				
Male adult (15-64) member											0.08 (0.050)	0.05 (0.056)		
Female adult (15-64) member													-0.09* (0.054)	0.01 (0.052)
Constant	0.42*** (0.017)	0.48*** (0.018)	0.42*** (0.017)	0.48*** (0.018)	0.42*** (0.017)	0.48*** (0.018)	0.42*** (0.017)	0.48*** (0.018)	0.42*** (0.017)	0.48*** (0.018)	0.42*** (0.017)	0.48*** (0.018)	0.42*** (0.017)	0.48*** (0.018)
Observations	4,402	4,234	4,402	4,234	4,402	4,234	4,402	4,234	4,402	4,234	4,402	4,234	4,402	4,234
R-squared	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02
Number of individuals	2,201	2,117	2,201	2,117	2,201	2,117	2,201	2,117	2,201	2,117	2,201	2,117	2,201	2,117

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 55: Death impact on current schooling - Individual fixed effects - Children between 4 and 17 in first wave - by urban/rural

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
2 nd round	0.05*** (0.012)	0.07*** (0.011)	0.05*** (0.012)	0.08*** (0.011)	0.05*** (0.012)	0.07*** (0.011)	0.05*** (0.012)	0.07*** (0.011)	0.05*** (0.012)	0.07*** (0.011)	0.05*** (0.011)	0.07*** (0.011)	0.05*** (0.012)	0.07*** (0.011)
<i>Identity of the deceased:</i>														
Household head	-0.00 (0.054)	0.06 (0.040)												
Cell head (not HH)			-0.07 (0.049)	-0.02 (0.047)										
Adult (15-64) member					-0.03 (0.043)	0.04 (0.036)								
Member less than 15							0.03 (0.057)	0.01 (0.049)						
Member more than 64									-0.02 (0.039)	0.01 (0.040)				
Male adult (15-64) member											0.03 (0.062)	0.08* (0.047)		
Female adult (15-64) member													-0.06 (0.055)	-0.02 (0.051)
Constant	0.59*** (0.018)	0.33*** (0.017)	0.59*** (0.018)	0.33*** (0.017)	0.59*** (0.018)	0.33*** (0.017)	0.59*** (0.018)	0.33*** (0.017)	0.59*** (0.018)	0.33*** (0.017)	0.59*** (0.018)	0.33*** (0.017)	0.59*** (0.018)	0.33*** (0.017)
Observations	4,018	4,618	4,018	4,618	4,018	4,618	4,018	4,618	4,018	4,618	4,018	4,618	4,018	4,618
R-squared	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Number of individuals	2,009	2,309	2,009	2,309	2,009	2,309	2,009	2,309	2,009	2,309	2,009	2,309	2,009	2,309

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 56: Death impact on the probability of having ever worked on the market - Individual fixed effects - Children aged between 6 and 17 in first wave - by sex

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
2 nd round	0.09*** (0.012)	0.18*** (0.012)	0.09*** (0.012)	0.17*** (0.012)	0.09*** (0.012)	0.18*** (0.012)	0.09*** (0.012)	0.17*** (0.012)	0.09*** (0.012)	0.17*** (0.012)	0.09*** (0.012)	0.17*** (0.012)	0.09*** (0.012)	0.17*** (0.012)
<i>Identity of the deceased:</i>														
Household head	0.06 (0.047)	-0.05 (0.048)												
Cell head (not HH)			0.09* (0.054)	0.03 (0.048)										
Adult (15-64) member					0.06 (0.041)	-0.01 (0.041)								
Member less than 15							-0.04 (0.054)	-0.00 (0.058)						
Member more than 64									0.09** (0.042)	0.02 (0.041)				
Male adult (15-64) member											0.05 (0.055)	-0.01 (0.057)		
Female adult (15-64) member													0.05 (0.058)	-0.00 (0.055)
Constant	0.12*** (0.018)	0.15*** (0.019)	0.12*** (0.018)	0.15*** (0.019)	0.12*** (0.019)	0.15*** (0.019)	0.11*** (0.018)	0.15*** (0.019)	0.12*** (0.019)	0.15*** (0.019)	0.12*** (0.018)	0.15*** (0.019)	0.12*** (0.018)	0.15*** (0.019)
Observations	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786
R-squared	0.04	0.11	0.04	0.11	0.04	0.11	0.04	0.11	0.04	0.11	0.04	0.11	0.04	0.11
Number of individuals	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 57: Death impact on the probability of having ever worked on the market - Individual fixed effects - Children between 6 and 17 in first wave - by urban/rural

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
2 nd round	0.13*** (0.010)	0.13*** (0.014)	0.13*** (0.010)	0.13*** (0.013)	0.13*** (0.010)	0.13*** (0.014)	0.13*** (0.010)	0.13*** (0.013)	0.13*** (0.010)	0.13*** (0.014)	0.13*** (0.010)	0.13*** (0.013)	0.13*** (0.010)	0.13*** (0.013)
<i>Identity of the deceased:</i>														
Household head	0.01 (0.044)	0.00 (0.049)												
Cell head (not HH)			-0.03 (0.043)	0.14** (0.055)										
Adult (15-64) member					-0.00 (0.037)	0.05 (0.043)								
Member less than 15							-0.08 (0.051)	0.01 (0.059)						
Member more than 64									0.04 (0.034)	0.07 (0.049)				
Male adult (15-64) member											-0.02 (0.053)	0.05 (0.058)		
Female adult (15-64) member													0.01 (0.049)	0.04 (0.061)
Constant	-0.02 (0.016)	0.27*** (0.021)	-0.02 (0.016)	0.28*** (0.021)	-0.02 (0.016)	0.27*** (0.021)								
Observations	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120
R-squared	0.10	0.05	0.10	0.05	0.10	0.05	0.10	0.05	0.10	0.05	0.10	0.05	0.10	0.05
Number of individuals	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 58: Death impact on current market work - Individual fixed effects - Children aged between 6 and 17 in first wave - by sex

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
2 nd round	0.08*** (0.011)	0.21*** (0.013)	0.08*** (0.011)	0.22*** (0.013)	0.08*** (0.012)	0.21*** (0.013)	0.09*** (0.011)	0.22*** (0.012)	0.08*** (0.012)	0.21*** (0.013)	0.08*** (0.011)	0.21*** (0.012)	0.08*** (0.011)	0.22*** (0.012)
<i>Identity of the deceased:</i>														
Household head	0.04 (0.046)	0.04 (0.049)												
Cell head (not HH)			0.12** (0.052)	-0.04 (0.049)										
Adult (15-64) member					0.07* (0.039)	0.02 (0.042)								
Member less than 15							-0.03 (0.052)	-0.08 (0.060)						
Member more than 64									0.10** (0.041)	0.04 (0.042)				
Male adult (15-64) member											0.08 (0.053)	0.13** (0.059)		
Female adult (15-64) member													0.05 (0.055)	-0.08 (0.056)
Constant	0.07*** (0.018)	-0.01 (0.019)	0.07*** (0.018)	-0.01 (0.019)	0.07*** (0.018)	-0.01 (0.020)	0.06*** (0.018)	-0.01 (0.019)	0.07*** (0.018)	-0.01 (0.020)	0.07*** (0.018)	-0.00 (0.019)	0.07*** (0.018)	-0.01 (0.019)
Observations	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786
R-squared	0.03	0.15	0.03	0.15	0.03	0.15	0.03	0.15	0.03	0.15	0.03	0.15	0.03	0.15
Number of individuals	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 59: Death impact on current market work - Individual fixed effects - Children between 6 and 17 in first wave - by urban/rural

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
2 nd round	0.12*** (0.010)	0.17*** (0.014)	0.12*** (0.010)	0.17*** (0.014)	0.12*** (0.010)	0.17*** (0.014)	0.12*** (0.010)	0.18*** (0.013)	0.11*** (0.010)	0.17*** (0.014)	0.12*** (0.010)	0.17*** (0.013)	0.12*** (0.010)	0.18*** (0.013)
<i>Identity of the deceased:</i>														
Household head	0.02 (0.043)	0.05 (0.049)												
Cell head (not HH)			-0.03 (0.042)	0.09* (0.056)										
Adult (15-64) member					-0.01 (0.036)	0.08* (0.044)								
Member less than 15							-0.05 (0.049)	-0.08 (0.059)						
Member more than 64									0.04 (0.032)	0.11** (0.049)				
Male adult (15-64) member											-0.03 (0.051)	0.18*** (0.058)		
Female adult (15-64) member													0.01 (0.047)	-0.04 (0.061)
Constant	-0.03** (0.015)	0.09*** (0.021)	-0.03** (0.015)	0.09*** (0.021)	-0.03** (0.015)	0.09*** (0.021)	-0.03** (0.015)	0.08*** (0.021)	-0.03* (0.015)	0.09*** (0.021)	-0.03** (0.015)	0.09*** (0.021)	-0.03** (0.015)	0.08*** (0.021)
Observations	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120
R-squared	0.09	0.08	0.09	0.08	0.09	0.08	0.09	0.08	0.09	0.08	0.09	0.08	0.09	0.08
Number of individuals	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 60: Death impact on hours of domestic work - Individual fixed effects - Children aged between 6 and 17 in first wave - by sex

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
2 nd round	4.81*** (0.550)	-0.22 (0.324)	4.73*** (0.545)	-0.18 (0.323)	4.54*** (0.556)	-0.16 (0.328)	4.96*** (0.546)	-0.19 (0.320)	4.71*** (0.555)	-0.22 (0.328)	4.94*** (0.545)	-0.12 (0.320)	4.66*** (0.543)	-0.26 (0.321)
<i>Identity of the deceased:</i>														
Household head	3.54 (2.181)	0.19 (1.254)												
Cell head (not HH)			6.45*** (2.476)	-0.36 (1.264)										
Adult (15-64) member					5.77*** (1.887)	-0.46 (1.082)								
Member less than 15							1.58 (2.480)	-0.33 (1.536)						
Member more than 64									4.06** (1.958)	0.14 (1.085)				
Male adult (15-64) member											2.18 (2.543)	-1.95 (1.509)		
Female adult (15-64) member													9.08*** (2.650)	1.00 (1.439)
Constant	7.41*** (0.853)	4.71*** (0.501)	7.50*** (0.850)	4.67*** (0.501)	7.68*** (0.856)	4.65*** (0.504)	7.26*** (0.851)	4.68*** (0.499)	7.51*** (0.856)	4.71*** (0.504)	7.28*** (0.850)	4.61*** (0.499)	7.56*** (0.847)	4.75*** (0.499)
Observations	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786	3,956	3,786
R-squared	0.05	0.00	0.05	0.00	0.05	0.00	0.05	0.00	0.05	0.00	0.05	0.00	0.05	0.00
Number of individuals	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893	1,978	1,893

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 61: Death impact on hours of domestic work - Individual fixed effects - Children between 6 and 17 in first wave - by urban/rural

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
2 nd round	1.68*** (0.416)	2.97*** (0.491)	1.54*** (0.417)	3.06*** (0.487)	1.43*** (0.422)	2.98*** (0.498)	1.59*** (0.413)	3.18*** (0.485)	1.38*** (0.426)	3.12*** (0.492)	1.67*** (0.413)	3.18*** (0.486)	1.36*** (0.413)	3.06*** (0.484)
<i>Identity of the deceased:</i>														
Household head	-1.49 (1.825)	3.55** (1.774)												
Cell head (not HH)			1.01 (1.782)	3.17 (2.008)										
Adult (15-64) member					2.21 (1.511)	2.63* (1.577)								
Member less than 15							0.13 (2.087)	1.14 (2.129)						
Member more than 64									2.29* (1.377)	1.57 (1.770)				
Male adult (15-64) member											-1.93 (2.161)	1.27 (2.101)		
Female adult (15-64) member													5.47*** (1.991)	3.78* (2.207)
Constant	4.45*** (0.647)	7.50*** (0.759)	4.59*** (0.648)	7.41*** (0.756)	4.70*** (0.651)	7.49*** (0.763)	4.54*** (0.646)	7.29*** (0.755)	4.75*** (0.653)	7.35*** (0.759)	4.46*** (0.645)	7.30*** (0.755)	4.77*** (0.645)	7.41*** (0.754)
Observations	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120	3,622	4,120
R-squared	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03
Number of individuals	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060	1,811	2,060

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 62: Death impact on probability of being fostered - Individual fixed effects - Children less than 15 not fostered in first wave - by sex

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
2 nd round	0.03*** (0.006)	0.03*** (0.005)	0.03*** (0.006)	0.03*** (0.005)	0.03*** (0.006)	0.03*** (0.005)	0.03*** (0.006)	0.03*** (0.005)	0.03*** (0.006)	0.03*** (0.005)	0.03*** (0.006)	0.03*** (0.005)	0.03*** (0.006)	0.03*** (0.005)
<i>Identity of the deceased:</i>														
Household head	0.03 (0.022)	0.04** (0.021)												
Cell head (not HH)			0.02 (0.027)	0.00 (0.022)										
Adult (15-64) member					0.03 (0.020)	0.01 (0.018)								
Member less than 15							0.04* (0.024)	0.03 (0.023)						
Member more than 64									0.02 (0.019)	0.03 (0.018)				
Male adult (15-64) member											0.02 (0.027)	-0.00 (0.025)		
Female adult (15-64) member													0.04 (0.027)	0.01 (0.023)
Constant	-0.01 (0.009)	-0.02* (0.008)	-0.01 (0.009)	-0.02** (0.008)	-0.01 (0.009)	-0.02** (0.008)	-0.01 (0.009)	-0.02** (0.008)	-0.01 (0.009)	-0.02* (0.008)	-0.01 (0.009)	-0.02** (0.008)	-0.01 (0.009)	-0.02** (0.008)
Observations	4,616	4,526	4,616	4,526	4,616	4,526	4,616	4,526	4,616	4,526	4,616	4,526	4,616	4,526
R-squared	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Number of individuals	2,308	2,263	2,308	2,263	2,308	2,263	2,308	2,263	2,308	2,263	2,308	2,263	2,308	2,263

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 63: Death impact on probability of being fostered - Individual fixed effects - Children less than 15 not fostered in first wave - by urban/rural

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
2 nd round	0.02*** (0.006)	0.04*** (0.005)	0.02*** (0.006)	0.04*** (0.005)	0.02*** (0.006)	0.04*** (0.005)	0.02*** (0.006)	0.04*** (0.005)	0.02*** (0.006)	0.04*** (0.005)	0.02*** (0.006)	0.04*** (0.005)	0.02*** (0.006)	0.04*** (0.005)
<i>Identity of the deceased:</i>														
Household head	-0.00 (0.025)	0.06*** (0.019)												
Cell head (not HH)			-0.01 (0.026)	0.03 (0.024)										
Adult (15-64) member					-0.00 (0.021)	0.03* (0.017)								
Member less than 15							0.02 (0.026)	0.04** (0.022)						
Member more than 64									0.01 (0.018)	0.05** (0.020)				
Male adult (15-64) member											-0.01 (0.029)	0.02 (0.024)		
Female adult (15-64) member													0.00 (0.028)	0.04 (0.023)
Constant	0.00 (0.009)	-0.02*** (0.008)	-0.00 (0.009)	-0.03*** (0.008)	0.00 (0.009)	-0.02*** (0.008)	0.00 (0.009)	-0.02*** (0.008)	0.00 (0.009)	-0.02*** (0.008)	0.00 (0.009)	-0.03*** (0.008)	0.00 (0.009)	-0.03*** (0.008)
Observations	4,018	5,124	4,018	5,124	4,018	5,124	4,018	5,124	4,018	5,124	4,018	5,124	4,018	5,124
R-squared	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03
Number of individuals	2,009	2,562	2,009	2,562	2,009	2,562	2,009	2,562	2,009	2,562	2,009	2,562	2,009	2,562

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Table 64: Cell head death impact on various outcomes - Individual fixed effects - by sex

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
	Current schooling		Ever worked		Currently working		Doing dom. work		Hours dom. work		Fostered	
2 nd round	0.08*** (0.014)	0.07*** (0.015)	0.08*** (0.019)	0.18*** (0.019)	0.07*** (0.018)	0.22*** (0.020)	0.16*** (0.018)	0.06** (0.025)	4.21*** (0.739)	-0.05 (0.510)	0.02*** (0.004)	0.02*** (0.003)
Cell head death*Wave	0.02 (0.054)	0.01 (0.090)	0.09 (0.101)	0.02 (0.073)	0.13 (0.103)	-0.03 (0.112)	0.14 (0.095)	-0.12 (0.096)	10.01*** (3.662)	-1.55 (2.086)	-0.01 (0.014)	-0.01 (0.012)
Own cell head death*Wave	-0.24 (0.193)	-0.29** (0.117)	0.14 (0.143)	0.22* (0.125)	0.03 (0.133)	0.08 (0.206)	-0.23 (0.198)	0.36** (0.149)	-3.45 (10.303)	4.06 (2.472)	0.16 (0.121)	0.09 (0.096)
Constant	0.38*** (0.021)	0.45*** (0.023)	0.14*** (0.028)	0.14*** (0.028)	0.09*** (0.027)	-0.02 (0.029)	0.49*** (0.026)	0.33*** (0.036)	8.18*** (1.094)	4.60*** (0.748)	-0.02*** (0.006)	-0.02*** (0.005)
Observations	3,248	2,994	2,864	2,604	2,864	2,604	2,864	2,604	2,864	2,604	3,862	3,764
R-squared	0.03	0.02	0.03	0.12	0.03	0.15	0.09	0.01	0.04	0.00	0.03	0.02
Number of individuals	1,624	1,497	1,432	1,302	1,432	1,302	1,432	1,302	1,432	1,302	1,931	1,882

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Samples differ from one regression to the other. School enrolment: 4 to 9 years old in first wave ; Current schooling: 4 to 17; Everworked - Currently working and Domestic work: 6 to 17; Fostered: 0 to 14 and not fostered in first wave.

Table 65: Cell head death impact on various outcomes - Individual fixed effects - by urban/rural

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
	Current schooling		Ever worked		Currently working		Doing dom. work		Hours dom. work		Fostered	
2 nd round	0.07***	0.08***	0.12***	0.13***	0.11***	0.17***	0.15***	0.08***	1.36**	2.88***	0.02***	0.02***
	(0.017)	(0.014)	(0.015)	(0.025)	(0.015)	(0.025)	(0.025)	(0.022)	(0.606)	(0.749)	(0.004)	(0.004)
Cell head death*Wave	-0.07	0.06	-0.06	0.12	-0.07	0.11	-0.09	0.05	3.32	3.29	-0.02***	-0.00
	(0.055)	(0.091)	(0.046)	(0.105)	(0.045)	(0.131)	(0.140)	(0.070)	(3.145)	(2.963)	(0.004)	(0.014)
Own cell head death*Wave	-0.13	-0.35**	0.29***	0.15	0.31***	-0.08	0.01	0.19	-3.03	1.07	-0.00*	0.22
	(0.119)	(0.167)	(0.104)	(0.162)	(0.107)	(0.233)	(0.181)	(0.168)	(3.267)	(6.841)	(0.000)	(0.169)
Constant	0.56***	0.30***	-0.02	0.27***	-0.03	0.09**	0.27***	0.52***	4.66***	7.84***	-0.01**	-0.02***
	(0.025)	(0.021)	(0.021)	(0.037)	(0.021)	(0.037)	(0.036)	(0.032)	(0.896)	(1.100)	(0.005)	(0.006)
Observations	2,756	3,486	2,396	3,072	2,396	3,072	2,396	3,072	2,396	3,072	3,272	4,354
R-squared	0.02	0.03	0.09	0.06	0.08	0.08	0.06	0.02	0.01	0.02	0.02	0.04
Number of individuals	1,378	1,743	1,198	1,536	1,198	1,536	1,198	1,536	1,198	1,536	1,636	2,177

Standard errors are clustered at the household level.

*** p<0.01, ** p<0.05, * p<0.10

Samples differ from one regression to the other. School enrolment: 4 to 9 years old in first wave ; Current schooling: 4 to 17;

Everworked - Currently working and Domestic work: 6 to 17; Fostered: 0 to 14 and not fostered in first wave.

Chapter 5

Parental depression and the child labor-schooling nexus:
evidence from Mexico

1 Introduction

Bad mental health is responsible for huge welfare losses around the world. Depression is now the second contributor to years lived with disability, having scaled from fourth place in 1990 and third place in 2000 (Ferrari et al. 2013). Major depressive disorder is responsible for 8.3% of years lived with disability in the world, and its large incidence and contribution to overall burden of disease are not only a feature of high-income countries. Rather, lifetime prevalence rates of depression and anxiety stand at over 10% in both high-income and low- and middle-income countries alike (Kessler et al. 2005). Yet, mental health in low- and middle-income countries receives little attention, and the attention it receives tends to be of the sensational kind. Reports of degrading and cruel treatment of individuals with mental disabilities in the developing world regularly surface, and human rights defenders such as Amnesty International continuously point out the lack of care given to persons suffering from mental disorders in many countries in the world. This not only concerns patients with severe psychiatric illnesses needing inpatient treatment: development actors such as the World Bank and the World Health Organization recently called for an upscaling of interventions targeting people with treatable mental illnesses such as anxiety and depression, but who are often left to fend for themselves (Carey 2016, April 16). A recent study published in *The Lancet* showed that interventions in said domains are likely to provide benefits outnumbering costs by a factor of 2-3 when only economic costs are considered, and 3-5.7 when the economic value of good health is taken into account (Chisholm et al. 2016).

A large share of those afflicted by mental health problems are parents, and it thus seems warranted to consider potential impacts of depressive symptoms on the family environment. The literature on family background factors as determinants of child outcomes is plentiful, and child development effects in relation to family structure (Björklund and Sundström 2006; Ermisch and Francesconi 2001; Gennetian 2005), parental work patterns (Ruhm 2004; Waldfogel, Han, and Brooks-Gunn 2002) and income (Blau 1999; Dahl and Lochner 2012) have regularly been found in countries at various stages of development. That there are effects on children from their early living circumstances comes as no surprise, since childhood and adolescence are crucial times for individuals. They correspond not only to the period in which human beings shape their personalities, but also to that in which human capital is being accumulated and most cognitive skills are formed. In addition to circumstances where revenue loss acts as the primary mediator of negative outcomes, mental health shocks might exert influence on household decisions

independently of resources. The psychological literature has shown that parents with psychiatric conditions sometimes resort to maladaptive behavior with children, something that might translate into adjustment problems and hampered cognitive development. The economics literature—especially from developing country contexts—has regularly shown how various types of shocks to the household impede a range of development processes in children. However, evidence regarding the nature and scope of transmission mechanisms from bad parental mental health to child socioeconomic outcomes is lacking, particularly in low and middle income countries.

Knowledge regarding intergenerational consequences of mental illness in the context of middle income countries is important for the public debate, inasmuch as mental health outside of high-income countries by all accounts suffers from underfinancing. The 2014 World Mental Health atlas (WHO 2014) highlights the discrepancy between high-income countries and low- and middle-income countries in terms of public expenditures on mental health care: low- and middle-income countries spend less than 2\$ per capita annually on mental health, while high-income countries spend almost 60\$, and the USA 272.80\$⁵⁷. In the upper middle-income category, Mexico is the median spender, allocating a reported 1.96\$ per capita on mental health. Upper middle-income countries in general also allocate a smaller proportion of their total health budget to mental health than high-income economies (2.4% versus 5.1%, WHO (2014)). Furthermore, while in high-income countries the amounts spent on the three service categories *mental hospitals*, *other inpatient and day care* and *outpatient and primary care* are roughly comparable, the group of upper middle-income countries allocates around 50% of their resources to mental hospitals. These facts, against a backdrop of media coverage on abuse of the mentally ill across the world, paint a picture of mental health in large parts of the world as a problem mainly concerning the indirectly affected.

This article investigates the relationship between parental depressive symptoms and child schooling and labor outcomes in Mexico, an upper middle-income country with a population of 120 million. Relying on survey data from three waves of the Mexican Family Life Survey and using assaults in the streets as a source of exogenous variation of depressive symptoms, I show that an increase in parental depressive symptoms leads to increased rates of repetition in children, and increases their probability of working. The effects are not driven by children of parents already showing strong signs of depression at

⁵⁷In shares of GDP per capita, the U.S. spent around 0.5 percent in 2014, while Mexico spent a mere 0.02 percent.

the onset of the survey. Based on this evidence, it is likely that negative outcomes of depression are intergenerational in nature, and programs attempting to address mental health issues should take this into account.

The article is structured as follows. Section 2 reviews some the evidence on the links between parental mental illness and child outcomes. Section 3 presents the data and the state of mental health and mental health care in Mexico. Section 4 presents the theoretical background of the article and the empirical strategy being used. Section 5 shows results from the estimations, addresses robustness and discusses the mechanisms at play. The last section concludes.

2 Parental mental health and children's outcomes

Much focus has been put on childhood conditions shaping long-run outcomes in the literature on educational mobility. Very few, however, attempt to quantitatively measure the impact of parental psychological distress on children's educational progression. A notable exception includes Farahati, Marcotte, and Wilcox-Gök (2003), who, relying on data from the National Comorbidity Survey, find that parental mental illness is linked to increased probability of dropout from high school in the U.S.. The effect is stronger for young women than for young men, the largest effect being that of mothers' psychiatric illness on daughters high-school completion. Jayakody, Danziger, and Kessler (1998) also include measures of parental psychiatric status in their study of early onset mental illness and socio-economic outcomes in males, but fail to find any significant link to schooling attainment. Frank and Meara (2009) include a measure of repetition in an attempt to study the links between maternal depression and child behavioral and cognitive outcomes in the U.S., using the NLYS. They however fail to find a significant association between maternal depression and repetition or cognitive outcomes, but do find evidence of a link between maternal depression and child behavioral issues. Connecting to the above literature, I use information on parental mental illness to evaluate children's educational and work outcomes. This study however distinguishes from previous literature in at least three dimensions: firstly, by using panel data I am able to remove individual fixed effects from the estimates; secondly, I propose a new source of plausibly exogenous variation in mental health: violent assault in the street; finally, I use data from a middle-income country with strong shortcomings in public mental health services and a low use of the services that exist.

The present section reviews some of the evidence on transmission mechanisms between parental mental health, income shocks and child development. At least three mechanisms can be thought of to explain why parental mental illness would impact children's educational and labor market trajectories. First and foremost, like physical illness, mental disorder might incapacitate parents, leading to loss of job revenue, and the need for children to take up household chores or market work that parents previously handled (which has the potential side effect of slowing down school progression). Second, mental illness is linked to parenting practices, with negative mental health shocks leading to worsened parenting practices that may affect children's cognitive and behavioral development. Third, there is a large body of evidence on the inter-generational correlations of mental health in families. It could thus be that the onset of emotional trouble in parents creates emotional disturbance in children, causing them to perform less well in school, and taking up work rather than pursuing higher levels of education. The three following sub-sections review some of the literature on these mechanisms.

2.1 Income shocks and the child labor-schooling nexus

A strand of the child labor literature, starting with the seminal article of Basu and Van (1998), presents child labor as a trade-off for parents, who choose between sending children to work or to school, subject to preferences and income constraints. A central result from their paper is that below a certain consumption level, parents keep children out of school. When income increases to above subsistence level, parents put their children in school, and at a sufficiently high consumption level, they will dedicate all their children's time to schooling. In this framework, a loss of income induces parents to send their children to work or withdraw them from school as a means of compensating for the revenue loss. It nowadays seems reasonably clear that children in developing countries are being relied upon in the event of shocks. Duryea, Lam, and Levison (2007), for example, investigate household responses to economic shocks in Brazil for the period 1982 to 1998. They find that negative income shocks lead to a small decrease in the probability of girls to advance in school, and an increase in the probability to work. Gubert and Robilliard (2008) find evidence of an increased risk of school dropout upon negative agricultural shocks in Madagascar, consistent with the work-schooling trade-off operating through older rather than younger children. Grimm (2011) finds evidence that a 10% decrease in household income leads to a 2.5-3 percentage point drop in the enrolment rate in Burkina Faso, relying on disparate income evolutions for cotton and food crop farmers in the 1990s as a source of exogenous income variation. In light of such evidence, cash transfer programs

have been implemented as a coping mechanism for households facing adverse resource shocks, enabling them to keep children in school. Evidence of such positive mechanisms have for example been found for Mexico (De Janvry et al. 2006), Ecuador (Edmonds and Schady 2012) and Burkina Faso (Akresh, De Walque, and Kazianga 2013). Fitzsimons and Mesnard (2014) investigate whether or not conditional cash transfers can mitigate the effect of a father's departure from the household in Colombia, and find that this seems to be the case since the main effect of a father's departure is a liquidity-tightening income loss.

That health shocks indeed lead to important asset losses has been shown by Coile (2004) and Wu (2003), and a positive correlation between health status and home and market chores (and a negative one between health status and leisure) was found by Podor and Halliday (2012) using U.S. data. Their estimates suggest that moving from poor to good self-assessed health is associated with an additional daily 12 minutes of home production and 100 minutes in market work for men, and 25 and 45 minutes respectively for women. Zivin, Thirumurthy, and Goldstein (2009) show how the provision of antiretroviral drugs significantly improves the status of children in Western Kenya. It is however not clear whether this is due to an increase in labor supply or a pure modification of allocative behavior. Regarding mental well-being—the focus of this article—empirical evidence on the links between mental health and the labor market has shown that individuals who suffer from mental disorders are less productive when at work, and have higher rates of unemployment (Berndt et al. 1998; Cseh 2008; Currie and Madrian 1999; Ettner, Frank, and Kessler 1997; Frank and Koss 2005; Mitra and Jones 2017; Peng, Meyerhoefer, and Zuvekas 2013).

2.2 Mental health and parenting

In an investigation of children's labor supply and schooling, ignoring the interplay between parental health and the quality of parent-child interactions would be reductive, especially when depressive symptoms are concerned. As previously stated, psychological research shows that parents with mental health issues resort to maladaptive behavior. Leinonen, Solantaus, and Punamäki (2003) suggest that parents with mental health problems suffer difficulties in *parenting*. In general, depressive parents resort to coercion rather than negotiation when trying to control their children. Fathers' depressive symptoms are associated with less nurturing and more punitive parenting (McLoyd 1989), while mothers' depressive symptoms imply a failure to monitor children (Chilcoat, Breslau, and

Anthony 1996). Several studies have also highlighted the fact that depressed mothers show a more negative mood, and are more critical and rejective toward their children (Berg-Nielsen, Vikan, and Dahl 2002; Goodman et al. 1994; Whitbeck et al. 1992). Using longitudinal data from 782 families, Johnson et al. (2004) conclude that paternal psychiatric symptoms were associated with an elevated risk of maladaptive parenting behavior⁵⁸. In particular, fathers with one psychiatric disorder were twice as likely as fathers without a psychiatric disorder to engage in at least two types of maladaptive behavior. Fathers with two or more psychiatric disorders were more than three times as likely to engage in said behavior. Smith (2004) reviews evidence from studies on parental mental health and disruptions to parenting. Quoting Berg-Nielsen, Vikan, and Dahl (2002), she suggests that the two major dimensions of disruption operating through the mental illness-parenting nexus are parental negativity and ineffective discipline practices. Other findings from the literature suggest that poor paternal mental health can lead to limited father involvement, impaired father-child interactions and parents judging children's behavior less positively (LeFrançois 2010).

2.3 Effects on children's mental and physical health

The abovementioned studies all suggest that the quality of children's environment decreases when parents are mentally distressed. This has potential consequences on children's physical, cognitive and behavioral development. Kiernan and Mensah (2009) found evidence of maternal depression negatively influencing children's cognitive development and behavior in the UK using the Millennium Cohort Study. Behavioral difficulties were correlated to maternal depression even when poverty, family status and other background factors are accounted for. The longitudinal study of Rutter and Quinton (1984) showed that children whose parents had psychiatric disorders were more likely to express emotional and behavioral disturbance. Wright et al. (2000) report that teachers of children with parents who have psychiatric disorders report those children to have higher than average levels of adjustment and behavior problems, and weaker academic performance. A negative relationship between educational performance and child behavioral traits has previously been found by Currie and Stabile (2006) and McLeod and Kaiser (2004). Reviewing studies of mentally distressed fathers, LeFrançois (2010) quotes a negative impact on child development, poor adolescent functioning in girls, poorer functioning

⁵⁸Behaviors listed are *frequent loud arguments with mother, low affection toward child, low amount of time spent with child, low assistance to child's mother, poor fulfillment of paternal role in family, poor communication with child, poor supervision with child, regular cigarette smoking in presence of child, and poor maintenance of home.*

in the early years for boys and poorer physical health as child impacts. The results of Lewinsohn, Olino, and Klein (2005) suggest that depressed parents lead to psychosocial impairment in offspring, and suggest that further research should determine the role of these impairments as mediators in the intergenerational transmission of depression. Using a set of 1587 children from the National Longitudinal Survey of Youth, Frank and Meara (2009) attempt to identify the effect of maternal depression on child behavioral, cognitive and educational outcomes. They find no link between maternal depression and cognitive ability, but their results suggest that maternal symptoms of depression might induce child behavioral problems.

A number of studies on twins have been conducted to assess the importance of genetics in transmission of depression from parents to children, results suggesting that environmental factors systematically account for the largest explanation of variance in depressive symptoms (Agrawal et al. 2004; Gatz et al. 1992; McGue and Christensen 1997). Furthermore, data from the WHO World Mental Health surveys have confirmed the correlation between parental psychiatric illness and offspring disorder using a sample of 22 countries (McLaughlin et al. 2012). There is also evidence of parental mental health influencing children's physical health. Propper, Rigg, and Burgess (2007) show that for a UK birth cohort, maternal mental health is negatively related to a number of child health outcomes, and that the effect seems to be larger than that of financial hardship.

3 Data and context

3.1 Context

Formally, history of mental health care in Mexico is long, as the first psychiatric hospital of America was established there shortly after the Spanish conquest in 1566 (Lartigue and Vives 1991). It however took until the 1950s to see a department of psychology open at the Faculty of Medicine of the National University of Mexico and since 1983 the right to receive mental health services has been present in Mexico's constitution (Lartigue and Vives 1991). Out of the budget spent on mental health, 80% is used to fund the operation of psychiatric hospitals, who are the center of gravity in Mexico's mental health system (Berenzon Gorn et al. 2013). Indeed, Berenzon Gorn et al. show that only 30% of primary care facilities have protocols for detecting and treating mental disorders. Mental hospitals, although receiving the lion's share of the mental health budget, are generally understaffed, since the country only has 3.47 psychiatrists per 100 000 inhabitants, and

56% practice in the Federal District (Heinze et al. 2012) which holds less than 10% of the population⁵⁹. Furthermore, the reports of cruel and degrading behavior towards the mentally ill across the developing world have not escaped Mexico. A recent report by Disability Rights International details the systematic torture and abuse of mentally disabled individuals in the country (Rodriguez et al. 2015). The report details systematic forced retention and inhumane conditions in many of the shelters—formal or informal—set up to house the mentally disabled in the country. Anecdotally, in 2014, 596 children were rescued from *La Gran Familia*, an abusive institution in the state of Michoacán. Although prominent Mexican figures leaped to the defense of 86 year-old Mama Rosa, founder of the institution, the squalor in pictures from the establishment, and the fact that one year later, the government had yet to relocate some of the institution’s tenants (Rodriguez et al. 2015), bears witness to the incapacity of the country to provide mental health care to those most in need of it.

Luckily, most individuals with mental health problems do not have to experience living in shelters. However, among the non-institutionalized population, bad mental health is by all estimates an important problem. Prevalence estimates vary by type of disease, screening instrument, time scale and representativity of the sample. Medina-Mora et al. (2005) found a 12.1% 12-month prevalence of psychiatric disorder⁶⁰ in the urban population; Medina-Mora et al. (2007) estimate that 26.1% of adults above 18 years old in Mexico had at least experienced one psychiatric disorder in their life, and 36.4% of the population will eventually experience one; Benjet et al. (2016) find an 8-year incidence of psychiatric order among adolescents of 37.9%. Furthermore, neuropsychiatric diseases account for 19.6% of the global burden of disease in Mexico and is the third contributor to Disability Adjusted Life Years (DALY) (WHO 2011). In the group of adolescents studied by Benjet et al. (2016), the 8-year incidence of any anxiety disorder is at 7% and that of major depressive disorder at 12.9%. Table 66 shows the available evidence on the prevalence of those disorders which the screening instrument I use was designed to capture, namely mood and anxiety disorders. The prevalence of any anxiety disorder in the working age population stands at 14.3% and that of mood disorders at 9.2%⁶¹. Studies concentrating on Major Depressive Disorder such as Slone et al. (2006)

⁵⁹This distribution does not seem to reflect differences in needs. In 2005, the Federal district had the tenth highest prevalence of depression in women, and the third lowest in men among Mexico’s 32 states (Belló, Puentes-Rosas, and Medina-Mora 2005).

⁶⁰16 disorders from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) were used.

⁶¹Mood disorders contain Major Depressive disorder, Dysthymia and Bipolar disorder but is dominated by the first mentioned.

or Andrade et al. (2003), find a prevalence of around 10% (12.8 and 8.1 respectively). Studies focusing on particular segments of the population, such as adolescents (Benjet et al. 2016), older individuals (García-Peña et al. 2008) or emergency room patients (Castilla-Puentes et al. 2008) find numbers that are not strikingly different (13.2% for older individuals, 23% for emergency room patients).

While depression and anxiety seem widespread in Mexico, treatment, by all accounts, is not. A study by Borges et al. (2008) shows that treatment is far from a natural consequence of illness in Mexico, even in the relatively psychiatrist-dense Mexico City. 8.4% of adolescents between ages of 12-17 with anxiety disorder and 12.5% of those with mood disorders sought any treatment for emotional problems in 2005. They also look at predictors of treatment, finding that young women and children of educated parents have a higher probability of seeking treatment. Medina-Mora et al. (2005) study prevalence in adults using a survey representative of Mexico's urban population. Classifying psychiatric disorders as mild, moderate or severe, the percentages of individuals having sought treatment by category stood at 12.6%, 20.8% and 23.8% respectively⁶². The underfinancing of mental health in Mexico is thus mirrored in an underutilization of mental health services.

3.2 The Mexican Family Life survey

The Mexican Family Life Survey (MxFLS) is a large-scale longitudinal survey carried out by researchers from the Ibero-American University (UIA), the Center for Economic Research and Teaching (CIDE), the National Institute of Public Health (INSP), University of California, Los Angeles (UCLA) and Duke University. Three rounds of the survey have been implemented: in 2002, 2005-2006, and 2009-2011. The sample of the first round was representative at national, regional and urban/rural levels (Rubalcava and Teruel 2013), and targeted 8 400 household (35 000 individuals) in 150 communities in 16 of Mexico's 32 states. The attrition associated with the second and third waves is around 10% (Rubalcava and Teruel 2013).

All household members were interviewed, and most of the questions contained in MxFLS1 are present in the following waves, with some questions added along the way. The database is organized into 5 books, with the first two books collecting information

⁶²Note that this includes treatment of any kind, and does not imply that the individual went to see a mental health professional.

Table 66: Prevalence of depression and anxiety disorder in Mexico

<i>Source</i>	<i>Disorder</i>	<i>Estimate type</i>	<i>Estimate</i>	<i>Sample size</i>	<i>Survey year</i>	<i>Coverage</i>
Benjet et al. 2016	Any anxiety disorder Any mood disorder	8-year incidence	7%	1071	2005, 2013	Adolescents in the Mexico City Metro Area
		8-year incidence	12.9%	1071	2005, 2013	Adolescents in the Mexico City Metro Area
Medina-Mora et al. 2007	Any anxiety disorder Any mood disorder	Lifetime prevalence	14.3%	5782	2001-2002	18-65, national
		Lifetime prevalence	9.2%	5782	2001-2002	18-65, national
Castilla-Puentes et al. 2008	MDD	Prevalence	23%	313	-	Emergency Room patients above 18 years old
Slone et al. 2006	MDD MDD	Lifetime prevalence	12.8%	2509	1999-2001	18 years or older, four Mexican cities
		Last 12 months	6.1%	2509	1999-2001	18 years or older, four Mexican cities
Andrade et al. 2003	MDD MDD	Lifetime prevalence	8.1%	1734	1995	18-54 years old, Mexico City
		Last 12 months	4.5%	1734	1995	18-54 years old, Mexico City
Garcia-Pena et al. 200	MDD	Prevalence	13.20%	7449	2004	Adults older than 60 years, Mexico City

Source: Author's collection from various studies of the prevalence of anxiety and depressive disorders in Mexico.

Note: Garcia-Pena find this estimate after applying correction procedures on their initial data, which suggests a prevalence of 21.7%.

MDD: Major Depressive Disorder. At least five of the following symptoms present *nearly every day*: depressed mood or irritable, decreased interest and pleasure, significant weight change (5%) or change in appetite, change in sleep, change in activity, fatigue or loss of energy, guilt/worthlessness, concentration, suicidality (DSM-IV).

on consumption and production activities at the household level. Book 3 is answered by all household members aged 15 years or older and contains information on education, work history, health (including depressive symptoms), migration, victimization and other. Book 4 is answered by women in age to be fertile and contains questions on fertility and contraception. Book 5 concerns children below the age of 15, and contains information on education, employment, time allocation, health and upbringing. Furthermore, Raven's matrices are added in a cognitive module administered to all individuals above 5 years of age. Additionally, a set of anthropometric and health measures were taken from each respondent.

The bulk of the information used in the present article is compiled from the education, health, work, cognitive skills and household modules of the survey. Included respondents are those who respond to books 3 or 5, i.e. those giving detailed information about their educational, work and health status and histories. Where information was missing, it was corrected by one of two methods: either, by comparing individual or household information across waves, or through the use of information from the control book, containing the household member roster (providing some basic information on age, educational and occupational status). In case of conflict, the information given in Books 3 and 5—more thorough—was relied upon.

Table 67 shows descriptive statistics on a set of 8 359 individuals less than 18 years old and children of the household head, who were present in all three rounds. The table shows that consumption per capita in the household increases throughout the period, as does work income for both household heads and their spouses. Cognitive scores of household heads and their spouses are not strictly comparable between years since a large proportion of individuals were not questioned in rounds 2 and 3. Children's cognitive scores can neither be meaningfully compared on average, since different raven matrices were used on individuals below and above 12 years old. In the last section, this is dealt with by computing age-specific cognitive score distributions, and then using the individual's decile in a given round as an outcome variable. Finally, age, schooling and work variables increase as would be expected in a panel setting.

3.3 Measuring depressive symptoms

Several screening methods have been used to test for mental illness using survey questionnaires. Most of these scales focus on depression as the main outcome, and commonly used

Table 67: Descriptive statistics on panel sample

	# Obs	Round 1	Round 2	Round 3
Age	25 077	8.71	12.00	16.34
Male	25 077	0.48	0.48	0.48
Household size	25 077	5.7	5.9	5.4
Consumption per capita	23 628	240.7	279.7	343.4
Currently in school	24 993	0.68	0.73	0.58
Attended high school	22 494	0.04	0.13	0.30
Attended college	22 494	0.00	0.02	0.08
Repeated a grade	15 696	0.21	0.23	0.26
Ever worked	21 618	0.08	0.14	0.31
Currently working	25 077	0.07	0.11	0.26
<i>Household Head:</i>				
Works	21 222	0.74	0.72	0.78
Work income	7 398	2369.9	3789.7	4527.8
Cognitive score	3 192	5.0	5.5	4.4
Self-assessed health	15 186	2.50	2.40	2.50
Smoking	15 183	0.16	0.13	0.14
Number of symptoms last month	14 142	2.0	1.6	1.8
Hospitalized last 12 months	15 138	0.03	0.03	0.04
Any chronic illness	14 016	0.23	0.18	0.27
<i>Spouse of household head:</i>				
Works	21 066	0.21	0.21	0.28
Work income	1 188	2358.3	3892.6	5443.5
Cognitive score	4 029	4.8	5.5	4.5
Self-assessed health	18 978	2.6	2.5	2.6
Smoking	18 996	0.04	0.03	0.04
Number of symptoms last month	17 589	2.5	1.9	2.3
Hospitalized last 12 months	18 921	0.10	0.05	0.05
Any chronic illness	17 355	0.29	0.23	0.32

Source: Author's calculation using panel observations of children of the household head less than 18 years old in the first round. For work income, only individuals who declared a work income in all three rounds are included. Variable definitions are given in Table 79.

measures include Beck's depression inventory (Beck 1961), the Zung self-rating depression scale (Zung 1965), the General Health Questionnaire (Goldberg 1972), the Center for Epidemiological Studies Depression Scale (Radloff 1977). The Mexican Family Life Survey uses a screening questionnaire developed by Calderón-Narváez (1997) to detect depression in Mexico. The questionnaire, the *Clinical Questionnaire for the Diagnosis of Depressive Syndrome* (Cuestionario Clínico para el Diagnostico del Síndrome Depresivo (henceforth CCDS)), contains 21 items related to the emotional well-being of individuals. Typical of screening questionnaires, answers lie on a Likert scale (Likert 1932), with a set of responses reflecting increasing intensity of symptoms felt during a reference period. In the MxFLS, the reference period is the last 4 weeks, and for each item in the questionnaire, respondents give one of four answers: *No*, *Sometimes*, *Many times* and *All the time*.

Table 81 (available in the Appendix) shows the items included in the CCDS. 20 out of the 21 items were included in this analysis, and two alternate versions of the score were tested. In the first one, the question on the decrease of sexual desire was taken out because of the option not to respond, which was retained by a significant proportion of respondents. Instead, the question on loneliness, not part of the original score (Calderón-Narváez 1997), was inserted. The second version, which is the one retained for the remainder of the analysis, assumes that a missing answer on the question on sexual desires implies a no. This version excludes the additional question on loneliness, which is absent in the original score. For both scores twenty questions are thus included, and answers are worth 1 to 4 points depending on the intensity of the symptoms experienced (from 1 point for *No* to 4 points for *All the time*). The total psychometric score is simply the sum of the individual scores from all questions. As such, the CCDS scale ranges from 20 to 80, 20 being the minimal level of depressive symptoms, and 80 the maximum level of depressive symptoms. Whether the modified or the original version is being used, the test score shows good signs of internal consistency. Cronbach's α ⁶³ from the modified test score is equal to 0.92, 0.94 and 0.94 for rounds 1, 2 and 3 respectively. The α for the original score equal 0.91, 0.94 and 0.93 for rounds 1, 2 and 3. All of the main regressions have been run using both versions of the score, and results proved to be practically identical⁶⁴.

⁶³The statistic is computed as follows: $\alpha = \frac{k}{k-1} \left(1 - \frac{\sum_{i=1}^k \sigma_{Y_i}^2}{\sigma_{X_i}^2} \right)$. A high value of α implies that the values of the different test items are strongly correlated, suggesting that they all capture some underlying concept; in this case, depressive symptoms.

⁶⁴Results using the modified version of the score are available upon request.

Table 68: CCDSD score by round and population

Variable	Round 1 (2002)	Round 2 (2005-2006)	Round 3 (2009-2011)
All	26.8	25.6	25.8
<i>Male</i>	24.8	24.2	24.3
<i>Female</i>	28.3	26.6	26.9
<i>Urban</i>	26.5	25.6	26.0
<i>Rural</i>	27.1	25.6	25.5
<i>Center-Northeast</i>	25.7	24.5	25.5
<i>Central Region-West</i>	27.8	26.4	27.0
<i>Central Country Region</i>	27.2	26.7	26.3
<i>Northwest Region</i>	26.7	25.5	24.6
<i>South-Southeast Region</i>	26.4	24.8	25.4
Consumption per capita deciles			
<i>d1</i>	27.0	26.2	25.7
<i>d2</i>	26.7	25.6	25.8
<i>d3</i>	27.3	25.5	26.0
<i>d4</i>	26.9	25.6	25.9
<i>d5</i>	26.8	25.5	25.6
<i>d6</i>	27.0	25.6	26.0
<i>d7</i>	26.7	25.4	25.7
<i>d8</i>	26.9	25.7	25.7
<i>d9</i>	26.5	25.3	25.8
<i>d10</i>	26.0	25.4	25.5
Calderon classification:			
<i>Normal person</i>	86.2%	88.4%	88.3%
<i>Moderate anxiety</i>	11.7%	9.7%	9.5%
<i>Average depression</i>	2.0%	1.7%	1.9%
<i>Severe depression</i>	0.1%	0.3%	0.4%
Total	100%	100%	100%

Source: Author's calculations using 63 645 observations from MxFLS1-3.

The CCDS D module can be exploited in several ways. First, a cut-off point may be chosen, considering that scores above a certain level correspond to a certain clinical diagnosis. According to Calderón-Narváez (1997), a score between 20 and 35 constitutes a normal state; a score between 36-45 denotes a person with a moderate level of anxiety; 46-65 denotes average depression, and values above 65 correspond to severe depression. Second, the resulting score may be treated as a continuous variable (see structural shift versus latent index models (Ettner, Frank, and Kessler 1997)). Since the score is by nature continuous, and since the focus of this paper lies in seeing how individual outcomes are affected by increases in average depressive symptoms rather than the crossing over a (possibly quite arbitrary) clinical threshold, the latent index approach is used. Hence, the CCDS D score represents an ordinal measure of depressive symptoms ranging from 20 to 80. A low score implies that depressive symptoms are relatively absent from an individual's life, while a high score implies a strong presence of markers of depression such as anxiety, insomnia or fearfulness. In the empirical analysis below, I retain couples with children for which the score is available for both the household head and his/her spouse, and I use as an independent variable the average score of the couple.

4 Methodological approach

4.1 Theoretical considerations

In order to formalize the problem at hand, it helps to place the child labor-schooling decision problem in a theoretical framework, as in Soares, Kruger, and Berthelon (2012). Their model, alike that of Basu, Das, and Dutta (2010), focuses on a one parent-one child static problem, where the parent is assumed to make the decisions concerning the child. The present model draws heavily on theirs. A distinguishing feature is the addition of productivity parameters for parent and child, which are assumed to depend on mental health status, as suggested by the literature on mental health and work productivity (e.g. Cseh (2008) and Ettner, Frank, and Kessler (1997)). The child's productivity parameter further depends on parental productivity, as to capture the intergenerational transmission of mental health status abundantly shown in the literature. It may also be considered to capture the fact that parents provide inputs to the child human capital acquisition function, and that the quality of these inputs is decreasing in the parental efficiency

parameter⁶⁵. Parental efficiency thus acts on the child labor-schooling nexus in two ways: through its direct link to household income, and through its indirect role in the child's human capital acquisition. More precisely, parental mental health affects human capital acquisition through a deterioration in the child's own efficiency, corresponding to a transfer of negative mental health onto the child, but it may also act negatively on human capital acquisition through lessened parental input (in quantity or quality). In Soares, Kruger, and Berthelon (2012), the household utility function is equal to:

$$U(c, h) = \frac{c^\sigma}{\sigma} + \beta h \quad (40)$$

Where σ and β are constant parameters, with $0 < \sigma < 1$ and $\beta > 0$. c and h denote consumption and child human capital. Wages for adults and children are taken as determined. The representative parent is assumed to dedicate all his/her time to work, and earns an income depending on an exogenous wage and on a productivity parameter θ_p , related to (among other things) his/her mental health status. The child's time is divided between labor and human capital acquisition. Furthermore, the child wage is fixed, and does not depend on θ_c ⁶⁶. The full income constraint is thus equal to $c + w_c(1 - l_c) \leq w_p\theta_p t_p + w_c t_c$, with $t_c = t_p = 1$. Human capital is accumulated through a human capital acquisition function, increasing in θ_c , the child's productivity parameter, $1 - l_c$ the time the child spends in school and in v_c a set of individual time-invariant characteristics. To account for the correlation in mental health between members of the same family, let the child's efficiency parameter θ_c depend on the adult's mental health, with $\theta_c = \theta_c(\theta_p)$, and $\theta'_c > 0$. Finally, let $h(\cdot)$, the human capital acquisition function, be equal to:

$$h(\theta_c(\theta_p), 1 - l_c, v_c) = \theta_c(\theta_p)(1 - l_c) \exp(v_c) \quad (41)$$

⁶⁵I choose not to specify how this effect operates for now. Let us however note that it is compatible with a number of psycho-social transmission mechanisms: lowered quality of parental assistance, lowered child cognitive and behavioral development, and worsened child physical or mental health.

⁶⁶This assumption might seem unrealistic. However, it is likely that the work available to children [at least those of relatively low ages] often takes place informally, in the household, and that mental acuity has little relevance for the income derived from it. Relaxing this constraint implies that the predictions of the model become less straightforward. Notably, the impact of a decrease in θ_p on child labor will depend on the levels of parental and child productivity.

This implies that human capital accumulation is a function of time spent in school ($1-l_c$), and of efficiency of converting that time into human capital. I here assume that the efficiency is divisible into a component related to productivity, θ_c (influenced by parental depression symptoms), and a residual containing all other factors affecting human capital accumulation, v_c . The associated first order conditions with respect to c and l_c are:

$$\begin{cases} c^{\sigma-1} = \lambda \\ \beta\theta_c(\theta_p) \exp(v_c) = \lambda w_c \end{cases} \quad (42)$$

Any interior solution thus satisfies:

$$\beta\theta_c(\theta_p) \exp(v_c) = c^{\sigma-1} w_c \quad (43)$$

Thus, parents will divide child time between schooling and labor as to equalize marginal utility derived from an increase in human capital acquisition with marginal utility derived from the increase in consumption derived from child labor. A *no schooling* corner solution arises when the marginal gain from investing in schooling is less than the marginal loss in terms of child contribution to household income. Conversely, a *no child labor* corner solution exists when the opposite is true, i.e. when investing in education always generates a higher utility return than having the child work.

At the optimum, a parent will choose to have his child work more whenever the left-hand side of equation (43) decreases with respect to the right-hand side, displacing the optimum choice towards more child labor and less schooling. That is, when the marginal return to investment in education decreases more than the marginal return to child labor. Our interest lies in how a change in parental mental health might impact this decision. Recognizing the fact that $c = w_p\theta_p + w_cl_c$, we get:

$$w_cl_c^* = \left[\frac{\beta\theta_c(\theta_p) \exp(v_c)}{w_c} \right]^{\frac{1}{\sigma-1}} - w_p\theta_p \quad (44)$$

Developing this and differentiating l_c^* with respect to θ_p gives:

$$\frac{\delta l_c^*}{\delta \theta_p} = \frac{\theta_c' \theta_c (\theta_p)^{\frac{2-\sigma}{\sigma-1}}}{(\sigma-1)w_c} \left[\frac{\beta \exp(v_c)}{w_c} \right]^{\frac{1}{\sigma-1}} - \frac{w_p}{w_c} < 0 \quad (45)$$

From this setup, the positive (negative) impact on child labor (schooling) from a decrease in parental productivity parameter θ_p becomes unambiguous⁶⁷. The effect applies via two mechanisms. First, a decrease in parental income increases the amount of child labor, as child and parental labor are substitutes. Second, a mental health shock also lowers the productivity of the child's human capital acquisition, making it less worthwhile to direct resources to schooling. We thus expect that increases in depressive symptoms in parents will lead to an increased probability of children working, and to a lower school attainment (quantity or quality-wise).

4.2 Empirical strategy

The empirical strategy relies on using linear probability models with individual fixed effects. Since the MxFLS is a panel survey with low attrition rates, a relatively large sample of individuals present in all three waves is available. It is thus possible to estimate individual fixed effects models, thereby controlling for possible unobserved heterogeneity between individuals that might confound identification. As a corollary, using fixed effects models also implies that I estimate the impact of transitory variations of mental health, rather than the impact of its genetic or "lifetime" component. This being said, one might worry that parental mental health might be correlated with the unobserved error term in the structural models (even though individual fixed effects are present), with an unknown direction of bias. Concerning school presence, for example, a child leaving home for school might increase the feeling of loneliness in parents staying at home, or parents working hard to finance children's schooling might result in worse mental health, biasing the coefficient upwards. Conversely, a child's failure in school (such as repeating a grade, or dropping out of school to work) might deteriorate the mental health of parents, biasing coefficients downwards. Furthermore, unobserved events might simultaneously affect mental health and schooling (bullying, for example, may lead parents to withdraw their children from school, while at the same time deteriorate their emotional status). Finally, as acknowledged by Ettner, Frank, and Kessler (1997), mental health is likely to be jointly

⁶⁷Since σ is defined as strictly bounded by 0 and 1.

determined with income and employment, and basically with any other labor market decision. It can be improved on by investing in formal or informal treatment⁶⁸, and intrinsic characteristics of employment might influence mental health with an unknown direction of bias: stigma and stress, modified social network and self-esteem are all plausible outcomes of a change in labor market status.

Splitting the individual effect term v_c into an observable, time variant ($X_{i,t}$) and an unobservable time-invariant component (δ_i), I estimate the following specification:

$$P(\text{Outcome} = 1)_{i,t} = \alpha + \beta_1 CCDS D_{i,t} + \beta_2 X_{i,t} + \gamma_t + \delta_i + \epsilon_{i,t} \quad (46)$$

Where $P(\text{Outcome} = 1)$ is the probability of occurrence of a set of child labor and schooling related outcomes, $CCDS D$ is the average parental depression score discussed above, our main variable of interest (proxying for θ_p). $X_{i,t}$ is a set of time-variant individual and household level characteristics, and δ_i a set of time-invariant characteristics of the child. To deal with the main endogenous regressor, the parental $CCDS D$ score, I resort to IV estimation, using the Limited Information Maximum Likelihood (LIML) estimator⁶⁹. In the literature, instruments for mental health captured in survey data include parental mental health (Ettner, Frank, and Kessler 1997), genetic markers (Fletcher and Lehrer 2011) physical activity (Hamilton, Merrigan, and Dufresne 1997), daylight (Tefft 2012), death of a close friend (Frijters, Johnston, and Shields 2010), long-term non-acute illnesses (Hamilton, Merrigan, and Dufresne 1997), lagged or past mental health (Chatterji et al. 2007; Ettner, Frank, and Kessler 1997), religiosity (French and Alexandre 2001). Genetic markers and parental mental health are probably statically linked to child mental health, but a dynamic relationship is difficult to argue, so their use as instruments for transitory mental health shocks in a panel setting is limited. The use of lagged variables to avoid simultaneity bias has recently been questioned, evidence showing that even when used as instruments, lagged variables need to satisfy strong assumptions to achieve causality (Bellemare, Masaki, and Pepinsky 2015; Reed 2015). In particular, identification requires that there are no dynamics either in the error term, or in the outcome variable. This is a questionable assumption in the present case. It is likely that depressive symptoms, when non addressed, progresses steadily. It is also likely that people displaying high rates of

⁶⁸Although arguably with less certainty than regarding physical health.

⁶⁹Some of the regressions raise concerns for weak instruments, which are more efficiently handled by LIML (Angrist and Krueger 2001).

symptoms (such as the severely depressed) in one round seek treatment, and will appear with lower scores in the next round. Instead of using lags, I thus propose an instrument that is time variant, strongly correlated with current mental health, and uncorrelated with the error term. This is having been assaulted in the street.

Table 69: Descriptive statistics from victimization module, 2002-2005-2009

	Round 1 (2002)	Round 2 (2005-2006)	Round 3 (2009-2011)
	[%]	[%]	[%]
Compared to 5 years ago, do you feel..			
<i>Safer</i>	20.9	15.2	10.8
<i>The same</i>	53.1	59.2	55.6
<i>Less safe</i>	26.0	25.6	33.7
	100	100	100
Ever assaulted outside home/plot/business			
<i>Yes</i>	11.6	12.9	14.2
<i>No</i>	88.4	87.1	85.8
	100	100	100
Assaulted last 3 years			
<i>Yes</i>	5.4	3.9	4.7
<i>No</i>	94.6	96.1	95.3
	100	100	100
	CCDSD Score	CCDSD Score	CCDSD Score
Ever assaulted outside home/plot/business			
<i>Yes</i>	27.0	26.3	26.6
<i>No</i>	26.7	25.5	25.6
Difference	0.3**	0.9***	1.0 ***
Assaulted last 3 years			
<i>Yes</i>	27.1	27.3	27.1
<i>No</i>	26.7	25.5	25.7
Difference	0.4**	1.8***	1.4***
Frequency	19 390	20 517	23 427

Source: Author's calculations using 63 334 observations of respondents >14 years old, from MxFLS1-3. Stars represent significant differences at the * < 10%, ** < 5% and *** < 1% levels.

The link between violence and mental health is firmly established in the literature. Among others, Kilpatrick et al. (1985) show increased mental health problems after victimization in a group of 2000 adult women in South Carolina. Pastore, Fisher, and Friedman (1996) show that youth reporting having witnessed a stabbing or who knew someone who had been murdered were twice and three times as likely to have suicidal tendencies. Romito and Grassi (2007) find evidence of a relationship between mental health and exposure to violence among university students in Italy. Sulemana (2015) finds, using data from the Afrobarometer surveys, that physical assault decreases subjective well-being

among men and women in Africa, and Ribeiro et al. (2013) show a link between violent assault and 10 common psychiatric disorders in Rio de Janeiro and Sao Paolo, Brazil.

The MxFLS contains a module on individual victimization, detailing both current and perceived future trends of safety, as well as information on incidents that happened in the past. In order to construct the instrument, question VLI05 is used, namely "Have you ever been assaulted, robbed or have you been a victim of any violence outside your household, plot or business?". The module further details time, age at incident, whether or not weapons were used, if the incident was reported, and if death or other physical injury resulted from the incident. Table 69 shows some summary statistics of respondents to the victimization module. It appears that according to public perception at least, Mexico has become a less safe place. Looking at the percentage of persons ever assaulted, it increases. This result might indicate increasing violence; however, since a large proportion of the sample is composed of panel respondents, this might indicate nothing more than an age effect. Indeed, when looking at the percentage of individuals assaulted in the last three years, the number drops from 2002 to 2005, to increase again between 2005 and 2009. Finally, most of the assaults reported are termed robberies by the respondents. In MXFLS3, of the 2020 reported incidents for which there is information on the nature of the incident, 91.6% were declared as robberies or assaults, 4.2% as fights, 1.3% as sexual assaults, 1% as kidnappings, and 1.8% as *other*.

As can be seen from Table 69, there is a significant correlation between assault and score on the CCDS depression scale. Table 80 shows these and additional statistics on a sample of household heads and their spouses present in all three waves. It confirms the picture of less perceived safety in Mexico. It also confirms that while most assaults are being judged as serious, weapons being involved more often than not, few (6%-8%) lead to any bodily harm of the respondent. Since the MxFLS is a rich dataset, it is possible to control for a set of time-varying potential confounding factors that might question the exogeneity of the instrument. Finally, through using individual fixed effects, those household unobservables that are time-invariant are effectively withdrawn.

5 Results

5.1 Main outcomes of parental depressive symptoms

Table 70 shows two-sample t-tests over our main outcomes, related to work and schooling of children. They largely confirm the predictions from the theoretical model, that increased parental depressive symptoms are associated with less schooling and more child labor. As such, not being in school, not having attended higher levels of schooling and having repeated one or more grades are all associated with higher parental CCDS scores, implying more depressive symptoms. Currently working, whether in schooling or not, or having worked at some point, are also significantly associated with higher parental depression symptoms. Finally, being inactive also seems to be associated with a higher parental CCDS.

Table 70: Two-sample t-tests on main outcomes

	Yes	No	
	Parental CCDS score		Difference
Currently in school	25.7	26.2	-0.5†
Attended high school	25.4	26	-0.6†
Attended college	24.7	25.9	-1.2†
Ever repeated	26.6	25.8	0.9†
Ever worked	26.6	25.7	0.9†
Currently working	26.5	25.8	0.7†
Inactive	26.4	25.8	0.6†
Combining work & schooling	27.1	25.8	1.2†

Population: 16 967 panel respondents under the age of 18 in 2002.

† P<0.001

The impacts of variations in parents' depressive symptoms on four child outcomes (school presence; grade repetition; having ever worked; combining work and schooling) are shown in tables 71-74. Estimates from regressions on four more outcomes (ever gone to high school; ever gone to college; currently working; inactivity) are shown in appendix tables 82-85. All regressions were also run with indicator variables for state and parental education, but since these are fairly time-consistent and did not show up significant they were dropped from the estimations, which did not change the results. All regressions were run with both random effects and individual fixed effects, and standard errors were clustered at the individual level in all models. The IV regressions were estimated using Limited Information Maximum Likelihood, and first-stage statistics are shown for each

estimation⁷⁰ at the bottom of the tables. A Kleibergen-Paap rank test (Kleibergen and Paap 2006) was used to test for underidentification, which is rejected at conventional levels for all regressions except *Attended college*, where the sample is greatly reduced. The Hansen J-test for overidentifying restrictions is also provided, and indicates that our instruments are correctly excluded. Finally, weak instruments may be a cause for concern. Stock and Yogo (2005) provide critical values for the LIML estimator, based on the Cragg-Donald Wald F statistic. In our case however, the assumption of identically and independently distributed errors is violated since the errors are clustered at the individual level. The Kleibergen-Paap Wald rk F is thus added, since it is robust to a violation of the iid assumption. Comparing it to Stock & Yogo's critical values suggests limited bias. Finally, weak-instrument robust tests were performed using **weakiv**, a user-written Stata command developed by Finlay, Magnusson, and Schaffer (2013). A conditional likelihood ratio test, robust to clustered standard errors, is provided along with the other test statistics. Under the null hypothesis, the coefficient of parental depressive symptoms is equal to zero.

The results regarding education appear less clear than in the simple correlations above. Table 71 shows the probability of being in school as a function of parental depression symptoms and a set of exogenous variables. The random effects coefficient is negative and significant, indicating that individuals with more depressed parents are less likely to be in school. When controlling for individual fixed effects, however, the coefficient is no longer significant and when instrumented, it becomes positive and significant, suggesting that a parental depressive episode is associated with a higher probability of presence in school. This might not be as counter-intuitive as it seems. Two separate mechanisms account for presence in school: 1) the choice to pursue education at higher levels, which should intuitively be positively associated with income and health of the family, and 2) grade repetition, implying longer school presence at a given level of education. The presence of both effects make the interpretation less straightforward. Schooling is mandatory in Mexico up until grade 9, and it could be for example that depressive symptoms imply a longer presence in school for relatively young children, who are still in primary school (repeating grades), while they imply a negative effect on older children who are less likely to enter higher educational cycles. It will be shown in the next section—when decomposing the effect by age—that the results are consistent with this interpretation. The coefficient from "Very bad health" stands out. It is odd to find that individuals in very bad health would be more present in school. This, however, could be explained if

⁷⁰The full first-stage regression results are available from the author upon request.

Table 71: Parental CCDS D impact on the probability of being in school

	RE		FE		FE-IV	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Parental CCDS D	-0.003***	(0.001)	-0.000	(0.001)	0.039**	(0.018)
Round 2 dummy	0.034***	(0.010)	-0.136***	(0.009)	-0.118***	(0.014)
Round 3 dummy	-0.033*	(0.019)	-0.431***	(0.012)	-0.395***	(0.021)
<i>Child characteristics:</i>						
Age (in years)	-0.053***	(0.002)				
Sex	0.009	(0.010)				
Good health	-0.015	(0.015)	0.006	(0.018)	-0.002	(0.021)
Regular health	-0.054***	(0.017)	-0.011	(0.021)	-0.043	(0.028)
Bad health	-0.130**	(0.055)	-0.052	(0.059)	-0.077	(0.064)
Very bad health	0.377***	(0.061)	0.483***	(0.087)	0.495***	(0.137)
Ref: Very good health						
Per capita consumption	0.000***	(0.000)	0.000	(0.000)	0.000	(0.000)
<i>Household head and spouse characteristics:</i>						
HH age	-0.003***	(0.001)				
Spouse age	0.001	(0.001)				
HH works	0.004	(0.021)	0.007	(0.027)	-0.010	(0.031)
Spouse works	0.022	(0.023)	-0.015	(0.029)	-0.023	(0.032)
HH working*income	0.000***	(0.000)	-0.000	(0.000)	-0.000	(0.000)
Spouse working*income	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
HH working*hours worked	-0.001*	(0.000)	-0.000	(0.000)	0.000	(0.001)
Spouse working*hours worked	0.001	(0.001)	0.001	(0.001)	0.001	(0.001)
HH hospitalized	-0.014	(0.030)	-0.044	(0.035)	-0.109**	(0.052)
Spouse hospitalized	-0.007	(0.020)	-0.027	(0.025)	-0.037	(0.026)
HH chronic illnesses	0.023**	(0.012)	-0.001	(0.016)	-0.066*	(0.034)
Spouse chronic illnesses	0.002	(0.010)	-0.011	(0.014)	-0.044**	(0.022)
Constant	1.645***	(0.040)	0.955***	(0.038)		
<i>First-stage statistics</i>						
Cragg-Donald Wald F					12.6	
Kleibergen-Paap rk LM χ^2					17.0	0.000
Kleibergen-Paap Wald rk F					10.6	
Hansen J					0.645	0.422
Conditional Likelihood ratio					4.97	0.03
Observations	5 799		5 799		5 799	
Number of individuals	1 933		1 933		1 933	

Sample: Panel individuals more than 5 and less than 16 years old in 2002.

Standard errors are clustered on individuals.

*** p<0.01, ** p<0.05, * p<0.10

Table 72: Parental CCDS D impact on the probability of having repeated a grade

	RE		FE		FE-IV	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Parental CCDS D	0.003***	(0.001)	0.003**	(0.001)	0.038**	(0.019)
Round 2 dummy	-0.042***	(0.014)	0.018**	(0.009)	0.033**	(0.013)
Round 3 dummy	-0.080***	(0.025)	0.055***	(0.008)	0.087***	(0.020)
<i>Child characteristics:</i>						
Age (in years)	0.014***	(0.003)				
Sex	-0.074***	(0.016)				
Good health	0.012	(0.015)	0.010	(0.016)	0.002	(0.018)
Regular health	0.028*	(0.016)	0.026	(0.017)	-0.005	(0.025)
Bad health	0.075*	(0.046)	0.066	(0.043)	0.053	(0.051)
Very bad health	0.322*	(0.176)	0.292	(0.181)	0.303**	(0.144)
Ref: Very good health						
Per capita consumption	-0.000	(0.000)	0.000	(0.000)	-0.000	(0.000)
<i>Household head and spouse characteristics:</i>						
HH age	0.002	(0.001)				
Spouse age	0.003*	(0.002)				
HH works	-0.025	(0.018)	-0.029	(0.020)	-0.047*	(0.028)
Spouse works	0.016	(0.019)	0.024	(0.019)	0.017	(0.023)
HH working*income	0.000	(0.000)	0.000	(0.000)	0.001	(0.001)
Spouse working*income	-0.000	(0.000)	-0.000	(0.000)	0.000	(0.001)
HH working*hours worked	-0.000*	(0.000)	0.000	(0.000)	-0.000	(0.000)
Spouse working*hours worked	-0.000***	(0.000)	-0.000	(0.000)	-0.000	(0.000)
HH hospitalized	-0.004	(0.021)	0.004	(0.022)	-0.051	(0.039)
Spouse hospitalized	-0.028	(0.017)	-0.014	(0.019)	-0.025	(0.022)
HH chronic illnesses	-0.014	(0.011)	-0.011	(0.012)	-0.066**	(0.033)
Spouse chronic illnesses	0.005	(0.010)	0.012	(0.011)	-0.014	(0.019)
Constant	-0.201***	(0.053)	0.111***	(0.033)		
<i>First-stage statistics</i>						P-value
Cragg-Donald Wald F					7.0	
Kleibergen-Paap rk LM χ^2					11.5	0.003
Kleibergen-Paap Wald rk F					6.8	
Hansen J					0.494	0.482
Conditional Likelihood ratio					5.70	0.022
Observations	5 286		5 286		5 286	
Number of individuals	1 762		1 762		1 762	

Sample: Panel individuals aged more than 5 and less than 16 years old in 2002.

Standard errors are clustered on individuals.

*** p<0.01, ** p<0.05, * p<0.10

Table 73: Parental CCDS D impact on the probability of having ever worked

	RE		FE		FE-IV	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Parental CCDS D	0.004***	(0.001)	0.003**	(0.001)	0.035*	(0.019)
Round 2 dummy	-0.049***	(0.011)	0.089***	(0.009)	0.103***	(0.014)
Round 3 dummy	0.000	(0.019)	0.321***	(0.012)	0.351***	(0.022)
<i>Child characteristics:</i>						
Age (in years)	0.043***	(0.002)				
Sex	-0.132***	(0.010)				
Good health	0.000	(0.016)	-0.010	(0.019)	-0.018	(0.020)
Regular health	0.030*	(0.018)	0.016	(0.022)	-0.012	(0.028)
Bad health	0.028	(0.051)	0.026	(0.060)	0.004	(0.067)
Very bad health	0.063	(0.183)	-0.030	(0.184)	-0.022	(0.225)
<i>Ref: Very good health</i>						
Per capita consumption	-0.000	(0.000)	0.000	(0.000)	-0.000	(0.000)
<i>Household head and spouse characteristics:</i>						
HH age	0.005***	(0.001)				
Spouse age	-0.004***	(0.001)				
HH works	-0.043**	(0.021)	-0.040	(0.027)	-0.053*	(0.030)
Spouse works	-0.010	(0.025)	0.024	(0.032)	0.015	(0.033)
HH working*income	0.001***	(0.000)	0.001	(0.001)	0.001**	(0.001)
Spouse working*income	0.000	(0.001)	-0.000	(0.001)	-0.000	(0.001)
HH working*hours worked	-0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Spouse working*hours worked	-0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
HH hospitalized	0.005	(0.029)	0.015	(0.035)	-0.041	(0.051)
Spouse hospitalized	-0.008	(0.018)	-0.011	(0.022)	-0.016	(0.024)
HH chronic illnesses	0.010	(0.013)	0.009	(0.016)	-0.044	(0.035)
Spouse chronic illnesses	0.038***	(0.011)	0.044***	(0.014)	0.016	(0.022)
Constant	-0.463***	(0.040)	-0.026	(0.038)		
<i>First-stage statistics</i>						P-value
Cragg-Donald Wald F					13.2	
Kleibergen-Paap rk LM χ^2					17.6	0.0002
Kleibergen-Paap Wald rk F					11.2	
Hansen J					1.52	0.218
Conditional Likelihood ratio					5.0	0.029
Observations	5 757		5 757		5 757	
Number of individuals	1 919		1 919		1 919	

Sample: Panel individuals aged more than 5 and less than 16 years old in 2002.

Standard errors are clustered on individuals.

*** p<0.01, ** p<0.05, * p<0.10

Table 74: Parental CCDS D impact on the probability of combining school and work

	RE		FE		FE-IV	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Parental CCDS D	0.002***	(0.001)	0.002**	(0.001)	0.037**	(0.017)
Round 2 dummy	0.001	(0.008)	0.010	(0.007)	0.026**	(0.012)
Round 3 dummy	-0.011	(0.012)	0.008	(0.007)	0.042**	(0.018)
<i>Child characteristics:</i>						
Age (in years)	0.003**	(0.001)				
Sex	-0.030***	(0.006)				
Good health	-0.001	(0.009)	0.002	(0.012)	-0.008	(0.015)
Regular health	0.010	(0.011)	0.018	(0.014)	-0.014	(0.022)
Bad health	0.004	(0.034)	0.031	(0.039)	0.028	(0.049)
Very bad health	-0.049***	(0.012)	-0.192	(0.175)	-0.183	(0.212)
<i>Ref: Very good health</i>						
Per capita consumption	0.000**	(0.000)	0.000**	(0.000)	0.000	(0.000)
<i>Household head and spouse characteristics:</i>						
HH age	0.001**	(0.001)				
Spouse age	-0.001*	(0.001)				
HH works	-0.001	(0.012)	0.010	(0.017)	-0.013	(0.024)
Spouse works	0.008	(0.017)	0.016	(0.022)	0.002	(0.026)
HH working*income	0.000	(0.000)	-0.000	(0.000)	-0.000*	(0.000)
Spouse working*income	0.000	(0.000)	-0.000	(0.001)	0.000	(0.000)
HH working*hours worked	-0.000***	(0.000)	-0.000	(0.000)	0.001	(0.000)
Spouse working*hours worked	-0.000	(0.000)	0.000	(0.000)	0.000	(0.001)
HH hospitalized	-0.004	(0.019)	0.004	(0.023)	-0.053	(0.040)
Spouse hospitalized	-0.018*	(0.010)	-0.011	(0.012)	-0.018	(0.017)
HH chronic illnesses	0.015*	(0.008)	0.016	(0.010)	-0.038	(0.027)
Spouse chronic illnesses	0.010	(0.007)	0.012	(0.009)	-0.015	(0.016)
Constant	-0.040*	(0.023)	-0.029	(0.024)		
<i>First-stage statistics</i>						
Cragg-Donald Wald F					7.1	P-value
Kleibergen-Paap rk LM χ^2					11.8	0.003
Kleibergen-Paap Wald rk F					7.31	
Hansen J					0.02	0.891
Conditional Likelihood ratio					8.53	0.005
Observations	5 310		5 310		5 310	
Number of individuals	1 770		1 770		1 770	

Sample: Panel individuals aged more than 5 and less than 16 years old in 2002.

Standard errors are clustered on individuals.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

worsened health leads to repetition (as Table 72 suggests). Furthermore, extremely few individuals report having a very bad health in the sample (0.06% of individuals less than 18 years old in 2002). In the Table 71 sample, only two individuals move to a very bad health between rounds 1 and 2.

From the results in the appendix (Tables 82-83) it can be seen that parents' CCDSD scores do not significantly influence the choice to continue on to high school or college⁷¹, bearing in mind that these results should be interpreted with caution since the instrument is weakly correlated with depressive symptoms. Depressive symptoms do however significantly increase the probability of grade repetition, as seen in Table 72. The size of the coefficient is rather small, 0.003, and implies that a change of one standard deviation (5.9 points on the score) in parents' CCDSD score would increase the predicted probability of a child having repeated a grade by around 2 percentage points (5.9×0.003). It also implies that a child in a family where one parent goes from 20 to 46 on the CCDSD scale—that is, from perfect mental health to average depression—sees its probability of repeating a grade increase by 4 percentage points (13×0.003). However, as previously discussed, endogeneity is likely to bias the coefficient in an *a priori* unknown direction. Measurement error is one such likely bias: if parents are incoherent in their ways of responding to the emotional well-being module in time, or if the screening device is simply imperfect, then measurement error of the underlying true depressive symptoms is likely to bias coefficients towards zero. Another potential downward bias is if the amount and quality of extra-curricular help provided by parents negatively influences their emotional well-being, through extra work or stressful behavior for example. Column 3 shows the same regression run with instrumental variables. The result is similar, but the size of the coefficient on parental mental health is now more than 10 times larger. In the IV estimates, an increase of one standard deviation of parental CCDSD implies a change in the probability of repetition of 24 percentage points. For the previous example, of one parent with no symptoms of negative affect who develops average depression, the associated probability increase is of 52 percentage points.

Tables 73 and 84 show the results of regressions pertaining to work outcomes. In all specifications but one (fixed effects, currently working), parental CCDSD is positively associated with currently working or having worked at one time. As such, according to the fixed effect estimation, one standard deviation increase in parental CCDSD corresponds to an increase of 1.8 percentage points in the probability of the child having ever worked,

⁷¹Compulsory education in Mexico ends after lower secondary school, at 15 years of age.

while the coefficient of currently working is not significant in fixed effects. Again, the IV estimates are sensibly higher, with a one standard deviation increase in parental CCDS equal to a 20.7 (5.9*0.035) percentage point increase in the probability of having worked, and a 17.1 (5.9*0.027) percentage point increase in the probability of currently working. While the finding of higher grade repetition speaks rather clearly, the fact that individuals work more might not necessarily reflect a constraint. Work could, indeed, be a very positive outcome if it occurs after graduation and pleases the young person under consideration. If, for the sake of argument one deliberately takes the (counter-intuitive) stand that individuals whose parents' mental health deteriorates are more likely to find a job upon graduation, and that this is what is being picked up in the previous estimates, then this should be reflected in a lower probability to be inactive. Yet, table 85 shows that increasing parental negative affect is not correlated with decreasing rates of inactivity within individuals. On the contrary, the coefficient is positive in both regressions, but not significant when IV is used. The plausibility of estimates reflecting increased success on the job market is thus low. On the contrary, what we seem to be picking up is an increased probability of combining work and schooling (see Table 74, consistent with the mechanism of revenue loss leading to work uptake extensively described in the literature on household income shocks and children's school and work decisions (e.g. Fitzsimons and Mesnard (2014))). Another interpretation consistent with my framework is simply that the work-schooling ratio increases due to decreasing benefits from education (reflected in the presence of parameter θ_p in the child's human capital acquisition function).

5.2 Considerations on vulnerability

The previous results show that an exogenous increase in mental health is associated with increased work and school repetition in children. While informative in itself, in order to draw policy conclusions it would be even more important to know whether the relationships uncovered originate from a particular segment of the population. If an increase of negative affect provokes the abovementioned outcomes independently of parents initial mental health, or whether already vulnerable parents are those who drive the results, matters in terms of the possibility of identifying cost-beneficial strategies to counter school failure and premature work.

Table 75 shows marginal effects from regressions run with the added interaction term Parental CCDS \times Parental CCDS₂₀₀₂. Here, I thus allow depressive symptoms to have differential effects according to the initial (first wave) level of depressive symptoms. The marginal effects are evaluated at the scores denoting the boundaries of Calderon's classification. The coefficients all tell us the same story: while mental health shocks have impacts on child schooling and work outcomes, these results are not driven by the "extremes", i.e. those parents who were already at high levels of distress in 2002. On the contrary, the marginal effects at higher levels of initial depressive symptoms are rather negative, but not significant. A potential explanation for negative results at the higher end tail could be that pre-existing high morbidity, when accentuated, triggers help interventions by local government or friends and family, effectively taking care of children when parents are unable to. Table 89 shows three alternative specifications of the CCDS score (linear, squared and cubic) and presents marginal effects by steps of 10. The results are consistent with the below table: higher scores are significantly correlated with child outcomes at initial values of 20 and 30, but not above⁷².

The literature on early childhood effects on future outcomes provides another source of potential heterogeneity in the estimated coefficients. If children exhibit varying sensitivities to parental depression depending on their age, this should be reflected as age-specific differences in the impact of parental illness on child outcomes. However, we only have knowledge of parental mental health at three points in time, and we do not know the duration of symptoms or the time at which they started. We thus risk to be confronted with noisy estimates when running the above regressions adding interactions between

⁷²Note that since this is the average score, it could still correspond to a couple where one of the two is moderately anxious (with a CCDS of say, 40), and the other one in perfect mental health

Table 75: Marginal effects of parental CCDS, at levels of 2002 CCDS.

2002 score	Currently in school		Ever repeated		Ever worked	
20	-0.0015	(0.0019)	0.0062***	(0.0018)	0.0040**	(0.0018)
35	-0.0005	(0.0016)	0.0008	(0.0015)	0.0014	(0.0016)
45	0.00022	(0.0031)	-0.0028	(0.0029)	-0.0004	(0.0029)
65	0.0016	(0.0063)	-0.0099	(0.0061)	-0.0039	(0.0059)
	Currently work		Inactive		Working in school	
20	0.0028*	(0.0017)	0.0044***	(0.0017)	0.0018*	(0.0010)
35	0.0000	(0.0015)	0.0012	(0.0013)	0.0005	(0.0009)
45	-0.0017	(0.0026)	-0.0010	(0.0024)	-0.0003	(0.0015)
65	-0.0054	(0.0054)	-0.0054	(0.0049)	-0.0020	(0.0030)

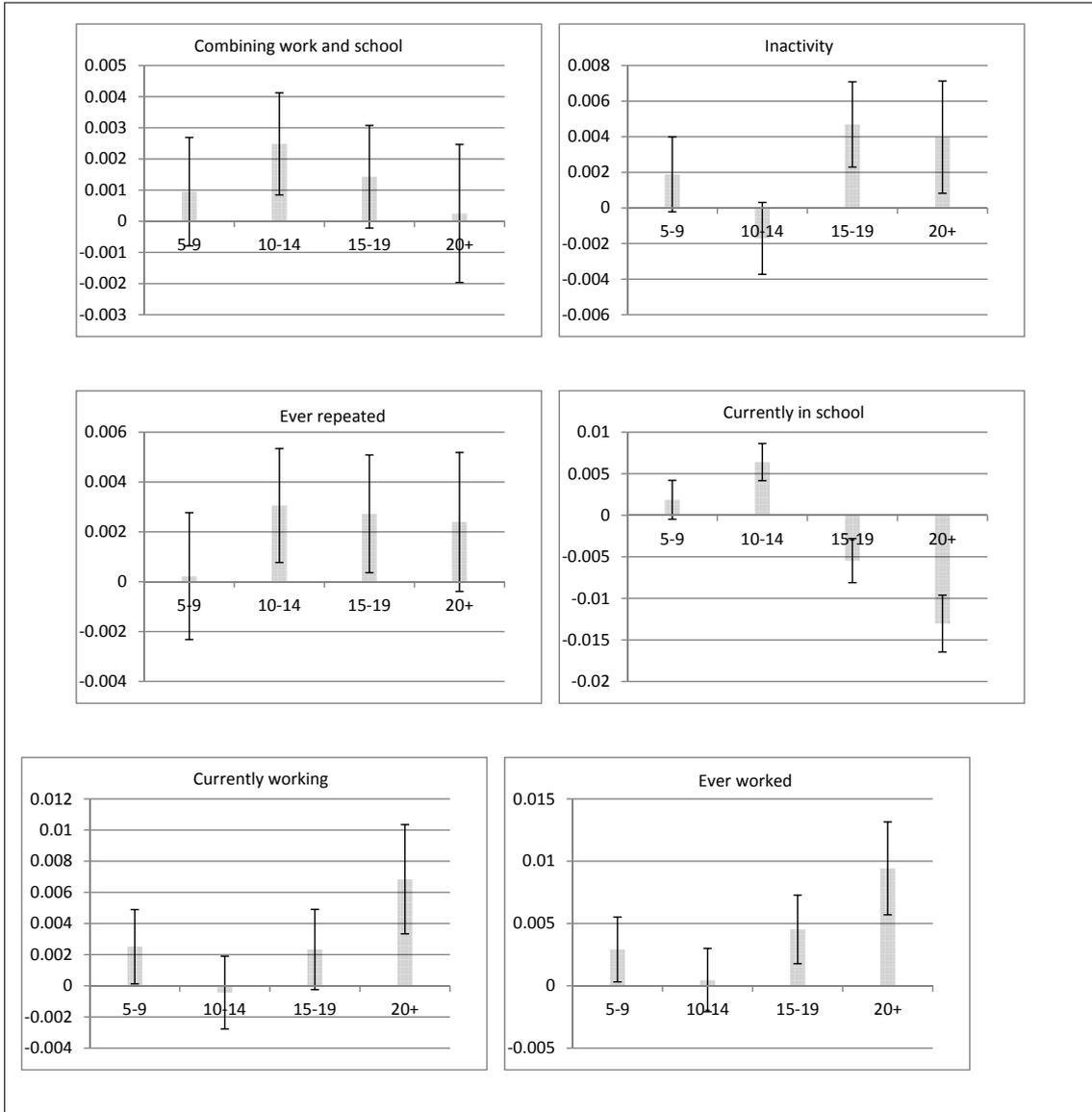
Marginal effects from a random effects model run with interactions between CCDS score and 2002 CCDS score. * <0.1 , ** <0.05 , *** <0.01 .

Standard errors are clustered on individuals.

parental CCDS and age group indicators. Furthermore, the relatively short time span of the data reduces the possibility of comparing effects on children at different ages, since some outcomes are age-specific. In other words, if parental mental health only affects children in their early childhood (say between 0 to 5 years of age), then we will not pick up an effect on high school and college enrollment. These caveats having been mentioned, Figure 24 shows marginal effects from a fixed effect regression by age group for six outcomes.

The results provide some interesting insights. Bearing in mind that the actual effects might have occurred in between waves, it seems that older offspring (above 15 years old) are both at higher risk of working and at higher risk of inactivity. Furthermore, they are less likely to be in school; most likely a sign that they are less likely to continue to high school and college. The impact of parental depressive symptoms thus seems to be hindering progression into higher levels of education, adding an important nuance to what the full sample estimates of the previous subsection showed. The ever repeated graph show that effects on learning do not seem to intervene in the first years of schooling, although this might be due to the fact that we are picking up effects with a time delay, and that 9 years is too low an age for repetition to start becoming an issue. Looking at

Figure 24: Marginal effects of parental CCDS for different age groups



Source: Author's calculations from a random effects regression run with interactions between parental CCDS and child age groups. Bounded vertical lines show 95% confidence intervals.

the work-school combination, it is significant for 10-14 years old, i.e. at lower secondary school age. This is coherent with income loss as a primary driver of parents' decision to send children to work, since school is compulsory to the age of 15. Past that age, income-constrained parents can choose not to send their children to high school, which contrary to previous educational cycles is not free and mostly found in urban areas.

Finally, it makes sense, given findings from the psychological literature, to try to distinguish impacts from the mother from impacts from the father. This is done in tables 86 and 87, where all regressions are run with the two CCDS scores of fathers and mothers respectively entered as two separate variables. The fixed effect specifications shows that fathers' symptoms seem to be of higher importance in terms of outcomes, mothers symptoms being non significant in all regressions except 'Inactive'. However, while instrumented mothers' symptoms are significantly associated with all of the previously significant outcomes, fathers' symptoms are not. The reason fathers' symptoms are not significant most likely stems from the fact that the instrument is very weakly correlated with fathers' depressive symptoms.

5.3 Robustness checks

Identifying the above impacts as impacts of mental health implies excluding possible confounding factors, and involves examining the exclusion criteria of the proposed instrument. First, assaults should not provoke any other consequences relevant for children's outcomes than those on mental health. Two other outcomes come to mind; a physical health shock, and an income shock. Although physical violence is relatively rare in the assaults picked up in the data, and parental physical health is controlled for in the estimations through the number of chronic symptoms and having been hospitalized in the last 12 months or not, a cause for worry could be that estimates are picking up the effects of a deterioration in physical health. To see if this is the case, we exclude from our estimates those individuals whose parents were hurt during the latest assault. From the looks of table 76, this does not much impact the results. Another imaginable consequence of assault might be revenue loss. Although the question refers to assaults taking place in the street, outside of the workplace and home, it could be that individuals carry valuables such as weekly sales revenue or bonuses, or are being robbed of their vehicles. To see whether this revenue loss, rather than resulting mental illness, interferes with our results we exclude from the estimations all individuals who suffered a prejudice higher than 20000 Mexican pesos, i.e. about 1000 euro. At such high levels, the transitory income shock, that we may

not be perfectly capturing through the *per capita* consumption variable, might induce long-term behavioral changes in the household that are unrelated to mental health. As can be seen from table 76, the results do not change upon the exclusion of these observations⁷³.

Second, in our regressions we are assuming that assault is orthogonal to the error term in the structural equation. This is violated if individuals with particular characteristics are at different risks of assault. Even though individual fixed effects are added to the estimation, and all time-invariant characteristics of the individual are thus controlled for, an infinite number of time-variant unobservable characteristics (behavioral ones, primarily) could explain why an individual is at the same time at a high risk of exposure to violent assault and has children experiencing difficulties in school, or having to do market work. Individuals starting to use drugs, for example, will most certainly find themselves at higher risks of assault while at the same being less productive at work and in assisting offspring with scholarly tasks. While not all of the plausible confounding characteristics can be captured in the data, information on self-assessed probability of being assaulted is present and available for use as a proxy variable for risky behavior. This variable resumes private information from the individual on risk factors or preventive behavior making him or her more exposed to assault, which may be correlated with the error term, and is thus a way of minimizing the possibility that $Cov(Z_{i,t}, u_{i,t}) \neq 0$. As shown in Table 76, all the main results hold upon the introduction of this variable. Additionally, in a separate regression (not shown), smoking and alcohol habits were added as additional controls. This proved not to modify the signs, significance or approximate magnitudes of the estimated coefficients.

⁷³A relate—not shown—robustness check was carried out where the value of robbed items was introduced as an explanatory variable in the regressions. This turned out to not affect the results.

Table 76: Alternative samples and specifications (robustness checks)

		Curr school	Attended high school	Attended college	Ever repeat	Ever work	Currently work	Inactivity	Working while in school
Panel A: Removing all hurt individuals	FE	0.0001 (0.0013)	0.0015 (0.0018)	-0.0014 (0.0015)	0.0027** (0.0012)	0.0029** (0.0013)	0.0015 (0.0012)	0.0020* (0.0012)	0.0017** (0.0008)
	FE-IV	0.065** (0.028)	0.035 (0.042)	0.10 (0.17)	0.053 (0.033)	0.053** (0.025)	0.048** (0.024)	-0.042 (0.032)	0.064** (0.030)
	<i>No. Obs.</i>	5 616	3 057	1 584	5 121	5 574	5 616	5 205	5 133
Panel B: Removing individuals with large financial losses	FE	<0.0001 (0.0013)	0.0009 (0.0017)	-0.0015 (0.0015)	0.0026** (0.0012)	0.0030** (0.0013)	0.0016 (0.0012)	0.0020* (0.0011)	0.0016** (0.0008)
	FE-IV	0.034** (0.016)	-0.005 (0.025)	0.041 (0.06)	0.036** (0.017)	0.032** (0.015)	0.028* (0.015)	-0.014 (0.017)	0.038*** (0.015)
	<i>No. Obs.</i>	5 769	3 129	1 611	5 256	5 727	5 769	5 352	5 280
Panel C: Including probability of being assaulted	FE	-0.0003 (0.0013)	0.0012 (0.0018)	-0.001 (0.0015)	0.0026** (0.0012)	0.0026** (0.0013)	0.0012 (0.0012)	0.0021* (0.0012)	0.0014* (0.0008)
	FE-IV	0.048** (0.022)	0.012 (0.033)	0.09 (0.10)	0.049* (0.026)	0.034* (0.019)	0.030 (0.019)	-0.025 (0.026)	0.047** (0.022)
	<i>No. Obs.</i>	5 805	3 159	1 614	5 292	5 763	5 805	5 388	5 316

Standard errors clustered on individuals. *<0.1, **<0.05,***<0.01.

Lastly, Mexico's "drug war" implies fluctuating security and sudden outbursts of violence in various regions of the country, as regional groups extend or defend their territories. It could be that a shift in the local political setting induced by such power struggles acts simultaneously on the likelihood to be assaulted in the street, and on the local labor markets. This might modify the relative wages of parents and children and induce an endogenous shift of the optimal schooling and labor decision. To attempt to control for such an effect, and to allow for a flexible specification of state-level heterogeneity in general, a state \times year interaction is introduced. A final cause for concern might be panel attrition, inducing bias if non-respondents in follow-up rounds are different from those who remain in the sample. Table 88 shows a few statistics on the main sample versus attrited individuals. The attrited are more often male, older and never having worked than those who remain in the sample. This would be consistent with migration as a way out of inactivity in low-employment areas. In terms of parental CCDS, however, differences between attrited and in-sample individuals are small. A way of checking if attrition plays a major role in the previous results would be to run all the regression on an unbalanced sample. This was done (results available upon request). The one change in the results that emerges from this exercise is that the previously significant effects on inactivity in the Random effects and Fixed effects model are no longer significant. In light of the results from this section, using assault in the street as a plausibly exogenous source of variation in mental health seems warranted.

5.4 Transmission mechanisms

The previous sections have shown that increased depressive symptoms in parents lead to children more often having to work, and performing less well in school. I will now—based on the previous literature review—examine the evidence for the various plausible mechanisms at hand.

A sizable literature on the labor market effects of mental illness exists, and has generally shown negative effects of poor mental health on employment and labor market participation (Berndt et al. 1998; Chatterji et al. 2007; Cseh 2008; Kessler 1997; Mitra and Jones 2017). Table 77 shows coefficients from a set of regressions run on work, inactivity and the number of hours worked in a general week for household heads. They show a negative relationship between work and depressive symptoms, and between depressive symptoms and inactivity, when an individual fixed effects model is used. However, simultaneity concerns are warranted, since unemployment and inactivity could for various

reasons lead to worsened psychological status. Indeed, the coefficients are no longer significant when depressive symptoms are instrumented. The negative effect found might thus not primarily come from a revenue constraint, but rather from a change in the quality of parent-child interactions, or more generally through the transmission of negative emotional well-being. These mechanisms are hard to test, as information on parent-child interactions is absent from the longitudinal data, and depressive symptoms are only known for children who are 15 years or older. Table 78 however presents regressions run on three outcomes of interest; children's physical health, the relative cognitive capacity of children, and the CCDS score of children older than 14 years.

The correlations between parental depressive symptoms and those of children are highly significant, even when instrumented. Thus, exogenous shocks to depressive symptoms trigger emotional reactions in children which may deteriorate their educational productivity, leading to increased repetition rates and an increased probability to take up work. Previous literature has investigated whether cognitive development of children is affected when parents are under mental distress, with varying results. In line with Frank and Meara (2009), I find no effects of parental depressive symptoms on the relative cognitive skills of affected children⁷⁴. However, an impact can be found on children's health, as measured by an indicator giving the number of physical symptoms experienced by individuals in the last 4 weeks. The symptoms refer to common health problems (see table 78 for the list of symptoms), and the coefficients found are all positive and significant. It thus seems that another outcome on children is a deterioration in their health, which in itself can have multiple causes. One such cause is if taking up work leads to worsened health outcomes. A separate regression (not shown) was run where child work was added as an additional explanatory variable. The coefficients were all significant, suggesting that worsened health may be a by-product of the increased propensity to work with increased parental depressive symptoms. However, parental CCDS remained significant as well, including when instrumenting, suggesting that additional transmission mechanisms, such as parental disengagement, account for worsened health outcomes.

⁷⁴It should be noted, though, that most of the evolutions in the sample concern mild depressive symptoms.

Table 77: Effect of depressive symptoms on work-related outcomes (HH)

	Works				Inactive				Work hours			
	FE		FE-IV		FE		FE-IV		FE		FE-IV	
CCDSD	-0.003***	(0.001)	-0.001	(0.017)	0.002***	(0.001)	0.011	(0.015)	-0.046	(0.048)	2.355	(1.784)
Round 2 dummy	-0.023***	(0.009)	-0.022	(0.017)	0.024***	(0.008)	0.031**	(0.015)	-0.270	(0.513)	1.241	(1.319)
Round 2 dummy	-0.032***	(0.009)	-0.030**	(0.015)	0.028***	(0.008)	0.034**	(0.013)	-0.785	(0.505)	0.223	(1.013)
Household size	-0.003	(0.004)	-0.003	(0.004)	-0.001	(0.004)	-0.001	(0.004)	0.070	(0.262)	0.038	(0.355)
Rural	0.011	(0.024)	0.011	(0.025)	0.003	(0.021)	0.001	(0.022)	-2.213	(1.374)	-3.472*	(2.077)
Separated	0.054*	(0.030)	0.051	(0.045)	-0.045*	(0.027)	-0.061	(0.040)	2.907	(2.038)	-0.065	(3.527)
Divorced	0.124***	(0.044)	0.122**	(0.050)	-0.142***	(0.039)	-0.154***	(0.045)	4.781*	(2.852)	1.365	(4.611)
Widow	0.083*	(0.050)	0.077	(0.089)	-0.064	(0.044)	-0.100	(0.079)	-0.638	(3.412)	-8.564	(7.475)
Married	0.006	(0.022)	0.006	(0.023)	-0.005	(0.019)	-0.009	(0.021)	3.111**	(1.309)	2.978*	(1.770)
Single	0.094***	(0.036)	0.094***	(0.036)	-0.105***	(0.032)	-0.105***	(0.032)	1.872	(2.438)	1.620	(3.297)
Chronic diseases	-0.003	(0.012)	-0.006	(0.035)	0.006	(0.011)	-0.010	(0.031)	0.062	(0.725)	-4.104	(3.246)
Hospitalized	-0.120***	(0.025)	-0.123***	(0.038)	0.105***	(0.022)	0.090***	(0.034)	0.688	(1.720)	-3.307	(3.767)
First-stage F-stat			8.1				8.1		4.0			
Observations	6,249		6,249		6,249		6,249		4,620		4,620	
Number of individuals	2,083		2,083		2,083		2,083		1,540		1,540	

Sample: Household heads present in all three rounds. Standard errors are clustered on individuals. *.p<0.1, **.p<0.05, ***.p<0.01.

Table 78: Potential transmission mechanisms between parental CCDS and child outcomes

	Parental CCDS		HH CCDS		Spouse CCDS							
	FE	FE-IV	FE	FE-IV	FE	FE-IV						
<i>Child CCDS</i>												
Coefficient	0.428***	(0.036)	0.727*	(0.438)	0.242***	(0.032)	0.699*	(0.394)	0.266***	(0.026)	0.449	(0.382)
Observations	5 043		5 043		5 043		5 043		5 043		5 043	
Number of individuals	1 681		1 681		1 681		1 681		1 681		1 681	
<i>Cognitive deciles</i>												
Coefficient	0.007	(0.009)	-0.013	(0.1)	-0.007	(0.008)	-0.20	(0.157)	0.011*	(0.006)	0.033	(0.070)
Observations	6 144		6 144		6 144		6 144		6 144		6 144	
Number of individuals	2 048		2 048		2 048		2 048		2 048		2 048	
<i>Number of symptoms</i>												
Coefficient	0.022***	(0.005)	0.168**	(0.074)	0.014***	(0.005)	0.209*	(0.107)	0.013***	(0.003)	0.119**	(0.055)
Observations	8 034		8 034		8 034		8 034		8 034		8 034	
Number of individuals	2 678		2 678		2 678		2 678		2 678		2 678	

Child CCDS: *Sample:* children of the household head between 15 and 29 years old in 2002.

Cognitive deciles: *Sample:* number of children between ages of 5 and 17 in 2002.

Number of symptoms: number of the following symptoms experienced the last 4 weeks: tooth ache, headache, stomach pain, flu, breathing difficulties, cough, fever, nausea, diarrhea, infected eyes. *Sample:* number of children between ages of 5 and 17 in 2002.

All regressions contain the explanatory variables from regressions 71-74.

Standard errors are clustered at the individual level.

6 Conclusion

I have above shown evidence on the causal impact of parental depressive symptoms on children's educational and labor outcomes in Mexico. The results show that an increase in parental depression symptoms leads to an increased probability of grade repetition, but is not significantly associated with high school or college attendance (although this might be caused by weak instruments). Furthermore, parental depression does lead to increased work rates (including when in school). I then attempt to disentangle the transmission mechanisms involved. The evidence does not support revenue loss as a primary mechanism driving the above results, suggesting that the negative impacts on children stem primarily from worsened parent-child interactions. This is confirmed looking at the intergenerational transmission of depressive symptoms. An exogenous increase of parental depressive symptoms leads to a significant increase in depressive symptoms and to a decrease of physical health in children, as measured in the numbers of symptoms shown in the last 4 weeks.

Using assaults in the street as a source of exogenous variation in mental distress, I conclude that an increase of one standard deviation in parents' average depressive symptoms leads to an increase of 15-25 percentage points in the probability of repeating a grade and carrying out (or having carried out) market work, respectively. Results are robust to alternative samples and specifications. Based on these results, I conclude that the consequences of mental illness should be of primary concern to policy makers in the area of public health if they are looking to address intergenerational sources of inequality. Given the low cost of generic anti-depressants, and the massive under-utilization of mental health services in Mexico, there seems to be ample space for cost-effective interventions, which apart from healing the suffering, come with positive externalities at the family level.

References

- Agrawal, Arpana et al. (2004). “A Population Based Twin Study of Sex Differences in Depressive Symptoms”. In: *Twin Research* 7.02, pp. 176–181.
- Akresh, Richard, Damien De Walque, and Harounan Kazianga (2013). *Cash Transfers and Child Schooling: Evidence from a Randomized Evaluation of the Role of Conditionality*. World Bank Policy Research Working Paper 6340.
- Andrade, Laura et al. (2003). “The epidemiology of major depressive episodes: results from the International Consortium of Psychiatric Epidemiology (ICPE) Surveys”. In: *International Journal of Methods in Psychiatric Research* 12.1, pp. 3–21.
- Angrist, Joshua and Alan B Krueger (2001). “Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments”. In: *Journal of Economic Perspectives* 15.4, pp. 69–85.
- Basu, Kaushik, Sanghamitra Das, and Bhaskar Dutta (2010). “Child labor and household wealth: Theory and empirical evidence of an inverted-U”. In: *Journal of Development Economics* 91.1, pp. 8–14.
- Basu, Kaushik and Pham Hoang Van (1998). “The Economics of Child Labor”. In: *The American Economic Review* 88.3, pp. 412–427.
- Beck, Aaron T (1961). “A systematic investigation of depression”. In: *Comprehensive Psychiatry* 2.3, pp. 163–170.
- Bellemare, Marc, Takaaki Masaki, and Thomas B Pepinsky (2015). *Lagged Explanatory Variables and the Estimation of Causal Effects*. Unpublished manuscript. University Library of Munich, Germany.
- Belló, Mariana, Esteban Puentes-Rosas, and María Elena Medina-Mora (2005). “Prevalencia y diagnóstico de depresión en población adulta en México”. In: *Salud Pública de México* 47.
- Benjet, Corina et al. (2016). “Eight-year incidence of psychiatric disorders and service use from adolescence to early adulthood: longitudinal follow-up of the Mexican Adolescent Mental Health Survey”. In: *European Child & Adolescent Psychiatry* 25.2, pp. 163–173.
- Berenzon Gorn, Shoshana et al. (2013). “Evaluation of the mental health system in Mexico: where is it headed?” In: *Revista Panamericana de Salud Pública* 33.4, pp. 252–258.
- Berg-Nielsen, Turid Suzanne, Arne Vikan, and Alv A Dahl (2002). “Parenting Related to Child and Parental Psychopathology: A Descriptive Review of the Literature”. In: *Clinical Child Psychology and Psychiatry* 7.4, pp. 529–552.
- Berndt, Ernst R et al. (1998). “Workplace performance effects from chronic depression and its treatment”. In: *Journal of Health Economics* 17.5, pp. 511–535.
- Björklund, Anders and Marianne Sundström (2006). “Parental Separation and Children’s Educational Attainment: A Siblings Analysis on Swedish Register Data”. In: *Economica* 73.292, pp. 605–624.
- Blau, David M (1999). “The Effect of Income on Child Development”. In: *Review of Economics and Statistics* 81.2, pp. 261–276.
- Borges, G et al. (2008). “Treatment of mental disorders for adolescents in Mexico City”. In: *Bulletin of the World Health Organization* 86.10, pp. 757–764.
- Calderón-Narváez, Guillermo (1997). “Un cuestionario para simplificar el diagnóstico del síndrome depresivo”. In: *Revista de Neuro-Psiquiatría* 60.2, pp. 127–135.
- Carey, Benedict (2016, April 16). *Aid Groups Aim to Put Mental Health on World Agenda*. New York Times. Retrieved from <https://www.nytimes.com>.
- Castilla-Puentes, Ruby C et al. (2008). “A multicenter study of major depressive disorder among emergency department patients in Latin-American countries”. In: *Depression and anxiety* 25.12, E199–E204.

- Chatterji, Pinka et al. (2007). “Psychiatric disorders and labor market outcomes: evidence from the National Latino and Asian American Study”. In: *Health Economics* 16.10, pp. 1069–1090.
- Chilcoat, Howard D, Naomi Breslau, and James C Anthony (1996). “Potential Barriers to Parent Monitoring: Social Disadvantage, Marital Status, and Maternal Psychiatric Disorder”. In: *Journal of the American Academy of Child & Adolescent Psychiatry* 35.12, pp. 1673–1682.
- Chisholm, Dan et al. (2016). “Scaling-up treatment of depression and anxiety: a global return on investment analysis”. In: *The Lancet Psychiatry* 3.5, pp. 415–424.
- Coile, Courtney C (2004). *Health Shocks and Couples’ Labor Supply Decisions*. National Bureau of Economic Research Working Paper 10810.
- Cseh, Attila (2008). “The Effects of Depressive Symptoms on Earnings”. In: *Southern Economic Journal* 75.2, pp. 383–409.
- Currie, Janet and Brigitte C Madrian (1999). “Health, health insurance and the labor market”. In: *Handbook of Labor Economics* 3, pp. 3309–3416.
- Currie, Janet and Mark Stabile (2006). “Child mental health and human capital accumulation: the case of ADHD”. In: *Journal of Health Economics* 25.6, pp. 1094–1118.
- Dahl, Gordon B and Lance Lochner (2012). “The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit”. In: *The American Economic Review* 102.5, pp. 1927–1956.
- De Janvry, Alain et al. (2006). “Can conditional cash transfer programs serve as safety nets in keeping children at school and from working when exposed to shocks?” In: *Journal of Development Economics* 79.2, pp. 349–373.
- Duryea, Suzanne, David Lam, and Deborah Levison (2007). “Effects of economic shocks on children’s employment and schooling in Brazil”. In: *Journal of Development Economics* 84.1, pp. 188–214.
- Edmonds, Eric V and Norbert Schady (2012). “Poverty Alleviation and Child Labor”. In: *American Economic Journal: Economic Policy* 4.4, pp. 100–124.
- Ermisch, John F and Marco Francesconi (2001). “Family structure and children’s achievements”. In: *Journal of Population Economics* 14.2, pp. 249–270.
- Ettner, Susan L, Richard G Frank, and Ronald C Kessler (1997). “The Impact of Psychiatric Disorders on Labor Market Outcomes”. In: *Industrial & Labor Relations Review* 51.1, pp. 64–81.
- Farahati, Farah, Dave E Marcotte, and Virginia Wilcox-Gök (2003). “The effects of parents’ psychiatric disorders on children’s high school dropout”. In: *Economics of Education Review* 22.2, pp. 167–178.
- Ferrari, Alize J et al. (2013). “Burden of Depressive Disorders by Country, Sex, Age, and Year: Findings from the Global Burden of Disease Study 2010”. In: *PLoS Med* 10.11.
- Finlay, Keith, Leandro Magnusson, and Mark E Schaffer (2013). *WEAKIV: Stata module to perform weak-instrument-robust tests and confidence intervals for instrumental-variable (IV) estimation of linear, probit and tobit models*. Statistical Software Components, Boston College Department of Economics.
- Fitzsimons, Emla and Alice Mesnard (2014). “Can Conditional Cash Transfers Compensate for a Father’s Absence?” In: *The World Bank Economic Review* 28.3, pp. 467–491.
- Fletcher, Jason M and Steven F Lehrer (2011). “Genetic lotteries within families”. In: *Journal of Health Economics* 30.4, pp. 647–659.
- Frank, Richard G and Catherine Koss (2005). *Mental health and labor markets productivity loss and restoration*. Disease Control Priorities Project Working Paper 38.
- Frank, Richard G and Ellen Meara (2009). *The Effect of Maternal Depression and Substance Abuse on Child Human Capital Development*. National Bureau of Economic Research Working Paper 15314.

- French, Michael T and Pierre K Alexandre (2001). "Labor Supply of Poor Residents in Metropolitan Miami, Florida: The Role of Depression and the Co-Morbid Effects of Substance Use". In: *The Journal of Mental Health Policy and Economics* 4.4.
- Frijters, Paul, David W Johnston, and Michael A Shields (2010). "Mental Health and Labour Market Participation: Evidence from IV panel Data Models". IZA Discussion Paper.
- García-Peña, Carmen et al. (2008). "Depressive Symptoms Among Older Adults in Mexico City". In: *Journal of General Internal Medicine* 23.12, pp. 1973–1980.
- Gatz, Margaret et al. (1992). "Importance of shared genes and shared environments for symptoms of depression in older adults." In: *Journal of Abnormal Psychology* 101.4, pp. 701–708.
- Gennetian, Lisa A (2005). "One or two parents? Half or step siblings? The effect of family structure on young children's achievement". In: *Journal of Population Economics* 18.3, pp. 415–436.
- Goldberg, David P (1972). *The detection of psychiatric illness by questionnaire: A technique for the identification and assessment of non-psychotic psychiatric illness*. Oxford University Press.
- Goodman, Sherryl H et al. (1994). "Mothers' Expressed Attitudes: Associations with Maternal Depression and Children's Self-Esteem and Psychopathology". In: *Journal of the American Academy of Child & Adolescent Psychiatry* 33.9, pp. 1265–1274.
- Grimm, Michael (2011). "Does household income matter for children's schooling? Evidence for rural Sub-Saharan Africa". In: *Economics of Education Review* 30.4, pp. 740–754.
- Gubert, Flore and Anne-Sophie Robilliard (2008). "Risk and Schooling Decisions in Rural Madagascar: A Panel Data-Analysis". In: *Journal of African Economies* 17.2, pp. 207–238.
- Hamilton, Vivian H, Philip Merrigan, and Éric Dufresne (1997). "Down and out: estimating the relationship between mental health and unemployment". In: *Health Economics* 6.4, pp. 397–406.
- Heinze, Gerhard et al. (2012). "Psychiatrists in Mexico: their distribution and practice". In: *Salud Mental* 35.4, pp. 279–285.
- Jayakody, Rukmalie, Sheldon Danziger, and Ronald C Kessler (1998). "Early-onset Psychiatric Disorders and Male Socioeconomic Status". In: *Social Science Research* 27.4, pp. 371–387.
- Johnson, Jeffrey G et al. (2004). "Paternal Psychiatric Symptoms and Maladaptive Paternal Behavior in the Home During the Child Rearing Years". In: *Journal of Child and Family Studies* 13.4, pp. 421–437.
- Kessler, Ronald C (1997). "The effects of stressful life events on depression". In: *Annual Review of Psychology* 48, pp. 191–214.
- Kessler, Ronald C et al. (2005). "Lifetime Prevalence and Age-of-Onset Distributions of DSM-IV Disorders in the National Comorbidity Survey Replication". In: *Archives of General Psychiatry* 62.6, pp. 593–602.
- Kiernan, Kathleen E and Fiona K Mensah (2009). "Poverty, Maternal Depression, Family Status and Children's Cognitive and Behavioural Development in Early Childhood: A Longitudinal Study". In: *Journal of Social Policy* 38.04, pp. 569–588.
- Kilpatrick, Dean G et al. (1985). "Mental health correlates of criminal victimization: a random community survey." In: *Journal of Consulting and Clinical Psychology* 53.6, pp. 866–873.
- Kleibergen, Frank and Richard Paap (2006). "Generalized reduced rank tests using the singular value decomposition". In: *Journal of Econometrics* 133.1, pp. 97–126.
- Lartigue, Teresa and Juan Vives (1991). "Mental Health Services in Mexico". In: *Journal of Sociology & Social Welfare* 18, pp. 57–74.
- LeFrançois, Brenda A (2010). "Distressed fathers and their children: A review of the literature". In: *International Journal of Social Psychiatry* 58.2, pp. 123–130.

- Leinonen, Jenni A, Tytti S Solantaus, and Raija-Leena Punamäki (2003). "Parental mental health and children's adjustment: The quality of marital interaction and parenting as mediating factors". In: *Journal of Child Psychology and Psychiatry* 44.2, pp. 227–241.
- Lewinsohn, Peter M, Thomas M Olino, and Daniel N Klein (2005). "Psychosocial impairment in offspring of depressed parents". In: *Psychological Medicine* 35.10, pp. 1493–1503.
- Likert, Rensis (1932). "A technique for the measurement of attitudes." In: *Archives of Psychology* 22.
- McGue, Matt and Kaare Christensen (1997). "Genetic and environmental contributions to depression symptomatology: evidence from Danish twins 75 years of age and older." In: *Journal of Abnormal Psychology* 106.3, pp. 439–448.
- McLaughlin, Katie A et al. (2012). "Parent psychopathology and offspring mental disorders: results from the WHO World Mental Health Surveys". In: *The British Journal of Psychiatry*.
- McLeod, Jane D and Karen Kaiser (2004). "Childhood Emotional and Behavioral Problems and Educational Attainment". In: *American Sociological Review* 69.5, pp. 636–658.
- McLoyd, Vonnie C (1989). "Socialization and development in a changing economy: The effects of paternal job and income loss on children." In: *American Psychologist* 44.2, pp. 293–302.
- Medina-Mora, M Elena et al. (2005). "Prevalence, service use, and demographic correlates of 12-month DSM-IV psychiatric disorders in Mexico: results from the Mexican National Comorbidity Survey". In: *Psychological Medicine* 35.12, pp. 1773–1783.
- Medina-Mora, María Elena et al. (2007). "Psychiatric disorders in Mexico: lifetime prevalence in a nationally representative sample". In: *The British Journal of Psychiatry* 190.6, pp. 521–528.
- Mitra, Sophie and Kristine Jones (2017). "The impact of recent mental health changes on employment: new evidence from longitudinal data". In: *Applied Economics* 49.1, pp. 96–109.
- Pastore, Doris R, Martin Fisher, and Stanford B Friedman (1996). "Violence and mental health problems among urban high school students". In: *Journal of Adolescent Health* 18.5, pp. 320–324.
- Peng, Lizhong, Chad D Meyerhoefer, and Samuel H Zuvekas (2013). *The Effect of Depression on Labor Market Outcomes*. National Bureau of Economic Research Working Paper 19451.
- Podor, Melinda and Timothy J Halliday (2012). "Health status and the allocation of time". In: *Health Economics* 21.5, pp. 514–527.
- Propper, Carol, John Rigg, and Simon Burgess (2007). "Child health: evidence on the roles of family income and maternal mental health from a UK birth cohort". In: *Health economics* 16.11, pp. 1245–1269.
- Radloff, Lenore Sawyer (1977). "The CES-D Scale: A Self-Report Depression Scale for Research in the General Population". In: *Applied Psychological Measurement* 1.3, pp. 385–401.
- Reed, William Robert (2015). "On the Practice of Lagging Variables to Avoid Simultaneity". In: *Oxford Bulletin of Economics and Statistics* 77.6, pp. 897–905.
- Ribeiro, Wagner Silva et al. (2013). "The Impact of Epidemic Violence on the Prevalence of Psychiatric Disorders in Sao Paulo and Rio de Janeiro, Brazil". In: *PloS one* 8.5, e63545.
- Rodriguez, Priscilla et al. (2015). *No Justice: Torture, Trafficking and Segregation in Mexico*. Tech. rep. Disability Rights International.
- Romito, Patrizia and Michele Grassi (2007). "Does violence affect one gender more than the other? The mental health impact of violence among male and female university students". In: *Social Science & Medicine* 65.6, pp. 1222–1234.
- Rubalcava, Luis and Graciela Teruel (2013). *The Mexican Family Life Survey: Third Wave*. Working Paper.
- Ruhm, Christopher J (2004). "Parental Employment and Child Cognitive Development". In: *Journal of Human Resources* 39.1, pp. 155–192.

- Rutter, Michael and David Quinton (1984). "Parental psychiatric disorder: Effects on children". In: *Psychological Medicine* 14.04, pp. 853–880.
- Slone, Laurie B et al. (2006). "Epidemiology of major depression in four cities in Mexico". In: *Depression and Anxiety* 23.3, pp. 158–167.
- Smith, Marjorie (2004). "Parental mental health: disruptions to parenting and outcomes for children". In: *Child & Family Social Work* 9.1, pp. 3–11.
- Soares, Rodrigo R, Diana Kruger, and Matias Berthelon (2012). "Household Choices of Child Labor and Schooling A Simple Model with Application to Brazil". In: *Journal of Human Resources* 47.1, pp. 1–31.
- Stock, James H and Motohiro Yogo (2005). "Testing for Weak Instruments in Linear IV Regression". In: *Identification and inference for econometric models: Essays in honor of Thomas Rothenberg*. Cambridge University Press. Chap. 5.
- Sulemana, Iddisah (2015). "The Effect of Fear of Crime and Crime Victimization on Subjective Well-Being in Africa". In: *Social Indicators Research* 121.3, pp. 849–872.
- Tefft, Nathan (2012). "Mental health and employment: the SAD story". In: *Economics & Human Biology* 10.3, pp. 242–255.
- Waldfogel, Jane, Wen-Jui Han, and Jeanne Brooks-Gunn (2002). "The effects of early maternal employment on child cognitive development". In: *Demography* 39.2, pp. 369–392.
- Whitbeck, Les B et al. (1992). "Intergenerational Continuity of Parental Rejection and Depressed Affect". In: *Journal of Personality and Social Psychology* 63.6, pp. 1036–1045.
- WHO (2011). *Mental Health Atlas 2011*. Tech. rep. World Health Organization.
- (2014). *Mental Health Atlas 2014*. Tech. rep. World Health Organization.
- Wright, Cheryl A et al. (2000). "Early maternal depression and children's adjustment to school". In: *Child Study Journal* 30.3, pp. 153–153.
- Wu, Stephen (2003). "The Effects of Health Events on the Economic Status of Married Couples". In: *Journal of Human Resources* 38.1, pp. 219–230.
- Zivin, Joshua Graff, Harsha Thirumurthy, and Markus Goldstein (2009). "AIDS treatment and intrahousehold resource allocation: Children's nutrition and schooling in Kenya". In: *Journal of Public Economics* 93.7, pp. 1008–1015.
- Zung, William WK (1965). "A Self-Rating Depression Scale". In: *Archives of General Psychiatry* 12.1, pp. 63–70.

7 Appendix

Table 79: Description of variables used

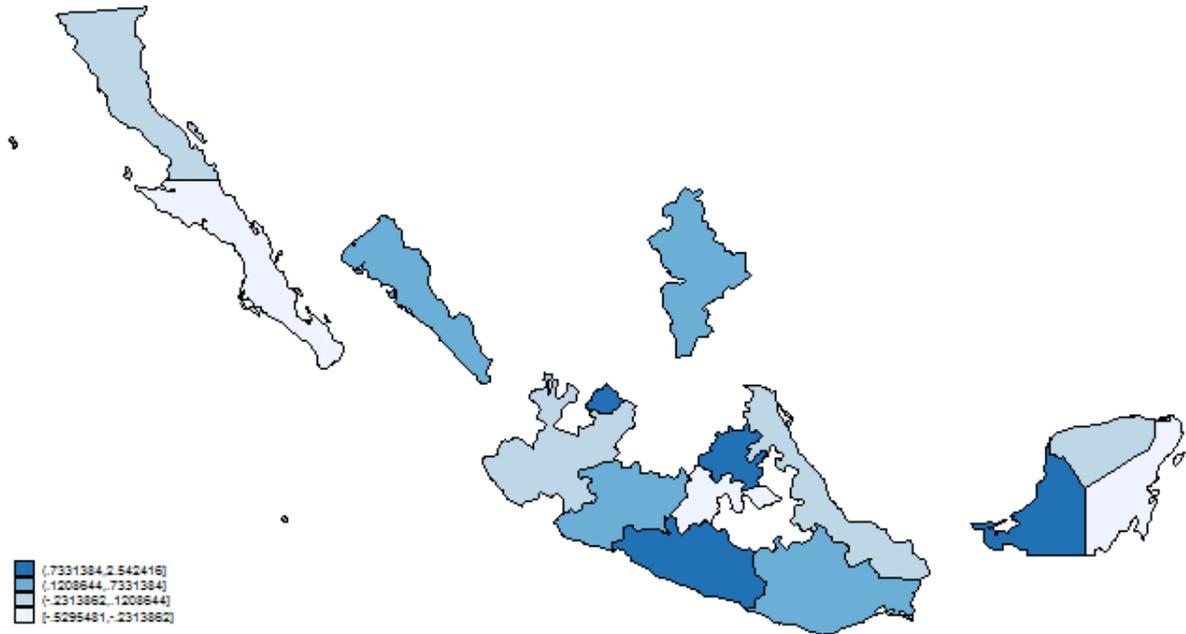
Age	Age in years
Male	Being a male
Household size	Number of household members currently living in the household
Consumption per capita	Weekly per capita household consumption of non-durables and durables
Self-assessed health	Likert scale: 1) Very good health - 5) Very bad health
Currently in school	Currently enrolled and attending school
Attended high school	Once attended high school (but did not necessarily complete the cycle)
Attended college	Once attended college (but did not necessarily complete the cycle)
Repeated a grade	Ever repeated a grade, regardless of cycle. Defined for those above 4 years old who once entered school.
Ever worked	Ever contributed to household expenditure.
Currently working	Currently contributing to household expenditure.
Inactive	Out of the labor force.
Work & in school	Currently working, and enrolled.
<i>Parents:</i>	
Works	Employed (ILO definition)
Work income	Income last month from main job
Work hours	Hours worked last week in main job
Cognitive score	Based on answers to 10 Raven's matrices
Self-assessed health	Likert scale: 1) Very good health - 5) Very bad health
Symptoms last 4 weeks	Number of the following symptoms experienced last 4 weeks: Flu, Cough, Difficulty breathing, Strong stomach pain, Nausea/vomit, Diarrhea, Swollen joints, Welts/irritation, Irritated/red eyes, Molar/teeth pain, Headache, Temperature/fever, Body ache, Pain in left side of chest (pneumonia), other symptoms.
Hospitalized last 12 months	Received patient care at any type of hospital in the last year, including (but rarely) offices or houses of private doctors.
Any chronic illness	Any of the following declared illnesses/conditions: Diabetes, Hypertension, Heart disease, Cancer, Arthritis/rheumatism, Gastric ulcer, Migraine, Other illness.

Table 80: Descriptive statistics from Victimization module, 2002-2005-2009

	Round 1 (2002)	Round 2 (2005-2006)	Round 3 (2009-2011)
	[%]	[%]	[%]
Compared to 5 years ago, do you feel..			
<i>Safer</i>	17.5	12.7	8.5
<i>The same</i>	55.6	61.0	56.4
<i>Less safe</i>	26.9	26.3	35.1
Total	100	100	100
Ever assaulted outside home/plot/business			
<i>Yes</i>	10.7	14.3	16.8
<i>No</i>	89.3	85.7	83.2
Total	100	100	100
Assaulted last 3 years			
<i>Yes</i>	3.9	3.4	3.1
<i>No</i>	96.1	96.6	96.9
Last incident: somebody hurt?			
<i>Myself</i>	4.8	6.6	5.1
<i>Myself & other people</i>	1.3	1.6	1.5
<i>Other people</i>	3.2	2.9	5.1
<i>Nobody</i>	90.6	88.9	88.3
Total	100	100	100
Last incident: serious?			
<i>Very serious</i>	38.6	39.9	40.9
<i>Serious</i>	24.9	30.0	31.4
<i>A little serious</i>	26.8	25.1	23.0
<i>Not serious</i>	9.6	4.9	4.7
Total	100	100	100
Last incident: weapons used?			
<i>Yes</i>	55.5	47.7	51.1
<i>No</i>	28.4	31.3	33.9
<i>Don't know</i>	16.1	21.0	15.0
Total	100	100	100
Last incident: reported?			
<i>Yes</i>	23.9	23.5	35.8
<i>No</i>	76.1	76.5	64.2
Total	100	100	100
Frequency	9 056	9 056	9 056

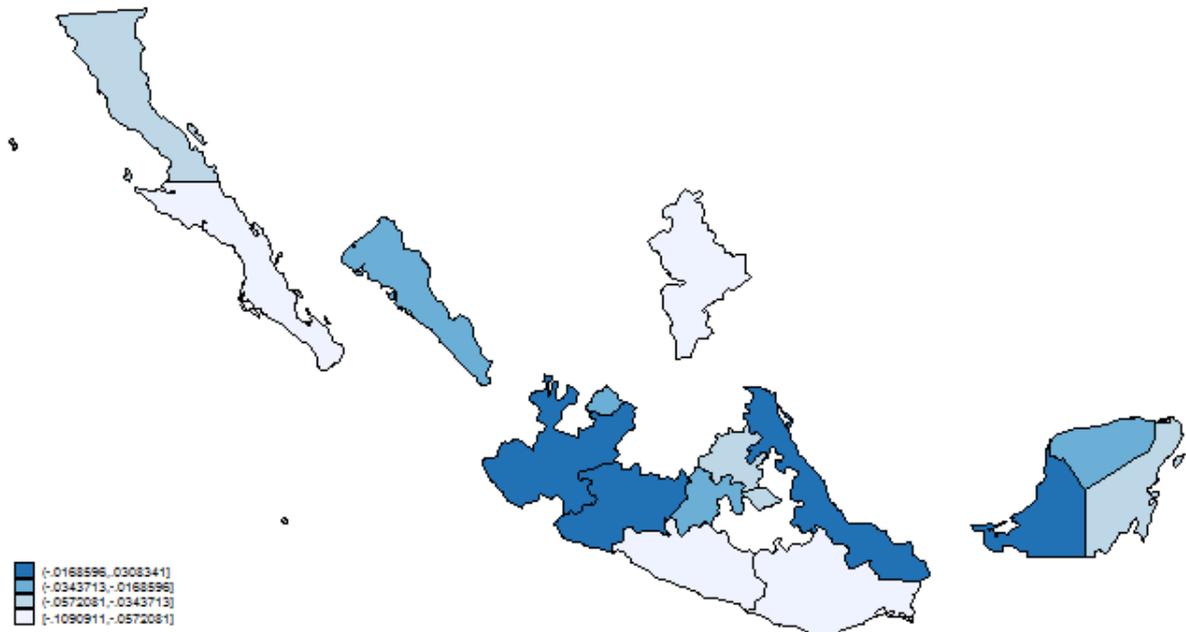
Source: Author's calculations using 29 574 observations from MxFLS1-3.
Population: Household heads or their spouses present in all three waves.

Figure 25: Evolution of homicides by federal entity (16 states), 2002-2009



Source: Compiled by author using data from Secretariado Ejecutiva del Sistema Nacional de Seguridad Pública.

Figure 26: Evolution of CCDS score by federal entity (16 states), 2002-2009



Source: Compiled by author using data from three rounds of the Mexican Family Life Survey.

Table 81: Cuestionnario Clínico para el Diagnostico del Síndrome Depresivo

In the last 4 weeks...	Pooled distribution of answers [%]		
	No	Yes	All the time
		Most of the time	
...have you felt sad or sorrowful?	62.0	33.2	3.4
...have you cried or felt like crying?	66.3	29.3	3.4
...have you slept poorly at night?	63.6	31.7	3.4
...have you woken up depressed (due to lack of energy or fear)?	68.7	28.0	2.4
...have you had difficulties focusing on your daily activities?	76.1	21.3	1.8
...has your appetite diminished?	79.8	17.7	1.8
...have you felt obsessive or repetitive?	77.0	19.7	2.2
...has your sexual desire decreased?	83.7	8.0	3.5
...do you consider that your performance in your daily activities/job has diminished?	73.6	22.4	2.4
...have you felt pressure in your chest?	82.5	15.1	1.5
...have you felt nervous, anguished, anxious or eager more than normal?	66.7	29.5	2.8
...have you felt more tired or more discouraged than normal?	64.0	31.8	3.1
...have you felt pessimistic or have you thought things will go wrong?	75.9	21.5	1.7
...have you had frequent headaches or felt pain in the nape?	70.8	25.3	2.8
...have you felt more irritated or angry than normal?	71.3	25.2	2.6
...have you felt insecure or with lack of confidence in yourself?	77.8	19.8	1.7
...have you felt useless to your family?	80.6	16.5	1.9
...have you felt fear of some things, as if you were waiting for something serious to happen to you?	75.3	22.0	1.9
...have you wished to die?	90.4	7.9	0.9
...have you lost interest in things?	86.3	11.7	1.2
... <i>have you felt lonely?</i>	75.6	20.1	2.8

Source: <http://www.envih-mxfs.org/enhiv-2.html>, accessed on August 1, 2016.

The last question is not part of the original CCDS score (Calderón-Narváez 1997) and was thus excluded. Non-respondents on question 8 (Sexual desire) were considered as responding no.

Table 82: Parental CCDS D impact on the probability of having attended high school

	RE		FE		FE-IV	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Parental CCDS D	-0.002*	(0.001)	0.002	(0.002)	0.006	(0.029)
Round 2 dummy	0.113***	(0.017)	0.269***	(0.014)	0.271***	(0.017)
Round 3 dummy	0.174***	(0.037)	0.554***	(0.016)	0.559***	(0.033)
<i>Child characteristics:</i>						
Age (in years)	0.051***	(0.005)				
Sex	0.030*	(0.016)				
Good health	-0.015	(0.024)	0.020	(0.027)	0.020	(0.028)
Regular health	-0.040	(0.027)	0.027	(0.030)	0.024	(0.034)
Bad health	-0.092	(0.075)	0.059	(0.086)	0.062	(0.088)
Very bad health	-0.119	(0.140)	0.065	(0.163)	0.067	(0.155)
<i>Ref: Very good health</i>						
Per capita consumption	0.000**	(0.000)	0.000*	(0.000)	0.000	(0.000)
<i>Household head and spouse characteristics:</i>						
HH age	-0.001	(0.001)				
Spouse age	-0.002	(0.002)				
HH works	0.029	(0.031)	0.013	(0.037)	0.009	(0.044)
Spouse works	-0.004	(0.033)	-0.056	(0.038)	-0.057	(0.041)
HH working*income	0.000***	(0.000)	0.000	(0.000)	0.001	(0.001)
Spouse working*income	0.000***	(0.000)	0.000*	(0.000)	0.001	(0.001)
HH working*hours worked	-0.000	(0.001)	0.001	(0.001)	0.000	(0.000)
Spouse working*hours worked	0.000	(0.001)	0.001	(0.001)	0.000	(0.000)
HH hospitalized	0.056	(0.041)	0.008	(0.049)	0.000	(0.069)
Spouse hospitalized	0.087***	(0.030)	0.041	(0.035)	0.039	(0.037)
HH chronic illnesses	0.017	(0.017)	-0.010	(0.022)	-0.018	(0.052)
Spouse chronic illnesses	-0.016	(0.016)	-0.039*	(0.020)	-0.042	(0.028)
Constant	-0.458***	(0.079)	-0.053	(0.053)		
<i>First-stage statistics</i>						
Cragg-Donald Wald F					4.59	P-value
Kleibergen-Paap rk LM χ^2					3.32	0.19
Kleibergen-Paap Wald rk F					2.1	
Hansen J					0.057	0.811
Conditional Likelihood ratio					0.05	0.85
Observations	3 156		3 156		3 156	
Number of individuals	1 052		1 052		1 052	

Sample: Panel individuals aged more than 9 and less than 16 years old in 2002.

Standard errors are clustered on individuals.

*** p<0.01, ** p<0.05, * p<0.10

Table 83: Parental CCDS D impact on the probability of having attended college

	RE		FE		FE-IV	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Parental CCDS D	-0.002	(0.001)	-0.001	(0.001)	0.085	(0.094)
Round 2 dummy	0.103***	(0.021)	0.125***	(0.016)	0.148***	(0.040)
Round 3 dummy	0.164***	(0.035)	0.208***	(0.019)	0.286***	(0.091)
<i>Child characteristics:</i>						
Age (in years)	0.003	(0.004)				
Sex	0.001	(0.022)				
Regular health	-0.103***	(0.035)	-0.065*	(0.034)	-0.052	(0.057)
Bad health	-0.144***	(0.035)	-0.075**	(0.034)	-0.126	(0.080)
Very bad health	-0.180***	(0.051)	-0.079	(0.067)	-0.183	(0.215)
Ref: Very good health						
Per capita consumption	0.000***	(0.000)	0.000	(0.000)	0.000	(0.000)
<i>Household head and spouse characteristics:</i>						
HH age	-0.000	(0.002)				
Spouse age	0.000	(0.002)				
HH works	-0.096***	(0.037)	-0.080**	(0.040)	-0.161	(0.116)
Spouse works	0.004	(0.048)	0.014	(0.053)	0.054	(0.092)
HH working*income	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Spouse working*income	0.000	(0.000)	-0.000	(0.000)	-0.000	(0.000)
HH working*hours worked	0.001	(0.001)	0.001	(0.001)	0.002	(0.002)
Spouse working*hours worked	0.000	(0.001)	-0.000	(0.001)	0.003	(0.004)
HH hospitalized	0.075	(0.049)	0.071	(0.047)	-0.018	(0.136)
Spouse hospitalized	-0.015	(0.032)	0.008	(0.037)	-0.036	(0.076)
HH chronic illnesses	0.032*	(0.019)	0.001	(0.022)	-0.088	(0.103)
Spouse chronic illnesses	0.000	(0.017)	0.011	(0.021)	-0.116	(0.145)
Constant	0.134	(0.101)	0.145***	(0.053)		
<i>First-stage statistics</i>						
Cragg-Donald Wald F					0.66	
Kleibergen-Paap rk LM χ^2					1.51	0.469
Kleibergen-Paap Wald rk F					0.84	
Hansen J					0.05	0.823
Conditional Likelihood ratio					2.09	0.26
Observations	1 605		1 605		1 605	
Number of individuals	535		535		535	

Sample: Panel individuals aged more than 14 and less than 20 years old in 2002.

Standard errors are clustered on individuals.

*** p<0.01, ** p<0.05, * p<0.10

Table 84: Parental CCDS impact on the probability of currently working

	RE		FE		FE-IV	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Parental CCDS	0.003***	(0.001)	0.001	(0.001)	0.030*	(0.017)
Round 2 dummy	-0.035***	(0.009)	0.079***	(0.008)	0.092***	(0.012)
Round 3 dummy	0.011	(0.017)	0.277***	(0.012)	0.303***	(0.020)
<i>Child characteristics:</i>						
Age (in years)	0.036***	(0.002)				
Sex	-0.132***	(0.009)				
Good health	0.005	(0.015)	0.010	(0.018)	0.005	(0.019)
Regular health	0.032*	(0.017)	0.031	(0.021)	0.008	(0.026)
Bad health	0.011	(0.047)	0.004	(0.055)	-0.014	(0.063)
Very bad health	-0.268***	(0.039)	-0.292	(0.205)	-0.283	(0.230)
<i>Ref: Very good health</i>						
Per capita consumption	-0.000	(0.000)	0.000	(0.000)	-0.000	(0.000)
<i>Household head and spouse characteristics:</i>						
HH age	0.004***	(0.001)				
Spouse age	-0.004***	(0.001)				
HH works	-0.031	(0.019)	-0.020	(0.025)	-0.032	(0.027)
Spouse works	-0.010	(0.023)	0.019	(0.029)	0.013	(0.030)
HH working*income	0.001**	(0.000)	0.001	(0.000)	-0.000	(0.000)
Spouse working*income	0.000	(0.001)	-0.001	(0.001)	0.000	(0.000)
HH working*hours worked	-0.000**	(0.000)	-0.000	(0.000)	0.001*	(0.001)
Spouse working*hours worked	-0.000	(0.000)	0.000	(0.000)	-0.000	(0.001)
HH hospitalized	0.018	(0.029)	0.027	(0.034)	-0.020	(0.046)
Spouse hospitalized	-0.017	(0.017)	-0.018	(0.021)	-0.025	(0.023)
HH chronic illnesses	0.012	(0.012)	0.020	(0.015)	-0.027	(0.031)
Spouse chronic illnesses	0.023**	(0.010)	0.034***	(0.013)	0.010	(0.020)
Constant	-0.362***	(0.038)	-0.023	(0.036)		
<i>First-stage statistics</i>						P-value
Cragg-Donald Wald F					12.6	
Kleibergen-Paap rk LM χ^2					17.0	0.0002
Kleibergen-Paap Wald rk F					10.6	
Hansen J					0.189	0.664
Conditional Likelihood ratio					3.80	0.058
Observations	5 799		5 799		5 799	
Number of individuals	1 933		1 933		1 933	

Sample: Panel individuals aged more than 5 and less than 16 years old in 2002.

Standard errors are clustered on individuals.

*** p<0.01, ** p<0.05, * p<0.10

Table 85: Parental CCDSD impact on the probability of currently being inactive

	RE		FE		FE-IV	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Parental CCDSD	0.002**	(0.001)	0.002*	(0.001)	-0.019	(0.021)
Round 2 dummy	0.001	(0.007)	0.086***	(0.007)	0.076***	(0.013)
Round 3 dummy	0.043***	(0.015)	0.239***	(0.011)	0.219***	(0.023)
<i>Child characteristics:</i>						
Age (in years)	0.026***	(0.002)				
Sex	0.096***	(0.008)				
Good health	0.006	(0.013)	-0.014	(0.015)	-0.008	(0.017)
Regular health	0.030**	(0.015)	0.008	(0.018)	0.028	(0.027)
Bad health	0.003	(0.046)	-0.041	(0.048)	-0.040	(0.049)
Very bad health	0.019	(0.149)	-0.106	(0.117)	-0.111	(0.096)
<i>Ref: Very good health</i>						
Per capita consumption	-0.000**	(0.000)	-0.000	(0.000)	0.000	(0.000)
<i>Household head and spouse characteristics:</i>						
HH age	-0.001	(0.001)				
Spouse age	0.002*	(0.001)				
HH works	0.013	(0.019)	0.014	(0.024)	0.028	(0.029)
Spouse works	-0.003	(0.018)	0.025	(0.024)	0.031	(0.025)
HH working*income	-0.000	(0.000)	-0.000	(0.000)	0.000	(0.000)
Spouse working*income	-0.000**	(0.000)	-0.000**	(0.000)	-0.000**	(0.000)
HH working*hours worked	-0.000	(0.000)	-0.000	(0.000)	-0.001	(0.001)
Spouse working*hours worked	-0.001	(0.000)	-0.001	(0.001)	-0.001*	(0.001)
HH hospitalized	-0.005	(0.026)	0.006	(0.029)	0.039	(0.046)
Spouse hospitalized	-0.021	(0.015)	0.001	(0.020)	0.006	(0.021)
HH chronic illnesses	-0.012	(0.010)	-0.000	(0.014)	0.031	(0.034)
Spouse chronic illnesses	-0.002	(0.009)	0.007	(0.013)	0.023	(0.022)
Constant	-0.364***	(0.036)	-0.036	(0.034)		
<i>First-stage statistics</i>						
Cragg-Donald Wald F					6.80	P-value
Kleibergen-Paap rk LM χ^2					11.3	0.004
Kleibergen-Paap Wald rk F					6.92	
Hansen J					2.03	0.154
Conditional Likelihood ratio					1.31	0.273
Observations	5 382		5 382		5 382	
Number of individuals	1 794		1 794		1 794	

Sample: Panel individuals aged more than 5 and less than 16 years old in 2002.

Standard errors are clustered on individuals.

*** p<0.01, ** p<0.05, * p<0.10

Table 86: Household heads and spouses depressive symptoms and child outcomes

	Currently in school	Attended high school	Attended college	Ever repeat	Ever work	Currently work	Inactive	Work and schooling
<u>Fixed effects</u>								
<i>HH CCDS</i>	0.0004 (0.0012)	0.0037** (0.0016)	0.0004 (0.0012)	0.0016* (0.0009)	0.0016 (0.0010)	0.0004 (0.001)	0.0003 (0.001)	0.0014** (0.0007)
<i>Spouse CCDS</i>	-0.0002 (0.0009)	-0.0012 (0.0012)	-0.0014 (0.0012)	0.0011 (0.0008)	0.0013 (0.0009)	0.0009 (0.0009)	0.0016* (0.0008)	0.0004 (0.0006)
<u>Fixed effects IV</u>								
<i>HH CCDS</i>	0.056 (0.043)	0.01 (0.027)	0.030 (0.025)	0.046 (0.036)	0.077* (0.045)	0.060 (0.043)	-0.0018 (0.03)	0.049 (0.030)
<i>F-Statistic</i>	2.1	3.32	2.62	1.78	2.55	2.14	2.13	2.2
<i>CLR</i>	5.24	0.13	2.4	4.45	6.41	3.91	0.02	8.1
<i>CLR P-value</i>	0.038	0.74	0.16	0.061	0.019	0.075	0.917	0.009
<i>Spouse CCDS</i>	0.031** (0.014)	0.0001 (0.02)	-0.038 (0.061)	0.032* (0.016)	0.022* (0.013)	0.021* (0.012)	-0.020 (0.016)	0.031** (0.015)
<i>F-Statistic</i>	10.2	3.84	0.4	4.8	10.0	10.2	4.8	4.7
<i>CLR</i>	6.93	0.00	2.4	6.0	4.19	3.64	1.92	8.7
<i>CLR P-value</i>	0.01	0.98	0.25	0.019	0.045	0.063	0.19	0.005
Observations	5 799	3 156	1 605	5 286	5 757	5 799	5 382	5 310

Standard errors are clustered at the individual level in the fixed effects specification. The fixed effects specification contains both the head's and the spouse's score. The FE-IV estimations instrument separately the head's and the spouse's CCDS, controlling each time for the remaining member's score.

Table 87: Father/mother depressive symptoms and child outcomes

	Currently in school	Attended high school	Attended college	Ever repeat	Ever work	Currently work	Inactive	Work and schooling
<u>Fixed effects</u>								
<i>Father CCDS</i>	0.0006 (0.0012)	0.003* (0.0016)	0.00018 (0.0012)	0.0020** (0.0009)	0.0018* (0.0011)	0.0007 (0.001)	0.0001 (0.001)	0.0017*** (0.0007)
<i>Mother CCDS</i>	-0.0003 (0.0009)	-0.0013 (0.0012)	-0.0016 (0.0012)	0.0006 (0.0008)	0.0015 (0.0009)	0.0011 (0.0010)	0.0015* (0.0008)	0.0007 (0.0006)
<u>Fixed effects IV</u>								
<i>Father CCDS</i>	0.062 (0.05)	0.008 (0.028)	0.088 (0.088)	0.047 (0.041)	0.088 (0.055)	0.064 (0.049)	0.0018 (0.032)	0.063 (0.041)
<i>F-stat</i>	1.73	2.98	0.63	1.38	2.0	1.73	1.67	1.68
<i>CLR</i>	7.25	0.09	4.2	3.66	6.63	3.75	0.27	10.17
<i>CLR P-value</i>	0.0145	0.787	0.094	0.101	0.0192	0.0882	0.672	0.0035
<i>Mother CCDS</i>	0.029*** (0.011)	0.0011 (0.019)	0.012 (0.062)	0.024* (0.013)	0.017* (0.010)	0.017* (0.010)	-0.019 (0.014)	0.030** (0.013)
<i>F-stat</i>	15.34	4.35	0.25	6.33	15.3	15.4	6.39	6.26
<i>CLR</i>	9.0	0.00	3.66	4.77	3.46	3.50	2.42	10.62
<i>CLR P-value</i>	0.003	0.96	0.142	0.035	0.067	0.0658	0.1343	0.0016
Observations	5 934	3 237	1 650	5 400	5 886	5 934	5 514	5 445

Standard errors are clustered at the individual level in the fixed effects specification. The fixed effects specification contains both the father's and the mother's score. The FE-IV estimations instrument separately the father's and the mother's CCDS, controlling each time for the remaining member's score.

Table 88: Summary statistics by panel round presence

	Present in all rounds	Attrited in 2005	Attrited in 2009
Age	26.7	26.6	32
Female	0.54	0.5	0.44
Married	0.5	0.47	0.38
Ever work	0.53	0.48	0.43
Currently work	0.31	0.27	0.32
Work income	2406.9	3275.4	2702.4
Currently in school	0.3	0.3	0.29
Ever repeated	0.3	0.24	0.29
Cons per cap	297	417.2	339.9
Attended high school	0.14	0.25	0.21
Attended college	0.05	0.11	0.08
CCDSD	26.9	26.3	26.6
Observations	24 495	2 223	7 684

Source: Author's calculations. Summary statistics at first round, by panel presence.

Table 89: Polynomials of CCDS D score and marginal effects on grade repetition at first round CCDS D score value

Ever repeat	(1)	(2)	(3)
<i>CCDS D</i>	0.013*** (0.005)	0.013* (0.0072)	0.05*** (0.015)
<i>CCDS D</i> ²		-0.00001 (0.00014)	-0.0012*** (0.0004)
<i>CCDS D</i> ³			0.000011*** (0.000003)
<i>CCDS D</i> ₂₀₀₂	0.011** (0.005)	0.012** (0.0055)	0.0054 (0.0052)
<i>CCDS D</i> ₂₀₀₂ × <i>CCDS D</i>	-0.00035** (0.00016)	-0.00035* (0.00019)	-0.00014 (0.00018)
Dummies	<i>All previous</i>	<i>All previous</i>	<i>All previous</i>
Marginal effects of CCDS D at 2002 values			
<i>CCDS D</i> ₂₀₀₂			
20	0.0062*** (0.0018)	0.0062 (0.0075)	0.0060*** (0.0017)
30	0.0027** (0.0011)	0.003 (0.0083)	0.0045*** (0.0014)
40	-0.0008 (0.0022)	-0.00079 (0.0094)	0.0031 (0.0028)
50	-0.0044 (0.0037)	-0.0043 (0.011)	0.0016 (0.0044)
60	-0.0079 (0.0053)	-0.0078 (0.012)	0.0002 (0.0062)
Observations	5 286	5 286	5 286

Standard errors are clustered on individuals. Columns 1, 2 and 3 represent random effects regressions run with all dummies included in the main regressions.

*:p<0.1, **:p<0.05, ***:p<0.01.

Figure 27: The impact of θ_p on the child's labor supply

The condition for an interior solution is:

$$w_c l_c^* = \left[\frac{\beta \theta_c(\theta_p) \exp(v_c)}{w_c} \right]^{\frac{1}{\sigma-1}} - w_p \theta_p \quad (47)$$

Some algebraic development gives:

$$l_c^* = \frac{1}{w_c^{\frac{\sigma}{\sigma-1}}} [\beta \theta_c(\theta_p) \exp(v_c)]^{\frac{1}{\sigma-1}} - \frac{w_p \theta_p}{w_c} \quad (48)$$

Differentiating with respect to θ_p gives:

$$\frac{\delta l_c^*}{\delta \theta_p} = \frac{\theta'_c \theta_c(\theta_p)^{\frac{2-\sigma}{\sigma-1}}}{(\sigma-1)w_c} \left[\frac{\beta \exp(v_c)}{w_c} \right]^{\frac{1}{\sigma-1}} - \frac{w_p}{w_c} < 0 \quad (49)$$

Now suppose instead that the child's wage w_c is increasing in θ_c , such that the full income constraint is equal to $c + w_c \theta_c (1 - l_c) \leq w_p \theta_p t_p + w_c \theta_c t_c$. This implies the following condition for an interior solution:

$$w_c \theta_c(\theta_p) l_c^* = \left[\frac{\beta \exp(v_c)}{w_c} \right]^{\frac{1}{\sigma-1}} - w_p \theta_p \quad (50)$$

Developing gives:

$$l_c^* = \frac{1}{\theta_c(\theta_p)} \frac{1}{w_c^{\frac{\sigma}{\sigma-1}}} [\beta \exp(v_c)]^{\frac{1}{\sigma-1}} - \frac{w_p \theta_p}{w_c \theta_c(\theta_p)} \quad (51)$$

Differentiating with respect to θ_p now gives:

$$\frac{\delta l_c^*}{\delta \theta_p} = -\frac{\theta'_c}{\theta_c^2 w_c^{\frac{\sigma}{\sigma-1}}} [\beta \exp(v_c)]^{\frac{1}{\sigma-1}} - \frac{w_p}{w_c \theta_c(\theta_p)} + \frac{w_p \theta_p \theta'_c}{(w_c \theta_c(\theta_p))^2} \geq 0 \quad (52)$$

General conclusion

The preceding chapters have all been motivated by a willingness to understand and measure features of youth's trajectories through education and the labor market. In doing this, Chapter 1 reflects on the concept of school-to-work transitions (SWT) and carries out a review of the theoretical and empirical work done on SWT in developing countries, including a discussion on methodology. I argue that although surrounded by methodological difficulties, the transition from school to work is worthy of study. First of all, the patterns of transitions in developing countries need to be more adequately mapped out. Second, many relevant dimensions of labor economics, such as social networks and noncognitive skills, have yet to be studied through the lens of transitions from school to work. Auxiliary to this recommendation is a need for transition data to be richer (through, for example, the systematic inclusion of educational and labor market history modules in household surveys), and a recognition that continued methodological and theoretical advances will benefit empirical researchers in this area of research. In Chapter 2, co-written with Mohamed Ali Marouani, we study two dimensions related to the success of labor market transitions: the supply of education and the demand for skills. We first argue that skill-biased technological change has been a feature of the Malaysian labor market in recent years. We then apply a retrospective computable general equilibrium model to the Malaysian labor market, to assess what could have happened if technological change had been skill-neutral, and the government had restricted access to higher education. The important role of both educational policy and bias in technological change in the shaping of labor market outcomes is confirmed, and it is shown that the expansion of higher education has contributed to a reduction in wage inequality in Malaysia despite skill-biased technological change, which is inequality-enhancing.

In subsequent chapters, I focus on household interactions. The chapters highlight the fact that policy makers need to take into account the contexts in which economic decision makers evolve. In chapter 3, I investigate sibling peer effects in Indonesia. Relying on the famous INPRES school construction program as an exogenous source of variation in schooling in younger siblings, I show that education displaces older siblings into the labor force and reduces their probability to be inactive, doing housekeeping. The effect remains after the schooling of the younger sibling has been completed, and does not suggest

that Indonesian households specialize occupationally. Instead, results are indicative of spillover effects among siblings. Looking at the effects of adult deaths in the household in Senegal in chapter 4, co-written with Philippe De Vreyer, we initially find small or no negative effects on children's schooling, work and household labor. However, the recognition that Senegal is a polygamous society where the budgetary organization of households differs starkly from that in other parts of the developing world pleads for a closer examination of these estimates. Our data, drawn from a panel survey that identifies cells with budgetary autonomy, permits us to place children in different cells. Focusing on deaths of the heads of these cells, we find strong negative impacts of adult deaths for those children living in the cell headed by the deceased adult. The impact on other children in the household is weak, which suggests that informal risk sharing does not fully operate or at the very least fails to entirely compensate for idiosyncratic shocks in Senegal.

Chapter 5 complements Chapter 4 in the study of parental shocks and their household level externalities. In an altogether different context—Mexico—where there is no polygamy and where household sizes and incomes are much closer to those of high income countries, I show that exogenous variations of mental health (measured through a series of questions on depressive symptoms) lead children to perform worse in school, and to take up employment to a larger extent. The main mechanism most likely operates through a transmission of depression symptoms and/or a deterioration in the quality of parent-child interactions. The fact that bad mental health is contagious in the family is known from psychological research, but no evidence on this— and on the link to child development and school progression— had hitherto emerged from low- or middle-income countries. The recent calls for upscaling of interventions in mental health in developing countries, on the basis of cost-benefit studies suggesting important returns, may be even more justified when family spillover effects are integrated.

These results contribute to a broad literature aiming to understand what drives resource allocation in the household, and in particular how the (re)allocation of time and *roles* to children can be called upon to mitigate shocks. The literature concerning marriage formation and dissolution and within-couple bargaining in developing countries is voluminous. This is not particularly surprising, since a large body of theoretical work on collective household decision-making takes as a starting point a husband and his wife. In my opinion, it is nevertheless important to verify 1) whether or not this is indeed a good approximation of the decision nucleus in developing country households, and 2) whether the hypothesis of Pareto efficiency in households (the cornerstone of the

collective household model) actually holds. This is already an active field of study, and Pareto efficiency has been both confirmed and refuted in the literature. An interesting research agenda, already opened by Harouman & Wahhaj (JDE, 2017; quoted in Chapter 4), links efficiency to household structure. In Burkina Faso, they find evidence of Pareto efficiency in nucleic households but refute it for extended family households.

A specific line of research to which this thesis offers a contribution concerns how health shocks modify the intra-household allocation of resources. Previous literature has shown that improvements in adult health can alter the resources devoted to children. Zivit et al. (JPE, quoted in chapter 5) show how the availability of free antiretroviral drugs significantly alters the prospects of children of HIV-positive adults in Kenya, increasing their nutrition, school presence and decreasing their workload. There is no reason for allocative behavior to respond to physical disease, but not to mental illness. That depressive symptoms alter parenting behavior is known by psychologists and has been shown in the psychological literature, and a promising future research agenda would consist in assessing to what extent the allocative rules in the household are modified when members suffer from mental disorders. Along those lines; although their measurement is delicate, the relationship between *discount factors*—a central feature most dynamic economic models—and mental health would be of utmost interest to any researcher interested in evaluating the economic consequences of vastly common mental disorders such as depression or dysthymia.

Although somewhat tangential to the issues of household resource allocation, the contribution from chapter 2 proves that there is scope for an active educational policy by governments, and that such a policy needs to consider to what extent technology complements skilled labor. If technological change is largely skewed towards skilled labor, and such technology diffusion is pervasive, then increasing the amount of graduates from higher education institutions may be both growth-enhancing and inequality-reducing. However, as the experience from the Middle East & North Africa suggests, other conditions may need to be fulfilled for this virtuous circle to operate. Continued research is needed to clearly establish why some countries and not others manage to take advantage of their higher education graduates.

Although much further research is needed, a few simple messages for policymakers emerge from my research. First and foremost; household arrangements are important and worthy of consideration. The results from chapter 4 provide an example: if losing

one's cell head leads to a redefinition of the sharing rule within the household, such that directly impacted children are left with less resources than before, then transfers directed to the household head may do absolutely nothing to improve the situation of these children. Second, there may be spillover effects in the household. The empirical results from chapters 3 and 5 show that household members are affected by both positive and negative shocks that affect other members, and the channels need not primarily be income-related. Although macroeconomic effects of upscaling of small-scale interventions have been of concern to researchers, the evaluation of programs and interventions at smaller scale should also consider externalities in social networks, and even within the household.

Résumé

Dans cette thèse, les déterminants des trajectoires éducationnelles et professionnelles des jeunes dans les pays en développement sont examinés, avec un accent particulier mis sur les relations au sein du ménage. Le premier chapitre fournit une revue des contributions théoriques et empiriques de la littérature autour du concept de transition de l'éducation vers le marché du travail dans les pays en voie de développement. Le deuxième chapitre développe un modèle d'équilibre général calculable, appliqué de manière rétrospective à l'économie de la Malaisie, dans l'optique d'étudier les conséquences sur le marché du travail du progrès technique biaisé et d'une politique éducative de masse. Les chapitres suivants s'interrogent sur les interactions au sein des ménages et leurs impacts lors de chocs. Un accent est ici mis sur le travail des enfants ainsi que sur leur scolarisation. Les résultats soulignent d'importantes externalités et une absorption hétérogène des chocs au niveau des ménages. L'évaluation de politiques publiques gagnerait à tenir compte de ces externalités intra-ménage.

Mots Clés

Transitions éducation - marché du travail, scolarisation, travail des enfants, partage du risque au sein du ménage, chocs idiosyncratiques.

Abstract

The aim of this thesis is to advance our understanding of the constraints and opportunities facing youth as they transit through schooling and to the labor market. The first chapter provides a literature review of the theoretical and empirical contributions to what we know about school-to-work transitions in developing countries and their specificities. The following chapter builds a computable general equilibrium model that is applied to the Malaysian labor market, in order to study the impact of skill-biased technological change and educational policy on labor market evolutions. Subsequent chapters examine household interactions arising from exogenous shocks, from the angle of children's work and schooling. The findings from these chapters point to the presence of important spillover effects and heterogeneous absorption of shocks in the household. Impact evaluation of policy would therefore benefit from the systematic incorporation of such household-level externalities.

Keywords

School-to-work transitions, schooling, child labor, household risk sharing, idiosyncratic shocks.