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# The strategic choice of the multinational firms and the relationship between exports and FDI: application of bivariate probit model, and dynamic gravity model in the Mediterranean area

Mahmoud Sabra

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**ECOLE DOCTORALE (509) de l'USTV**

**THESE présentée par:**

**Mahmoud M. SABRA**

**Soutenu le : 06 Juillet 2011**

**Pour obtenir le grade de docteur en Sciences Economiques**

**Les choix stratégiques des firmes multinationales et la relation entre les  
exportations et les IDE**

**Application d'un modèle Probit bi-varié, et d'un modèle de gravité dynamique aux pays  
Méditerranéens**

THESE dirigée par:

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Juillet 2011



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# **Résumé de thèse de doctorat**

## **Les choix stratégiques des firmes multinationales et la relation entre les exportations et les IDE:**

### **Application d'un modèle Probit bi-varié et d'un modèle de gravité dynamique aux pays Méditerranéens**

Dans les dernières décennies, de nombreuses théories ont été développées pour expliquer les flux de capitaux et de marchandises entre les nations. Ces théories incluent notamment les déterminants des flux d'échanges et des IDE ainsi que le rôle des échanges pour expliquer les IDE et vice-versa. En particulier, la relation entre commerce international et IDE a fait l'objet d'une recherche croissante au cours des années récentes. D'un point de vue de politique économique, c'est une question controversée qui a des implications importantes sur l'économie locale. Ce débat a d'ailleurs largement dépassé le cadre théorique puisque de nombreuses études empiriques ont également été effectuées non seulement au niveau macroéconomique mais plus récemment au niveau de l'entreprise.

Dans cette thèse, nous discutons cette relation et tentons de trouver une relation de long terme entre ces variables. Dans cette analyse, nous étudierons tout d'abord de manière empirique les déterminants des exportations et des l'IDE, à la fois au niveau micro et macro. Ceci nous permettra par la suite de détecter plus précisément la relation entre ces deux variables. Plus précisément, cette thèse comporte les points suivant:

Au niveau micro (niveau de la firme), les multinationales sont susceptibles de mettre en œuvre les deux activités (exportations et IDE) pour servir les marchés étrangers, mais les choix stratégiques des multinationales permettent aussi de choisir entre exportations et IDE. Sur ce point, la productivité des entreprises multinationales ainsi que leurs autres caractéristiques ont un rôle crucial pour éclairer le mécanisme de choix entre les stratégies et la relation entre exportations et investissements. Ceci fera l'objet de la première partie qui proposera une application au cas français. Dans cette partie, nous distinguerons également les décisions stratégiques en fonction de la taille de l'entreprise (très grandes ou grandes entreprises françaises).

Au niveau macro, nous chercherons à identifier les déterminants simultanés des exportations et des IDE. Pour se faire, un système gravitaire dynamique bivarié sera estimé afin d'éclairer le rôle de ces déterminants et la relation entre exportations et IDE. Ceci fera l'objet de la seconde partie, qui sera appliquée aux échanges entre la France et dix partenaires euro-méditerranéens. Le choix de ces pays s'appuie sur l'importance qu'ils revêtent dans les échanges français. Par ailleurs, l'absence de littérature appliquée à ces pays dans ce domaine constitue une motivation supplémentaire.

Ainsi, ce travail vise à contribuer à mieux cerner la nature des relations entre exportations et IDE. De cette relation dépend en effets de nombreux indicateurs de l'économie locale. Par exemple, les exportations contribuent à accélérer la croissance et la compétitivité de l'économie domestique, et donc à réduire le chômage et les déficits commerciaux

De même, l'internationalisation des entreprises multinationales (FMN) et la croissance des IDE permettent à l'économie domestique d'améliorer l'accès aux ressources et aux marchés

extérieurs, ce qui permet d'augmenter l'emploi dans les filiales ainsi que les transferts financiers à l'économie locale.

Par conséquent, une relation de substitution entre exportations et IDE est susceptible de diminuer la production et d'élever le taux de chômage à long terme, dans le cas où l'IDE augmente. En revanche, une relation de complémentarité pourrait être plus favorable à l'économie locale en améliorant l'emploi, la croissance, la présence économique à l'étranger et la compétitivité. De plus, une meilleure compréhension des choix stratégiques des entreprises entre exportations et IDE permet d'éclairer les choix de politiques économiques liées aux entreprises. Par exemple, en cas de relation de substitution, la taxation des IDE est susceptible d'améliorer la production locale. En revanche, si cette relation est complémentaire, la politique gouvernementale devrait davantage promouvoir les IDE.

La relation entre l'IDE et des exportations est complexe car de multiples variables doivent être prises en compte. D'ailleurs, la littérature théorique et empirique est encore controversée sur la nature de la relation exportations-IDE. En effet, si la plupart des théories des IDE tendent encore à soutenir l'hypothèse de substitution, de plus en plus d'études empiriques défendent l'hypothèse de complémentarité. Cependant, certains auteurs remettent en cause cette hypothèse de complémentarité en raison de problèmes statistiques et économétriques récurrents dans la plupart des études empiriques (Head and Ries, 2004).

En outre, la prise en compte des IDE horizontaux et verticaux complique encore la nature de la relation IDE-exportations. Enfin, certains auteurs montrent que le choix de la stratégie des FMN dépend d'un nombre important de variables, comme la productivité, les économies d'échelle, la similarité des pays, les dotations factorielles relatives, la taille de marché, etc... Sur ce point, la contribution de cette thèse portera en particulier sur l'identification des variables appropriées avec des méthodes économétriques spécifiques. Les principaux points que ce travail tentera d'éclairer sont les suivants:

Déterminer les caractéristiques qui influencent le choix des multinationales entre les exportations et l'IDE (niveau micro)

Identifier le rôle de la productivité sur la détermination de la stratégie des multinationales et sur les différents types d'entreprises (locales, exportatrices, investisseurs et exportatrices-investisseur).

En particulier, étudier le rôle des différentes proxy utilisées pour mesurer la productivité. Nous développerons une proxy originale et montrerons que cette proxy produit de meilleurs résultats explicatifs que la proxy traditionnellement utilisée.

Etudier le rôle des caractéristiques horizontales (entre les types d'entreprises) et verticales à travers des tailles d'entreprises (grandes, très grandes et les deux ensemble).

Identifier les déterminants des exportations et les IDE sortants dans la région méditerranéenne.

Détecter la nature de la relation entre les IDE sortants et les exportations, au niveau macro et micro.

Pour atteindre ces objectifs, nous procéderons comme suit:

Nous présentons dans le chapitre deux les grandes tendances ainsi que les indicateurs statistiques concernant les exportations, les IDE et les FMN.

Nous analysons ensuite l'évolution de la littérature théorique récente concernant la relation IDE-exportations et la relation entre ces deux variables (chapitre trois).

Nous étudions par la suite les différentes catégories d'entreprises françaises (grandes, très grandes et les deux ensemble), leurs choix stratégiques concernant notamment les exportations et les IDE à travers les caractéristiques internes à ces entreprises, en particulier la productivité. En outre, nous étudions le rôle des effets marginaux sur les différents types d'entreprises. Ce travail, exposé dans le chapitre 4, est fondé sur la base de données AMADEUS, qui sera utilisée et appliquée au cas français à travers un modèle probit bi-varié.

Nous développons enfin un modèle de panel dynamique (type gravité), afin d'analyser les déterminantes des exportations et des IDE français vers les pays méditerranéens (chapitre 5)

Dans le reste de cette présentation, nous résumons nos travaux détaillés dans la thèse, par chapitre.

**Le deuxième chapitre** appelé « les exportations et les IDE en France: Quelques faits stylisés »

Le chapitre 2 analyse les principaux faits stylisés correspondant aux évolutions récentes des exportations, des IDE et des FMN, qui constituent tous trois les éléments clés de notre thèse. Les faits stylisés sont présentés d'abord d'un point de vue mondial avant un recentrage sur les zones d'étude de la thèse (Europe, France en particulier et pays méditerranéens) sur les 20 dernières années. Ce chapitre rappelle également l'intérêt des IDE et des exportations comme facteurs de croissance ou de développement économique dans les différents pays étudiés. Le poids de la France dans les FMN mondiales est également souligné, en particulier avec ses grandes et très grandes entreprises. Ces informations seront utiles par la suite pour mieux comprendre les choix stratégiques des FMN françaises.

**Le troisième chapitre** appelé «la relation entre les exportations et les IDE, des évidences théoriques et empiriques ».

Le troisième chapitre nous donne un aperçu des théories des entreprises multinationales (MNE), des IDE verticaux et horizontaux, des définitions, de la littérature actuelle et antérieure, des propositions des théories et les implications de chaque type d'IDE. Nous présentons aussi une revue de la littérature empirique qui analyse le commerce, et plus particulièrement les relations existant entre les exportations et les IDE, soit au niveau des pays, soit au niveau de la branche ou de l'entreprise. Cela nous conduit à discuter les déterminants des stratégies de l'entreprise concernant le choix entre les exportations et les IDE, et les déterminants au niveau des pays. En fait, expliquer les activités des multinationales en fonction des caractéristiques des entreprises du pays d'origine et du pays d'accueil peut s'avérer être une bonne tentative de compréhension des stratégies des entreprises, des choix de localisation et des déterminants de l'IDE au niveau des pays.

La stratégie horizontale des multinationales pour desservir les marchés étrangers en implantant une nouvelle filiale au lieu des exportations est fondée sur de nombreux facteurs. Ces facteurs incluent en particulier la présence des coûts de transaction, la taille du marché et

des économies d'échelle au niveau des entreprises, Brainard (1993b); Markusen (1984). Les principales motivations d'une entreprise d'opter pour l'IDE horizontal est d'éviter les coûts de transactions (coûts de transport, barrières tarifaires) ou d'accéder à un marché étranger qui ne peut être desservi que localement. En outre, les modèles d'IDE horizontaux prédisent que les activités des multinationales peuvent augmenter entre des pays similaires, Markusen and Venables (1998). Les modèles théoriques de l'IDE horizontal sont basés sur la substitution entre les coûts fixes additionnels d'implantation d'une filiale et la diminution des coûts variables en évitant les tarifs douaniers et les frais de transport, Markusen (1995) ; Markusen and Maskus (2001).

Dans les multinationales verticales, la chaîne de production est fragmentée en plusieurs étapes, souvent avec des facteurs différents pour chacune des étapes. Il devient rentable de déplacer une étape vers un autre pays lorsque la différence de prix des facteurs est notable, Helpman (1984, 1985) ; Helpman and Krugman (1985). Cela est rentable si et seulement si les coûts de fragmentation sont moins élevés que les économies réalisées sur les écarts de dotations factorielles relatives qui font que les entreprises deviennent des MNE verticales. La force motrice du modèle réside dans l'absence de l'égalisation du prix des facteurs (FPE), ainsi que les coûts de transaction, Helpman (1984). Si dans le cas contraire la différence entre les dotations relatives des pays n'est pas suffisamment grande, les échanges de marchandises entraîneront l'égalisation des prix des facteurs entre ces pays.

En résumé, la théorie de la MNE verticale met en lumière l'incitation pour les entreprises de séparer géographiquement les activités de production de leur siège social.

Les modèles « Knowledge Capital » permettent d'emboîter les motivations de la décision des entreprises multinationales, soit à partir de la recherche de marchés qui se cachent derrière la MNE horizontale ou à partir de la recherche de ressources et de minimisation des coûts qui se cachent derrière la MNE verticale, Markusen et al. (1996); Markusen (1997).

Une question cruciale se pose: comment le choix des MNE est-il affecté par les principales caractéristiques citées précédemment? Il existe deux grandes catégories de caractéristiques

importantes pour déterminer la décision des MNE, soit pour l'activité multinationale de départ ou pour le choix du type de l'activité de multinationale, Antràs and Helpman (2004) ; Helpman et al. (2004). Elles concernent d'une part les caractéristiques du pays d'origine et celles du pays d'accueil telles que la taille du marché, les dotations en facteurs et des coûts de transaction (droits de douane et transports), et d'autre part les caractéristiques internes de l'entreprise, telles que la productivité.

Les deux stratégies possibles pour desservir les marchés étrangers sont les exportations et les IDE. Au niveau de l'entreprise, la décision d'opter pour l'une ou l'autre de ces stratégies est influencée par les déterminants suivants: la productivité, les économies d'échelles et les autres caractéristiques d'entreprise, Oberhofer and Pfaffermayr (2011); Melitz (2003); Helpman et al. (2004) et Bernard et al. (2003). En revanche, la similarité entre les pays, les dotations en facteurs, la taille du marché influencent la décision de stratégie au niveau des pays, Magalhaes and Africano (2007).

Par conséquent, l'analyse traditionnelle de la théorie économique indique d'un côté une relation de substitution forte entre les exportations et l'IDE horizontal, et d'un autre côté une relation de complémentarité avec l'IDE vertical. La controverse concerne la réalité de la relation de complémentarité.

Trois cas pourraient expliquer la relation de complémentarité entre les exportations et l'IDE:

Tout d'abord, Markusen and Venables (1998, 2000) montrent que le cas de la FMN horizontale sera dominant lorsque les économies d'échelle au niveau de la firme et de l'unité de production sont élevées. Il s'agit alors d'un modèle d'entreprise représentative avec un produit unique, où l'IDE horizontal dominant en raison certes des économies d'échelles (Markusen and Venables (1998, 2000)), mais la complémentarité entre l'IDE et les exportations est encore possible lorsque les pays ont des dotations, des préférences et une technologie identiques.

Les entreprises commencent à changer de comportement en investissant à l'étranger, et ils continuent tant que les avantages (profits) associés à la production à l'étranger (en évitant les

coûts de transactions) dépassent les coûts fixes de l'établissement d'une nouvelle entreprise à l'étranger, Head and Ries (2004). Lorsque l'entreprise entre sur le marché étranger, si le nombre d'investisseurs augmente ou dépasse la limite de capacité du marché, le marché étant ainsi encombré, les profits potentiels sont partiellement éliminés pour les investisseurs ce qui maintient l'existence des deux stratégies (exportations et IDE). En d'autres termes, les investisseurs vont cesser de passer des exportations vers l'IDE après un délai spécifique. Par conséquent, l'érosion (crowding out) de marché explique la coexistence des deux stratégies, Head et al. (2002), Baldwin and Ottaviano (2001).

Deuxièmement, dans le cas d'un produit unique avec les entreprises hétérogènes, les différences de productivité sont considérées comme une nouvelle façon d'expliquer le choix entre les stratégies, Clerides et al. (1998). Les entreprises les plus productives substituent leurs exportations par les IDE. Ces entreprises sont aussi les plus profitables et ont le coût marginal le plus faible. Les firmes changent leurs stratégies vers la plus profitable, tant que les profits augmentent. Ainsi, l'entreprise passe de la stratégie locale pour servir les marchés étrangers à travers les exportations, puis par l'IDE, quand la productivité augmente, Greenaway and Kneller (2007). Il existe aussi la possibilité que les entreprises qui ont un même niveau de productivité peuvent choisir différentes formes d'échange autour d'un certain seuil, ce qui fait coexister les deux stratégies, Meltiz (2003); Helpman et al. (2004).

En outre, comme toutes les entreprises préfèrent les marchés plus vastes et à faibles coûts, le choix d'une stratégie intéressante entre le local et la délocalisation à l'étranger se produit lorsqu'il y a un arbitrage entre un marché vaste à coûts élevés et un marché petit à coûts faibles. Les profits associés à la localisation à l'étranger sont supérieurs à ceux de la centralisation locale avec un niveau de productivité bas des entreprises. Ainsi, les entreprises sont toujours à la recherche de faibles coûts et investissent à l'étranger. Le point intéressant est que les exportateurs et les investisseurs coexistent dans ce scénario, Head and Ries (2004).

Cette partie présente les apports de la nouvelle théorie du commerce international qui expliquent la nature des relations entre les exportations et l'IDE. En effet, selon cette théorie, les différences de niveau de productivité représentent le moyen le plus efficace et le plus



récent pour déterminer la nature des relations et de les expliquer, à côté des variables traditionnelles qui proviennent des théories de l'investissement directs étranger.

Le troisième cas de figure concerne l'entreprise qui fabrique plus d'un produit. Pour les entreprises « multi-produits » et en utilisant des données au niveau des entreprises, nous avons constaté que si les produits d'une entreprise sont horizontalement reliés, l'entreprise poursuit une stratégie de centralisation locale dans pays d'origine pour un produit et une stratégie de duplication pour un autre. Donc, en même temps l'entreprise exporte et investit à l'étranger. En effet, si elle fabrique les deux produits dans un même pays, ils seront en compétition les uns avec les autres. Ainsi, pour éviter la concurrence entre les deux produits, elle concentre chaque produit dans un pays, Grossman and Helpman (1991); Head and Ries (2004).

Le modèle de Helpman (1984) implique que dans le cas de l'IDE vertical, il existe des complémentarités d'une part entre les flux commerciaux des produits finis des filiales à l'étranger vers l'entreprise mère, et d'autre part des transferts intra-firme de biens intermédiaires de l'entreprise mère vers leurs filiales à l'étranger. Les statistiques du commerce international montrent que le résultat brut d'exploitation pour toutes les filiales étrangères était d'environ 10,6% du PIB mondial en 2009, tandis que les exportations de ces filiales représentaient près de 33% du commerce mondial, la CNUCED (2010). Par conséquent, le commerce et l'IDE entre les pays développés pourraient être considérés comme des substituts tandis que le commerce et l'IDE entre les pays développés et les pays en développement seraient complémentaires.

### **Le survey des études empiriques:**

La littérature sur les études empiriques peut être divisée en fonction du niveau d'agrégation: les études au niveau des pays, au niveau de l'industrie, au niveau de l'entreprise et au niveau du produit.

Les études empiriques montrent la dominance de la relation de complémentarité entre les IDE sortants et des exportations, Falk and Hake (2008); Andersen and Hainaut (1998); Fontagné

and Pajot (1997); Marchant et al. (2002); Pfaffermayr (1994, 1996). Peu de ces études se sont concentrées sur le rôle de la productivité et les caractéristiques de l'entreprise dans le choix entre les deux stratégies, Heckelei and Weissleder (2008).

Oberhofer et Pfaffermayr (2011) ont aussi confirmé la relation de complémentarité, et ont à leur tour fourni des preuves pour les caractéristiques déterministes, y compris la productivité, ce qui montre un effet négatif sur le choix entre IDE et les exportations. Ils ont également précisé que les entreprises utilisent une combinaison des IDE et des exportations pour desservir les marchés étrangers, ce qui signifie que les deux stratégies coexistent. Ils utilisent un modèle théorique étroitement liée à celui de Helpman et al. (2004) et l'ont étendu à trois pays. Ils montrent que le mode optimal pour desservir les marchés étrangers peut varier d'un pays d'accueil à l'autre. Nous utilisons ce modèle pour étudier les grandes et les très grandes entreprises françaises, avec deux variables proxy de productivité.

Concernant les travaux empiriques sur la région méditerranéenne, plusieurs études ont examiné les déterminants de l'IDE, du commerce (ou des exportations) dans la région du Moyen-Orient et de l'Afrique du Nord (MENA), Altomonte and Guagliano (2003); Heckelei and Weissleder (2008); Ferragina and Pastore (2006); Peridy and Uttama (2010). En revanche, nous n'avons pas trouvé d'études qui évaluent la relation entre les exportations et l'IDE dans la zone. En outre, aucune étude n'a abordé le sujet avec des pays d'accueil spécifiques, qui permet de connaître l'effet final sur l'économie locale. Nous avons essayé de remplir cette lacune, en estimant les déterminants et les relations entre les exportations françaises et les IDE dans la région méditerranéenne.

Enfin, les effets totaux sur le pays d'origine peuvent être évalués en connaissant la relation entre les exportations et l'IDE (vertical et horizontal). Par conséquent, la relation dominante entre les exportations et les sorties d'IDE montrent les effets finaux des activités multinationales (et la relation entre eux) sur l'économie locale (emplois et croissance).

Selon la littérature antérieure, nous pouvons tout d'abord étudier la relation au niveau de l'entreprise, à travers les effets des caractéristiques de l'entreprise et en particulier la

productivité, sur le choix de la stratégie des multinationales entre exportations et les investissements étrangers. Cela permet de déterminer la nature de la relation entre les exportations et les IDE. Cela permet de plus d'estimer les déterminants microéconomiques des activités multinationales. Puis, nous pouvons utiliser une approche au niveau macroéconomique pour déterminer la relation globale et les déterminantes macros des activités des multinationales dans la région méditerranéenne.

Ce chapitre est une contribution à la littérature jusqu'à présent très limitée concernant l'étude de la relation entre les IDE et les exportations. Il donne un aperçu et une explication des points de vue théoriques des différentes relations possibles entre les stratégies mentionnées. En outre, il présente une vue d'ensemble des théories pertinentes et leurs conclusions. Il passe également en revue les différents déterminants et variables appliquées et les proxies possibles pour effectuer une analyse économétrique, que ce soit au niveau des entreprises ou des pays.

Par conséquent, la productivité et les différences des caractéristiques internes des entreprises en tant que déterminants expliquent le choix de la stratégie de desservir le marché étranger. Ceci est l'apport de la première partie empirique. Il s'agit d'une nouvelle tendance qui confirme la coexistence des deux stratégies expliquées précédemment, en plus des déterminants micros des stratégies et les relations entre elles. Cette étude est la première appliquée aux entreprises françaises.

Par ailleurs, un examen de la relation entre les variables, au niveau des pays, pourrait être étendu en utilisant les variables qui capturent les différents types d'IDE. En outre, nous étudierons la question dans la deuxième partie qui sera empirique et appliquée à la zone méditerranéenne.

**Le quatrième chapitre** est intitulé « Les choix stratégiques des entreprises multinationales entre les exportations et les IDE »

Les recherches empiriques précédentes ainsi que les plus récentes dans ce domaine se sont penchées principalement sur les preuves et les effets de la différence de productivité entre les exportateurs et ceux qui produisent pour le marché local à l'étranger.

Les données concernant les entreprises françaises utilisées dans l'analyse empirique sont extraites de la base de données AMADEUS. Nous avons collecté des informations générales concernant les exportations et le statut MNE pour 43906 entreprises, correspondant aux grandes et aux très grandes entreprises françaises pour l'année 2009.

L'analyse empirique est divisée en trois parties, correspondant respectivement aux grandes entreprises, aux très grandes entreprises et à l'ensemble des entreprises également, selon la classification d'AMADEUS. Cette distinction permet de tester le rôle de la productivité à travers les différents types d'entreprises (local, exportateur et investisseur) aussi à travers les groupes d'entreprises (grandes et très grandes). Ce test empirique permettra d'obtenir des résultats plus robustes dans le cas d'un seul pays puisque ce dernier présente des caractéristiques communes, notamment statistiquement et économiquement, ce qui devrait nous donner en effet des résultats plus intéressants, plus fiables et plus crédibles.

Ce chapitre présente une première analyse empirique des données en fonction de la taille des entreprises (grande, très grande ainsi que toutes les stratégies des entreprises françaises qu'elles soient exportatrices ou produisant pour le marché local à l'étranger). Nous tenterons d'éclaircir la nature de la relation entre ces choix et de vérifier s'ils sont complémentaires ou substituables.

Pour notre estimation, nous utilisons un modèle Probit bi-varié qui mesure comment la productivité et d'autres caractéristiques affectent la probabilité d'utiliser les exportations et/ou les IDE. En outre, nous montrons les effets marginaux de ces caractéristiques et variables sur

les différentes stratégies, et nous testons la multicolinéarité pour avoir des résultats plus robustes.

Nous suivons le modèle de, Oberhofer et Pfaffermayr (2011) qui se base sur Helpman, Melitz et Yeaple (2004). Ce modèle traite les données de trois pays, un pays hôte et deux pays d'accueil avec un seul secteur de production, dans lequel sont produit différents biens dans le secteur H en utilisant le travail  $L$ . Les entreprises font face à des taux de salaire donnés  $W$ .

Une entreprise rentre sur le marché d'un pays  $i$  qui est le pays d'origine; cette dernière fait face à des coûts d'entrée. Nous notons  $f_E$  pour les coûts d'entrée et  $E$  pour entrée. La firme entre sur le marché et elle décide si elle produit ou non. La nouvelle entreprise rentrante affiche un coefficient de rendement ( $a$ ) d'une distribution  $G(a)$ . Ce coefficient de rendement peut être perçu aussi comme coefficient de rendement par unité de travail, vu que le travail représente l'unique facteur de production. La courbe de rendement permet de décider si la firme produit ou non (Baldwin 2005). Le coefficient du rendement par unité de travail doit dépasser un seuil critique donné.

Une entreprise qui produit pour un marché local fait face à des coûts de travail fixes additionnels  $f_D$ . Sur le marché intérieur, aucun autre coût fixe n'est approprié, parce que le frais de transport peut être négligé. L'entreprise peut choisir d'exporter ses produits pour un marché étranger. Cette dernière fera face à d'autres coûts additionnels  $f_x$  pour chaque marché étranger où  $X$  désigne l'exportation. Ces coûts reflètent des dépenses supplémentaires comme la création d'un réseau de distribution dans le pays étranger.

Un marché extérieur peut être aussi servi par l'investissement direct étranger (IDE). Une entreprise qui choisie les IDE pour servir un marché étranger supporte des coûts fixes additionnels  $f_I$  avec  $I$  en référence aux IDE. Ce coût comporte des charges relatives à la construction d'un réseau dans chaque pays comme  $f_x$ , et des coûts de construction des filiales dans le marché étranger pour chaque pays. Par conséquent, nous pouvons résumer les

différents coûts fixes pour chaque cas.  $IDE = f_I + f_E$ ,  $Exportations = f_X + f_E$  et  $Local = f_D + f_E$  avec  $f_D < f_X < f_I$ , (Helpman et al. (2004)).

Les courbes de profit sont tracées sous la condition que le niveau de demande et le niveau de salaire sont les mêmes pour les trois pays (étrangers et locaux). Les trois coûts fixes ainsi que les trois options son illustrés par  $f_D < f_X < f_I$ .

La firme qui choisit d'exporter des biens vers un marché étranger est confrontée à des coûts de transport de type « iceberg » pour l'exportation d'un pays  $i$  (local) vers un pays  $j$  qui est l'un des pays hôte ( $\tau_{ij} > 1$ ) ; Ainsi,  $\tau_{ij}$  unités de production sont exportées vers un autre pays  $j$  mais uniquement une seule unité arrive. Tous les coûts de transport sont inclut dans ce coût « iceberg ».

Des coûts de transport qui augmentent avec la distance peuvent faire l'objet de recherche prometteuse. Martinez-Zarzoso et Suarez-Burguet, (2005) montrent qu'une plus grande distance induit à une augmentation des coûts de transport.

Comme nous l'avons mentionné précédemment, le coût marginal de production est la variable qui permet de décider pour les entreprises du niveau de productivité et par conséquent la stratégie à choisir. Les firmes produisent la quantité qui égalise les coûts marginaux et les revenus marginaux. Elles ont aussi un profit à gagner afin de payer le coût moyen, comme nous le montrons ultérieurement dans la partie de maximisation de profit. Par conséquent, les différences de productivité (indépendamment des autres caractéristiques des firmes) sont les causes principales qui déterminent le choix de stratégie de la firme via les coûts marginaux.

L'entreprise commence à travailler sur le marché local et choisit ensuite de servir le marché étranger, ce qui lui permet de tirer un profit du marché domestique et une stratégie pour le marché extérieur, soit  $\pi_D + \pi_{X_j}$  ou  $\pi_D + \pi_{I_j}$ . Ainsi, l'entreprise maximise les profits dans chaque marché séparément et le profit sur le marché local n'est pas affecté par le choix de stratégies pour servir le marché extérieur.

La différence entre les coûts fixes additionnels  $f_{Ij} - f_{Xj}$  reflète la différence des dépenses initiales avant qu'une unité de la marque ne soit vendue. S'il y a une grande différence, l'entreprise va vendre une grande quantité afin de réaliser des profits plus intéressants à travers l'investissement direct, car le coût fixe de l'investissement étranger est plus important que le coût fixe d'exportation. Cela montre réellement l'importance de la taille du marché pour équilibrer le surcoût (seuil de rentabilité). La taille du marché du pays extérieur affecte aussi le point de croisement (cut-off). Dans un marché relativement large, la demande pour le produit  $A_j$  est plus importante ce qui implique des revenus plus élevés qui permettent de payer des coûts fixes plus importants et compenser le reste des frais généraux.

En conclusion, les variables principales affectant le choix entre les différentes stratégies qui sont exposées dans le modèle incluent principalement la taille du marché, le coût de transport, les effets fixes et la productivité. Le profit est la variable clé que détermine la stratégie choisie. En effet la productivité une variable centrale qui affecte les effets marginaux et en corolaire le profit. En outre, la taille du marché et la demande affectent le choix de stratégie pour couvrir les coûts fixes, qui sont plus importants pour les IDE. Les coûts d'échanges sont également une variable clé et augmentent la probabilité des IDE tant qu'ils s'accroissent bien qu'il y ait une restriction des données pour une application empirique. D'autres variables ainsi que les caractéristiques propres aux entreprises restent importantes; elles sont introduites dans le modèle empirique.

L'analyse empirique permet de tester l'influence de l'entreprise et les caractéristiques de l'industrie sur les stratégies de servir le marché. Le modèle empirique que nous appliquons est relativement relié au model théorique décrit antérieurement.

Dans notre étude empirique, nous utilisons la valeur totale des IDE entrants des entreprises multinationales. Comme nous l'avons mentionné auparavant, l'objectif est de déterminer la relation entre les exportations et les IDE, substitution ou complémentarité, afin de connaître l'effet final sur l'économie locale. Dans le cas où les IDE substituent les exportations, une augmentation de ceux-ci conduira à la baisse de la production locale et du niveau d'emploi ce qui va par la suite augmenter le niveau du chômage. Dans le cas contraire où il y a une

complémentarité entre les exportations et les IDE, toute augmentation des flux des IDE (verticaux et horizontaux) aura des effets positifs sur l'économie locale que ce soit au niveau de l'emploi ou de la croissance économique. Ainsi, le but d'utiliser les différents types des IDE est de savoir et déterminer quels effets possibles peuvent être engendrés finalement sur l'économie locale.

La première équation que nous avons utilisée s'illustre dans le modèle probit bi-varié qui spécifie la probabilité qu'une entreprise  $i$  dans une industrie  $k$  exporte  $ex$  vers les marchés étrangers:

$$\begin{aligned}
 ex_{ik} = & \gamma_0 + \gamma_1 \log \text{ age}_{ik} + \gamma_2 \log \text{ size}_{ik} + \gamma_3 \text{productivi ty}_{ik} + \gamma_4 \text{mes}_k \\
 & + \gamma_5 \text{herfindahl index}_k + \gamma_6 \text{int .assets}_{ik} + \sum_{i=1}^4 \gamma_{control} (\gamma_7 \text{affiliate}_{ik} + \\
 & \gamma_8 \text{consolidat e}_{ik} + \gamma_9 \text{independen ce}_{ik} + \\
 & \sum_{i=1}^{10} \gamma_{10+i} \text{industry dummy variables}_k) + v_{ik} .
 \end{aligned}$$

La deuxième équation mesure l'influence des mêmes variables mentionnées ci-dessus pour que les entreprises deviennent des Firmes Multinationales (FMN):

$$\begin{aligned}
 mne_{ik} = & \gamma_0 + \gamma_1 \log \text{ age}_{ik} + \gamma_2 \log \text{ size}_{ik} + \gamma_3 \text{productivi ty}_{ik} + \gamma_4 \text{mes}_k \\
 & + \gamma_5 \text{herfindahl index}_k + \gamma_6 \text{int .assets}_{ik} + \sum_{i=1}^4 \gamma_{control} (\gamma_7 \text{affiliate}_{ik} + \\
 & \gamma_8 \text{consolidat e}_{ik} + \gamma_9 \text{independen ce}_{ik} + \\
 & \sum_{i=1}^{10} \gamma_{10+i} \text{industry dummy variables}_k) + v_{ik} .
 \end{aligned}$$

Ces équations représentent le modèle empirique qui inclut deux groupes de variables. Le premier groupe est composé des variables principales (l'âge, la taille, la productivité, la proportion de la taille entre les industries, l'index de Herfindahl et les immobilisations incorporelles). Le deuxième groupe est celui des variables de contrôle qui sont selon le



modèle: les filiales, les fusions, l'indépendance et la classification des industries. Les apports théoriques sur l'utilisation de ces variables reposent sur les considérations suivantes:

La première variable: la productivité. Théoriquement et empiriquement, les entreprises les plus productives ont une forte possibilité de réaliser des investissements directs à l'étranger, plus que les entreprises peu productives, Helpman et al. (2004). Les principales proxys utilisées pour mesurer la productivité sont:

Le produit d'exploitation par employé (proxy traditionnelle).

Le pourcentage des coûts des employés par rapport au produit d'exploitation (nouvelle proxy).

Le deuxième proxy est plus pertinente pour mesurer la productivité car elle met en évidence les charges salariales au lieu du nombre d'employés comme nous allons expliquer par la suite.

Head and Ries (2003) montrent que la relation entre la productivité et les IDE versus une décision à exporter dépend principalement de la proxy utilisée pour mesurer la productivité. Ainsi, nous avons choisi d'utiliser séparément les deux proxys pour confirmer cette constatation. Effectivement, nous montrons que la nouvelle proxy présente des résultats meilleurs que la première.

La seconde proxy est utilisée en plus de la proxy traditionnelle car elle permet de montrer le rôle de la productivité à travers différents canaux et parmi les différents niveaux des entreprises comme suit:

Nous montrons l'importance de la productivité en testant les entreprises les moins productives "les grandes entreprises" et les entreprises les plus productives "les très grandes entreprises". Ceci nous permettra d'expliquer le rôle de l'importance de la productivité comme une nouvelle variable pour influencer les stratégies des entreprises pour servir les marchés étrangers (Helpman et al. (2004)). Ainsi, nous pouvons montrer les principales stratégies adoptées par les deux différents groupes de entreprises: le groupe des entreprises les plus productives opte pour la stratégie d'investir directement à l'étranger pour servir les marchés

internationaux et le groupe des entreprises les moins productives choisissent les exportations pour servir les marchés étrangers.

En effet, selon la théorie, nous pouvons attendre qu'un niveau élevé de la productivité augmente la probabilité de choisir l'investissement direct pour s'introduire dans les marchés étrangers et réduit la possibilité que les entreprises optent pour seulement les exportations (Helpman et al (2004). L'effet marginal de la productivité est positif pour la stratégie en faveur des IDE et négatif pour la stratégie d'exportation ; ce résultat a été confirmé aussi par la récente étude de Oberhofer and Pfaffermayr (2011).

L'âge de l'entreprise qui est inclus en tant que variable explicative a un effet positif sur la transformation d'une entreprise en FMN selon la théorie, spécialement les FMN doivent être anciennes en moyenne comme elles ont acquis une grande expérience sur les marchés étrangers (Rob et Vettas (2003) et Saggi (1998)). Pradhan (2004) trouve un effet positif de l'âge de l'entreprise pour sur la décision à investir directement à l'étranger. Il explique cela lorsqu'il y a une augmentation dans le stock des immobilisations incorporelles d'une entreprise dans son processus de croissance. Ainsi, nous prévoyons un effet positif de l'âge que ce soit pour une stratégie en vue d'exportations ou d'IDE et ce peu importe le groupe auquel appartient l'entreprise, grande ou très grande. En outre, nous attendons à trouver un effet plus important pour les IDE. Les entreprises les plus âgées ont un stock d'immobilisations incorporelles plus important, ce qui permet à l'entreprise de financer les coûts fixes plus élevés dédiés aux IDE et de préférer cette stratégie qui s'avère plus profitable que d'exporter. Pour les grandes entreprises, l'impact de l'âge sur les exportations doit être plus important que pour les entreprises les plus grandes. Réciproquement, l'impact de l'âge d'une très grande entreprise doit être beaucoup plus important sur les IDE que celui pour les grandes entreprises. Cette hypothèse s'explique par la disposition d'un actif intangible cumulé très important. En plus, les entreprises les plus grandes sont plus anciennes en moyenne que les entreprises larges.

Nous nous attendons que l'effet marginal de l'âge soit positif pour la probabilité qu'une entreprise opte pour une stratégie d'investir directement à l'étranger alors qu'il va être négatif pour l'option d'exporter notamment pour les entreprises les plus anciennes qui sont aussi les plus grandes. En revanche, pour une stratégie d'investir localement, nous prévoyons un

impact négatif de l'âge de l'entreprise. Ceci peut être expliqué par les profits qui peuvent être régénérés si l'entreprise, toujours dans le cadre de l'ancienneté opérationnelle, décide d'investir à l'étranger au lieu d'investir localement ou servir les marchés étrangers par les exportations.

La troisième variable utilisée dans l'étude empirique est le nombre d'employés par entreprise. C'est une variable qui sert de proxy pour la taille de l'entreprise et par la suite comme proxy des coûts fixes de l'entreprise. Les entreprises qui disposent d'un nombre important d'employés ont tendance à produire et vendre plus que les autres entreprises. Ainsi elles sont dans la contrainte de se procurer des fonds plus importants pour financer les coûts fixes qui s'ajoutent pour un projet d'IDE. De ce fait, nous supposons que les grandes entreprises seront moins exposées que les très grandes pour fournir les fonds nécessaires à mettre en œuvre les deux stratégies. Autrement dit, l'impact de la taille de l'entreprise est remarquablement plus important pour les très grandes entreprises et cette importance est plus observée dans une stratégie d'IDE que celle d'exportation, Oberhofer et Pfaffermayr (2011).

Nous attendons que l'effet marginal de la taille de l'entreprise soit positif pour les deux stratégies, généralement. En revanche, dans une stratégie d'exportation, l'effet peut être négatif. Nous prévoyons aussi que l'impact de la taille sera plus important pour les très grandes entreprises plus que grandes surtout au niveau des IDE, dans la mesure où ce groupe d'entreprises a tendance à servir les marchés étrangers à travers les investissements directs.

La quatrième variable "measurement of enterprises size" (MES) mesure la taille moyenne d'une entreprise selon la classification NACE des branches. Il s'agit d'une autre proxy pour illustrer les coûts fixes. Une taille moyenne élevée suggère une forte probabilité à servir les marchés étrangers, Oberhofer and Pfaffermayr (2011). On considère que, les MES captent les effets des différences des tailles moyennes des entreprises entre les différentes branches qui doit affecter les choix décisionnels des stratégies à adopter par les entreprises. Ainsi, cette variable est complètement différente de celle du nombre d'employés comme proxy de la taille de l'entreprise. Nous attendons que les entreprises qui appartiennent à des industries dont la taille moyenne est élevée ont plus tendance à servir les marchés étrangers. Le MES va

influencer positivement la probabilité qu'une entreprise exporte ou qu'elle investit directement à l'étranger.

Les industries qui ont un MES modeste, en moyenne, seront les industries qui produisent des biens non commercialisables, notamment le secteur des services. Il s'agit d'une autre raison qui s'ajoute pour tester les deux groupes d'entreprises, les grandes et les très grandes, séparément dans le modèle.

La cinquième variable est le degré de la concentration sur le marché qui permet de fournir des informations sur le pouvoir le marché d'une entreprise. Nous nous sommes basés sur l'index d'Herfindahl pour mesurer la concentration sur le marché en supposant que toutes les entreprises de l'échantillon forment un seul marché. En effet, cet index mesure la concentration de chaque industrie, basée sur les revenus des entreprises pour chaque industrie divisé par le revenu total du marché (revenu total des entreprises). Il est élaboré à partir des entreprises de l'échantillon et il représente la proxy de la concentration réelle au marché. Il varie entre  $\frac{1}{n}$  et "1". La valeur "1" signifie qu'il y a une seule entreprise qui opérera dans un cadre monopolistique.

Nous supposons que les entreprises qui ne sont pas confrontées à un niveau de concurrence important sur le marché où elles opèrent auront un niveau élevé de marge. Ainsi, elles n'auront pas de contrainte pour servir les marchés étrangers que ce soit à travers le financement des coûts fixes liés aux IDE ou des coûts du transport liés aux exportations. L'impact de cette variable sera positif pour les deux stratégies.

En revanche, les effets d'une forte concentration seront beaucoup plus élevés sur les exportations que sur les IDE. En effet, toute augmentation du niveau de la concentration sur le marché (Herfindahl Index) se traduit par l'augmentation du pouvoir de marché de l'entreprise et diminue le niveau de la concurrence en augmentant ses profits. Ceci explique la préférence de l'entreprise après avoir maintenu sa position dans le marché local de développer ses activités par le service de nouveaux marchés à l'étranger via les exportations au lieu des IDE.

La stratégie d'exportation est le résultat de l'importance du niveau de la concentration d'une entreprise sur le marché local. Autrement dit, une décision d'IDE ne permet pas de réaliser des gains plus importants que si l'entreprise décide d'exporter.

La sixième variable illustre les immobilisations incorporelles qui constituent une proxy potentielle pour mesurer les activités de la Recherche et Développement (R&D). Les entreprises qui disposent d'immobilisations incorporelles élevées, tel que les logiciels, les brevets sont dotées d'un avantage comparatif spécifique qui permet d'augmenter la probabilité d'une possibilité de réaliser les IDE. Ainsi, nous supposons que l'importance des immobilisations incorporelles aura un effet négatif sur une décision d'exportations alors qu'il sera positif pour une stratégie d'externalisation (IDE). Cette hypothèse est plus valable pour les entreprises les plus grandes comme elles sont censées posséder des immobilisations incorporelles élevées ce qui permet la substitution entre les deux stratégies. En ce qui concerne les grandes entreprises, nous prévoyons que la variable « immobilisations incorporelles » aura un effet positif pour les deux stratégies (exportations et IDE).

En effet, cette catégorie d'entreprises n'est pas la plus grande en taille sur le marché et ainsi ne dispose pas d'immobilisations incorporelles cumulées importantes. Toute augmentation de cette variable pour ces entreprises entraînera des activités dédiées aux exportations au lieu d'investir directement à l'étranger. Une stratégie favorable aux IDE nécessite un niveau élevé de possession d'immobilisations incorporelles, ce qui n'est pas le cas des grandes entreprises. Ceci dit, avec le développement des activités d'exportation, les entreprises renforceront leur place sur le marché par l'acquisition d'un niveau nécessaire d'immobilisations incorporelles qui permettra, comme dans le cas des très grandes entreprises, d'augmenter la probabilité d'établir des IDE jusqu'à la substitution des exportations.

Nous avons choisi d'utiliser les valeurs d'immobilisations incorporelles pour éviter tout problème potentiel lié à l'endogénéité, Oberhofer and Pfaffermayr (2011). Comme nous l'avons indiqué, la valeur courante de cette variable peut dépendre du niveau d'activités multinationales liées à la R&D.

### **Le deuxième groupe de variables contient les variables de contrôle:**

La première variable mesure la relation d'une entreprise avec les autres entreprises. Elle prend la valeur " 1 " si l'entreprise est une filiale d'une autre compagnie et " 0 " dans le cas contraire. Nous supposons que les entreprises françaises, qu'elles soient des filiales d'autres entreprises ou non, vont adopter la même stratégie que celle de leurs dirigeants. Qu'elle prenne la valeur " 1 " ou " 0 ", la variable aura un effet positif sur les deux types de stratégies. Seulement, il faut bien contrôler le rôle des entreprises mères pour influencer les stratégies adoptées par leurs filiales.

En outre, le modèle inclut une variable qui permet de distinguer les dix différentes catégories de branches afin d'en tirer les effets spécifiques. Cette variable permettra d'avoir des résultats plus robustes par la distinction entre les branches par rapport aux autres variables utilisées.

Une autre variable de contrôle est incluse dans le modèle qui permet de faire la différence entre les entreprises consolidées, non consolidées et les deux à la fois en se référant à la base de données fournie par Amadeus. L'introduction de la variable qui mesure la présence de la consolidation permet d'en spécifier l'impact sur les choix des entreprises pour servir les marchés étrangers et ainsi d'améliorer le pouvoir explicatif du modèle.

Nous contrôlons également les différents niveaux d'autonomie des entreprises. Selon la base de données Amadeus, les entreprises sont classées selon quatre niveaux: très indépendantes, indépendantes, dépendantes et statut inconnu. Cette distinction de classification permet de détecter les différents comportements d'une entreprise selon son appartenance et son niveau de consolidation ou non par rapport aux choix d'exporter ou de réaliser des IDE.

Le tableau suivant englobe les différentes hypothèses, abordées dans notre modèle, selon le type de stratégie (Exportation versus IDE) et selon le groupe d'entreprises (large et très large).

Table (1): Résumé des signes attendus des variables sur les choix entre exportations et IDE.

La stratégie	Exportation		IDE	
	Large	Très large	Large	Très large
Age*	+xx	+x	++x	++xx
Employés	+	+	+x	++ xx
Filiale	+	+	+	+
Productivité	-	-	+	+
MES	+	+	+	+
Herfindahl	++xx	+x	+	+
Immobilisations incorporelles	+	-	+	+

++ signifie un effet plus fort pour les deux stratégies.

X indique un effet plus important entre les deux groupes d'entreprises.

\*l'effet de l'âge est plus important sur les IDE par rapport aux exportations. D'autre part, il est plus fort pour les grandes entreprises en termes d'exportations en comparaison des très grandes entreprises. Parallèlement, l'effet de l'âge est plus significatif pour une stratégie d'IDE dans les entreprises très grandes et moins important pour les grandes entreprises.

**Les hypothèses à tester dans notre modèle sont les suivantes:**

- L'augmentation de la productivité des entreprises tend à substituer les IDE au lieu des exportations.
- Les entreprises les plus productives ont tendance à internationaliser leurs activités.
- Plus l'âge, la taille et le niveau de la productivité augmente, plus la probabilité qu'une entreprise opte pour les IDE augmente.
- La productivité mesurée par la qualité du travail est une proxy plus pertinente.

La procédure et la méthodologie économétrique du travail que nous avons adoptées est la suivante: le modèle probit bi-varié est une extension du modèle probit binaire. Il s'agit d'un modèle à deux variables dépendantes où chaque variable est supposée être une fonction linéaire expliquée par un groupe de variables indépendantes. Chaque équation contient une constante et un terme d'erreur. Ce dernier est supposé suivre une distribution normale ce qui signifie selon le modèle probit bi-varié l'existence d'une distribution normale bi-varié du terme d'erreur. La distribution bi-variée permet de montrer la corrélation entre les termes d'erreur. Autrement dit, les termes d'erreur ne sont pas supposés indépendants des uns des autres parce qu'ils sont corrélés ce qui signifie l'existence de certaines corrélations entre les exportations et les IDE. Le modèle est estimé par la méthode de maximum de vraisemblance dans la mesure où les estimations sont réalisées conjointement. Ainsi, le modèle permet d'identifier les coefficients pour chaque ensemble des variables explicatives ainsi que les coefficients de corrélation relatifs aux termes d'erreur ( $\rho$ ) ou (rho) (Andrew (2007) Greene (2003)). L'avantage principal de ce modèle probit bi-varié est qu'il permet de tester la probabilité ou la préférence d'une stratégie au lieu d'une autre (IDE- Exportation) en utilisant les mêmes variables indépendantes. Il constitue un moyen d'estimer deux variables dépendantes séparément, en testant deux modèles probit binaires, en même temps.

La description statistique du test de Kruskal Wallis est réalisée pour différents groupes avec comme but de tester la parité de la population médiane parmi l'ensemble des groupes et ce en se basant sur l'analyse, en un sens unique, de la variance par rang (méthode non paramétrique). Le test ne suppose pas que la population suive une distribution normale. Le test Kruskal Wallis est un test non paramétrique utilisé pour comparer trois groupes et plus d'un échantillon de données (local, export, investissement et stratégie mixte).

Les effets marginaux des six principales variables explicatives pour les quatre stratégies (investissement domestique, IDE, export et stratégies mixtes) sont introduits et discutés pour chaque groupe d'entreprises séparément.

Les résultats descriptifs montrent, selon le test de Kruskal Wallis, que les quatre groupes d'entreprises (les producteurs locaux, les exportateurs, les IDE et les entreprises à stratégies



mixtes) sont significativement différents pour les trois groupes d'entreprises. Le test  $X^2$  qui indique que pour les entreprises qui appartiennent à un groupe homogène, est strictement rejeté pour les quatre variables dans les trois groupes d'entreprises.

Dans notre modèle, le ratio Likelihood est significatif à 1% ce qui montre que le modèle est bien adapté aux données; le modèle probit est le plus propice pour tester le choix entre les deux variables dépendantes (export versus IDE).

Le test de multicollinéarité indique un VIF très bas pour les trois groupes de entreprises, 1,62 pour les grandes entreprises, 1,64 pour les très grandes entreprises et 2,23 pour l'ensemble des entreprises. Ceci montre l'absence de la multicollinéarité.

Le tableau suivant montre les différentes estimations obtenus et qui sont majoritairement conformes aux hypothèses à tester.

Table (2): Résumé des signes obtenus des variables sur les choix entre exportations et IDE.

La stratégie	Exportation		IDE	
	Large	Très large	Large	Très large
Age*	+xx	+x (NS)	++x	++xx
Employees	-	+	+x (NS)	++ xx
Affiliate	+	+	+	+
Productivity	-	-	+	+(NS)
MES	+	+	+	+
Herfindahl	++xx	+x	+	+(NS)
Intangible Assets	+	-	+	+

Table (3): Estimation du modèle probit bi-varié.

La stratégie / les variables	Coefficient (grandes)	Coefficient (très grandes)	Coefficient (toutes les entreprises)
Exportation			
Age	0.076*** (6.98)	0.022 (0.77)	0.004*** (9.54)
Taille	-0.019** (-2.36)	0.042*** (2.64)	-0.00002*** (-2.71)
Filiale	0.13*** (3.41)	0.3** (2.46)	0.22*** (6.1)
Indépendance	-0.048** (-2.37)	0.05 (0.72)	-0.06*** (-3.24)
Consolidation	-0.11*** (-4.14)	0.5*** (15.02)	0.77*** (16.47)
HI	0.38*** (32.72)	0.27*** (9.57)	0.03*** (4.22)
MES	0.00024*** (36.27)	1.10 <sup>e</sup> -06*** (3.48)	0.00001*** (31.3)
Ind. Dummy	-0.09*** (-17.52)	-0.11*** (-6.01)	-0.22*** (-43.29)
Nouvelle proxy de productivité ^	-0.002*** (-3.91)	-0.01*** (-6.03)	-0.007*** (-13.62)
Intangible	7.92e-06*** (3.78)	-2.09 <sup>e</sup> -07*** (-2.9)	-1.50 <sup>e</sup> -07 * (-1.81)
Constant	0.21	-1.67***	-1.73***

	(1.32)	(-6.71)	(-11.82)
Observations	27208	3704	31175
IDE			
Age	0.17*** (10.66)	0.25*** (8.47)	0.006*** (14.04)
Taille	0.008 (0.75)	0.09*** (6.04)	0.00002*** (4.34)
Filiale	0.5*** (8.19)	0.3** (2.51)	0.49*** (9.2)
Indépendance	-0.38*** (-11.25)	-0.25*** (-3.39)	-0.37*** (-12.23)
Consolidation	-0.36*** (-12.62)	-0.36*** (-11.58)	-0.7*** (-16.52)
HI	0.034** (2.21)	-0.046 (-1.63)	0.2*** (29.48)
MES	0.0001*** (14.72)	3.37 <sup>e</sup> -06*** (10.45)	0.00001*** (24.97)
Ind. Dummy	-0.04*** (-6.02)	-0.17*** (-9.38)	-0.14*** (-20.69)
Nouvelle proxy de productivité ^	0.004*** (4.52)	0.001 (0.78)	0.003*** (4.19)
Intangible	0.00002*** (9.17)	1.19 <sup>e</sup> -07** (2.18)	4.85 <sup>e</sup> -08 (0.76)
Constant	-0.074 (-0.41)	-0.008 (-0.03)	1.42*** (9.59)

Model Fitness			
athrho	0.41*** (25.34)	0.1*** (3.36)	0.327*** (23.52)
Rho	0.37	0.1	0.316
LR chi2 (20)	4011.56***	1651.27***	6958.07***
Likelihood-ratio test of rho=0; chi2 (1)	685.877***	11.2847 ***	578.057***
Log likelihood	-24199.128	-4205.8819	-29270.574

Proxy traditionnelle de productivité ^ (Exports)	9.39 <sup>e</sup> -06*** (2.82)	8.90 <sup>e</sup> -06* (1.7)	0.00002*** (7.75)
Proxy traditionnelle de productivité ^ (FDI)	-4.46 <sup>e</sup> -06 (-0.71)	0.00001** (2.43)	5.73 <sup>e</sup> -06 (1.56)

Les symboles \*, \*\*, \*\*\* représentent respectivement les degrés de significativité à 10%, 5% et 1%.

Les valeurs de Z sont indiquées entre parenthèses.

^La nouvelle proxy de la productivité: les charges salariales/les produits d'exploitation, la proxy traditionnelle de la productivité: les produits d'exploitation par employé.

Comme nous l'avons mentionné avant, la nouvelle proxy de la productivité a un effet négatif sur les exportations et un effet positif sur les IDE pour les trois groupes d'entreprises.

L'effet négatif sur les exportations est plus prononcé pour les entreprises les plus grandes ce qui confirme la théorie. Les entreprises les plus productives ont tendance à favoriser les IDE par rapport aux exportations, comme indiqué dans Helpman et al (2004).

Ainsi, toute augmentation de la productivité diminue la probabilité d'adopter une stratégie d'exportation pour servir les marchés étrangers. L'entreprise en augmentant sa productivité diminuera les coûts marginaux et a intérêt d'opter pour l'autre stratégie (les IDE).

Ainsi, nous trouvons que la nouvelle proxy a un effet négatif sur les exportations tandis que la proxy traditionnelle a un effet positif. Pour bien représenter la productivité la nouvelle proxy

s'avère la mieux appropriée pour les trois groupes. D'autre part, les valeurs de la proxy traditionnelle sont plus petites que celles de la nouvelle proxy.

La proxy de la productivité utilisée traditionnellement a un effet positif et faible sur les IDE pour les trois groupes d'entreprises, et sur les exportations aussi sauf pour les grandes entreprises où elle signale un impact négatif. Ce résultat montre l'importance de la deuxième proxy qui inclut la qualité du travail pour mesurer la productivité (les charges salariales) au lieu du nombre d'employés utilisés par la proxy traditionnelle, ce qui permet d'avoir des estimations robustes.

Dans l'équation des exportations, l'effet de l'âge de l'entreprise est plus significatif pour les grandes entreprises que pour les entreprises les plus grandes. Pour les grandes entreprises parce que les immobilisations corporelles cumulées, la liquidité et le niveau de l'âge moyen ont un niveau moins important par rapport aux entreprises les plus grandes. Les grandes entreprises favorisent les exportations pour servir les marchés étrangers au lieu d'établir des IDE comme nous avons supposé.

Pour l'équation des IDE, l'impact de l'âge est très significatif pour les entreprises les plus grandes comme elles possèdent un niveau élevé d'immobilisations incorporelles, de liquidité et un niveau d'âge moyen élevé. Elles ont la capacité de financer les coûts fixes relatifs aux IDE pour servir les marchés étrangers dans un objectif de maximiser le profit.

La taille de l'entreprise montre un effet, en valeur absolue, plus important pour les IDE que pour les exportations, et ceci pour les deux groupes des entreprises (grandes et très grandes). Les résultats montrent que cette variable a un effet négatif sur les exportations et positif sur les IDE pour les grandes entreprises et l'ensemble des entreprises alors qu'il est positif pour les très grandes entreprises quelle que soit la stratégie (exportation ou IDE).

En effet, les entreprises les plus grandes ont un nombre d'employés beaucoup plus élevé que les autres ce qui explique l'importance des liquidités pour servir les marchés étrangers pour les deux types de stratégies. En outre, les grandes entreprises sont dotées d'un nombre moins

important d'employés en moyenne ce qui explique leur choix de substituer les IDE au lieu des exportations tant qu'elles réalisent plus de profit. Elles sont incapables d'adopter une stratégie mixte dans la mesure où elles n'ont pas des fonds suffisants pour se lancer dans des projets d'IDE.

La taille de l'entreprise confirme l'hypothèse que seules les entreprises les plus grandes peuvent opter pour les deux stratégies séparément ou conjointement pour servir les marchés étrangers. Ainsi, l'effet de la taille, dans le groupe des entreprises les plus grandes, est plus important par rapport aux autres groupes.

Les grandes entreprises ne représentent pas la plus grande partie du marché et ne bénéficient pas des hauts niveaux de ventes pouvant conduire à exporter au lieu d'investir directement à l'étranger. Ainsi, elles préfèrent adopter la stratégie la plus rentable, qui est dans ce cas les IDE. En plus, le niveau de compétitivité entre les grandes entreprises est trop élevé pour conduire à choisir les exportations pour servir les marchés étrangers ; elles préfèrent l'autre stratégie (IDE) ce qui explique la relation positive avec les IDE et négative pour l'autre stratégie.

Comme nous avons prévu, l'index de Herfindahl a un effet plus important sur les exportations par rapport aux IDE en ce qui concerne la catégorie des grandes et très grandes entreprises. Toute hausse de la concentration d'une entreprise entraîne plus de profits sur le marché et ainsi amène les deux groupes d'entreprises à renforcer leur place (réduire la concurrence) en augmentant la production locale pour servir le marché domestique et les marchés étrangers à travers les exportations.

Pour les entreprises les plus grandes, le renforcement de la concentration sur le marché est plus fort par rapport à l'autre groupe. Ce qui amène dans le cadre de la maximisation de profit, ces entreprises à opter pour la production locale là où le niveau de concurrence est bas et préfèrent l'exportation comme stratégie qui constitue le moyen le plus rentable par rapport aux IDE.

L'impact de l'index de HI sur les exportations pour les grandes entreprises est plus important que celui sur les exportations pour les entreprises les plus grandes, conformément aux

hypothèses. Ce qui prouve la préférence des grandes entreprises d'établir des activités d'exportations au lieu d'investir directement à l'étranger.

La taille moyenne de l'entreprise dans l'industrie a un effet positif sur les deux stratégies pour les trois groupes d'entreprises. Mais un effet peu significatif. Ainsi, toute augmentation de cette variable engendre une augmentation modeste pour servir les marchés étrangers que ce soit en termes d'exportation ou d'IDE.

Les résultats obtenus pour les immobilisations incorporelles confirment aussi la théorie. La variable a un effet positif sur les deux stratégies pour les grandes entreprises. Celles-ci disposent d'un niveau faible d'actifs incorporels par rapport aux entreprises les plus grandes. Ainsi, l'impact est plus important pour les IDE que pour les exportations.

Dans les entreprises les plus grandes, les immobilisations incorporelles ont un effet négatif sur les exportations et un effet positif sur les IDE. Un niveau élevé de cette variable dont dispose cette catégorie d'entreprises, conduit à substituer les IDE par les exportations.

Les différentes variables qui décrivent les caractéristiques des entreprises selon leur appartenance montrent une influence importante sur le choix d'exportation pour les grandes entreprises au lieu des IDE et à l'inverse, les entreprises les plus grandes ont tendance à opter pour les IDE et de substituer les exportations.

### **Les variables de contrôle:**

La variable liée aux filiales a un effet positif sur les deux stratégies pour les trois groupes d'entreprises. Les entreprises qui appartiennent à d'autres entreprises ont tendance à appliquer la même stratégie adoptée par la société mère. Ce qui explique les effets positifs de cette variable.

D'un autre côté, nous trouvons que les entreprises françaises détiennent toujours plus de 50% des filiales, ce qui explique davantage que ces dernières suivent leurs sociétés mères.

Les trois variables de contrôle (consolidées, indépendantes et branche) sont utilisées pour vérifier s'il y a des différences en ce qui concerne la structure des entreprises par rapport au niveau de consolidation, d'indépendance et d'autres caractéristiques des industries étudiées. Ces variables sont significatives ce qui montre la robustesse des résultats obtenus en introduisant ces variables de contrôle et permet ainsi de capturer d'autres caractéristiques omises dans le modèle.

Elles permettent aussi de contrôler l'impact de la structure de l'entreprise en termes des différences entre les industries, consolidation et d'indépendance sur le choix entre les IDE et les exportations pour servir les marchés étrangers.

Le tableau suivant résume les effets des variables relatives aux caractéristiques des entreprises sur les exportations et les IDE pour les différents groupes d'entreprises.

Table (4): les effets des caractéristiques des firmes sur les deux stratégies (les trois groupes)

Exports	Age	Taille	MES	HI	productivité	Intangible
Large	+	-	+	+	-	+
Très large	+ (NS)	+	+	+	-	-
Tout	+	-	+	+	-	-
IDE						
Large	+	+ (NS)	+	+	+	+
Très large	+	+	+	- (NS)	+ (NS)	+
Tout	+	+	+	+	+	+ (NS)

Le tableau montre que la productivité a un effet négative sur les exportations et positif sur les IDE. Plus l'âge, la taille, MES et l'actif intangible varient, plus la probabilité marginale d'établir un IDE varie, dans le même sens, pour une entreprise. En outre, plus HI, l'âge et MES augmente, plus la probabilité d'opter pour une stratégie d'export augmente.



Enfin, la productivité et l'actif intangible ont un impact positif sur les IDE au détriment des exportations; l'importance des deux indicateurs tend à engendrer un effet de substitution. L'âge et MES provoquent une relation de complémentarité des deux stratégies. Le reste des variables explicatives jouent des rôles différents selon les stratégies et le groupe d'entreprises.

Nous concluons qu'une proxy incluant la qualité du travail comme mesure de la productivité est plus pertinente comme indicateur de l'impact de cette variable sur le choix de servir les marchés étrangers. L'augmentation de la productivité tend à favoriser l'internationalisation des activités d'une entreprise ce qui amène à substituer les exportations en faveur des IDE. L'âge et la taille moyenne de l'entreprise selon la classification des industries NACE ont un effet complémentaire pour adopter les deux stratégies. Les immobilisations incorporelles ont un double effet: si leur niveau est faible, leur effet tend à engendrer la complémentarité entre les deux stratégies. Par contre si leur niveau est élevé, la variable impliquera la substitution des deux stratégies. De plus, les entreprises les plus anciennes, les plus grandes et les plus productives dans chaque groupe de entreprises ont tendance à opter pour une stratégie mixte ce qui révèle une relation de complémentarité entre les IDE et les exportations

**Le cinquième chapitre** est intitulé: « Une analyse panel gravité des exportations françaises et sorties d'IED dans des pays méditerranéens sélectionnés »

Ces dernières années, les exportations et leur promotion sont au centre des recherches économiques et des décisions politiques en raison de leurs multiples contributions positives pour améliorer les indicateurs macroéconomiques. Elles permettent entre autres de réaliser la stabilité macroéconomique, d'atténuer le chômage et le déficit commercial, d'accélérer la croissance économique et d'accroître la compétitivité internationale des économies locales.

De même, l'internationalisation des entreprises et l'augmentation des IDE améliorent l'accès aux ressources et aux marchés extérieurs, ce qui impacte positivement l'emploi de la société affiliée et les transferts financiers vers l'économie locale.

De ce fait, la nature de la relation entre les deux variables est essentielle pour l'élaboration de politiques économiques viables. Dans le cas d'une augmentation des IDE, la relation de substitution devrait diminuer la production et élever le taux de chômage à long terme. Alors qu'une relation de complémentarité permettrait de stabiliser l'économie locale, améliorer l'emploi, la croissance, la présence économique étrangère et la compétitivité, et à son tour stimuler cette relation.

Dans le chapitre précédent, nous avons examiné les relations entre les exportations et les IDE au niveau de l'entreprise, tandis que dans le présent chapitre nous allons étendre cette analyse au niveau des pays. Notre étude se concentre sur la relation entre les exportations françaises et les IDE sortants dans les pays du pourtour méditerranéen, à savoir: Algérie, Égypte, Jordanie, Liban, Libye, Maroc, Palestine, Syrie, Tunisie et Turquie.

Le principal apport de cette thèse est l'analyse de la relation entre les IDE sortants et les exportations, appliqué de façon empirique au cas français. Le choix de la France a permis de détecter une relation robuste entre les deux variables au niveau macroéconomique d'une part et au niveau microéconomique des grandes entreprises françaises d'autre part. Ce qui a permis de détecter les effets sur l'économie locale.

Dans ce chapitre, nous avons construit un panel bi-varié de données en incluant les déterminants les plus importants, qui capturent la nature de la relation entre les exportations françaises et les IDE dans la région méditerranéenne. Nous avons formulé le modèle de façon à satisfaire toutes les exigences théoriques, nous avons aussi inclus deux périodes de retards pour la variable IDE et une période de retard pour la variable exportation. Cela montre sans équivoque une relation robuste entre ces variables, comme nous le verrons dans plus amples détails dans les développements de ce chapitre.

Ainsi nous pouvons nous demander dans quelle direction et dans quelle proportion les exportations françaises et les IDE s'affectent mutuellement dans les pays  $J$ ? Autrement dit, comment les investisseurs et exportateurs français interagissent les uns par rapport aux autres, dans les pays  $J$ .

Quels sont les principaux facteurs gravitationnels qui affectent les flux des biens et des capitaux dans le bassin méditerranéen? Quel serait le potentiel d'internationalisation de ces activités dans les pays de cette zone.

Nous avons dérivé deux équations dynamiques basées d'une part sur les considérations théoriques antérieures et d'autre part concernant les modèles gravitationnels liés à la littérature économique traitant des flux d'IDE et des exportations, ainsi que de la relation qui peut exister entre elles.

L'analyse du panel dynamique inclut les retards des variables mentionnées. Les équations suivantes sont utilisées pour exécuter les données de panel dynamique qui calcule en différence première le rôle des variables entre les périodes  $(t, t-1)$ . De ce fait les équations sont:

$$\begin{aligned} \Delta \ln ex_{Fj} = & \beta_0 + \beta_1 \Delta \ln ex_{Fj(t-1)} + \beta_2 \Delta \ln FDI_{Fj(t-1)} + \beta_3 \Delta \ln Yg_{jt} + \beta_4 \Delta \ln RLF_{Fjt} \\ & + \beta_5 \Delta \ln SIMI_{Fjt} + \beta_6 \Delta \ln DISTW_{Fj} + \beta_7 \Delta \ln Exch_{Fjt} + \beta_8 \Delta \ln OP_j + \beta_9 \Delta \ln EFI_j \\ & + \mu_j + \Delta v_{Fjt} \end{aligned}$$

et

$$\begin{aligned} \Delta \ln FDI_{Fj} = & \beta_0 + \beta_1 \Delta \ln FDI_{Fj(t-1)} + \beta_2 \Delta \ln ex_{Fj(t-1)} + \beta_3 \Delta \ln Yg_{jt} + \beta_4 \Delta \ln RLF_{Fjt} \\ & + \beta_5 \Delta \ln SIMI_{Fjt} + \beta_6 \Delta \ln DISTW_{Fj} + \beta_7 \Delta \ln Exch_{Fjt} + \beta_8 \Delta \ln OP_j + \beta_9 \Delta \ln EFI_j \\ & + \mu_j + \Delta v_{Fjt} \end{aligned}$$

Où  $F$  se réfère à la France,  $J$  aux pays méditerranéens sélectionnés,  $t$  au temps,  $FDI_{Fj}$  au stock d'IDE français sortants vers les pays  $J$ ,  $ex_{Fj}$  les exportations françaises vers les pays  $J$  ; elles sont tous deux des variables dépendantes. Les formules concernant l'ouverture, le degré de similarité entre les pays et les dotations relatives en facteurs sont les mêmes que celle utilisées dans la littérature.

$$SIMI_{Fj} = \ln \left[ 1 - \left( \frac{GDP_F}{GDP_F + GDP_j} \right)^2 - \left( \frac{GDP_j}{GDP_F + GDP_j} \right)^2 \right]$$

$$RLF_{Fj} = \ln \left( \frac{GDP_F}{POP_F} - \frac{GDP_j}{POP_j} \right) \text{ comme proxy pour les dotations relatives en facteurs.}$$

$OP_j$  est l'ouverture de  $j$  qui sont calculée avec la formule suivante:

$$OP_j = \frac{\text{exports}_j + \text{imports}_j}{GDP_j}$$

$Yg_{jt}$  est la croissance du produit intérieur brut de chacun des pays  $J$ .

$DISTW_{Fj}$  est la distance pondérée de la France vers chaque pays  $J$ .

$Exch_{Fjt}$  est le taux de change entre la monnaie française (Euro) pour chaque monnaie des pays  $J$ .

$EFI_j$  est l'indice de liberté économique pour les pays  $J$ .

$\mu_j$  représente les effets spécifiques inobservés des pays  $J$ .

$V_{Fjt}$  est l'erreur standard.

Les variables retardées des exportations et des IDE, sont de deux types: En se basant sur les séries chronologiques précédentes, la période d'une variable dépendante retardée en tant que variable indépendante (côté droit de l'équation) a fortement et positivement prédit le flux attendu de la variable dépendante.

Le second type de retard est la variable dépendante d'une équation en tant que variable indépendante dans l'autre équation. Il détecte les relations entre les deux variables dépendantes (interconnexion transversale). En outre, chacune peut prédire le flux futur de l'autre, ce qui les rend endogènes (expliquées par la même variable indépendante) l'une par rapport à l'autre.

Les similarités entre les pays qui incluent également la demande de marché reflètent le développement économique relatif pour chaque économie en comparaison des autres. Cette variable peut expliquer et représenter un vaste groupe de théories qui expliquent les flux d'IDE basés sur le PIB, le niveau de développement et le poids gravitationnel entre deux économies, spécialement ceux concernant l'IDE horizontal, Ethier (1982); Frankel et al. (1995); Africano and Magalhaes (2005); Turkcan, (2006).

Les dotations relatives en facteurs traduisent l'attractivité relative du travail et les coûts de production pour chaque économie par rapport aux autres. Cette variable peut expliquer et représenter un grand nombre de théories du commerce international et du capital qui expliquent le commerce international et les flux d'IDE basés sur les coûts et l'abondance des facteurs entre les économies; cela est particulièrement vrai pour le l'IDE vertical, Helpman and Krugman (1985) ; Buch et al. (2003), et Limao and Venables (2001).

La distance est une variable essentielle affectant les flux d'IDE et les exportations; elle représente aussi différents types de coûts d'échanges. De plus, cette variable joue un rôle essentiel lors du choix entre les stratégies.

L'indice de liberté économique (EFI) est un ensemble de dix indicateurs économiques, à savoir la liberté des échanges, les dépenses du gouvernement, la dérégulation financière, la qualité de l'administration, la liberté d'investissement, la stabilité monétaire etc. Ces indices attribuent une note de 0 à 100, où 100 représente le maximum de liberté et par conséquent un meilleur environnement économique ou un ensemble de politiques qui est plus propice à la liberté économique.

Le taux de croissance du PIB est l'indicateur de revenu national du potentiel économique local. Il est lié à l'ensemble de la production, la consommation et la distribution de biens et services du pays qui sont positivement corrélées aux exportations et aux IDE, Bevan and Estrin (2004); Hong and Hsieh (2005); Hsiao and Hsiao (2006); Nguyen (2006).

L'ouverture est une autre variable indépendante qui montre l'internationalisation dans chaque pays. Le degré d'ouverture influence les flux d'exportations de la France vers les pays  $j$ , en plus de l'IDE. Il influe positivement sur les deux variables à la fois, Bougheas et al., (1999); Brenton et al., (1999); Limao and Venable, (2001); Bevan and Estrin, (2004); Borrmann et al. (2005).

Le taux de change affecte les exportations françaises vers la région  $J$ , de même que les coûts fixes des valeurs réelles de l'implantation des filiales françaises dans les pays  $J$ . Il influe sur

les prix relatifs dans les deux zones, et diminue les exportations françaises quand l'Euro s'apprécie; de l'autre côté, il augmente l'IDE quand l'Euro s'apprécie, car il augmente le pouvoir d'achat des investisseurs pour la réalisation de la demande d'investissement, et vice versa, Bergstrand (1985, 1989); Njong (2008); Turkcan (2006).

Enfin, nous avons résumé dans le tableau suivant les effets escomptés des variables précédentes sur les IDE et les exportations, avec de brèves explications des raisons pour chaque prévision:

Le tableau (5) résume les effets attendus des variables explicatives sur les exportations et les IDE

Tableau (5): Effets attendus des variables explicatives sur les exportations et les IDE.

Variables	Exportations		FDI	
Exportations retardées.	+	La même variable mais retardée (tendances précédentes)	-/+	Positive si complémentaires Négatif si substituables
IDE retardés.	-/+	Positive si complémentaires Négatif si substituables	+	La même variable mais retardée (tendances précédentes)
L'ouverture des pays d'accueil.	+	Accès élevé pour les activités des multinationales dans la région.	+	Accès élevé pour les activités des multinationales dans la région.
Similarité entre les pays.	+	Des conditions favorables de développement sont attendues pour les investisseurs et les exportateurs entre les deux régions.	+	Des conditions favorables de développement sont attendues pour les investisseurs et les exportateurs entre les deux régions.

Différences de dotations relatives entre les pays.	-/+	Négative dans le cas intra branche, et positive dans le cas inter branche.	+/-	Positive avec les coûts relativement faible du travail, et négative si attirés par le secteur des services.
Taux de change bilatéral.	+/-	Positive si l'euro s'est déprécié, négative si euro s'est apprécié.	+/-	Positive si l'euro s'est apprécié, négative si euro s'est déprécié
La croissance du PIB des pays d'accueil	+	La croissance du PIB attire les IDE et les exportations.	+	La croissance du PIB attire les IDE et les exportations.
Distance entre les deux régions.	-	Négative, ce qui augmente les coûts des barrières commerciales, de transport et de transaction.	-	Négative, ce qui augmente les coûts des barrières commerciales, de transport et de transaction.
Indice de liberté économique (ILE).	-/+	Positif si l'environnement est favorable à l'IDE et aux exportations dans la région, et vice versa.	-/+	Positif si l'environnement est favorable à l'IDE et aux exportations dans la région, et vice versa.

Nous avons utilisé deux méthodes statiques et une méthode économétrique dynamique, de plus nous avons effectué de nombreux tests ultérieurs. Hausman et Taylor (1981) ont construit un modèle hybride de FEM et REM à l'aide de variables instrumentales (IV). L'idée de base du modèle HT est de trouver des instruments internes appropriés pour estimer tous les paramètres du modèle, y compris les variables invariantes dans le temps ; en termes empiriques le modèle HT est généralement estimé par la méthode des moindres carrés généralisés (GLS), Mitze (2010). Par ailleurs, Plumper et Troeger (2007) ont développé la méthode du vecteur de décomposition à effets fixes (FEVD). Ce modèle en trois étapes FEM



(en deux étapes none alternatives IV) permet d'estimer les paramètres des variables invariantes tout en tenant compte des problèmes d'endogénéité.

Arellano et Bond (1991) ont proposé la méthode des moments généralisés (GMM), estimateur du premier modèle; il apporte d'importants gains d'efficacité des estimateurs en exploitant la condition additionnelle d'orthogonalité associée à des retards de la variable endogène dans l'ensemble des instruments, (Egger et Merlo (2007)). Toutefois, les examens ultérieurs de la performance de l'échantillon fini des estimateurs GMM ont montré qu'il est sensiblement biaisé. Selon Nelson et Startz, (1990 (a et b)) et Hayakawa, (2005), une des sources de biais est la faiblesse des instruments. Deuxièmement, l'ampleur du biais est proportionnel à la taille relative du nombre d'instruments dans l'échantillon. Blundell et Bond (1998) ont montré que cela est dû à la faiblesse des instruments utilisés. Pour surmonter cette incohérence des estimateurs (faibles), ils ont proposé le système d'estimateurs GMM. Ils ont tout d'abord montré que les estimateurs GMM de Arellano et Bover (1995) sont des instruments sans biais lorsque le paramètre concernant la variable retardée est proche de un. Ils ont ensuite combiné les moments conditionnels, qui sont utilisés en première différence, et le niveau des estimateurs GMM pour améliorer l'efficacité des estimateurs, Hayakawa, (2005). Par conséquent, nous avons utilisé le système d'équations dynamiques sur données de panel (DPDsys) pour exécuter les différents tests.

Nous avons collecté des données depuis divers sources pour plusieurs variables comme suit: nous avons utilisé les données des variables dépendantes des IDE français sortants et les exportations françaises vers les pays du Sud et de l'Est de la Méditerranée (à savoir Algérie, Égypte, Jordanie, Liban, Libye, Maroc, Palestine, Syrie, Tunisie et Turquie).

Nous avons également utilisé les données du PIB de chaque pays  $J$ , avec celui de la France pour calculer les similarités entre la France et les autres pays (variable SIMI), selon la formule introduite précédemment concernant la variable SIMI.

Le PIB par habitant de la France et des autres pays est aussi utilisé pour calculer le proxy des dotations relatives en facteurs entre les pays, qui est la différence absolue du PIB par habitant

entre la France et ces pays, selon les formules introduites précédemment cela concerne la variable RLF.

Toutes les données proviennent de la base de données de la CNUCED, excepté les stocks des IDE français sortants qui sont issus de la base de données de l'OCDE.

La Distance pondérée<sup>1</sup> entre la France et chacun des  $J$  pays mentionnés est également incluse comme variable explicative. Nous avons obtenu les données de la variable de distance pondérée à partir du site du Centre d'Etudes Prospectives et d'Informations Internationales (CEPII): <http://www.cepii.fr/anglaisgraph/bdd/chelem.htm>.

L'indice de liberté économique (EFI) est compris comme variable indépendante. Les données ont été collectées à partir du site web (<http://www.heritage.org/Index/>).

Notre panel global de données se compose de «dix» pays  $J$  entre 1994-2009. De ce fait, notre base de données a des observations en séries temporelles par section transversale de dix pays  $J$ , ce qui revient à 160 observations pour l'ensemble des données de panel de l'échantillon.

Les variables sont utilisées en logarithme afin de réduire la multicolinéarité, les problèmes possibles de variables endogènes. Ces problèmes doivent être traités prudemment avec les données de panel dynamique.

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<sup>1</sup> La mesure de la distance pondérée utilise des données au niveau des villes pour évaluer la distribution géographique de la population à l'intérieur de chaque nation ; elle calcule la distance entre deux pays en fonction des distances bilatérales entre leurs plus grandes villes ; ces distances inter villes sont pondérées par la part de la ville par rapport à l'ensemble de la population du pays. Sont utilisées aussi les latitudes, les longitudes et les données de la population des principales agglomérations du pays. La formule de la distance utilisée est une moyenne généralisée de la distance bilatérale de ville à ville développée par Head et Mayer (2002).

Résultats:

Tableau (6): Estimation des modèles et des paramètres de long terme.

Equation d'exportation	DPDsys	Exports vers les pays $j$		
		Paramètre à long terme	Hausman-Taylor	FEVD
retardé 1	0.74*** (14.58)			
IDE	0.058** (2.03)	-	-0.004 (-0.19)	-0.00008 (-0.01)
retardé 1	0.0003 (0.01)			
retardé 2	-0.064** (-2.23)	-0.18		
RLF	0.244* (1.86)	0.94	0.59*** (4.91)	0.60*** (6.64)
SIMI	0.403*** (3.85)	1.55	0.88*** (7.03)	0.83*** (22.43)
La croissance du PIB	0.064* (1.84)	0.25	0.0006 (0.08)	0.0012 (0.17)
Taux de change bilatéral	0.0003** (1.97)	0.0012	0.14*** (3.32)	0.11*** (13.6)
L'ouverture des pays d'accueil	0.156 (1.01)	0.6	0.73*** (3.10)	0.46*** (6.15)
Distance	-0.25* (-1.81)	-0.96	-2.11*** (-2.67)	-2.11*** (-28.03)

Indice de liberté économique (ILE).	0.46** (2.44)	1.77	-0.01 (-1.58)	-0.44*** (-4.01)
Constant	2.81* (1.73)		19.62*** (3.19)	19.2*** (20.35)
N. d'observations	150		160	160
	Wald chi2(11) = 54305.66***		Serial corr. (Rho) = 0.94	adj. R-squared= 0.98
Equation d'IDE	Stock d'IDE français sortants			
IDE retardé (1)	0.56*** (8.73)	-		
Exportations	0.49 (1.6)	-	-0.14 (-0.48)	-0.011 (-0.08)
Exportations retardées (1)	-0.50* (-1.66)	-1.14		
RLF	0.80* (1.93)	1.82	2.04*** (4.38)	1.14*** (3.80)
SIMI	0.83*** (2.89)	1.89	3.35*** (7.26)	3.93*** (11.79)
La croissance du PIB	0.07 (0.53)	0.16	0.026 (0.94)	0.27** (2.12)
Taux de change bilatéral	0.0008 (1.55)	0.002	-0.28* (-1.75)	-0.5*** (-9.83)
L'ouverture des pays d'accueil	1.62** (2.33)	3.7	2.54*** (2.87)	1.6*** (4.32)
Distance	-1.06**	-2.41	-1.53**	-0.7**

	(-2.08)		(-1.89)	(-2.46)
Indice de liberté économique (ILE).	0.99 (1.61)	2.25	1.8* (1.73)	1.5*** (3.17)
Constant	-0.26 (-0.04)		-15.13 (-0.73)	-26.5*** (-6.7)
N. d'observation	150		160	160
	Wald chi2(10) = 3170.21***		Serial corr. (Rho) = 0.91	adj. R-squared= 0.85

Les symboles \*, \*\*, \*\*\* sont pour 10%, 5% et 1% significatifs.

Paramètre de long terme (coefficient) = paramètre estimé ABBB / (1-paramètre correspondant à la variable retardée). Le ABBB se réfère au modèle de Bover Arellano / Blundell Bond. Nous utilisons les estimateurs ABBB pour les calculs des paramètres de long terme.

Le facteur VIF est inférieur à « 3 » indique la non présence de problèmes de multicolinéarité.

De plus, nous avons exécuté le test de Sargan, qui n'a détecté aucun problème avec les instruments de l'analyse dynamique. Toutefois, nous sommes loin de rejeter l'hypothèse nulle tant que les restrictions d'identification sont valides. Le test de Sargan montre que toutes les restrictions sur les moments sont remplies pour les spécifications dynamiques, n'est pas rejeté au seuil de 1% de significativité.

Nous testons aussi l'autocorrélation, et l'hypothèse que la différence première des résidus est corrélée en série au premier et deuxième ordre peut être rejetée pour toutes les spécifications. Ceci est une condition nécessaire pour une instrumentation valide. Le test de corrélation sérielle est fort et robuste au premier ordre et encore davantage au second ordre.

La période de retard des exportations dans l'équation des exportations est significatif au seuil de 1% avec un coefficient de 0,74 ; ce dernier est plus fort que la période de retard de l'IDE dans l'équation de l'IDE, qui est de 0,56 et est significatif au seuil de 1%. Cela indique que les exportations françaises vers les  $J$  pays de la région sont fortement influencées par l'expérience des exportations antérieures vers la même zone.

Les sorties d'IDE français dans la même zone sont moins influencées par les activités antérieures des investisseurs; en revanche, l'IDE influence fortement les activités antérieures des exportateurs. Ainsi, les exportateurs apprennent de l'expérience des exportations antérieures dans la zone, plus que les investisseurs avec l'expérience des investissements précédents.

Dans l'équation des exportations, le volume des retards d'IDE est significatif au seuil de 1% avec deux périodes de retard ; comme nous l'avons expliqué précédemment, l'IDE a besoin d'un temps relativement plus long que les exportations pour influencer les exportations futures et être exécuté.

D'après les résultats, nous pouvons compter sur la relation significative entre les exportations et l'IDE dans l'équation les exportations.

Ce relation pourrait être découverte par l'analyse du système DPD qui est négatif (substitut), à la suite de résoudre les problèmes comme l'endogénéité et l'instrument faible.

Dans le même temps, si nous ne sommes pas considérés les périodes retardées dans les variables transversalement (les deux périodes de retard d'IDE), nous obtenons une relation positive (complément) entre les deux variables, à la présence des problèmes d'endogénéité et des autres problèmes.

De même, dans l'équation de l'IDE, les exportations retardées montrent un coefficient significatif au seuil de 5% et un coefficient négatif de 0,50 de valeur. Par conséquent, la relation de substitution entre les deux variables est prouvée par la valeur du retard dans le panel dynamique.

Les deux variables (stratégies) montrent une relation de substitution dans les deux modèles statiques (HTM et FEVD). Toutefois, cette relation n'est pas significative en raison du problème d'endogénéité.

La variable dotations relatives en facteurs (RLF) montre un signe positif, qui reflète la nature des échanges interbranches entre la France et les pays  $J$ . La relation positive entre l'IDE se réfère aux faibles coûts salariaux dans les  $J$  pays, qui causent l'augmentation de l'IDE, comme expliqué précédemment. Ces valeurs sont également significatives au seuil de 10%.

Les coefficients de distance sont négatifs dans les deux équations, ce qui traduit le rôle des barrières aux échanges commerciales, et d'autres coûts, tels que les coûts de transport et les coûts de transaction. Cette variable est significative dans les deux équations et dans les trois modèles.

La liberté économique (EFI) montre une relation positive avec les exportations et l'IDE, ce qui signifie que lorsque la politique de la zone des pays  $J$  tend à être plus libérale, elle attire les investissements étrangers et génère des exportations. Les modèles statiques montrent un signe négatif dans l'équation des exportations, mais nous nous fions plus aux résultats du modèle DPDsys.

La variable taux de change montre des effets positifs, indifféremment dans l'analyse statique ou l'analyse dynamique de l'équation des exportations, qui sont significatives au seuil de 1% dans les modèles statiques, et à 5% dans le modèle dynamique. Cela montre qu'une dépréciation de l'Euro renforce les exportations françaises. De même, la dépréciation montre des effets négatifs sur l'IDE dans les modèles statiques, ce qui s'accorde avec la prévision précédente. L'effet sur l'IDE dans la dynamique n'est pas significatif.

La croissance du PIB montre des effets positifs indistinctement sur les exportations ou l'IDE, et a presque le même coefficient sur les deux variables. La croissance du PIB indique que la croissance de la demande potentielle se reflète positivement sur les deux stratégies. Les

coefficients des variables, en général, et spécialement, les paramètres de long terme, montrent un fort effet des principales variables, que nous avons mentionné précédemment, sur les deux stratégies. Les variables SIMI, RLF, distance et les variables retardées ont le plus fort impact sur les IDE et les flux les exportations, par rapport aux autres déterminants inclus dans le modèle

Enfin, les variables indépendantes sont disposées en ligne avec les signes prévus; par conséquent, nous présentons les effets empiriques de la direction des variables indépendantes (signes) de la région et les périodes mentionnées précédemment, comme suit:

Le tableau indique la direction de la relation entre les variables, comme montré dans les résultats du modèle dynamiques.

Table (7): la relation entre les variables et les stratégies dans le modèle dynamiques.

Les variables	Exports	IDE
Exportation retardees	+	-
IDE retardés	-	+
L'ouverture des pays d'accueil	+	+
SIMI	+	+
RLF	+	+
Taux de change bilatéral	+	-
La croissance du PIB	+	+
Distance	-	-
Indice de liberté économique (ILE).	+	+



Nous concluons que l'analyse des données en panel souligne une relation négative claire entre les exportations et les IDE sortants, dans la zone mentionnée et la période. Les exportations ont un fort effet de substitution sur l'IDE, et vice-versa. De ce fait, tout accord commercial bilatéral pourrait faciliter les flux de marchandises dans la région, et serait susceptibles d'affecter significativement et négativement la situation des IDE dans la région.

Ainsi, les IDE et les exportations, qui sont principalement influencées par les mêmes facteurs peuvent s'expliquer mutuellement. En outre, les différentes variables indépendantes expliquent assez bien les variables dépendantes, et expliquent parfaitement les forces gravitationnelles qui affectent les exportations et les flux d'IDE, et cela indistinctement dans les modèles statiques ou dynamiques. Enfin, l'analyse dynamique (modèle ABBB) est plus à même d'expliquer les variables dépendantes et les relations entre ces variables par rapport aux modèles statiques.

## **Conclusion**

Dans le cadre de cette thèse, nous trouvons une forte indication de la relation de substitution entre les variables autant au niveau macro qu'au niveau micro. Bien que ces deux stratégies coexistent au niveau micro-économique, les principales caractéristiques de l'entreprise telle que la productivité montrent la présence d'un effet de substitution entre les exportations et l'IDE.

En somme, on peut considérer que cette thèse fournit des preuves évidentes de la relation de substitution entre les exportations et les sorties d'IDE, ou les stratégies des multinationales de servir les marchés étrangers. L'effet négatif sur les exportations de l'IDE est plus fort que l'effet négatif des IDE sortants.

En termes de politiques économiques, les implications sont les suivantes: l'augmentation des investissements à l'étranger va augmenter les emplois de la société affiliée, la présence économique sur le marché international et augmenter les transferts pour l'économie locale, qui ont une incidence positive sur l'économie locale. D'autre part, cette augmentation de la production locale à l'étranger répond à la demande étrangère, et diminue les exportations, la

production domestique et les emplois, qui ont un impact négatif sur l'économie domestique. Cet impact dépend de l'ampleur des transferts de l'économie locale et de la nature de la société affiliée. En outre, cet impact dépend de l'élasticité de substitution entre ces variables, d'où découlent le degré de développement et l'attractivité de l'économie. Il s'agit d'une question cruciale, qui pourrait être examinée dans les recherches futures



# Chapter One:

## Introduction

In the last decades, many theories rose to explain the capital and goods flows between nations, accompanied by a wide developments and discussion to explain the relationship between trade and FDI. Bilateral trade flow, different FDI type's impacts on trade, FDI determinants and the impact of inward FDI on exports and economic growth are widely investigated. Recently, the relationship between exports and outward FDI is a controversial question, which allows detecting the impacts on the local economy. This discussion rose with different wide theoretical and empirical evidences, at micro and macro level, Helpman et al. (2004); Head and Ries (2003 & 2004); Oberhofer and Pfaffermayr (2011).

In this thesis, we discuss this relationship and try to find a clear-cut long relationship between them. In the course of this discussion, we study the exports and FDI determinants, empirically at micro and macro level, to be able later to detect the relationship between these variables. Hence, our work in the thesis concentrates on the following:

At micro level, multinationals execute these activities (exports and FDI) to serve the foreign market, whereas the multinationals strategic decision should detect the determinants of the relationship between exports and FDI. Hence, the multinational companies' productivity and their other characteristics could detect the choice mechanism between strategies, and the relationship between them. This is our work in the first part, which is applied on the large, very large and both large and very large French companies' strategy decision.

At the macro level, many different macro determinants have been used in the literature to capture the behaviour of trade and FDI flows. Therefore, a bivariate gravity dynamic equations framework captures the recent determinants can detect the relationship between the

variables. This is our work in the second empirical part, which applied on ten selected Mediterranean countries.

The current thesis aims to contribute in answering about the relationship nature of these important economic indicators. These indicators relationship is important, whereas the positive (negative) relationship between them have positive (negative) impacts on the local economy as follows:

Export has multiple positive contributions to improve the macroeconomic indicators, achieving the macroeconomic stability and alleviating the macroeconomic problems, such as unemployment and trade deficit, accelerating economic growth and increasing the international competitiveness of local economy.

Similarly, companies' internationalization and increasing outward FDI improve the access for the external resources and markets, for which increases is the foreign affiliates' employment and financial transfers to the local economy.

Hence, the substitutional relationship should decrease the output and raising the unemployment in the long run, in case of FDI increasing. In contrast, the complementary relationship should stabilize the local economy and improve employment, growth, the foreign economic presence and competitiveness, and in turn boost a positive relationship with each other.

However, this is very essential for policy making, whereas the government formulation to the trade and foreign investment policies benefits from clear understanding of, how MNEs make decision choice between exports and FDI. For example, could the increasing of FDI tax cost induce more production at home? Or would less favorable tax treatment for income earned by overseas affiliates simulate the manufacturing sector at home and encouraging local production? If on the other side, the overseas activities tend to complete home activity, it may not actually be in domestic workers' interest to discourage overseas investment, because it will not increase the unemployment level.

The relationship between FDI and exports is complex since there are several aspects that must be taken into account. In addition, controversial literature discussion about the nature of the

relationship exists; although the theory supports the substitutional hypothesis, meanwhile, the complementary case is supported by many empirical researches.

Outward FDI and exports relationship is a new trend rose in economic literature, which leads to study MNEs strategy choice and the determinants of FDI and exports, at micro level<sup>2</sup>. The relationship between them has different aspects, where the discussion and examination at the company level leads to the MNEs strategy choice determinants. On the other hand, the country level discussion and examination leads to capital (outward FDI) and goods (exports) flows determinants, specially, in specific country or region<sup>3</sup>. Anyway, these determinants and the relationship between the outward exports and FDI determine the impacts on employment and growth in the local economy, affects positively or negatively, as mentioned before.

In addition, the overall and final effects on the home country could be shown by knowing the overall relationship between the exports and FDI (both types, vertical and horizontal). Hence, the dominant relationship between exports and outward FDI helps to understand the final effects of the multinational activities (and the relation between them) on the local economy, (employments and growth).

Finally, it has shown that the multinationals strategy choice between exports and FDI depends on two different characteristics groups, which would explain the multinationals strategy decision.

The two possible strategy of serving the foreign market are the exports and the FDI, where the productivity, company's economies of scales and the other company's characteristics influence the strategy decision at the company level. This is our main work in the first part.

On the other hand, the similarity between countries, relative factor endowments, market size and others influence the strategy decision on the country level. These country determinants are the driving forces behind the horizontal and vertical FDI, or both nested as explain the knowledge capital model with the same incentives forces.

Hence, the main determinants, which represent the driving force incentive behind the FDI types, are included in the econometric test of the thesis.

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<sup>2</sup> This is represented in our first empirical part.

<sup>3</sup> This is represented in our second empirical part.

Therefore, the contributions of this thesis are to examine empirically using different and recent econometric methods, and answer the following questions:

- ❖ What are the determinants (characteristics) influencing the multinationals choice between exports and FDI, (the micro level).
- ❖ To investigate the role of productivity on determining the multinationals strategy, and on the different company types (local, exporter, investor and both exporter and investor companies).
- ❖ To investigate the role of productivity proxy used, whereas we show a new proxy better than the traditional one. This new proxy takes into consideration the role of labour quality represented by the cost of employees instead of just the employees' number<sup>4</sup>.
- ❖ To investigate the role of characteristics horizontally, across company types; and vertically across company groups (large, very large and both together).
- ❖ To determine the determinants of exports and outward FDI in the Mediterranean area.
- ❖ To detect the nature of relationship between outward FDI and exports, at macro and micro level.

To achieve these goals, we proceed as follows:

- We introduce the general trends and statistics related with exports, FDI and Multinational Enterprises (MNEs), which is our work in chapter two.
- We analyse and review the recent theoretical literature and the theoretical base in the field, which is our work in chapter three.
- We investigate the French large, very large and both companies groups strategy choice between exports and FDI through the internal characteristics including productivity. In addition, we investigate the role of the characteristics marginal effects on large French companies' types,

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<sup>4</sup> The traditional productivity proxy is “revenue per employee”; meanwhile our new proxy is the “cost of employees divided on the revenues”.

including the local company. This is through the bivariate probit model, which is our work in chapter four.

- We run a gravity panel econometric analysis on the French outward FDI and exports in selected MENA countries, using two static and one dynamic econometric method, which is our work in chapter five.

In the following parts, we introduce and summarize our detailed work in the thesis, by chapter.

Chapter two called “FDI and Exports in France: Some stylized facts”, which provides facts about the FDI and exports trends. It starts with definitions of FDI, exports and MNEs, which are the key elements in the current thesis. We introduce general and latest facts of worldwide, European and Mediterranean trends and structure of FDI. We investigate the FDI and exports indicators globally, and with some selected Mediterranean countries including France. These two factors are the essential two indicators of globalization, which are a key to boost an economic development in the regions and countries. We also introduce the presence of the leading global multinational enterprises (MNEs) and clarifying the French presence in these enterprises. Later on, we introduce the large and very large French companies’ information, which is later, the data in the first empirical part.

Chapter three called “Foreign Direct Investment and Exports Relationship: Theories and Empirical Evidences”, which provides an overview of the theories of multinational enterprises (MNEs), (vertical and horizontal FDI). It looks at definitions, intuitions, previous literature, theories propositions and implications of each type of FDI. It shows the theoretical base of the controversial literature about the subject.

The theory gives strong justifications about the relationship with exports when distinguishing between the FDI types (vertical and horizontal). Hence, we review the theoretical base of the related theories, and their discussion about the relationship between exports and FDI. The theories present many different justification and explanation of the substitution and complementary cases between these variables. We review these theories and show the theoretical justifications of both cases. In addition, these discussions show the new trends of



explain the relationship between the variables, and lead us to review the determinants explain exports and FDI relationship. In fact, these trends concentrate on the company productivity role at micro level, and the dynamic analysis at the macro level.

We also review empirical researches discuss the relationship between trade, especially exports, and the FDI either at country, industry or company level. This led us to discuss determinants used to examine the company strategy choice between exports and FDI (the micro level), and the country level determinants for the subject. The review for the empirical evidences show the precise subject, the data, the methods and the results, where help to choose for our later work.

In brief, this chapter contributes to the limited literature about the relationship between the home country outward FDI and exports, which provide an overview and explanation of the theoretical views of the different possible relationships between the mentioned strategies. In addition, it presents the overview on relevant theories and their conclusion. It also provides a reviews the different determinants and variables applied and proxies derived to carry out econometric analysis, either at company or country level.

This chapter is a theoretical introduction to the empirical parts, as follows: firstly, we can study the relationship at company level, through the effects of the company characteristic including productivity on the multinational strategy choice between the activities, either exports or FDI. This determines the relationship between exports and FDI; in addition, it determines the micro determinants of the multinational activities. Secondly, we can study the relationship at the macro level to determine the overall relationship, and the macro determinants of the multinational activities, in the Mediterranean area.

Hence, finally, it is the theoretical base for the empirical models, and it provides the determinants for examining the relationship between exports and FDI, at micro (company strategy choice) and macro level (exports and FDI determinants).

Chapter four called “Companies’ strategy choice between FDI and Exports”; it’s our first empirical part, which provides an intensive examination for the company strategy choice according its internal characteristics, including the company productivity.

The chapter introduces Oberhofer and Pfaffermayr (2011) model in a comparative-static analysis of the model, which is an extended of Helpman et al. (2004) to three countries. It explains that the company strategy choice can be different between countries, according to their productivity and other company internal characteristics. It is a new trend in the economic researches, and the first application on the large French companies. It investigates the role of two characteristics groups, firstly, the main group, such as (company age, size, productivity, intangible assets and others); secondly, the control variables group, such as (independence, industry differences and others).

The theoretical model explains the main variables (characteristics), which influence the strategy choice, and can clarify the predicted signs of these variables on each exports and FDI. Other control variables are included in the empirical model with prediction of their role on the strategy choice. In addition, theoretical considerations provided of the predicted role of the main variables marginal effect, on the large and very large companies. I.e. we intensively and precisely provide expectations for the variables impacts, in addition to their marginal effects, on each company group.

Many differences are done empirically from the original model, as follows:

The application on one unique country is the first difference from the original model, which the data collected in one unified data environment concerning the variables (more homogeneous group), meanwhile, the data set, which includes a wide group of countries should bias the results. These biases such as the companies number differences; criteria of company classification and collecting the data are widely different between some countries in the European Union (EU)<sup>5</sup>. Hence, these empirical tests get results more robust, where we do it in one specific country with internal homogeneous characteristics; one unified legal, statistical and economical environment. In fact, this gives more interesting, trustable and confidence in the results. I.e. using data from different areas is not useful as much as using data from the same country with unified data environment.

The separation between the companies is a main difference from the original model, which the characteristics are theoretically different between the groups. I.e. the separation is

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<sup>5</sup> The original model includes ten countries with spectrum ranges from the United Kingdom and France as leading economic areas to the thirty thousand residents in Principedom Liechtenstein.

necessary between the productive companies (the large) and the more productive (the very large), as long as, the strategy should be different between the groups. Hence, the productivity role is better detected.

The productivity measure is important to detect the productivity role; hence, we use two productivity proxies. The traditional one, which measures the simple relationship between the company revenues and the employees' number; the new one measures the relationship between the revenues and the cost of employees. This is another important difference from the original model.

The empirical model includes bivariate equations framework, which are tested together, and each dependent variables explained by the same independent variables set. The tests followed by calculating the marginal effect of the main variables for each companies group. In addition, the marginal effects are calculated for four companies types, which are local, exporter, investors and both exporters and investors together.

We collect a cross section data from AMADEUS database for the large French companies, for the last available year (2009). We use the database classification of the large, the very large companies and independence; and collect for the other variables such as the two productivity proxies, intangible assets and the other variables. The variables are calculated (such as, age and average size in industry) and estimated by statistical software namely STATA. The data cannot provide the exports destination, and it is not available for other leading economies in Europe such as Italy and Germany.

The bivariate probit model used in our estimations, which allows for investigating two equations model rather than one. The Likelihood-ratio test of  $\rho = 0$  rejects the restricted model and approves correlation in the error terms. This shows that the model is appropriate for similar tests of the two strategies. These estimations are done for the three groups of companies, which are large, very large and both large and very large companies.

The results are robust and show significant differences between the companies groups, the different proxies of the productivity and the other companies' characteristics. This, in addition, to the differences of the companies' groups' characteristics justifies our methodology of separating the companies, and using different proxies. Our results also confirm the results of both, Helpman et al. (2004) and Oberhofer and Pfaffermayr (2011).

In addition, we concluded that the productivity proxy who represents the labour quality is more able to detect the role of productivity. The productivity increasing leads to more internationalization to the company, which substitute's FDI instead of exports.

Chapter five called "A panel data dynamic analysis of French exports and outward FDI in Southern and Eastern Mediterranean countries", which provides a macro panel data analysis for the relationship between exports and outward FDI in the Mediterranean basin. It also discusses the exports and FDI determinants in the same area. This chapter is continuous for our work in the thesis, which examines the relationship at country level, in addition to our company level work in chapter four.

A very limited work about the exports and FDI determinants at the mentioned area, and we do not find any serious work, which examines the relationship between these activities, specifically, for the mentioned area. This part tries to choose the more homogeneous host countries in the host area.

We do not find any recent model, which can capture the relationship between the variables and can satisfy the theoretical considerations of the relationship between them. Hence, we review the most important development in the gravity equation and the most important or recent related work, as an introductive to build a suitable model.

We derive a bivariate gravity equations framework, where we connect the equations transversely by including the explanatory variable at the right hand side of the other equation, as an explanatory variable. Each dynamic equation includes the two dependent variables in lags periods, besides the most recent determinants, which justified theoretically and examined empirically, of the explanatory variables. These variables such as similarity between countries and relative factor endowments are calculated according the recent formulas used in the literature. In fact, this structure allows for capturing the relationship between the dependent variables and capturing the exports and FDI determinants.

An intensive discussion for the theoretical considerations of the model and the variables, which leads to use the stock instead of the flow, predicts the variables signs and justifies theoretically the relationship with the dependent variables.

These variables are collected from UNCTAD, OECD, Heritage and CEPII, for ten countries (Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia and Turkey) and period from 1994-2009.

Theoretically, the FDI requires a longer period than the exports to be executed, and start influencing the exports<sup>6</sup>, where it is new development on the model. This should ensure avoiding the endogeneity problem, and captures the real effects of FDI and helps to get the relationship between the variables.

In fact, the econometric methodology is one of important new contributions of the chapter, where we do not find any study using the Dynamic Panel Data system (DPDsys) to test the relationship. The other usual methods for the subject or the related subject usually used the Fixed Effect Model (FEM), Random Effect Model (REM), Hausman-Taylor Model (HTM) or Arellano Bond (1991). In general, these methods suffer from many problems and could not be the best for examining similar subject. The time invariant variables, not allow for dynamic examination of the model or using a weak instruments, which affect the parameters efficiency, where are the problems of the last methods. Meanwhile, the method we used (DPDsys) can face these problems efficiently. In addition, we use two additional static methods, which are HTM and the Fixed Effects Vector Decomposition (FEVD), these two static methods are estimated for the comparison purposes, and we rely in our results and interpretation on the dynamic one.

All the possible post estimations are done for the robustness reasons, where we tested for the multicollinearity using the variance inflation factor, and Sargan test for the validity of the instruments used, and the Arellano-Bond test for zero autocorrelation in first-differenced errors for the autocorrelation problem. We show the covariance matrices and model tests show high robustness and the good significance parameters.

The panel data analysis emphasizes a clear-cut substitution relationship between the exports and outward FDI, whereas exports have a very strong substitutional effect on FDI, comparing to the same negative effect of FDI on exports. Hence, FDI and exports can explain each other,

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<sup>6</sup> The exports to specific country or area can satisfy the demand, and affect the FDI during one year; meanwhile the foreign capital needs more time to establishing the affiliate and start satisfying the demand and influencing the exports.

as expected previously, and the two variables influenced mainly by the same factors, which are well explaining the dependent variables, in either the static models or the dynamic one.

In brief, this thesis introduces a new theoretical discussion for a controversial question in the economic theory, about the relationship between the exports and the FDI. This discussion leads to the most recent, important and driving forces behind the FDI and exports movements. These determinants examined at the micro level from the company strategy choice, point of view, which show the company characteristics, (including the productivity), impact on the choice of strategy of serving the foreign market. The role of these characteristics on the strategies (FDI and exports) shows the relationship nature between them. This applied on the large, very large and both groups of French companies using the bivariate probit model.

At the macro level, the most recent macro level determinants examine the French exports and outward FDI in ten selected Mediterranean countries. This shows the role of these determinants and the relationship between these variables. The structure of the gravity model and the econometric methods are considered well to acquire the best and robust results. Hence, we apply a bivariate dynamic gravity panel data econometric framework using the Dynamic Panel Data system method, which shows clear-cut robust results.

Finally, we can say that this thesis provides strong evidences for the substitutional relationship between exports and outward FDI, or the multinationals strategies of serving the foreign market. The negative exports effect on the outward FDI is stronger than the negative effect of the outward FDI. However, these effects proved to be strong.



# Chapter Two

## FDI and Exports in France: Some stylized facts

In this chapter, we provide facts about the FDI and exports trends, we start with definitions of FDI, exports and MNEs, which are the key elements in the current thesis. We introduce general and latest facts of worldwide, European and Mediterranean trends and structure of FDI. We investigate the FDI and exports indicators globally, and with some selected Mediterranean countries including France. These two factors are the essential two indicators of globalization, which are a key to boost an economic development in the regions and countries. We also introduce the presence of the leading global multinational enterprises (MNEs) and clarifying the French presence in these enterprises. Later on, we introduce the large and very large French companies' information, which is later, the data in the first empirical part.

In fact, the exports and the FDI amounts are increasing rapidly; for either the exports amounts or FDI flow or stock. In addition, the multinational enterprises role is widely increased in the last decade, especially, the biggest one. The presentation of these important indicators about FDI, exports and the MNEs show the importance of studying the relationship between both indicators and, in addition, the study of the MNEs strategy choice. Hence, this chapter introduce a brief description of these indicators statistics globally, regionally and the French presence in this field.

These indicators trends and fluctuation can essentially affect the local economies indicators, such as (employments, growth and trade balance). This chapter supports the choice of studying the large French companies' strategy choice in chapter four; and the macro analysis of these French indicators in the Mediterranean countries in chapter five. The choice of studying exports and FDI in this area concerns to the sever lack of this research in the mentioned area; and because the capital and goods movements are expected to be strongly reinforced in the perspective future, in the Mediterranean basin.



## 2.1 Introduction and definitions:

In this section, we present the definitions of FDI, exports and MNEs (parent (Headquarters), affiliate and subsidiary); we use general common definitions for these terms, which are used frequently in the current chapter and the thesis.

### Firstly, FDI definition:

In fact, there is no general FDI definition, but all different definitions have the same general features. They distinguish FDI from portfolio investment, and other matters of the strategic relationship between the direct investor and direct investment enterprise from one side. Moreover, the lasting interest of a significant degree of influence from the other side. We overview the foreign direct investment concepts and try to combine the general definitions and concepts of each United Nations Conference on Trade and Development (UNCTAD) and Organization for Economic Co-operation and Development (OECD).

Hence, the noted definition of FDI could be as:

*The foreign direct investment is a direct investment involving a strategic long-term relationship and reflecting a lasting interest of a resident entity in one economy (direct investor) in an entity (direct investment enterprise) resident in an economy other than of the investor. The direct investor's purpose (lasting interest) is to exert a significant degree of influence on the management of the enterprise resident in the other economy. FDI involves both the initial transaction between the two entities and all subsequent transactions between them, and among affiliated enterprises, both incorporated and unincorporated. Foreign direct investment may be undertaken by individuals, as well as business entities, UNCTAD, OECD, (1996) OECD (2008).*

Direct investment may also allow the direct investor to gain access to the economy of the direct investment enterprise, which it might otherwise be unable to do. The objectives of

direct investment are different from those of portfolio investment whereby investors do not generally expect to influence the management of the enterprise.

Hence, the degree of influence and the strategic long-term relationship are the key concepts in the definition to distinguish between FDI and the portfolio investment. While a portfolio investment generally involves a smaller share of ownership and short term activities, FDI differs from portfolio investment. FDI is recorded when a foreign investor owns at least ten percent of an entire equity, which accounts for controlling an enterprise as well, some compilers argue that the ten percent ownership is still depend of realizing a significant influence. In addition, the recommended methodology does not allow any qualification of the ten percent threshold and recommends its strict application to ensure statistical consistency across countries, OECD, UNCTAD glossary.

**Secondly, exports definition:**

*Exports should represent the value of the enterprise's (or enterprise group's) total exports of goods and services, including its exports to its foreign affiliates, UNCTAD Glossary.*

Merchandise exports should be valued free on board (f.o.b.) at the frontier of the exporting country (IMF, Balance of Payments Manual, chapter X).

Exports and imports of services cover the enterprise's exports and imports of transportation and travel services, communications, construction, insurance, financial, computer and information services, royalties and license fees, and other business, personal, cultural and recreational services. Exports should also include any sales, which the enterprise makes to foreign embassies and international institutions located in its country (IMF, Balance of Payments Manual, chapters XI, XII, and XIII).

### **Thirdly, MNE definition:**

*A MNE is an enterprise, which is irrespective of its country of origin and its ownership, including private, public or mixed, which comprises entities located in two or more countries. They are linked, by ownership or otherwise, such that one or more of them may be able to exercise significant influence over the activities of others and, in particular, to share knowledge, resources and responsibilities with the others. MNEs operate under a system of decision making which permits coherent policies and a common strategy through one or more decision-making centre, (UNCTAD & OECD) Glossary, OECD (2008).*

The OECD argued that either directly or indirectly ownership of 10% or more of its voting power if it is incorporated or the equivalent for an unincorporated enterprise.

The numerical threshold of ownership of 10% of the voting power determines the existence of a direct investment relationship between the direct investor and the direct investment enterprise. An ownership of at least 10% of the voting power of the enterprise is regarded as the necessary evidence that the investor has sufficient influence to have an effective voice in its management.

In the above definition, the term entities refer to both parent and affiliate enterprises, defined below, and other enterprises.

***Parent enterprise:** is an incorporated or unincorporated enterprise or group of enterprises, which has a direct investment enterprise operating in a country other than that of the parent enterprise, (UNCTAD & OECD) Glossary, OECD (2008).*

***Affiliate enterprise:** is an incorporated or unincorporated enterprise in which a foreign investor (individual or entity) has an effective voice in management. Such an enterprise may be a subsidiary, associate or branch. It is possible for a given enterprise*

*to be a member of two or more groups of affiliated enterprises.*  
(UNCTAD & OECD) Glossary, OECD (2008).

*Subsidiary enterprise is an incorporated enterprise in the host country in which another entity directly owns more than half of the shareholders voting power, or is a shareholder in the enterprise, and has the right to appoint or remove a majority of the members of the administrative, management or supervisory body.* (UNCTAD & OECD) Glossary, OECD (2008).

## **2.2 FDI in France**

In the first section, we introduce the economic outlook of FDI; we present the recent trends of worldwide and European FDI flow and structure. Later on, we describe the recent trends and patterns of FDI in France.

### **2.2.1 Recent trends in FDI in France and the world**

The flow of FDI has grown fast in the nineties decade, and it grown faster over the last decade in the current century. Higher flow of FDI over the world always reflects a better economic environment in the presence of economic reforms, investment oriented policies and multinationals reinvested earnings increasing. This reflects a rapid increase in both the volume of FDI and number of multinationals, because of the accelerated process of globalization and privatization in the world economy, UNCTAD (2010).

Outflow and inflow changed in all three groups of economies: developed countries, developing countries and the transition economies similarly to the worldwide change, meanwhile the developed countries play the essential role for the world wide change as the major sources and recipients of the FDI in the world as shown in outflow changes in the figure 2.2.

According to figure 2.1 based on the UNCTAD FDI database, there has been an overall phenomenal increase in the inflows of FDI in the last two decades around the world, the

general trend increased sharply since the start of the new millennium. We note that the first peak approached the record level of 1401 billion dollar in 2000 that is the highest realized worldwide amount of FDI inflow in the first half of the first decade. The inflow dropped sharply in 2001 and continue until 2003 where started rapid recovery in 2004 and lately realized the highest three inflows amounts in the second half of the first decade. These peaks are higher than the year 2000 peak in years 2006, 2007 and 2008, where the highest peak ever realized was in 2007 with 2,099 US billion dollars, UNCTAD (2010).

Similarly the realized worldwide FDI outflow follow the same curve down with the inflow with the peak in 2000 of 1,233 US billion dollars that decreased rapidly in 2001 and started to recover in 2003, with the three higher amounts in 2006, 2007 and 2008 than the year of 2000. The highest worldwide outflow ever realized with 2,268 US billion dollar, similarly in year of 2007. The differences in the criteria and instruments of measurements between countries cause none equality between the inflow and out flow, as shown in the figure (2.1)<sup>7</sup>.

In 2008 and early 2009, FDI flows declined globally following a period of continuous growth from 2003 to 2007, except a very small decline in the outflow in 2005. Meanwhile, the developing and transition economies share in the world FDI flows increased to nearly 43% in 2008, UNCTAD (2010). FDI initially began to decline sharply in developed countries, which realized a nearly 30% fall in their inflows, while flows to developing countries and to the transition economies of South East Europe (SEE) and the Commonwealth of Independent States (CIS) continued to increase respectively, by nearly 12% and 26% in 2008. However, in late 2008 and 2009, the latter two groups of countries also started to feel the impact of the crisis on their inflows. A number of these economies have experienced a significant fall in FDI inflows throughout 2009. Anyway, they improved relatively, away from the global disturbances in 2008, where they affected in 2009 but they did better than developed countries. After six years of continuous growth, the developing countries FDI inflows declined by 24 per cent in 2009, as shown in table 2.1. In 2009, the developed countries FDI inflows declined by nearly 44 per cent, to 565 billion US dollar. Remarkably, however, this contraction was relatively smaller than the decline in the previous downturn of 2000-2003, UNCTAD, (2010).

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<sup>7</sup> These reasons and others explained in chapter five, push to prefer the FDI stock instead of flow, in the econometric tests and in investigating the relationship with exports.

In the first half of 2010, this sharp decline realized a slight recovery, causes some cautious optimism for FDI in the short term. In the longer term, the FDI flows are expected to be in more momentum based on the expected forthcoming global recovery. Global inflows are expected to reach over 1.2 trillion US dollar in 2010, rise further to 1.3-1.5 trillion US dollar in 2011, and head towards 1.6-2 trillion US dollars in 2012. However, these FDI prospects are fully risks and uncertain, and could just realize a weak global economic recovery, OECD (2010); UNCTAD (2009a); UNCTAD (2010).

Figure 2.1: The world inflow and outflow

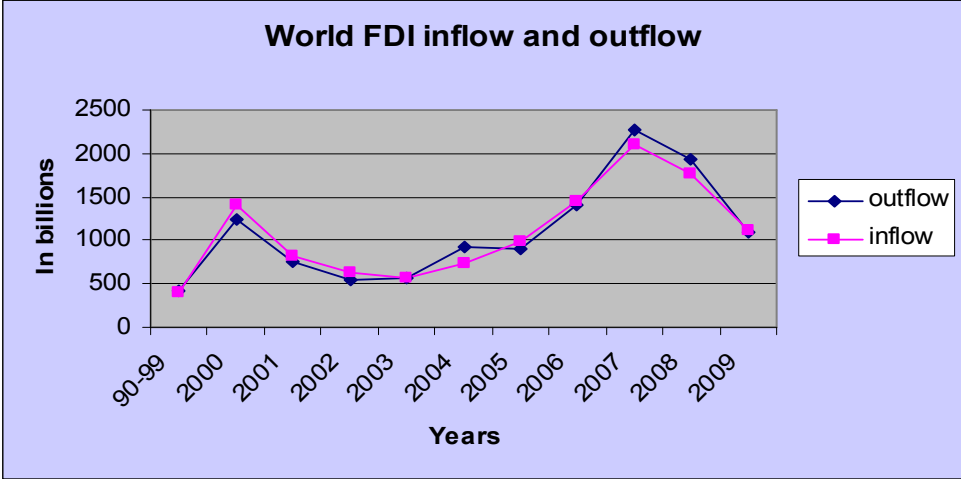


Table 2.1: World, economic groups and leading countries FDI inflow and outflow, 90-09.

<b>Region (Outflow)</b> billions	<b>90-99<sup>a</sup></b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
World	416	1233	753	537	565	920	893	1410	2268	1928	1101
Annual change (%)		1.96	-0.39	-0.29	0.05	0.63	-0.03	0.58	0.61	-0.15	-0.43
Developed countries	370	1094	667	482	509	785	751	1158	1923	1571	820
Annual change (%)		1.95	-0.39	-0.28	0.06	0.54	-0.043	0.54	0.66	-0.18	-0.48
European Union	225	813	435	265	285	367	612	694	1287	915	388
Annual change (%)		2.61	-0.46	-0.39	0.08	0.29	0.67	0.13	0.85	-0.29	-0.58
United States	86	142	124	134	129	294	15	224	393	330	248
Annual change (%)		0.65	-0.13	0.08	-0.04	1.28	-0.95	13.93	0.75	-0.16	-0.25
Japan	0.6	31	38	32	28	30	45	50	73	128	74
Annual change (%)		-	0.23	-0.16	-0.13	0.07	0.5	0.11	0.46	0.75	-0.42
China	2	0.9	6	2	2	5	12	21	22	52	48
Annual change (%)		-	6.7	-0.67	0	1.5	1.4	0.75	0.05	1.36	-0.08
France	39	177	86	50	53	56	114	110	164	161	147
Annual change (%)		3.54	-0.51	-0.42	0.06	0.06	1.04	-0.04	0.49	-0.02	-0.09
Developing countries	44	134	82	49	45	120	127	228	292	296	229
Annual change (%)		2.05	-0.39	-0.4	-0.08	1.67	0.06	0.79	0.28	0.014	-0.23
<b>Inflow</b>	<b>90-99<sup>a</sup></b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
World	401	1401	825	628	565	732	985	1459	2099	1770	1114
Annual change (%)		2.49	-0.41	-0.24	-0.10	0.30	0.35	0.48	0.44	-0.16	-0.37
Developed countries	279	1137	601	440	361	410	624	970	1444	1018	565
Annual change (%)		3.08	-0.47	-0.27	-0.18	0.14	0.52	0.55	0.49	-0.30	-0.44
European Union	160	698	383	309	259	213	502	586	923	536	361
Annual change (%)		3.36	-0.45	-0.19	-0.16	-0.18	1.36	0.17	0.58	-0.42	-0.33
United States	89	313	159	74	53	135	104	237	265	324	129
Annual change (%)		2.51	-0.49	-0.53	-0.28	1.55	-0.23	1.28	0.12	0.22	-0.60
Japan	2	8	6	9	6	7	2	-6	22	24	11
Annual change (%)		3	-0.25	0.5	-0.33	0.17	-0.71	-4	-4.67	0.09	-0.54
China	29	40	46	52	53	60	72	72	83	108	95
Annual change (%)		0.38	0.15	0.13	0.02	0.13	0.2	0	0.15	0.30	-0.12
France	22	43	50	49	42	32	84	71	96	62	59
Annual change (%)		0.95	0.16	-0.02	-0.14	-0.24	1.63	-0.15	0.35	-0.35	-0.05
Developing countries	118	256	214	176	183	291	330	434	564	630	478
Annual change (%)		1.17	-0.16	-0.18	0.04	0.59	0.13	0.32	0.30	0.12	-0.24

a Annual average

Source: UNCTAD, FDI data base, (<http://stats.unctad.org/FDI/>).

In general the worldwide outward FDI follows the leading developed economies, where the huge part of the flow belong to these countries and the increasing of the outflows causes a recovery in the global economy. On the other side, the decreasing in the worldwide inflows could show less attractively position to a developed economy as a cause of the deterioration (depression) in the global economy, which makes the advanced economy less attractive for

the FDI. The developed countries are source of the financial crisis, where influenced stronger than other regions of the FDI inflows.

Global FDI outflows in 2009 declined by nearly 43 per cent to 1101 billion US dollar reflecting also the trend in inflows. The global economic and financial crisis continued to weigh on FDI outflows from developed countries for 2008 and 2009, UNCTAD (2010). In addition, it started to affect outflows from developing and transition economies. Early 2010 data point to a modest recovery, though global FDI outflows rose by about 20 per cent in the first quarter of 2010 compared to the same period in 2009, which refers the recovery from the financial crisis, UNCTAD (2010). Major investor economies such as Germany, Sweden and the United States, besides, 26 countries of 51, recorded an increase in FDI outflows in the first quarter of 2010, largely reflecting stronger economic growth, higher profits for MNEs, and a better predictable economic climate, UNCTAD (2010). While the decline of FDI outflows from developed countries was widespread in 2009, with some exceptions such as, Denmark, Ireland, Norway and Sweden, the developed countries still the largest source of FDI, with outflows largely higher than the inflows. The global economic and financial crisis strongly and negatively influenced FDI in various sectors and industries of developed countries unevenly. In the manufacturing sector, cross-border M&A (Merger and Acquisitions) sales and purchases declined by around 80 per cent, while the decline in services was less pronounced, UNCTAD (2010). Industries that were hardly influenced by the economic crisis, such as automobile and machinery, UNCTAD (2010).

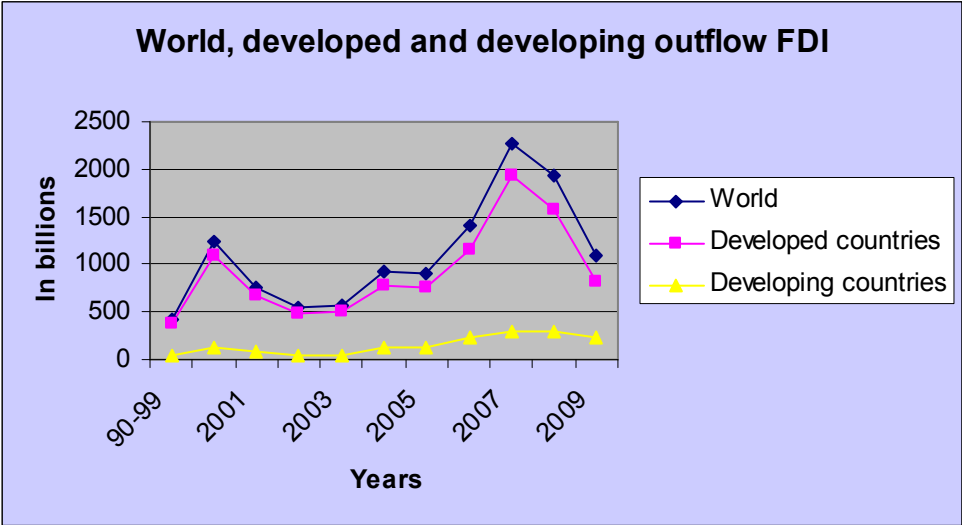
FDI outflows from the United States decreased sharply in their equity capital by 127 billion dollar due to some large divestments of foreign affiliates in European Union (EU) countries. For example, FDI outflows from the United States to Sweden were negative at 10 billion dollar. This negative value means that companies from the United States divested more than they invested in Sweden in 2009, UNCTAD, (2010).

Outflows from the United Kingdom declined by 89 per cent in 2009. In the European Union, FDI outflows fell by 224 billion dollar, lower than their 2005 level. In France, the FDI outflow shows higher amounts than the FDI inflow for the whole period, which reflects strong economic growth and high efficiency of the MNEs activities, as shown in the figure 2.3.



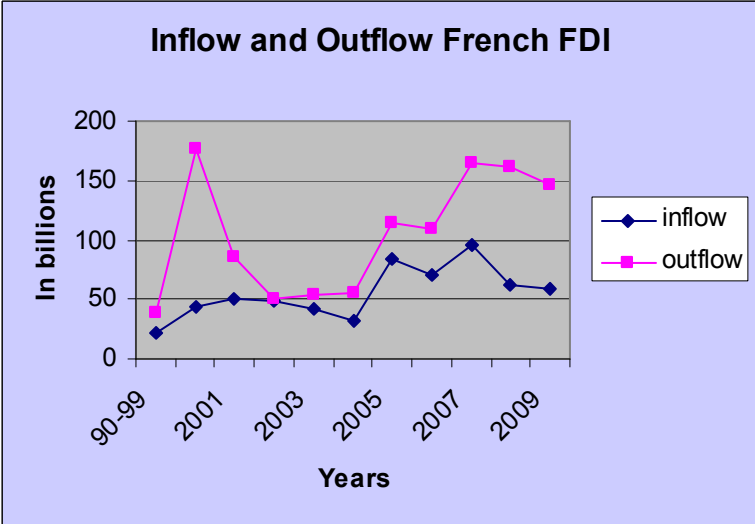
Outflows from developing countries amounted to 229 billion US dollar in 2009, a fall of 23 per cent over the previous year, after annual average of 55 percent of five years positive trend. In the developed countries, the reduction was stronger than the developing countries. The developing and transition economies increased their share to 25 per cent compared to 19 percent in 2008, which reflects the enforcing of their global position as emerging sources of FDI in 2009, UNCTAD (2010).

Figure 2.2: The outflow FDI of the worldwide main groups.



Source: UNCTAD, FDI data base, (<http://stats.unctad.org/FDI/>).

Figure 2.3: The French inflow and outflow of FDI.



Source: UNCTAD, FDI database, (<http://stats.unctad.org/FDI/>).

The worldwide largest FDI recipients confirm that United States maintained its first position and three developing and transition economies, which are China in the second rank, Hong

Kong, China in the fourth rank and Russian federation in the sixth rank were from the six largest recipients of foreign investment in the world in 2009, and France was the third recipient. The largest recipients of FDI in 2009 in the European Union (EU) are France, the United Kingdom (UK) and Germany respectively. On the other hand, France as a home economy occupied the second global rank in 2008 and 2009, UNCTAD (2010).

The emergence of some developing and transition countries confirm that the developed countries as a destinations of FDI are less interesting comparing to the developing countries, and is likely to continue so in the near future, UNCTAD (2011).

The annual growth rate of global FDI inflow rose from 22.5 percent in (1991-1995) period to 40 percent between years (1996-2000), because of the huge increase in 2000. Later it rose stably of 5.2% in (2001-2005) period, lately it sharply declined in 2008 and 2009 with nearly 16 and 37 percent respectively. Similarly, the outward global FDI rose by 16.8, 36.1 and 9.2 for the first three periods mentioned above, and declined lately steeply and steadily by 15 and 43 percent in 2008 and 2009 respectively. Meanwhile the global GDP in the current prices for the same periods mentioned above 5.9, 1.3, 10, 10.3 and -9.5 percent, UNCTAD (2010).

Table 2.2: World, regions, and leading countries FDI stocks, 1990 – 2009 in billions.

<b>Region(Outward)</b>	<b>90-99<sup>a</sup></b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
World	3744	7967	7684	7764	9866	11639	12416	15661	19313	16206	18982
Annual change (%)		1.13	-0.04	0.01	0.27	0.18	0.07	0.26	0.23	-0.16	0.17
Developed countries	3383	7083	6779	6832	8824	10411	10956	13682	16506	13585	16010
Annual change (%)		1.09	-0.04	0.008	0.29	0.18	0.05	0.25	0.21	-0.18	0.18
European Union	1349	3493	3485	3740	4831	5558	5764	7293	8913	8068	9006
Annual change (%)		1.59	-0.002	0.07	0.29	0.15	0.037	0.27	0.22	-0.09	0.12
United States	1450	2694	2314	2022	2729	3362	3637	4470	5274	3103	4302
Annual change (%)		0.86	-0.14	-0.13	0.35	0.23	0.08	0.23	0.18	-0.41	0.39
Japan	250	278	300	304	335	370	386	449	542	680	740
Annual change (%)		0.11	0.08	0.013	0.10	0.10	0.043	0.16	0.21	0.26	0.09
China	16	27	34	37	33	44	57	73	95	147	229
Annual change (%)		0.68	0.26	0.09	-0.11	0.33	0.30	0.28	0.30	0.55	0.56
France	203	925	798	638	946	1153	1232	1609	1805	1308	1719
Annual change (%)		3.56	-0.14	-0.20	0.48	0.22	0.07	0.31	0.12	-0.28	0.31
Developing countries	356	862	859	866	947	1116	1308	1755	2420	2393	2691
Annual change (%)		1.42	-0.003	0.008	0.09	0.18	0.17	0.34	0.38	-0.01	0.12
<b>Inward</b>	<b>90-99<sup>a</sup></b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
World	3634	7442	7468	7519	9372	11055	11524	14275	17990	1549	17743

										1	
Annual change (%)		1.05	0.003	0.007	0.25	0.18	0.042	0.24	0.26	-0.14	0.15
Developed countries	2725	5653	5592	5652	7216	8525	8535	10526	12858	1085	12352
Annual change (%)		1.07	-0.01	0.01	0.28	0.18	0.001	0.23	0.22	-0.16	0.14
European Union	1152	2322	2480	2954	3883	4747	4690	5969	7568	6669	7447
Annual change (%)		1.02	0.07	0.19	0.31	0.22	-0.01	0.27	0.27	-0.12	0.12
United States	1228	2783	2560	2021	2454	2717	2817	3293	3596	2552	3120
Annual change (%)		1.27	-0.08	-0.21	0.21	0.11	0.04	0.17	0.09	-0.29	0.22
Japan	23	50	50	78	89	96	100	107	132	203	200
Annual change (%)		1.17	0%	0.56	0.14	0.08	0.042	0.07	0.23	0.54	-0.02
China	96	193	203	216	228	245	272	292	327	378	473
Annual change (%)		1.01	0.05	0.06	0.06	0.08	0.11	0.07	0.12	0.16	0.25
France	171	390	384	441	653	867	888	1107	1260	920	1132
Annual change (%)		1.28	-0.01	0.15	0.48	0.33	0.02	0.25	0.14	-0.27	0.23
Developing countries	893	1728	1788	1751	2002	2331	2713	3352	4452	4213	4893
Annual change (%)		0.94	0.03	-0.02	0.14	0.16	0.16	0.24	0.33	-0.05	0.16

a Annual average

Source: UNCTAD, FDI Data base, (<http://stats.unctad.org/FDI/>).

FDI inward stock increased by nearly 15 percent in 2009, where reaches nearly 17.8 trillion US dollar. This rise, however, also reflects the improvements in the global stock markets performance, at the end of 2009, as FDI stock is usually valued at market price, as opposed to book value. In contrast, deterioration stock markets and currency depreciations in the US dollar had resulted in a 14 per cent decline in inward FDI stocks in 2008. These depreciations also further reduced FDI stock when measured in United States dollars, which the depreciations in the US dollar reduce the accumulated values of the FDI stocks. In contrast, the FDI measure of stable local currency could reflect FDI stock increasing. Such as the UK case in 2008, which FDI stock with the US dollar measure decreases in 282 billion, but increases in 52 billion £ (sterling pound), UNCTAD (2010), OECD (2010).

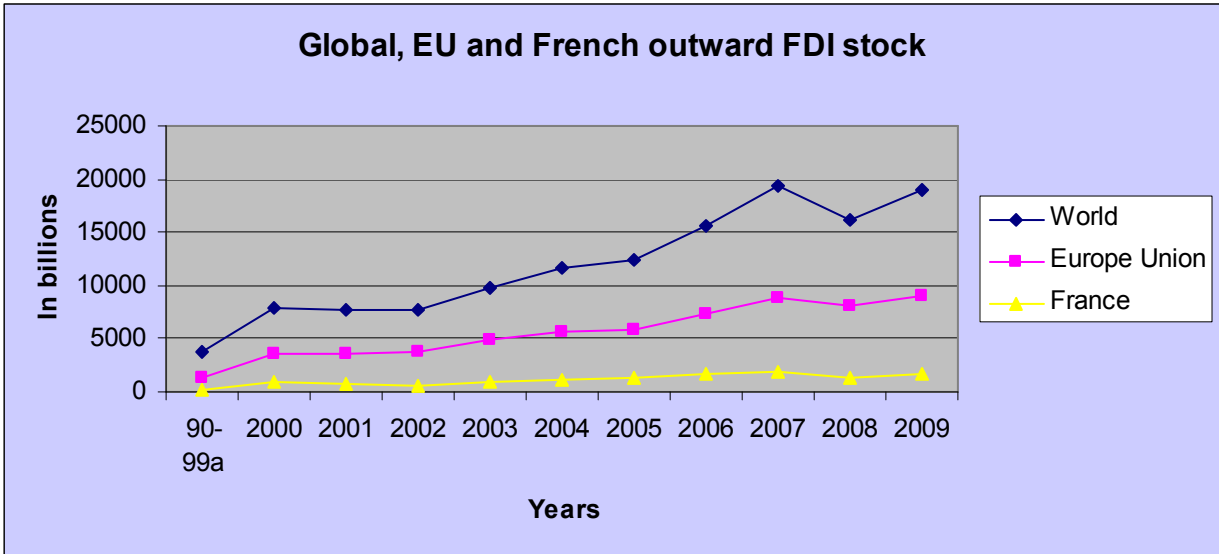
FDI inflows decreased in 2009 in the three major groups (the developed, the developing and the transition economies). This global decline reflects a fragile economic performance in many parts of the world, as well as the reduced financial capabilities of MNEs. Although, foreign affiliates' assets increased by 7.5 per cent in 2009, thanks to the largely increase in inward FDI stock mentioned before by 15 per cent. The increase in FDI stock was a result to the significant reduces of global stock markets as well as continued investment inflows of FDI, which remained positive but expanded at a reduced much more than before, UNCTAD (2010). FDI stock and assets continued to increase despite the final impacts on MNEs sales

and value added by the crisis, and the share of developing country MNEs in global production is grown, UNCTAD, (2009b, 2010).

The improvement of macroeconomic conditions continue gradually, corporate profits and stock market performance observed already in modest global term that continued in 2010, supporting rebound in business confidence. In addition, the recovery of FDI inflows in 2010 is stronger in developing countries than the developed countries. As a result, the trend in foreign investment inflows towards developing and transition economies is expected to accelerate in the foreseeable future, as shown in the main recipients countries before, UNCTAD (2010), UNCTAD (2011).

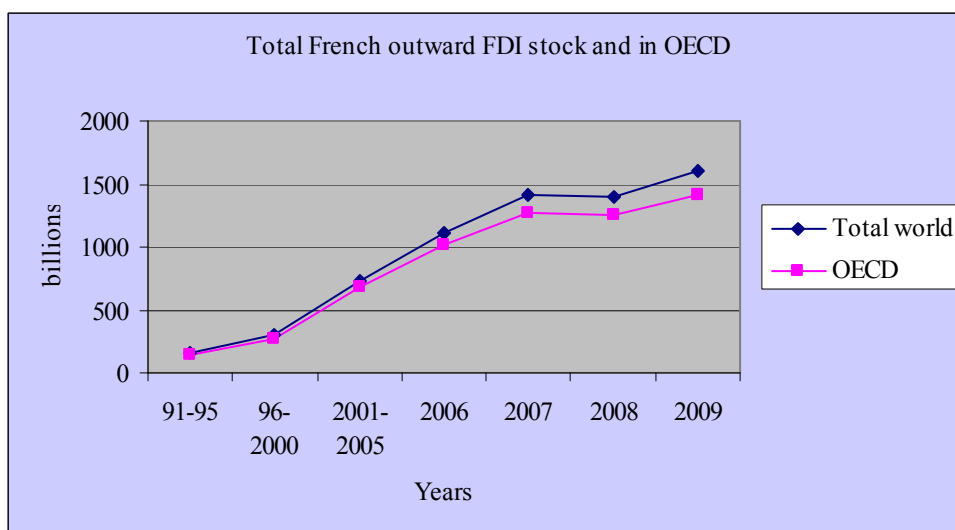
This trend already show during the period 2007-2009, where the developing countries show better annual increase in 2007 and 2009. Moreover, they show less decrease in 2008 comparing to the world and developed countries average. This is due to the economic growth in these economies and their significant reforms, as well as an increase in their openness to FDI and international production. As a result, developing and transition economies FDI inflows share now is accounted for nearly half of global one, UNCTAD (2010).

Figure 2.4: The Global, European and French outward FDI stock.



Source: UNCTAD, FDI data base, (<http://stats.unctad.org/FDI/>).

Figure 2.5: The OECD share to the total French outward FDI stock.



Source: UNCTAD (2010), FDI data base, (<http://stats.unctad.org/FDI/>).

The graph 2.5 shows that a high percentage of the French outward FDI is placed in the OECD countries. This percentage shows, in average, a higher than ninety percent for different years and periods. This could indicate, in general, a market seeking nature of the French outward FDI, which the majority is placed in the developed countries, (OECD).

Table 2.3: Highest three categories of world FDI inflow and outflow, in 2009.

Range	Inflow	Outflow
Above 100 billion US \$	United states	US and France
From 50 to 99 billion US \$	France	Japan and Germany
From 10 to 49 billion US \$	United Kingdom, Germany, Belgium, Italy, Luxembourg, Netherlands, Ireland, Australia, Canada, Spain, Japan, Poland and Sweden	Italy, Canada, Norway, Sweden, Ireland, United Kingdom, Australia, Netherlands, Spain, Denmark, Switzerland and Luxembourg

UNCTAD (2010)

Table 2.3 shows that France is placed in the highest worldwide category of the outflow FDI, besides the United States. On the other side, it takes place in the second category of FDI inflow. This also shows that the French outflow is higher than the inflow, not just in the 2009,

but for the all period from 1990 as shown in figure 2.3 before. In addition, table 2.3 shows that the biggest sources and recipients categories are developed countries.

Table 2.4: French outward and inward stocks and flows of FDI as a percentage of the GDP

Percentage/year	91-95 <sup>a</sup>	96-2000 <sup>a</sup>	2001-2005 <sup>a</sup>	2006	2007	2008	2009
French FDI Outflow /GDP	1.704	5.95	4.192	4.87	6.32	5.63	5.5
French FDI Inflow /GDP	1.286	2.31	3.002	3.16	3.7	2.17	2.23
French Inward FDI stock/GDP	10.542	17.848	35.678	48.8	48.5	32.2	42.3
French Outward FDI stock/GDP	12.124	28.656	53.77	70.9	69.5	45.7	64.3

a annual averages, Source: UNCTAD FDI statistics,

<http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx>.

Table 2.5: French outward FDI flows and stocks abroad, to OECD economies in percentage.

Economy (outflow) billions	91-95	96-2000	2001-2005	2006	2007	2008	2009
Total world	23	82	74	111	164	161	147
OECD	15	75	68	97	147	118	127
Percentage	66%	92%	93%	87%	90%	74%	87%
Outward stock	91-95	96-2000	2001-2005	2006	2007	2008	2009
Total world	166	307	733	1115	1419	1404	1610
OECD	149	271	675	1018	1273	1249	1418
Percentage	89%	88%	92%	91%	90%	89%	88%

UNCTAD statistics publications, country sheet (France).

The inward FDI performance index ranks countries by the FDI they receive relative to their economic size. It is the country's share in global FDI inflows ratio to the same country share in global GDP. A value greater than one indicates that the country receives more FDI than its relative economic size, a value below one that it receives less (a negative value means that foreign investors disinvest in that period). The index thus captures the influence on FDI of factors other than market size, assuming that, other things being equal, size is the "base line" for attracting investment, UNCTAD (2010).

The inward FDI potential index captures several factors (apart from market size) expected to affect an economy's attractiveness to foreign investors. It is an average of 12 variables of the values, normalized to yield a score between zero, for the lowest scoring country, to one, for the highest, UNCTAD (2005, 2008 & 2010).

The outward FDI performance index is calculated as the share of a country’s outward FDI in world FDI as a ratio of its share in world GDP. The index reflects two sets of factors that determine outward FDI by multinational enterprises MNEs headquartered in a given country, UNCTAD (2005, 2008 & 2010). The Performance index is shown for three year periods to offset annual fluctuations in the data.

Table 2.6: French FDI inflow performance and potential index and outflow performance index

<b>Inward FDI performance index</b>	<b>97-99</b>	<b>98-00</b>	<b>99-01</b>	<b>00-02</b>	<b>01-03</b>	<b>02-04</b>	<b>03-05</b>	<b>04-06</b>	<b>05-07</b>
(rank)	79	76	66	58	50	80	78	74	57
Index value (score)	0.936	0.834	0.99	1.17	1.606	1.229	1.46	1.366	1.659
<b>Inward FDI Potential Index</b>	<b>96-98</b>	<b>97-99</b>	<b>98-00</b>	<b>99-01</b>	<b>00-02</b>	<b>01-03</b>	<b>02-04</b>	<b>03-05</b>	<b>04-06</b>
Rank	10	12	12	15	14	12	16	15	18
Score (0-1)	0.448	0.441	0.434	0.403	0.396	0.413	0.390	0.387	0.383
<b>Outward FDI performance index</b>	<b>97-99</b>	<b>98-00</b>	<b>99-01</b>	<b>00-02</b>	<b>01-03</b>	<b>02-04</b>	<b>03-05</b>	<b>04-06</b>	<b>05-07</b>
Rank	12	9	10	10	10	16	16	18	14
Index value (score)	1.975	2.604	2.996	2.914	2.209	1.574	2.095	1.995	2.374

UNCTAD (2005, 2008 & 2010)

The performance index outflow and inflow show the relative importance of the FDI French flows comparing to global flows and, at the same time, comparing this ratio to the ratio of GDP with the global production. The comparison between the inward performance index ranks and the potential index could reflect the economy attractiveness and the market size. This is more clarifies from the UNCTAD definitions and the French ranks in table 2.6, UNCTAD (2010).

The French inward FDI performance index tended to increase in the last decade, this index shows the attractiveness of the French economy to the FDI. The index rank is getting better between the other countries, where the FDI inflow in France to the global FDI ratio is bigger than the French GDP to global GDP ratio. In addition, the potential index a better perspective for the French economy concerning the inward FDI, which encourages expecting higher inward FDI to the relative economic size.

Although the financial crisis and the fluctuation in the FDI flow, these flows tended to increase during the last two decades. The majority of FDI flow sources are the developed countries as similar as the host countries, meanwhile the developing and transition countries position is increasing. The French outward and inward flow increased in the last decades, where the former (outward) is much bigger the later (inward). France is placed in the first and second range of the outflow and inflow, respectively. In addition, France shows a better percentage of the French outward and inward flow or stock to the GDP during the last time. On the other hand, the majority of French FDI is placed in the developed countries, and the performance index of inward and outward FDI is getting better in the last two decades. Finally, although the inward FDI performance index rank rapidly improved, from 79 to 57 between world countries, but the outward FDI performance index rank is higher between the world countries, where placed in the rank 14 worldwide.

### **2.3 Exports indicator:**

The world economy recovered from the worst crisis since the Second World War. The global economy registered a slowdown in 2008 and rebound of almost 2 per cent in 2009; global GDP is expected to expand by about 3.5 per cent in 2010, UNCTAD (2009b), TDR (2010).

The global crisis in 2008-2009 was the first time in the post second world war period that global GDP contracted, whereas almost all regions in the world were affected, with short time between the financial shock and its impacts on the real economy. All regions were negatively affected, where the financial crisis initiated in the developed economies; and the worst impacts were on the transition economies, and developing economies also suffered GDP contractions, or at least their deteriorated significantly, OECD (2010), TDR (2010 & 2009).



Rapid recovery in many countries, particularly in developing regions, which these growth rates were relatively high in 2010 compared to the low levels in 2009. In developed economies, the several rescue packages started by governments in 2008 and 2009 stopped the collapse of financial markets, while supportive fiscal and monetary policies partially compensated the decrease in the private demand, TDR (2010). Several developed countries seem to be promoting net exports as a possible driver of growth, TDR (2010). World exports recorded fall by nearly 21 per cent in volume in 2009, as shown in table 2.7. Several transition economies were the strongest influenced in Eastern Europe and central Asia and had generated large current account deficits and accumulated sizeable stocks of external debt before the crisis, UNCTAD (2009b), TDR (2010).

The exports in all regions shown in table 2.7 including France increased for the periods from 2000-2008, except the decline after the 2000 peak. The European Union and China exports did not decline after this peak, and the United States exports declined for two successive years, in 2001 and 2002. In addition, all regions influenced of the financial crisis and decline in 2009. Similarly, the French merchandise exports declined with all its trade partners due to the 2008 crisis; in addition, to the decline after the 2000 peak with just one exception with developing countries. The exports experienced a continuous increase for the other years.

Table 2.7: The global, regional and leading countries exports, and French exports structure.

Regions (billions)	90-99 <sup>a</sup>	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
World	5779	7975	7721	8124	9440	11479	13064	15027	17452	19988	15833
Annual change (%)		0.38	-0.03	0.05	0.16	0.22	0.14	0.15	0.16	0.15	-0.21
Developed countries	4137	5393	5269	5490	6336	7503	8212	9235	10646	11856	9451
Annual change (%)		0.30	-0.02	0.04	0.15	0.18	0.09	0.13	0.15	0.11	-0.20
European Union	2477	3108	3155	3381	4044	4839	5251	5928	6951	7689	6098
Annual change (%)		0.25	0.02	0.07	0.20	0.20	0.09	0.13	0.17	0.12	-0.21
United States	763	1077	1012	981	1025	1168	1292	1470	1663	1847	1561
Annual change (%)		0.41	-0.06	-0.03	0.05	0.14	0.12	0.14	0.13	0.11	-0.16
Japan	436	548	468	482	549	663	705	767	829	935	709
Annual change (%)		0.26	-0.15	0.03	0.14	0.21	0.06	0.09	0.08	0.13	-0.24
China	145	279	299	365	484	655	836	1061	1339	1575	1331
Annual change (%)		0.92	0.07	0.22	0.33	0.35	0.28	0.27	0.26	0.18	-0.15
France	352	409	405	418	492	565	585	624	700	766	617
Annual change (%)		0.16	-0.01	0.03	0.18	0.15	0.04	0.07	0.12	0.09	-0.19
Developing countries	1521	2404	2271	2438	2857	3644	4431	5265	6167	7280	5810
Annual change (%)		0.58	-0.06	0.07	0.17	0.28	0.22	0.19	0.17	0.18	-0.20
French exports to: (Merchandise)	95-99 <sup>a</sup>	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
World	288	295	290	305	358	414	434	479	540	595	464
Developed countries	228	241	234	248	291	335	347	378	422	454	347
European Union	199	205	199	212	253	292	301	329	371	399	304
United States	19.6	25.9	25.6	24.7	24.8	28.7	31	33.2	34.1	35.1	27.4
Japan	5	5	4.8	5.2	6	6.6	6.7	7.2	7.9	8.3	6.6
China	3	3	2.94	3.3	5.2	6.6	7.2	10	12.4	13.3	10.94
Developing countries	50.2	50.2	51.1	51.9	61.4	71.5	80.2	91.1	105	124	105

a annual average

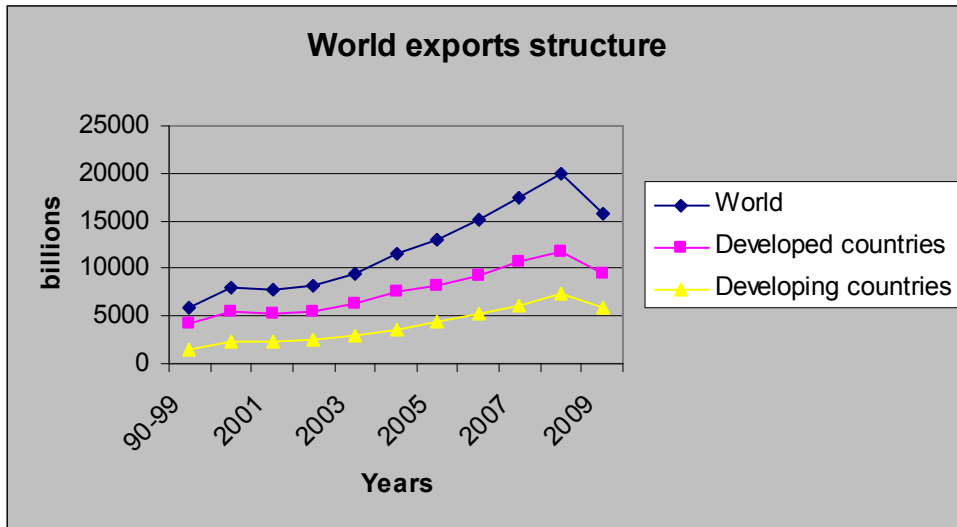
Source:

UNCTAD, Trade Data base, (<http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx>).

Figure 2.6 shows the exports shares of the developed and the developing countries to the world exports. Although, the high percentage of the developed countries exports to the world exports, it still less than the developed countries outward FDI percentage to the total world outward FDI.

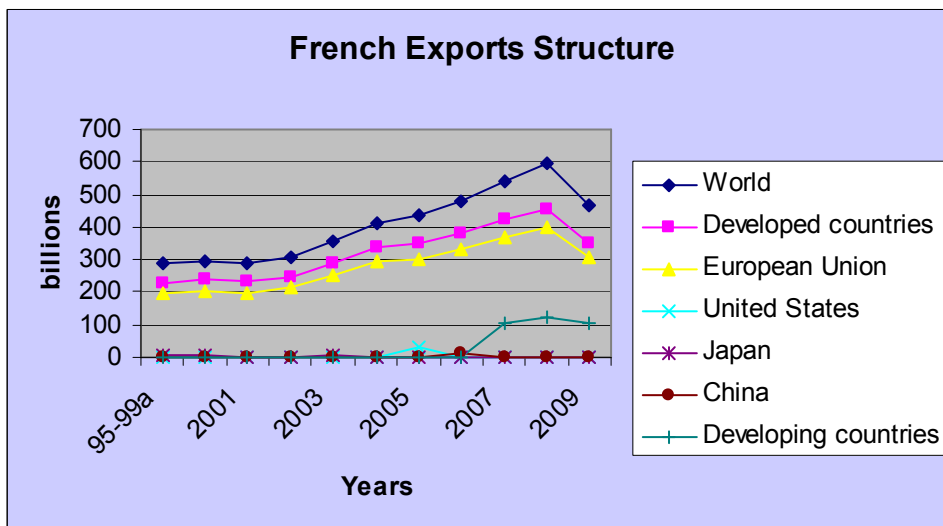
On the other hand, the French exports to the developed countries occupy a high percentage of the total French exports similarly to the outward French FDI in the developed countries to the total French outward FDI; see (figures, 2.5, 2.7).

Figure 2.6: The world exports structure



UNCTAD, Trade Data base, (<http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx>).

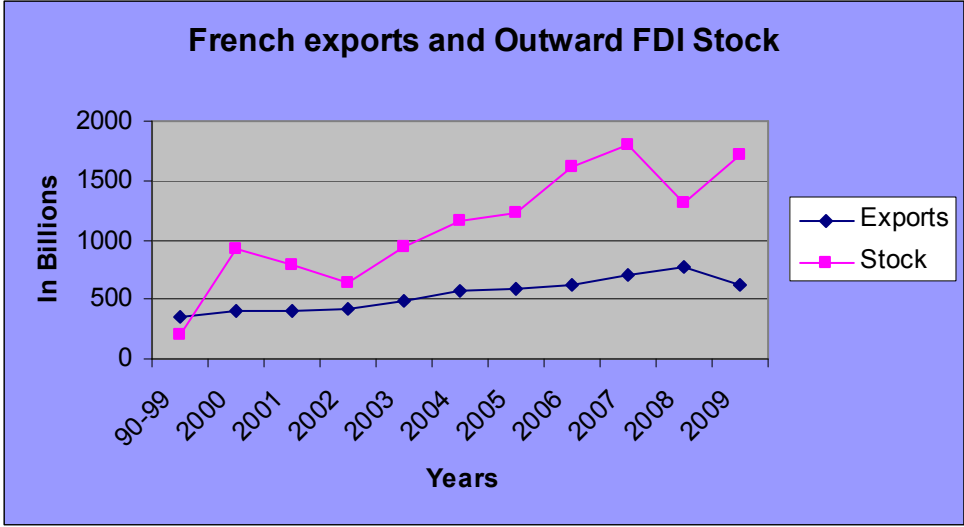
Figure 2.7: The French exports structure



UNCTAD, Trade Data base, (<http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx>).

Finally, the comparison between the French merchandise exports and outward FDI stock doesn't show a specific tendency that could refer to a long run relationship. Although, it shows an adverse changes between them (substitution) for the periods 2000-2002, 2007-2008 and 2008-2009; it shows a compatible changes of exports and FDI (complementary) for the other periods in the last decade.

Figure 2.8: The French exports and the French outward FDI



UNCTAD, Trade Data base, (<http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx>).  
 Source: UNCTAD, FDI data base, (<http://stats.unctad.org/FDI/>).

**2.4 Multinational enterprises and the international production activities**

MNEs contribute essentially in improving production processes and systems by their local and foreign operations, and by providing much needed capital and cutting-edge (innovative) technology for the production process. They occupy notable share of the gross fixed capital formation, international sales and production, employments and home economy growth, UNCTAD (2010).

In light of the current financial and economic crisis, there have been simultaneous moves to both liberalize investment regimes and promote foreign investment, and the MNEs activities are less affected by the crisis than their economies. This could show a leading role MNEs to guide the international economic trends.

Table 2.8: Selected indicators of global FDI and international production, 1990-2009

Item	Value at current prices (Billions of dollars)				Annual growth rate (percentage)				
	1990	2005	2008	2009	91-95 <sup>a</sup>	96-00 <sup>a</sup>	01-05 <sup>a</sup>	2008	2009
Income on inward FDI	74	791	1113	941	35.1	13.4	31.9	-7.3	-15.5

Income on outward FDI	120	902	1182	1008	20.2	10.3	31.3	-7.7	-14.8
Sales of foreign affiliates	6026	21721	31069	29298	8.8	8.2	18.1	-4.5	-5.7
Total assets of foreign affiliates	5938	49252	71694	77057	13.7	19	20.9	-4.9	7.5
Exports of foreign affiliates	1498	4319	6663	5186	8.6	3.6	14.8	15.4	-22.2
Gross product of foreign affiliates	1477	4327	6163	5812	6.8	7	13.9	-4.3	-5.7
Employment by foreign affiliates (thousands)	24476	57799	78957	79825	5.5	9.8	6.7	-3.7	1.1

a annual average

UNCTAD (2008), UNCTAD (2010), OECD (2009), OECD (2010).

The share of the foreign affiliates' value added in global gross domestic product (GDP) reached the highest level has ever been realized of nearly 11 per cent in 2009, UNCTAD (2010). MNEs foreign employment increased slightly in 2009 by 1.1%, to nearly 80 million workers, which represents 4 per cent of the global labour force. The rise of developing and transition economies is obvious in international production patterns. The developing and transition economies now host the majority of foreign affiliates' labour force, which accounted 53% of affiliate's total employment in 2007. In addition, they accounted for 28 per cent of the 82,000 MNEs worldwide in 2008, two percentage points higher than in 2006. This compares to a share of less than 10 per cent in 1992, and reflects the increasing of these countries importance as home countries, UNCTAD (2010).

The largest number of employees of the foreign affiliate is in China, which the highest ever realized with 16 million workers in 2008. This represents a high percentage of nearly 20 per cent of the world's total employees in foreign affiliates, which realized nearly 79 million in the same year. On the other hand, employment in foreign affiliates in the United States retracted by half a million between 2001 and 2008. In addition, the share of foreign affiliates' employment in manufacturing has declined in favour of services. In the developed countries,

employment in foreign affiliates in the manufacturing sector dropped sharply between 1999 and 2007, while in services it gained importance because of structural changes in the economies, UNCTAD (2008), OECD, (2010).

In addition, foreign affiliates' sales and value-added declined by nearly 4.5 to 6 per cent in 2008 and 2009 because of the recent economic and financial crisis. The recent crisis has significantly affected the MNEs operations abroad. Anyway, this contraction is less than the world economic contraction, UNCTAD (2009a).

Entities and bodies other than MNEs are also engaged in FDI. These parts include individual investors, governmental investments, and regional or international organizations, as well as special funds. While FDI by the former three entities is difficult to measure, FDI by special funds can be estimated by examining the data on cross border M&A (Merger and Acquisitions) deals, which account for most of their investments, UNCTAD (2010). In 2009, special funds combined FDI reached about 129 billion US dollar. Where 106 billion US dollar for private equity funds and 23 billion US dollar for sovereign wealth funds, accounting for over eleven per cent of global FDI flows, up from less than 7 per cent in 2000 but down from 22 per cent in the peak of 2007 year, UNCTAD (2010).

Hence, the role of the MNEs is essentially for improving the macroeconomic indicators and solves the macroeconomic problems. The employment in the foreign affiliates, sales, capital transfers from and to the local economy and the participation share of the local economy factors must affect the general macroeconomics trends in the local economy.

The largest worldwide MNEs are playing a leading role of the multinational activities. Many different criteria are including for calculating the transnationality index, which classify the MNEs. This index can be calculated as an average of three ratios, which are:

- Foreign assets to the total assets.
- Foreign sales to the total sales.
- Foreign employment to the total employment.

The following table shows the index classification from the one hundred largest worldwide MNEs firstly, and the one hundred largest MNEs in the developing and transition countries secondly.

Table 2.9: The transnationality index of the 100 largest worldwide and transitional developing MNEs, by home economies.

From 100 worldwide largest MNEs (2009)			100 developing and transitional largest MNEs		
Home region	Average TNI <sup>a</sup>	Number of entries	Home region	Average TNI <sup>a</sup>	Number of entries
Total	63.4	100	Total	48.9	100
EU (of which)	67.6	58	Africa	58.8	9
France	66.6	15	Latin America and the Caribbean	42.5	9
Germany	56.9	13	West Asia	50.6	7
UK	75.5	15	East Asia	51.1	47
Japan	50	9	South Asia	57.9	5
USA	58.1	18	South-East Asia	47.5	15
Developing and transition	50.7	7	South-East Europe and the CIS	27.2	8

a Transnationality index.  
UNCTAD (2010)

The majority of these companies are belonging to the developed countries, especially in the European Union. France occupies the second largest rank of the largest MNEs, similarly to the UK, and after the USA, which occupies the first rank. These French MNEs have an average of the transnationality index higher than the total average, and at the second rank with average of 66.6 after the UK, which has the highest average of 75.5.

On the other hand, nearly half of the 100 largest MNEs in the developing and transitional countries are placed in the East Asia. The average of the transnationality index in these companies is less than the average of the 100 largest worldwide MNEs, which have higher average of nearly 15 points.

**2.4.1 Large and very large French companies.**

The Amadeus database is the source of our first empirical part, which is the chapter four. This database does not provide times series data for many variables; meanwhile, other variables are available for the previous years.

Table 2.10 shows the number of employees for the large (large, very large and both groups) French companies from 2002-2009. These companies serve different market through different strategies. I.e. they could be local companies, exporters, investors or do mixed strategies (exports and FDI), and these workers could work locally or abroad. However, the table shows an important number of employee in these companies, where it arrives to more than 12 millions worker in 2009. Despite the decline in some years, but it has a general increasing trend. In fact, this shows the essential role of these companies, which are the main servers of the foreign markets. In addition, the difference between the large and very large companies' employees is huge from nearly 2.8 to 10 million workers, which indicates an essential difference between the groups and the importance of separating the groups for an econometric examination.

Table 2.10: The employee's number in the large French companies in thousands.

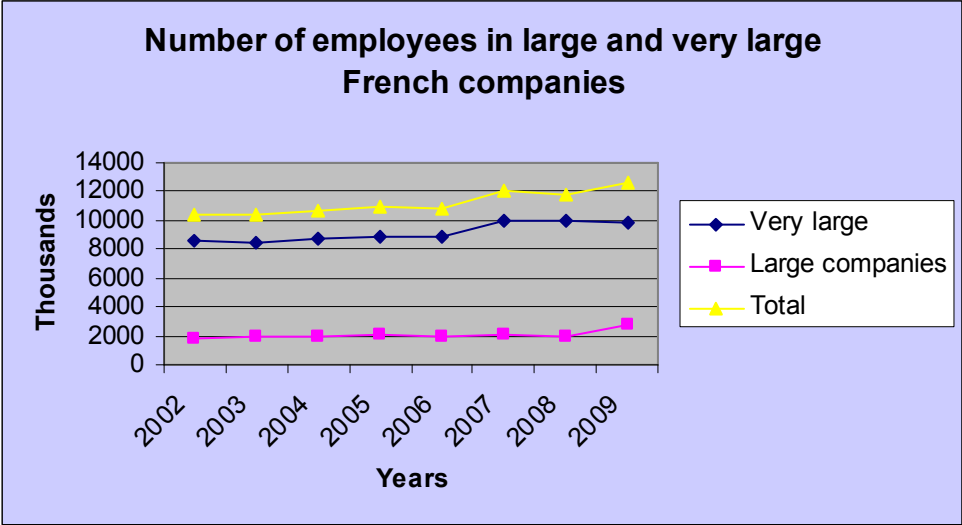
<b>Employees number</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
<b>Very large</b>	8551	8495	8707	8892	8830	10038	9941	9875
<b>Large companies</b>	1852	1934	1997	2052	1977	2069	1892	2805
<b>Total</b>	10403	10429	10704	10944	10807	12107	11833	12680

Amadeus database.

Figure 2.9 shows the huge difference of the employees' number in the large, very large and both groups of the French companies, similarly to the table 2.10. These statistics show the significant increase of the very large companies' employees after the year of 2006. This could have relationship with the significant increase in the French outward FDI stock, which shown before; and the significant decrease in exports turnover for these companies at the same period, as we see later.

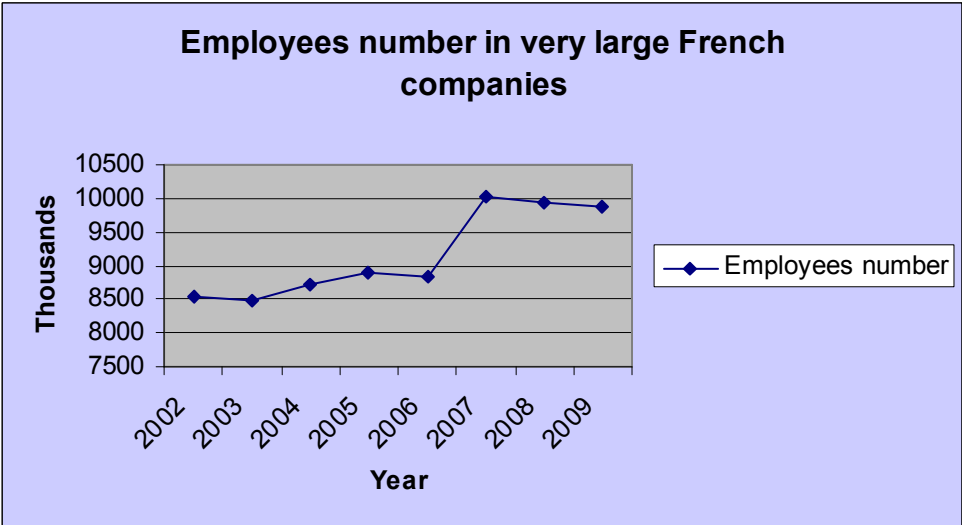


Figure 2.9: The employees' number in the French large companies



Amadeus database.

Figure 2.10: The employees number development in the very large companies



Amadeus database.

The large companies important participation of the economic activities such exports, as shown in table 2.11; and the large share of employment, which reached more than 12 million in 2009 explain the essential role that could affect the local economy.

The Amadeus micro data statistics detect that the decreasing in the French exports in 2009 mainly influenced of the sharp decreasing in the large companies' exports (all groups). Although, the FDI volume of these companies isn't known in Amadeus, the macro data of the French outward FDI stock increased accompanied with sever deceasing of the large

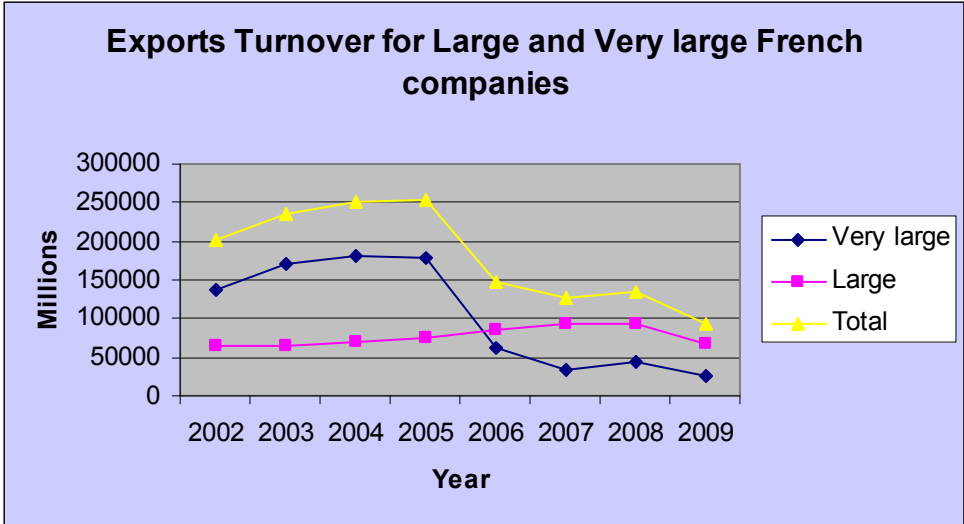
companies exports, and the total French exports. On the other hand, the increase in the very large French companies' employments could be in the foreign affiliates. The financial crisis seems to be strongly and negatively influence the French large companies' exports.

Table 2.11: The large and very large French company's exports turnover in millions.

Exports Turnover	2002	2003	2004	2005	2006	2007	2008	2009
Very large	137454	169961	181623	177738	63135	33331	43153	25380
Large companies	63981	64905	69297	76124	84222	93930	92345	67339
Total	201435	234866	250920	253862	147357	127261	135498	92719

Amadeus database.

Figure 2.11: The exports turnover of the French companies.



Amadeus database.

### 2.5 Southern and Eastern Mediterranean basin.

In this section, we present some economic indicators for the Southern and Eastern Mediterranean countries (Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia and Turkey). In chapter five, we study these countries as host countries for the French exports and FDI; hence, we present their FDI inflow and outflow range, openness, GDP, the economic freedom indicator and others.

Table 2.12: The FDI flows in selected Mediterranean countries by range, in 2009.

Range	Inflow	Outflow
From 5.0 to 9.9 billion US \$	Turkey	-
From 3.0 billion to 4.9 US \$	Egypt, Lebanon	-
From 2.0 to 2.9 billion US \$	Algeria, Libya, Jordan	Turkey
From 1.0 to 1.9 billion US \$	Tunisia, Morocco, Syria	Libya, Lebanon
From 0.5 to 0.9 billion US \$	-	Egypt
From 0.02 to 0.4 billion US \$	-	Morocco, Algeria
Bellow 0.1 billion US \$	Palestine	Jordan, Tunisia, Palestine and Syria

Created from OECD statistics database, <http://www.oecd-ilibrary.org/>.

The Southern and Eastern Mediterranean countries are net recipients of the FDI. The range of the inflow FDI in these countries is from 1-10 billions US dollar, except Palestine, meanwhile the range of the outflow FDI is from 0.1 to 2.9 billion US dollar. These ranges are relatively small but their income yielded on FDI as host countries is high. In addition, the investors from North Africa have raised their investment in the same region, and North Africa realized the highest income yielded rate in Africa. Generally, income on FDI in Africa yielded the highest rate of return among developing host regions for several years of rapid growth, (UNCTAD, 2008 & 2010), in 2009 it declined by 31 per cent, UNCTAD, 2010. Turkey realized the highest rate of income on FDI between the other countries. Flows to these countries declined despite its more diversified FDI and sustained privatization programmes, except Lebanon. Some countries introduced investment policy measures to promote the conditions of the foreign investment by lowering corporate taxes such as Morocco or introduced more attractive investment policy environment such as Libya. In contrast, there was also a restrictions of the regulatory framework by some new foreign ownership limitations in specific sectors such as in Algeria. Other countries raised the maximum level for foreign ownership such as Syria. A number of countries reduced the tax rate in order to stimulate the economy across the board or in particular sectors or regions such as Turkey. These countries generally show a good rank average of the economic freedom index, as we show lately, UNCTAD (2009a), UNCTAD (2010).

Anyway, among the main recipient countries, Turkey was hit the hardest, with declines of 58 per cent. FDI outflows from West Asia decreased by 39 per cent in 2009, but the decline was uneven also between the countries, UNCTAD, (2010).

Table 2.13: Macroeconomic indicators of southern and eastern Mediterranean countries

Country	Inward FDI stock (Millions)	Inward FDI per capita	GDP (Millions)	Openness (percentage)	Economic Freedom Index <sup>8</sup>
Algeria	17344	497	140786.62	59.98	56.9
Egypt	66709	804	188105.5	36.15	59
Jordan	18705	2961	22998.812	91.59	66.1
Lebanon	32085	7597	32467.553	63.94	59.5
Libya	15508	2416	61576.954	91.65	40.2
Morocco	40719	1273	88477.036	52.51	59.2
Palestine	1205	282	6159.3811	67.00	67.7
Syria	7334	335	52356.872	54.23	49.4
Tunisia	31857	3102	38800.876	86.46	58.9
Turkey	77729	1039	626492.42	38.80	63.8

OECD statistics database, <http://www.oecd-ilibrary.org/>; Heritage Database, <http://www.heritage.org/index/ranking>.

The openness<sup>9</sup> in these countries is relatively high, where it ranges from 50% to 90% except Egypt and Turkey. Other countries have a relatively high openness percentage basing on their petroleum exportations, such as Algeria and Libya. However, this reflects less protectionism policies in these countries toward the trade or the FDI. In addition, the inward FDI per capita in these countries is relatively high to their economic indicator, where it's yielded a high income on FDI, as mentioned before.

These countries reflect nearly the same level of the economic freedom reflect the homogeneity of the area concerning the economic environment, meanwhile, Libya and Syria seem to be more restricted in this field. However, this level of economic freedom seems to be encouraging for the trade and capital movements within the area and inter the other areas.

Finally, we summarize that the FDI flow and trade tended to increase during the last two decades notwithstanding the decreases because of the financial crisis. The majority sources of FDI flow are the developed countries as similar as the host countries, meanwhile the developing and transition countries position is increasing. The developing countries share in the world exports is more than sixty percent during the last decade. Both exports and FDI were hit during the financial crisis. The French outward and inward flow increased in the last decades, where the former (outward) is much bigger the later (inward). France is placed in the first and second range of the outflow and inflow, respectively. In addition, France shows a

<sup>8</sup> They measure “ten” components of economic freedom which represent different indices, assigning a grade in each using a scale from 0 to 100, which 100 represent the maximum freedom. A score of 100 signifies an economic environment or set of policies that is most conducive to economic freedom.

<sup>9</sup> The openness is calculated as the sum of both exports and imports to the Gross Domestic Product (GDP).

good percentage of the French outward and inward flow or stock to the GDP during the last time. On the other hand, the majority of French FDI is placed in the developed countries, as similar as French merchandise exports to the developed countries. The performance index of inward and outward FDI is getting better in the last two decades. Finally, although the inward FDI performance index rank rapidly improved, from 79 to 57 between world countries, but the outward FDI performance index rank is higher between the world countries, where placed in the rank 14 worldwide. The comparison between the French merchandise exports and outward FDI stock does not show a specific tendency that could refer to a long run relationship. Although, it shows an adverse changes between them (substitution) for the periods 2000-2002, 2007-2008 and 2008-2009; it shows a compatible changes of exports and FDI (complementary) for the other periods in the last decade.

The majority of the 100 largest worldwide MNEs belong to the developing countries and the French one of the MNEs have a high transnationality index than the average. These companies and the other MNEs have an increasing share and role in the global production, employment and exports. Hence, the role of the MNEs is essentially for improving the macroeconomic indicators and solves the macroeconomic problems. The employment in the foreign affiliates, sales, capital transfers from and to the local economy and the participation share of the local economy factors must affect the general macroeconomics trends in the local economy. In addition, the French large companies show an important role in the French economic indicators such employments and exports. The Southern and Eastern Mediterranean countries show a high income on FDI and seem to be an attractive area for these activities, especially, for the other developed countries in the Mediterranean area.

Hence, the examining of the relationship between exports and FDI as different strategies for serving the foreign market is important at the company and country level. This is our work in chapter four, which examines the multinationals strategy choice between these activities from the company point of view, basing on the recent literature. In chapter five, we examine the mentioned relationship between exports and outward FDI in the Mediterranean area using the recent panel econometric methods. These evidences are applied on the French case, which has a notable presence for its MNEs, FDI and exports. In addition, the Mediterranean countries such as France and the other countries in our panel are expected to have stronger relations concerning these activities, in the course of the dialogue of the union for the Mediterranean and the other similar projects in the area.

## **2.6 Conclusions:**

The statistics of these economic indicators show a rapid increase during the time. The last decade shows a more than double increase in either the worldwide exports or the stock of FDI. The French levels of these activities realize a rapid increase of nearly 75% in the last decade. Notwithstanding the financial crisis, these indicators show a rapid recovery and play an essential role of recovering the global economy.

In addition, the MNEs play an essential role in the world economy. Their activities influence strongly the global economy through FDI and exports activities and tend to increase during time. The income realized on the FDI could arrive more than 30% and their affiliates employments in 2009 reached nearly 80 million workers. In addition, the increase of the very large French companies' employments by nearly 1.5 million workers could show the importance of the MNEs activities impact on the local macroeconomic indicators. The outward FDI is less influenced of the annual fluctuations than the flow, where is more preferable to be used in the econometric examinations.

The majority of the French outward FDI is placed in the developed countries, as similar as its exports.

The descriptive statistical relationship between exports and FDI could show a positive or negative direction, but it could not be a real representative for the long run relationship between these indicators. Hence, the dynamic and econometric analysis for this relationship, at macro and micro levels, should detect this relationship.

Hence, the investigation of the relationship exports and the outward FDI is essential to know the impacts of these activities changes. The investigation of the overall FDI is a necessary condition to measure lately the net impact on the local economy.

The large, very large French companies show significant differences in the employees' numbers and exports turnover. In addition, the biggest 15 French MNEs, which are part of the biggest 100 global MNEs play an essential role globally and at the French level. This calls the researchers to more classification between the large companies to detect their role.

# Chapter Three

## Foreign Direct Investment and Exports Relationship Theories and Empirical Evidences

### 3.1 Introduction:

Outward FDI and exports relationship is a new controversial question rose in economic literature. The relationship between them has different aspects at the micro and macro level, where the discussion and examination at the company level leads to the MNEs strategy choice determinants. On the other hand, the country level discussion and examination leads to capital and goods flow determinants, specially, in specific country or region. Anyway, these determinants and the relationship between the outward exports and FDI determine the effects on employment and growth in the local economy.

The overall and final effects on the home country could be shown by knowing the overall relationship between the exports and FDI (both types, vertical and horizontal). Hence, the dominant relationship between exports and outward FDI shows the final effects of the multinational activities (and the relation between them) on the local economy, (employments and growth).

If the relationship is substitutes, the increasing in the outward FDI will increase the foreign affiliate's employments, the economy presence in the international market and increase the transfers to the local economy, which impact positively on the local economy. On the other hand, this increase of the production locally abroad satisfies the foreign demand, and decreases the exports, local output and employments, which impact negatively on the local economy. These contradicted impacts will eliminate each other and cause a net negative or

positive impact. This, of course, depends on the magnitude of transfers of the local economy and the foreign affiliate's employments nature (national or foreigner).

If the relationship is complements, the increasing in the outward FDI will increase the foreign affiliate's employment, the economy presence in the international market and increase the transfers to the local economy, which impact positively on the local economy. On the other hand, it induces more exports, local production and employment, where the variables feed each other's positively.

As a starting point for the further analysis, this chapter provides an overview of the multinational enterprises (MNEs) theories (horizontal and vertical FDI), which have been accumulated so far. Each type has a different theoretical point of view about the relationship of these variables. Hence, we introduce them to show the theoretical base of the controversial literature about the subject. In order to do so we look at definitions, previous literature, theories propositions and implications of each type of FDI.

We review the relationship nature of these variables basing on the theory, we follow unconventional methodology review, of Head and Ries (2004), that could show how the relationship differ in the empirical research according to the data type and test scope.

We also review empirical researches, which discuss the relationship between trade, especially, exports and the FDI, either at country, industry or company level. This leads us to discuss determinants of the company strategy choice between exports and FDI, which are discussed theoretically and examined empirically in chapter four. We also review the empirical work in the Mediterranean area concerning the subject. Lately, we examine the FDI and exports relationship in the area empirically in the chapter five which shows the determinants of the French outward FDI and goods in the area.

Finally, the empirical findings are discussed. We continue our later empirical work based on the previous theoretical and empirical work and the findings of the chapter, which are important theoretical base for the forthcoming empirical work of the thesis.



## **3.2 Theories of Multinational Enterprises**

This section provides a theoretical and empirical review of traditional FDI theories. We briefly review the theoretical background of the new trade theory, which includes the definitions and concepts of FDI. Lately, we review the theories of vertical, horizontal and knowledge capital model.

### **3.2.1 Theoretical background:**

The development of theories of the multinational enterprise occurred in three stages. The first models of multinational enterprises emerged from the traditional literature on international trade with competitive, constant-return models.

Early analysis viewed multinational activities as a part of the theory of capital flows (Caves, 1971, 1996). He worked on the direct investment associated with company specific capital. He stated that the investment brings about the shift of an industry in home country to the same industry in host country. This theory generated clear results that headquarter activities should be placed in capital-abundant countries with subsidiaries in capital-scarce countries. Thus, there was no motive for FDI to occur between identical countries.

The factors driving global capital flows in general are analyzed on the eclectic paradigm, which is a framework for analyzing the decision to engage in FDI, based on three kinds of advantages that FDI may provide in comparison to exports: ownership, location, and internalization, Dunning (1977, 1979 and 1981). The ownership could be a product or a production process to which other companies do not have access, such as a patent, blueprint, or trade secret or something intangible, like a trademark or reputation for quality, Markusen, (1995). Location which market must offer an advantage that makes it profitable to produce the product in the foreign country rather than simply produce it at home and export it to the foreign market. Although tariffs, quotas and transport costs; the access to customers and cheap factor prices are the most obvious sources of location advantages. And finally, internalization which if a company has a proprietary product or production process, and due to tariffs and transport costs, it is advantageous to produce the product abroad rather than export it, it is still not obvious if the company set up a foreign subsidiary or it will licensing a foreign company, as an alternative, Markusen (1995). (OLI) advantages under the eclectic

paradigm are the answer to explain why multinational enterprises choose FDI. Despite it is understood in static terms and is unable to explain the dynamics or the process of change of international production. Nevertheless, the empirical results under constant-return model are inadequate to explain location decision of company in circumstances that are more complex and this led in the next stage to the “new trade theory” as a considerable extension of international trade theory, which included the idea of increasing returns to scale and imperfect competition to the traditional models.

Subsequently, the theory of the multinational enterprise was split into two parts to obtain two motives that to reduce factors costs in the first and to serve foreign market in the second which appears as a new multinational activity replace the exports.

In the first part, the theory of “vertical” FDI emerges, when the company geographically separates the stages of production. It builds on the theory of capital flows, where direct investment is essentially a foreign production branch.

The second part consists of “horizontal” FDI models, which the company produces the same goods or services in different locations.

In the third stage, the new models tried to combine the two branches. The respective theory was called the “Knowledge Capital” model (KC). Before moving to the results of the mentioned models, it is useful to introduce the most outstanding definitions for vertical and horizontal FDI used in the literature.

In fact, four main definitions of vertical and horizontal FDI have been used in the previous literature.

The first definition is based on the motivation of investment. Here, FDI is classified to be vertical or horizontal depending on the motive for affiliate operations. Thus, Horizontal FDI companies save on trade costs associated with exporting by setting up foreign facilities whose range of production activities similar to the operations they perform at home, Markusen (2002), and Markusen and Venables (2000). While, vertical FDI is conducted in order to benefit from factor price differences between countries, Hanson et al., (2003), companies fragment different production stages across different countries to benefits from the international differences in factor prices, Helpman (1984); Helpman and Krugman (1985); and Yeaple (2003).

In the jargon of trade theory, vertical production networks are a form of “vertical FDI” through which multinationals spread across different locations the different activities that they perform, such as R&D, input production, and input processing, Hanson et al. (2003).

Theories of multinational enterprises offer several explanations for vertical production networks, including cross-country and/or cross-industry differences in trade costs, factor prices, and the technological separability of production, Hanson et al. (2003).

The second definition to discriminate between the two types of FDI was proposed by, Brainard (1993a), who uses the term “factor proportion” in order to explain foreign activities of MNEs based on Markusen (1984); Helpman (1984); Helpman and Krugman (1990); and Ethier and Horn (1990), and explains vertical expansion across borders in terms of relative factor endowments and technological parameters.

This methodology is derived from the empirical estimation of international trade flows. The alternative to the factor proportions hypothesis formulates location advantages in terms of proximity to customers or specialized suppliers, which motivate horizontal expansion across borders at the expense of reduced scale, Krugman, (1983); Horstman and Markusen (1992); and Brainard (1993a).

The third definition concentrates on the geographical distribution at the foreign affiliate sales level, Brainard (1993b, 1997).

Finally, Markusen (1995) defines vertical FDI as a geographical separation of the production process by stages, which is very similar to fragmentation<sup>10</sup> and considered the horizontal foreign investment, is more important quantitatively than the vertical.

Indeed, a clear separation between horizontal and vertical FDI is not possible, because in case of horizontal FDI affiliates draw some headquarter services from the parent company, which include geographical separation, even when the company duplicates the same production activity in several countries. Thus, each horizontal MNE has some vertical traits.

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<sup>10</sup> Recent definition of fragmentation is: the splitting of a product process into two or more steps that lead to the same final product; it calls international or cross-border fragmentation when takes place beyond national borders, Matsuura and Hayakawa (2008).

Closely related to the term vertical FDI is the literature on outsourcing and fragmentation, which defined “the splitting of production processes into separate parts that can be done in different locations, including in different countries” Ronald and Kierzkowski (1990). These terms are more general and include often the geographical separation of production that takes place outside the company. Furthermore, different prominent researchers refer to geographical separation of production “multinational vertical company” in different ways. Feenstra (1998) calls it “disintegration of production”, Leamer (1996) calls it as “delocalization” and Krugman (1996) used term of “slicing the value chain”, and Matsuura and Hayakawa (2008) called it “cross-border fragmentation” if takes place beyond national borders.

Another term considered as complex integration strategy of MNEs is “export platform FDI”. It is defined as FDI from a source country into a host country for, the purpose of, exporting production to a third country market, and not in the parent or local market. Thus, such a definition includes both features of vertical and of horizontal FDI. Here setting foreign affiliate serves a large integrated market as a horizontal investment. However, at the same time, the location within the region is chosen based on cost considerations, which is typical for vertical FDI, Ekholm et al. (2003), Grossman et al. (2003), Yeaple (2003) and Egger et al. (2004). However, empirical findings by Hanson et al. (2001) suggest a closer relationship to vertical FDI, since this type of investment is strongly cost driven, and depends negatively on the size of the foreign market.

The complex vertical FDI is more complicated, which motivated by the advantage of the third country. It is assumed to have plants in the host and third country with exports from the third one to the home country. Complex vertical MNE tends to dominate when total world income is high, when bilateral countries are similar in size, when home and host countries are similar in relative factor endowments, when home and third countries are different in relative factor endowments, when bilateral countries are different in relative unskilled labour, and when transport costs between countries are high.

### **3.2.2 Theories of Horizontal FDI**

Horizontal multinationals are companies that produce the similar good or services in two or multiple plants in different countries, which each plant serves the local market from the local production with one or more headquarters in home country. The multinationals strategy to

serve the foreign market, by setting up a new affiliate instead of serving through exports based on many factors determines the company decision to be horizontal MNE. These factors are presence of trade costs, market size and company-level scale economies.

The main motivation for horizontal FDI as mentioned before is to avoid trade costs or to get access to a foreign market, which only can be served locally, in addition, the horizontal models predict that multinational activities can arise between similar countries.

The comparison between benefits and costs is the intuition behind the company decision to become horizontal MNE. Setting up a foreign production affiliate instead of exports serving to the foreign market means additional costs of serving the new country. Moreover, there are production costs, both fixed and variable, depending on factor prices and technology. The plant-level economies of scale will increase the costs of establishing foreign affiliates. On the other side, there are cost savings when switching from exports to local production. The most obvious are trade costs. Additional benefits arise from the proximity to the market, as shorter delivery, increasing knowledge of the market, and quicker response to the market becomes easier. Thus, if benefits outweigh the costs, a multinational enterprise will conduct a horizontal FDI.

The interaction of trade costs and economies of scale either at plant or company level arise the capital flows between similar countries, which explain the horizontal FDI, as shown in table 3.1.

In order to explain the perception behind the models, we assume two countries, which are relatively different in either size or factor endowments. Anyway, moderate transportation costs are assumed. In the first situation, the horizontal MNEs will not arise, because they will have a disadvantage relatively to the local company with headquarter and production plant in the larger country by setting the complete production in one plant. The multinationals have to bear fixed costs for the plant in the smaller market which it requires a big sales amount to cover the new affiliate fixed cost and acquire economies of scales. In the other side, the national or local company in the larger country faces trade costs for the small amount of exports to the smaller country. Of course, while serving foreign markets via exports increases transport costs on production costs, but setting up a new plant abroad as an alternative is costly as well. A trade-off between costs of setting up a new plant and trade costs from exports is a feasible strategy for decision of the company. Company should make a decision to become horizontal multinational, when plant-specific costs are lower than transport costs.

From this point of view, the role of scale effects, which the market size is proxy to it, in relation to transport costs, which distance is proxy to it, is an essential and important issue.

In the second case, the countries are similar in size but different in factor endowments. The horizontal multinational has no advantage when, firstly places the production in both countries, or secondly in the factor-scarce country (higher cost). The local company placed in the factor-abundant country, such as labour, executes the whole production in the low cost country (with low costs). Thus, the MNEs aim to determine the cut off point that equalize profits between the two strategies (exports or FDI) to decide continue exporting or set up a new plant (we will be discussed in details later).

The trade off between the additional fixed costs from setting up a new affiliate abroad and avoiding the variable costs such as transport cost and tariff, arise the horizontal multinational. Markusen (1984) is one of the first works, which explains the horizontal FDI model with company-level scale economies as a driving force. A company of two plants has a fixed cost that is less than twice times of the fixed costs of a company with single plant, this give a strong motivation for multi-plant production. Extensions and refinements of this model can be found in, Horstman and Markusen (1987, 1992). Horstmann and Markusen (1992) examine the model with two countries, one homogeneous good and imperfect competition. The monopolistic company is located in each country in order to serve the local market only. The model assumes that the company has constant marginal costs in production; and there are two different types of fixed costs involved in the company. One is plant-specific costs i.e. fixed costs in each single production plant. Another is company-specific costs, which act as joint inputs across plants, and it finds that companies are more likely to become horizontal multinationals by producing in both home and host locations, when plant-specific costs are low relative to company-specific costs. A decision of MNEs depends on the size of economies of scale and on the production technology of the company. However, their implications are insufficient to explain a decision of company since an activity to foreign markets is costly.

Markusen (1995) describes the horizontal multinaional as an alternative option to trade and local companies, where the amount of direct foreign investment increases relative to trade (but not necessarily absolutely) as tariffs and transport costs increase. In addition, he discusses the problem of internalization. Markusen and Maskus (2001) provide a survey of literature and an overview of empirical finding.

More general model, Brainard (1993b) discusses the scale effects role at the company and plant level in relation to transportation costs. The perception is that the horizontal FDI appears as an alternative to exports, if the trade costs are larger than the fixed costs from setting up a new affiliate, which is also known as proximity-concentration approach. The driving force behind is the trade off between the advantages to be near the market and avoiding the variable costs such as the transportation costs (proximity), and economies of scale effects when producing in one plant (concentration). The horizontal model predicts two cases, which can dominate the exports or full crowd them out. Firstly, if the transportation costs are larger than the plant fixed costs; meanwhile the second case occurs if the company-level scale effects are larger than plant-level scale effects. This means that the horizontal MNEs arise when transport costs are relatively higher than the fixed plant costs, and the greater are increasing returns at the company level relative to the plant level. This refers that transport costs and the economies of scale are significant to the company to become horizontal multinational.

Markusen and Venables (1998) extended and developed the previous horizontal model to a multi-country framework which, they develop a two-factor, two-sector, two-country model of the new trade theory with monopolistic competition and product differentiation. The model predicts the multinational activity for horizontal FDI, their model allows for the mix of multinational and local companies in each country. In the former, multinationals dominate in countries that are similar in size, factor and technology endowments. In the later, they show that differences in relative factor endowments decrease the horizontal activity of MNE.

Table 3.1 shows the necessary conditions for the appearance of horizontal multinationals: These conditions are countries similar in size, and in the factor endowments, and the presence of transportation costs, and economies of scale at the company level.

Table 3.1: Conditions for the Existence of Horizontal FDI

<b>Presence of horizontal FDI when:</b>	<b>Horizontal FDI</b>
<b>Country characteristics</b>	
Absolute market size	Large
Relative market size	Similar
Relative factor endowment	Similar

Trade costs / barriers	Moderate / high
Of which (Tariff barriers)	High
<b>Economies of scales</b>	
Company-level	High
Plant-level	Low

### 3.2.3 Theories of Vertical FDI

The theory of vertical FDI is the second important pillar of the MNE theoretical literature, which takes place if the MNE geographically fragments its production by stages. In particular, countries with differences in factor endowments. In contrast to the horizontal MNE, that duplicates the production process between similar countries.

The fragmentation of production occurs in order to exploit differences in relative factor costs. The motive of the name vertical could be that the production stages split in different countries are complements to each other. The vertical FDI is based on, the idea that, different parts of the production process have different input factors. Thus, the input prices differentials across countries makes splitting production profitable, for example labour intensive production stages in country with low labour costs.

Similar to the perception behind the horizontal models, the decision to adopt the vertical FDI stands behind the trade-off between costs and benefits. The benefits arise from the lower production costs in the new country. The production chain includes several stages, and each stage usually requires different factors. Hence, it's profitable to shift particular stage to the country, which has the required factor in relatively cheaper price, as a result to the factor prices differentials. This is only profitable when the costs of splitting the production process are lower than the cost savings. The costs of fragmentation take many forms such as transport costs, additional costs of setting up new affiliates, creating new networks or existing different production parts in different countries. The economic feasibility is to compare the additional various costs arise from production splitting with the production costs reduction arise from exploiting the factor price differentials between countries (or different production stages).

The theoretical modelling of vertical FDI was driven typically by differences in factor endowments. The early literature of vertical FDI made by Helpman (1984, 1985) and followed by Helpman and Krugman (1985). They assume that countries differ with respect to



relative factor prices; and vertical multinationals use differences in factor prices between countries to minimize production costs. These initial studies explain the expansion across countries on the base of factor proportion abundance, in which the companies headquarter, is separated geographically from the production. These models were based on the extended Heckscher-Ohlin trade theory with two factors of production and two production sectors, homogeneous goods and differentiated goods. While the production of homogeneous goods is under a perfect competition with constant return to scale, the production of differentiated goods is under increasing return to scale. The production process of differentiated goods could be divided into multiple stages i.e. headquarters services and final production one.

In the former, Helpman (1984) model indicates a general-equilibrium condition “relative factor endowment differentials” that causes companies to become vertical multinationals. He explains the appearance of vertically separated production by cost savings for MNEs, if it separates the high-skilled labour (human capital) intensive headquarter activities and low-skilled labour intensive production activities. These two activities have different factor intensities between countries and can be split geographically, every activity in the abundant country factor related. The model constructed without tariffs or transport costs, so that the company will open only one foreign plant whereas its not include the trade costs from exporting outputs back to home country. It is further assumed that the production factors across countries are immobile.

The driving force of the model was the absence of Factor-Price-Equalization (FPE). If otherwise the difference in relative endowments of countries is not sufficiently large, trade in goods will lead to the equalization of factor prices between countries. Then, there will be no incentive for the company to separate headquarters and production activities, and FDI will not occur. If, however, the difference in relative factor endowments is large, one country for example has a much higher endowment of labour relative to capital, and then trade does not equalize factor prices. Hence, it is profitable for the company to split activities, locating the labour-intensive part of production for example (assembling) in the labour-abundant country. Consequently, vertical FDI arises if this separation occurs by setting up an own affiliate.

Thus, the intuition of Helpman (1984) was to show that multinational companies have a motive to fragment the production geographically and separate the production process only if

the countries differ sufficiently in relative factor endowments and vertical FDI will not arise between similar countries.

The literature on vertical FDI is related closely to the models of outsourcing, and other complex investment decisions, which the vertical separation of production occurs without multinationals, Grossman and Helpman (2005).

Vertical FDI can be seen as a subset of this fragmentation, since parts of the production chain are also adopted abroad but by other companies.

Some studies analyze the decision of MNE between outsourcing and FDI. Grossman and Helpman (2002) investigate the choice between outsourcing and integration through FDI as a trade off between incomplete contracts, in arm's length relationship, against less-efficient integration within a MNE. While Antras and Helpman (2004) show how the different productivity levels of the company affects the decision to source the inputs from external suppliers or from the company own affiliate abroad.

The literature indicates only the impact on international trade flows, such as Markusen et al. (1996) and Markusen and Venables (2000), which vertical FDI is considered as a trade creating<sup>11</sup>, as long as products at different stages (input and final goods) are shipped between different locations. On the other hand, trade costs have a negative impact on the location of vertical FDI, Zhang and Markusen (1999) explain that the host market size has a negative impact on vertical FDI because the fixed costs for the new plant can be sooner covered in a larger market.

Last point rises interestingly recently concerning the relationship between trade and the FDI in which, recent studies refer to positive relationship between vertical FDI and trade where fragmentation of production increase the trade of input and goods between countries.

In the other side, duplicating production and setting up new affiliates reduce the trade flow between countries, and we will discuss this idea in a separate section in this chapter.

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<sup>11</sup> Trade creating is caused by extra output produced between countries, which the replacement of the expensive domestic production by cheaper imports (from the affiliates) from more efficient partner country (factor abundant country). Absence of Factor-Price-Equalization (FPE) is a necessary condition between countries.

In summary, the theory of vertical MNE explains an incentive for companies to separate geographically their headquarters and production activities. The intuition behind theory of vertical MNE is based on factor-price differentials as well as trade costs.

Table (2) shows that differences between country characteristics are the driving force behind this type of FDI.

Company is driven to become vertical MNE when countries are different in factor endowments, and transport costs and tariff barriers must be low in order to make the separation more valuable. The implications of vertical multinational activity are always explained by an absence of FPE.

Table 3.2: Conditions for the existence of vertical FDI

<b>Presence of vertical FDI when</b>	<b>Vertical FDI</b>
<b>Country characteristics</b>	
Absolute market size	Small
Relative market size	-
Relative factor endowment	Different
Trade costs / barriers	Low
<b>Economies of scales</b>	
Company-level	High

**3.2.4 Knowledge Capital Model**

We present the theoretical literature describes theories of MNE, vertical and horizontal separately. The KC model results of combining the theories of vertical and horizontal FDI, Markusen et al. (1996) and Markusen (1997) develop the “Knowledge Capital” model. The model nests the motivations behind the MNEs decision or choice, either market seeking that stand behind the horizontal MNE or resource seeking and cost minimization that stand behind the vertical MNE. These motivations are the driving force of the MNE decision to be vertical or horizontal.

The crucial question is how the MNE choice influenced by the main characteristics related. There are two main categories, which determine the MNE decision either for the initial

multinational activity or for the choice of the multinational activity type. First: characteristics of the home and host country such as (market size, relative factor endowments and trade costs (tariffs and transportations), second: company internal characteristics, such as (company productivity, size and age).

Thus, depending on country characteristics both types of FDI can arise endogenously within the single model, but there still need to include the companies' internal characteristics, which determine the national company decision<sup>12</sup>. The intuition behind the name "Knowledge Capital" (KC) because knowledge in the model is mobile across countries, and it serves as a joint input to improve the production in the multiple affiliates, independently of the type of FDI, either vertical or horizontal.

Similarly to the basic vertical and horizontal models, the KC model is a two-goods, two-factor and two-country framework which consists of homogeneous and differentiated goods, skilled and unskilled labour, and home and host country. The production of homogeneous goods is under a perfect competition with constant return to scale, and employs only unskilled labour.

The production of differentiated goods is under a Cournot competition with increasing return to scale which consists of headquarters services and production activities. Headquarter services e.g. blueprints, R&D and managerial services are skilled-labour intensive and serve as a joint input to multiple production plants.

The KC-model consists of three company types. One type is horizontal MNE, which duplicates the same activity in the foreign country and benefits headquarter in the home country. The second type is vertical FDI, which fragments the production process and locates the high-skilled labour intensive headquarter in the high-skilled labour abundant home country, meanwhile the low-skilled labour intensive production in the low-skilled labour abundant host country. The third type is firms from the home country, which serve the foreign market by exports. The main results are illustrated in Figure 3.1, where an Edgeworth box with country endowments of skilled and unskilled labour on the vertical and horizontal axis respectively. The origin of the home country is in the South-West corner and of the host

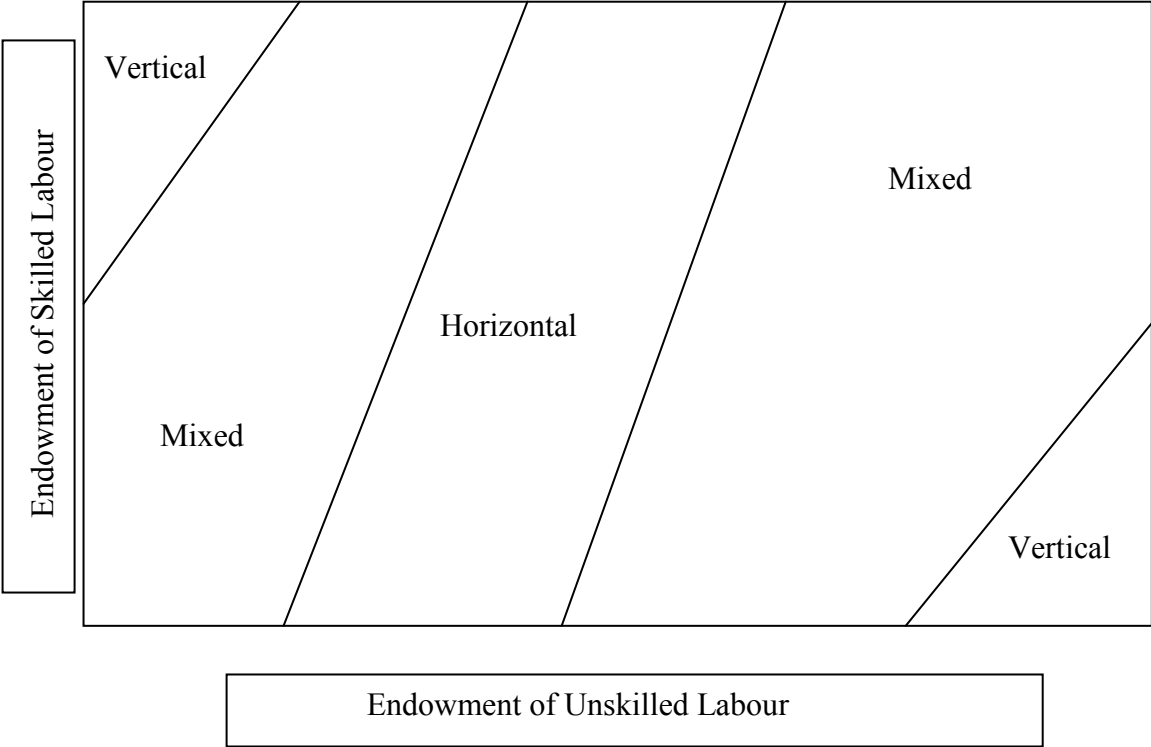
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<sup>12</sup> The analysis of the multinational strategy choice of serving the foreign market will be discussed empirically in chapter four. In addition the country level choice and relationship between the different strategies (exports, FDI) also discussed empirically in the chapter five.

country in the Northeast corner, where the simulation for medium transportation costs. In this situation, vertical FDI is dominating if the countries have different endowments.

Thus, we see vertical FDI in both North West and southeast corners. If, in contrast, the countries are very similar, there is no incentive to fragment the production chain, so there is no vertical FDI.

Figure 3.1: Horizontal and Vertical FDI in the K-C Model



Markusen et al. (1996).

At the same time, in the presence of transportation costs, it is more attractive to produce abroad by horizontal affiliate instead of serving the foreign market by exports. Thus, in the middle area, we find only the horizontal FDI. Meanwhile, the two areas between the presence areas of vertical and horizontal multinationals is the mixed presence of multinationals and companies serving the foreign markets by exports<sup>13</sup>. Overall, these results are consistent with

<sup>13</sup> Our later results and other empirical work, confirm that the multinationals presence of both strategies of serving the foreign market (exports and FDI). Therefore, we believe that we should not deal the lines separating the areas of vertical and horizontal, as a clear-cut lines or points. Hence, we prefer to consider these lines as nondeterministic (uncertain) areas, which allow for the presence of the FDI, in addition to exports.

the previously described models of vertical and horizontal FDI shown and summarized in tables (3.1, 3.2).

Theoretical implications of the KC model can explain the multinational activity as a function of characteristics of home and host country relating absolute, relative size and factor endowments.

- National company tends to dominate when home country is large and skilled labour abundant; and when home and foreign countries are similar in size and in relative endowments, and have low trade costs.
- Horizontal MNE tends to dominate vertical MNE when two countries are large, similar in size and in relative endowments, and have high trade costs between countries. With respect to this causality, the company chooses to penetrate foreign markets via FDI rather than export.
- Vertical MNE tends to dominate horizontal MNE between high cost country and low cost country (two countries are differences in relative factor endowments), and have low trade costs across countries. With respect to causality, company takes advantages of low factor costs from foreign country and exports outputs back to home country.

Trade costs make horizontal FDI more attractive while they are discouraging vertical FDI.

The implications of Markusen and Venables (1998, 2000) particularly illustrate that horizontal MNE will dominate when relative economies of scale at company and at plant level are high. However, they do not attempt to explain differences among companies and industries, in the propensities of company to become MNE. Helpman et al. (2004) a latter attempts to study the effect of the productivity. the model suggests a hypothesis that the more productive companies substitute their exports through FDI, which they found that the less productive company just serves the local market while the more productive company serves the foreign market via exports and the most productive company penetrates the foreign market via FDI. The company internal characteristics impact on the strategy choice decision to serve the market arises as a promising way to understand the MNEs strategy choice of serving the market.

Explaining the multinational activities as a function of characteristics of companies, home country and host country characteristics will be a good attempt to more understanding about the company strategy, location choice and the FDI determinants<sup>14</sup>.

Both types of FDI have a positive impact on global welfare by avoiding the duplication of headquarter activities, improving the global production efficiency and facilitate transferring the technology to the local suppliers; however, they differ in the impact on wages. Vertical FDI decrease the differences in absolute wage between countries and increase the relative wages within countries. In contrast, horizontal FDI increases the income in each country, without necessarily changing the distribution. Anyway, the relationship nature with the exports shows the impact on the local economy.

As the KC model combines the main features of the vertical and horizontal models, the KC model results fit well and support for the theory of horizontal and vertical FDI results. The same theoretical results predicted in the theories of vertical and horizontal FDI shown in tables (3.1, 3.2) get accordance with the KC model results. These results show that the similarity in market size and relative factor endowments with high trade cost support horizontal FDI theory according the KC model. On the other hand, differences in relative factor endowments with low trade costs encourage the vertical theory of FDI according the KC model. In a separate section in this chapter, we will present the empirical literature related.

Other interesting theory is the complex integration strategies has initiated a departure from two-country case, putting emphasis on the role of endowments firstly, and the trade and investment costs, secondly, in the rest of the world. In addition, the strength of the third country effect depends on a host country's relative remoteness from third markets, Baltagi et al. (2007). Complex multinationals operate plants abroad to serve the domestic market more cheaply or produce locally to save on trade costs, where engage in trade or even FDI with third market, Baltagi et al (2007). Hence, third markets affect bilateral FDI due to their weight (size) in worldwide demand or supply, production cost related, Baltagi et al. (2007).

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<sup>14</sup> This may represent our two empirical parts in this thesis.

### **3.3 Exports and FDI:**

In the last section, the multinationals theories show that the country and company characteristics affect the company decision of serving the foreign market. The two possible strategies of serving the foreign market are exports and FDI, for which the productivity, company economies of scale, and the other company characteristics influence the strategy decision at the company level. On the other hand, the similarity between countries, relative factor endowments, market size and others influence the strategy decision on country level. Hence, in this section, we review the theoretical and empirical base of these strategies, and the relationship nature between the strategies.

#### **3.3.1 Introduction**

Exports and overseas production (FDI) are alternative modes for serving foreign markets. MNEs are recently facing an important question, i.e. should they provide the market in country  $j$  (foreign market) using the existing factory in country  $i$  (home country) or should they invest to manufacture locally in country  $j$ . To more clarification to the idea: should supply the French MNEs, for example, their cars to the American consumers by exporting from their plants in France or by setting up other car plants in the American states? This example clarify that exporting and FDI are an alternative strategies to provide their products to the foreign consumers. Many empirical studies have struggled to support this proposition and others to contradict it. Meanwhile the previous MNEs theories literature formats a good base to explain the relationship between exports and FDI, but it still controversial. We will outline alternative theories of the MNEs that identify the economic mechanisms linking FDI and exports.

We then review the empirical works discussing the relationship between exports and FDI, substitutes or complements. Before going forward in this discussion, we should ask why we interest to know whether exports and FDI are substitutes or complements.

Multinationals play a leading role in the world economy. Different groups and parts are interesting about various subjects such as, environment, balance of payments, labor market,



tax revenue and others. Moreover, how these subjects could be affected by the globalization, and the relationship between multinationals activities.

In addition, the government formulation to the trade and foreign investment policies benefits from clear understanding of, how MNEs make decision choice between exports and FDI. For example, could the increasing of FDI tax cost induce more production at home? Alternatively, would less favorable tax treatment for income earned by overseas affiliates simulate the manufacturing sector at home and encouraging local production? If on the other side, the overseas activities tend to complete home activity, it may not actually be in domestic workers' interest to discourage overseas investment, because it will not increase the unemployment level, Head and Ries (2004).

Hence, the understanding of the factors, which determine the decisions of MNEs strategy choice decision between exports and FDI. In addition, the analysis of the main strategy, chosen by these companies, whether to serve a foreign market via exports or FDI. In fact, this formulates a paradox between different researches.

The previous discussion shows that the internal economic indicators of production and employment will be affected either positively or negatively depending on the predicted relationship between FDI and exports, whether its substitutes or complement.

### **3.3.2 Theoretical Literature**

Traditional economic theory identifies a clear-cut relationship between FDI and trade, Mundell (1957). Investigating the relationship between FDI and exports, based upon the assumptions of the neoclassical Heckscher-Ohlin-Samuelson theory, in their model, capital mobility only makes sense with the presence of obstacles to trade, where the flows of FDI and trade pattern depend on the differences in factor prices and factor endowments between countries. With international factors becoming mobile, these differences become smaller. Therefore, Mundell (1957) under certain assumptions concludes that capital mobility driven by FDI constitutes a perfect substitute for exports. These theories depend on presumptions made upon the sources of comparative advantages, and on the factor-price-equalization result of the free trade in goods.

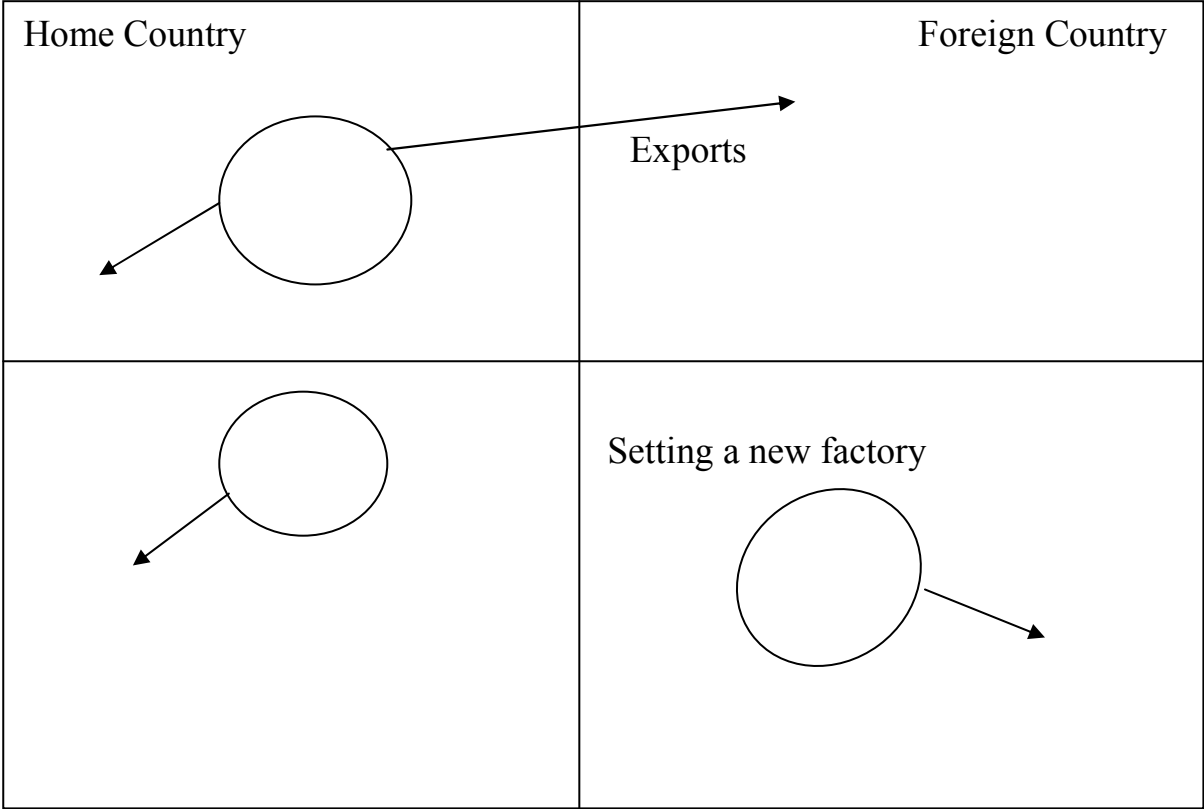
Additionally, other theories, as for instance the theory of internalization (Williamson, 1975; Markusen and Venables, 1995) suggest that FDI substitute for exports as the “OLI” conditions that developed by Dunning (1977) are supported, and there are sufficient costs for external transactions such as exporting and licensing, Falk and Hake (2008). Furthermore, Brainard (1993b) states that the “proximity-concentration trade off”, which was determined by the companies fixed costs, transportation costs, and trade barriers, is the explanation for the substitutive link between FDI and trade.

In the other side, Markusen (1983) examines different situations with a non-factor proportion basis for trade, in which capital movements and goods trade are complements.

### **3.3.2.1 Substitution Case**

Firstly, we present a simplest possible model that shows substitution case for the one product, which MNE sells its product to consumers, in both home  $H$  and foreign country  $F$ . Two main options are available to the company shown in figure (3.2) either the default one, by serving the foreign market by exports and concentrate the production at home. While the second option is to duplicate the company factor and set up a new one in the foreign market, which means Horizontal FDI, Head and Ries (2004) called it “replication”, we reduce the model shown in Head and Ries, (2004) to the first two cases represent the strategy choice between exports and FDI. We present this model without including or separating the different FDI type's, where we aim in this thesis to determine the relationship between exports and the overall FDI. This allows later to determine the final impacts on the local market.

Figure 3.2: Two Possible Strategies to MNEs to Serve the Foreign Market



Head and Ries, (2004)

To determine and clarify the key factors those affect the strategy choice. the model presented in a simple algebra for more precise analysis. The model consider that each market size as given; demand level exogenously determined, which no pricing decisions, each consumer demand just one unit for price equal or less than his evaluation, and zero above it. That means no demand for any price above it. Hence, the total revenue does not depend on the strategy, and the focus is on the cost minimization strategy. The current case relating to company level decision-making and it requires naturally a cross section of companies<sup>15</sup>.

This approach outlines the basic case of substitution, and the total cost for the first option given as<sup>16</sup>:

$$C_h = (W_h / A)M_h + (W_h / A + T_f)M_f + K \tag{1}$$

<sup>15</sup> Chapter four analyses cross-section data, of the large French companies, using the bivariate probit model.

<sup>16</sup> Head and Ries (2004).

Where  $(W_h / A)$  is a marginal cost in home production,  $W$  is labour wages, where labour is the unique production factor,  $A$  is a productivity and it does not depend on country, which means that it is equal in both countries.  $T_f$  is trade cost of exporting to the foreign market,  $M_h$  and  $M_f$  are the home and foreign market and  $K$  is the fixed cost for setting up an affiliate and it doesn't depend on the country, whereas duplicating the factories required duplicating the costs.

The cost of the second option (Horizontal FDI) is given as

$$C_d = (W_h / A)M_h + (W_f / A)M_f + 2K \quad (2)$$

The comparison between the two options is required, which the first option is preferred when:

$$C_d - C_h = [(W_f / A)M_f + K] - [(W_h / A + T_f)M_f] > 0 \quad (3)$$

By dividing on the size of the foreign market  $M_f$ , exports preferable when

$$W_f / A + K / M_f > W_h / A + T_f \quad (4)$$

Figure (3.3) graphs the two sides' inequality, it clarifies that FDI justified when the foreign market is large enough and by solving for the critical market size required to justify FDI (setting new affiliate in the foreign country). This is  $M_f^*$  that sets  $C_d = C_h$ :

$$M_f^* = K / [T_f - (W_f - W_h) / A] \quad (5)$$

As shown in figure (3.3), companies choose the first option and serve the foreign market by exports when  $M_f < M_f^*$ . For larger foreign market, the companies engage in FDI and serve the foreign market locally.

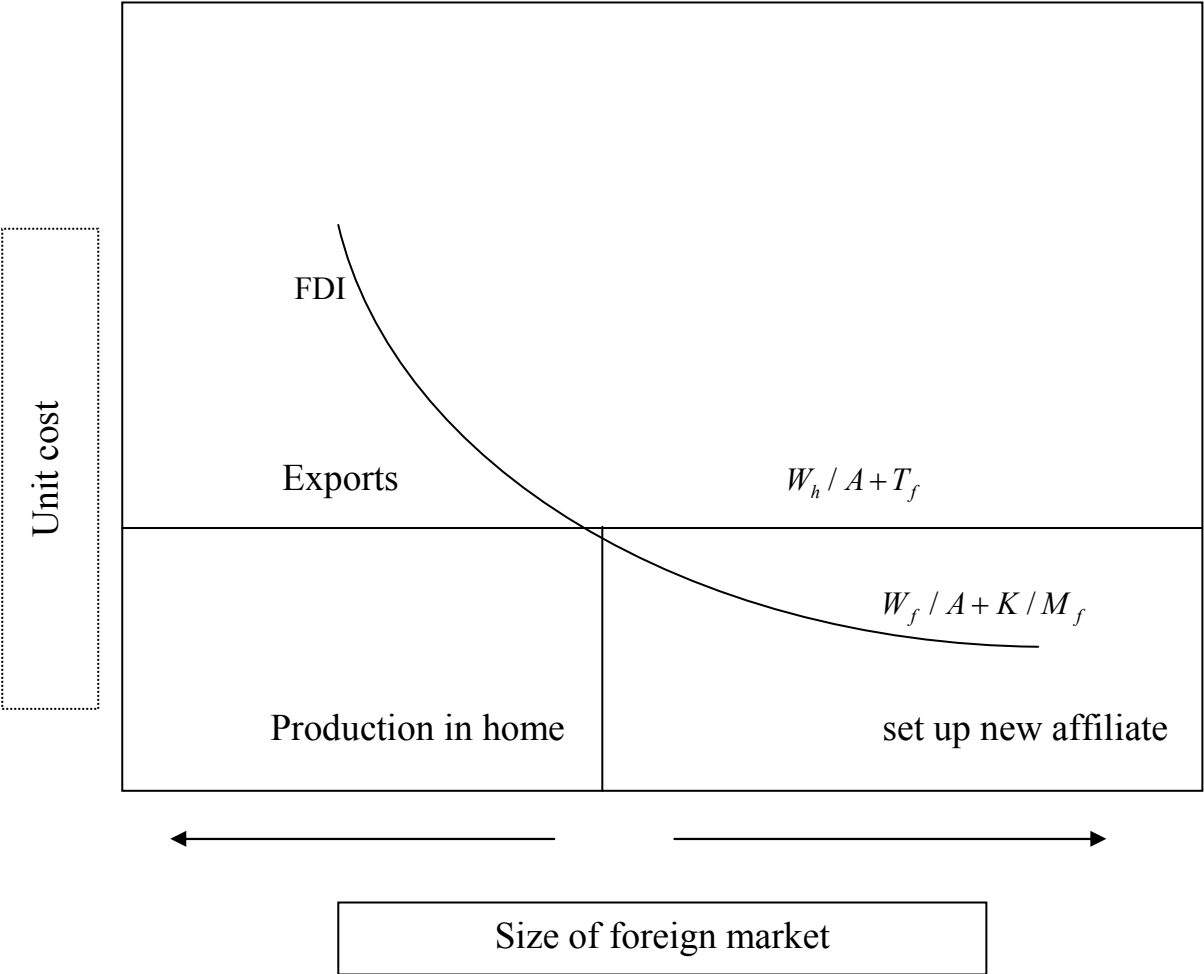
The last equation shows, the importance of plant level economies of scales which the larger scale economies should be faced by large market size to cover the large additional amount fixed cost by setting up a new affiliate in the foreign market.

In denominator; firstly, trade cost, the bigger they are, the smaller the critical size of foreign market. In the parentheses, we see the comparative advantage, (when  $W_f - W_h > 0$ ). The larger home comparative advantage, the bigger the foreign market will have to be to justify FDI.

The trade costs which include tariff and transports costs in this simple model. They play the same role of determining the critical market size, and strategies choice.

Hence, this analysis presents basic suggestion of the economic theory of the substitution relationship between exports and FDI. In addition, many key variables shown to be crucial of determining the strategy choice.

Figure 3.3: Critical foreign market size justifies FDI and exports trade-off



### **3.3.2.2 Complementary Case:**

It is natural to suppose that the data support the theoretical idea of negative or substitution relationship between exports and FDI, but is not a clear cut whereas many observations in different papers contrast this proposed relationship. These results challenge the traditional multinationals theory view, which exporting and FDI being substitute strategies. Meanwhile, Helpman et al. (2003) show that whether the relationship is complementary or subsidiary, it is an issue depends on the type of FDI.

Although, the intuitive behind the substitutive relationship is obvious and strong but other theoretical justifications for the complementarity case are still possible.

Now, we present the other theoretical side that explains the co-existence of exports and FDI. For representing the co-existence cases of FDI and exports, we follow classification and explanation of Head and Ries (2004), which they outline, three cases:

Firstly, the representative company with single product, secondly, the single product with heterogeneous company and finally the company produces more than one product. This may explain the motives behind raising the co-existence of FDI and exports.

#### **3.3.2.2.1 The representative company with single product:**

The traditional theories of FDI and the economic literature assume usually imperfect competition with representative companies; see for example Brainard (1993b, and 1997) and Markusen (2002). While the major theoretical breakthroughs associated with Melitz (2003) and Helpman et al. (2004) and Bernard et al. (2003) among others of heterogeneity and the participation of international market, Greenaway and Kneller (2007).

Bernard and Jensen (1995) drew attention to the fact that exporting and non-exporting companies co-existed in the same industry, but were marked by clear defining characteristics and following to it, there is now an extensive body of empirical analyses on a large number of industrialized, transitional and developing countries. This includes the companies' characteristics, which export to the foreign markets, and, in addition, those markers likely to be associated with survival and not exit the market, Greenaway and Kneller (2007).

The simple theory predicts the same company decision, with the same combination of characteristics (trade cost, market size, wage differences and plant level fixed cost) as mentioned before, which affect the profits and, thus, the decision of choice; in the case of price effects and competitors' interaction absence.

Therefore, it is important to understand the effects of mode decision on price and quantity sold that affect the profits (models with downward demand). This actually explains the forces that influence the FDI versus export decision.

Different models of MNEs show that, depending on the circumstances of FDI and trade, the relationship could be complementary relationship, as well as, substitute, Magalhaes and Africano (2007). Horizontal FDI model occurs normally between developed countries, Markusen (1984) predicts a substitution relationship between horizontal FDI and exports, whereas horizontal FDI arises as a product of the interaction of plant-level activities and company-specific activities ((Headquarter servicing) R&D, marketing, managerial services, etc.). That is means, whether the MNE set up a new affiliate or choose to export, its still depend on the trade cost from one side, and setting up fixed cost in another side. Nevertheless, it shows that complementarity between FDI and trade is still possible when countries have identical endowments, preferences and technology.

Head et al. (2002), Head and Ries (2004) explain how the asymmetry in outcomes could happened although the existence of an identical initial conditions, based on market partial crowding out.

In the simple theory of substitution between exports and FDI presented above, market crowding out couldn't happen because, price and demand is assumed to be exogenous variables and not affect the companies location decision. Meanwhile, the market crowding can influence these models with downward sloping demand curve.

Companies start to switch to do overseas mode and continue to do that as long as the benefits associated with the FDI option by avoiding trade costs bigger than the fixed cost of operating new plant, Head and Ries (2004). When the company entrance to the foreign market as investor increasing or exceeding the capacity limit of the market, then the market crowding out will partially eliminate the potential profits for investors and that keep the existence of the two modes of choice (exporting and FDI), in other words, this will stop switching to FDI after a specific limit.

The market crowding effect is common to models of FDI with representative companies and imperfect competition that gives rise to the co-existence of exports and the FDI in equilibrium, Head et al. (2002).

The previous part also shows that in representative company models with imperfect competition, either substitution or complement relationship depends on the same factors or initial circumstances as trade cost and fixed cost. Meanwhile some studies show substitution case in horizontal FDI where the case of substitution is stronger theoretically. Nevertheless, the complementary relationship is still possible in some cases. At the same context, the market crowding out case supports and explains the two strategies co-existence.

Therefore, representative companies with imperfect competition explain the complementary relationship between the two strategies and still depend on the same group of variables mentioned previously, with breakthroughs of introducing new endogenous effective variable could explain the phenomenon that is productivity, which will introduced in the next section.

#### **3.3.2.2.2 Single product with heterogeneous companies:**

An endogenously determined variable, which is productivity differences across companies, rose in the recent related researches. Productivity differences considered a new way to explain, why the some companies serve the foreign market by exports and others involve in production locally abroad, meanwhile others produce locally. The new variable has to be adding to list of variables that could explain the relationship effectively, such as (trade costs, plant level fixed costs, market size, and wage differentiations).

Clerides et al. (1998) is one of the first who modeled this explicitly in a discrete choice framework. In their model, the more productive companies with lower marginal costs earn higher gross profits from producing, but not all companies export. Only those with sufficiently high profits to cover the sunk costs do so. This intuitively appealing result leads to the conclusion that self-selection is fundamental sunk costs, and company heterogeneity interact and the most productive companies self select into export markets. Its corollary is that companies have to raise productivity before they enter. Therefore, it supports that there is a direct causality (connection) between productivity and the export choice, and its corollary to apply this result on the FDI choice, which needs sunk cost higher than exports, and this choice needs productivity level higher than exports. Moreover, the interaction of sunk cost and



productivity is key variable for the strategy choice, between exports or FDI, Greenaway and Kneller (2007).

Meltiz (2003), Helpman et al. (2004) developed a monopolistic competition model, which, company decides to choose between either exports or FDI. These differences in marginal cost of production are basing on their different levels of productivity. These modes of market access have different relative costs, exporting involves lower fixed costs while FDI involves lower variable costs.

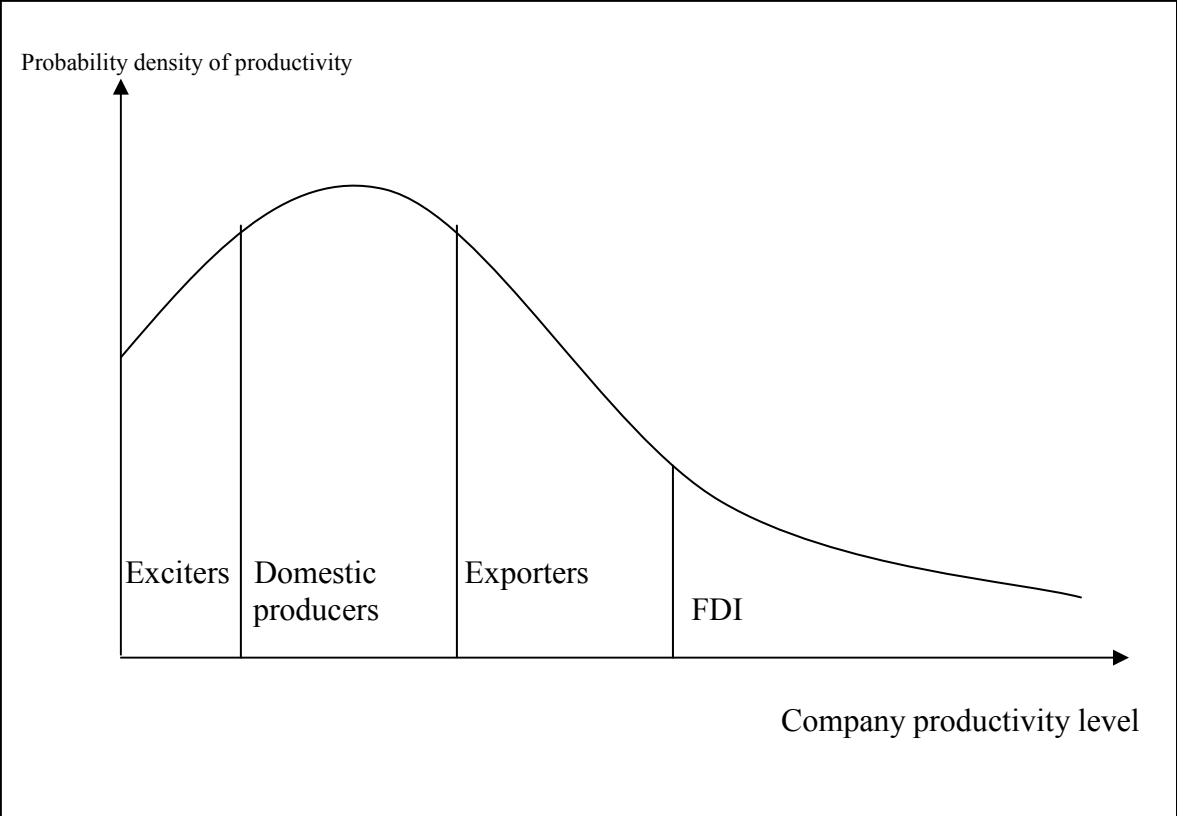
Each company produces a unique variety and consumer has Dixit-Stiglitz preferences. Company chooses FDI over exporting if the benefits associated with avoiding transportation costs exceed the fixed cost of setting up the second affiliate (Duplication). Helpman et al. (2004) model suggests the hypothesis that the more productive companies substitute their exports through FDI, and they found that most productive companies are most profitable of all. Firstly, only the most productive companies engage in foreign activities. This result mirrors other findings on company heterogeneity and trade, in particularly, Melitz (2003). Second, the least productive companies do not serve the foreign market at all. Third, the intermediate productivity levels serve the foreign market via exports. They found also that, FDI sales relative to exports are larger in sectors with more company heterogeneity.

In case, the fixed costs are equal between different strategies, the productivity distribution predicted initiated on Helpman et al. (2003). Figure (3.4) shows that increasing productivity will change the companies strategies from exports to FDI, meanwhile Girma et al. (2005) find that the possibility that companies of the same productivity level may choose different forms of commerce around a given cut-off point. Girma et al. (2005) considered the areas around the cut off points are uncertainty areas, and the relationship between productivity and the international trade is not so deterministic. Hence, these areas could include a presence of more than one strategy. In figure (3.4), we can replace each cut off line between the different productivity levels by an uncertain (nondeterministic ) area, which allows the existence of both strategies for serving the foreign market and the existence of non break even companies in the short run (companies don't cover the variables costs)<sup>17</sup>.

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<sup>17</sup> We draw the productivity density function for the French companies both large and very large, in chapter four.

Figure 3.4: Probability density of productivity

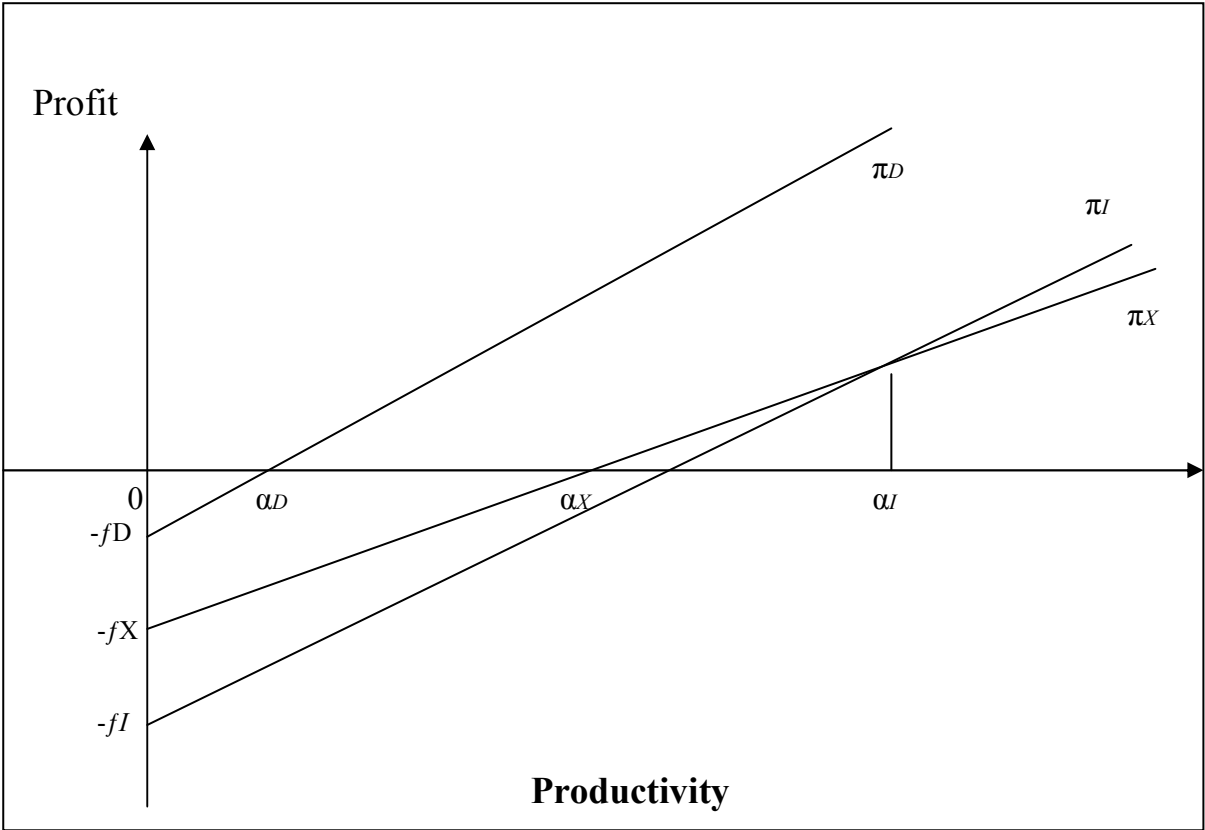


Modified from: Greenaway and Kneller (2007); Girma et al. (2005) and Helpman et al. (2003).

Head and Ries (2004) states that the MNEs choose between exporting and FDI, even though, the factor prices are the same in home and foreign country. In other words, the MNEs will engage in overseas production even it has not a foreign production cost advantage. They extended their model to the case of per unit trade cost instead of melting iceberg, and linear, independent demand curves for each company’s product, instead of constant elastic of substitution.

The figure 3.5 below shows, the profits associated with exporting and FDI based on different levels of productivity using Helpman et al. (2004) model, the same graph presented in Head and Ries (2004). However, the profits are nonlinear productivity function and it used by many other articles.

Figure 3.5: Heterogeneous Productivity and the Exports versus FDI Decision



Helpman et al. (2004)

As shown in figure (3.5), the profit function  $\pi_D$  and  $\pi_I$  are parallel, this based on the assumption of two markets equality. Initially, the profits of FDI are lower as the fixed costs of FDI are higher than the fixed costs of domestic production. The profit function  $\pi_X$  is steeper than both are  $\pi_D$  and  $\pi_I$  due to their high variable costs raised from trade (example: Transportations).

Each company either produces locally or export or engage in FDI has a special fixed cost for its type of producing, which shown in the figure (3.5),  $F_D$ ,  $F_X$  and  $F_I$ . This shows that, in the theory, serving foreign market via exports has also its own fixed cost (includes fixed costs of research into product compliance, distribution networks, advertising and so on). This was not available in theory introduced in the simple theory of substitution and answer, the question stands their.

It is clear that, in the low productivity level companies, the exports are more profitable than FDI and less profitable for high productivity level companies. The least productive companies expect negative operating profits and therefore exit the industry. At productivity level less

than  $\alpha_D$ , which  $\alpha$  is the productivity coefficient of company, exit the market. Companies with productivity between  $\alpha_D$  and  $\alpha_X$  have positive profits but they expect to lose from exporting or engaging in the FDI, so they serve just the local market. The cut-off  $\alpha_X$  is the breakeven point for the exporters; hence, companies with higher productivity can export profitably. Productivity level above the cut-off  $\alpha_I$  can produce profitably overseas, Helpman et al. (2004).

Some empirical studies found the possibility that the cut off or the breakeven point of the strategy could be unclear. Therefore, companies with the same level of productivity may choose different forms of trade around a given cut off, Girma et al. (2005), and we will introduce it later in the empirical literature.

In addition, they considered that ex-ante productivity determines the choice of whether or not to export, and thus, to export or engage in the FDI. Companies have to become more productive before they change their strategy and shift to a new one, and causality runs from productivity to exports or FDI. Causality in the opposite direction is less clear. One can think of plausible reasons why a presence in export markets might raise productivity after entry, for instance exposure to best practice technology and learning, Greenaway and Kneller (2007).

Oberhofer and Pfaffermayr (2008) extended Helpman et al. (2004) to three countries model. We use their theoretical and empirical model, and apply it to the large French companies, as we explain later.

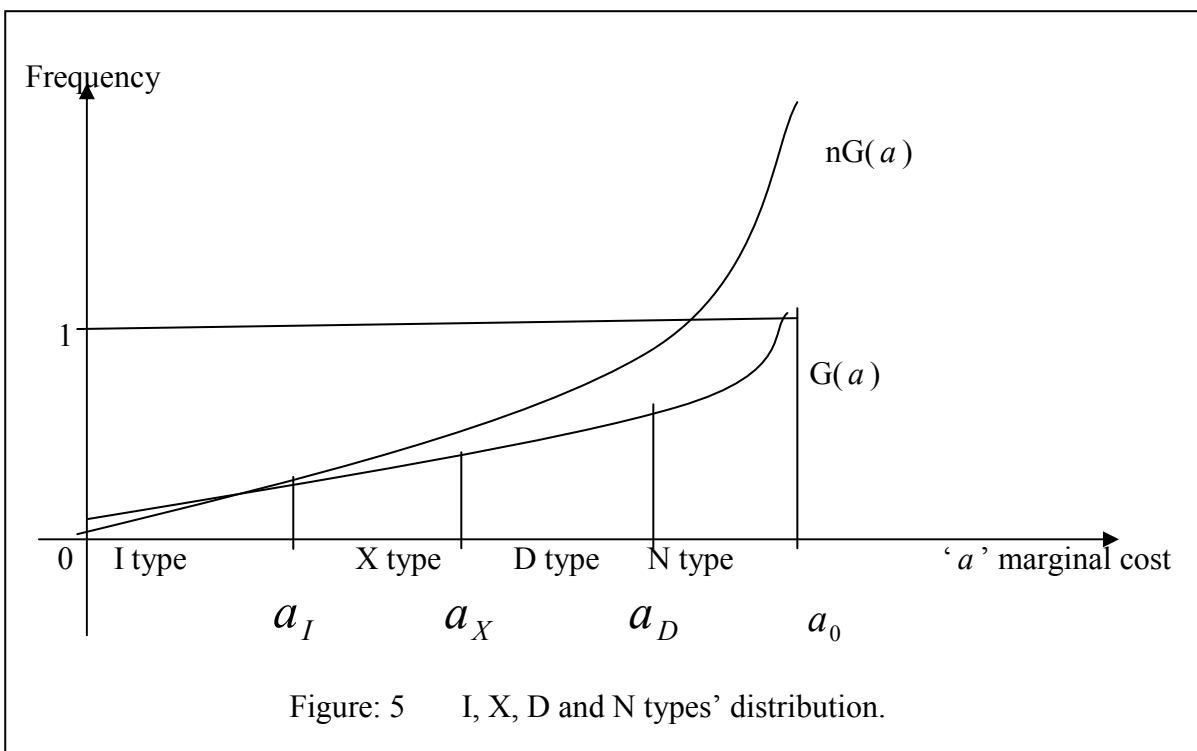
Head and Ries (2004), they include the case of foreign centralization, which the company centralizes the production in foreign market. Meanwhile, Helpman et al. (2004) did not consider the mentioned strategy because they assumed that the company must have a production facility in a country to be basing there. Anyway, the most interesting result in Head and Ries (2003), which they reversed the productivity ordering of Helpman et al. (2004).

The home centralization strategy is very important for Small and Medium Enterprises (SMEs). That, since all companies prefer big and low cost markets, the interesting strategy choice in home versus foreign centralization decision occurs when there is a trade off between a large-high cost market and a small low cost market. They find that the profits associated with foreign centralization exceed those of home centralization for the low-productivity level

companies. Therefore, they are seeking low-cost and invest abroad. The witness point is exporters and investors co-exist in this scenario.

On the other side, although each company has its own marginal cost, it is useful to group companies into four types. Companies that produce but sell only locally (D-types, short for domestic companies), companies that sell locally and also export (X-types, short for export companies), companies that sell locally and also sell overseas (I-types, short for invest companies), and companies that do not produce (N-types, short for non producers). As it shown in the figure below:

Figure 3.6: Cumulative distribution of company types based on the marginal cost differences.



Modified from: Baldwin (2005)

The level of a company's sales increase as its relative price falls, and its relative price falls as its relative marginal cost falls (relative here means relative to that of its competitors).

The graph shows three types of fixed costs which tell us that, only companies with sufficiently low marginal costs will enjoy operating profits that justify paying the beachhead (fixed) costs. Since there are three beachhead costs,  $F_D$ ,  $F_X$  and  $F_I$ , there will be three cut-off levels, i.e. thresholds, for marginal cost. Following the notational procedure, the marginal cost cut-offs are labelled as,  $a_D$ ,  $a_X$  and  $a_I$ .

The marginal costs for the different companies types should be  $a_I < a_X < a_D$ , i.e. the maximum marginal cost threshold for overseas sales companies is below the maximum marginal-cost threshold for exporting companies, and these in turn is below the maximum marginal cost threshold for companies that sell domestically.

Finally, as shown before, Clerides et al. (1998) firstly initiated a model which the most productive company with lowest marginal cost gain higher profits, therefore those with sufficiently high profits to cover the sunk costs do serving to foreign market. It concludes that self-selection is fundamental sunk costs and company heterogeneity interacts, and thus, the more productive companies self select into export markets, and corollary, the most productive companies self select for the selling locally overseas. Parallel, Meltiz (2003), Helpman et al. (2004) developed a monopolistic competition model, whereas company decides to choose between exports or FDI according to differences in marginal cost of production based on their different levels of productivity. They conclude that when companies graduate in productivity, they switch to the more profitable mode of serving foreign market from exports to FDI. These theoretical frameworks and others refer to coexistence of the two strategies.

The last part shows that new breakthroughs in the new trade theory that occurred explain the relationship nature between exports and FDI. That, productivity level differences became the most efficient and newest way to determine the relationship nature and explain it. Besides, the traditional variables those come from foreign direct investment theories.

### **3.3.2.2.3 Company produces more than one product**

For multi-product companies and at company level data, if a company's products were associated horizontally, it pursued a home centralization strategy for one product but duplication strategy for another; so, it is simultaneously export and carries out FDI. Because, producing the two products at the same country, they will compete more with each other. Therefore, to avoid the competition between the two products of the company, it centralizes each product in a different country Head and Ries (2004). Baldwin and Ottaviano (2001) model supports the same idea through showing similar effects to market crowding phenomenon described earlier.

The model of Helpman (1984) implies that in the case of vertical FDI, there are complementarities between the trade flows of final goods from foreign affiliates to parent companies, and intra-firm transfers of intermediate goods from parent companies to foreign affiliates. In general, the model suggests that vertical FDI is likely to occur between developed and developing countries, that this idea may strongly supported in the Mediterranean area. For example, a company's presence on a foreign market with one product may increase the total demand for the entire line of products, Lipsey and Weiss (1984). The co-existence of exporting and FDI is much supported by vertically integrated companies, and also by branching, which the company centralizes all stage production in one country and duplicate the final stage production in the other country. Vertical specialization and branching are associated with the multi product company in both export and conducting FDI, and they lead to greater distance between different stages of production (upstream and downstream) Head and Ries (2004). The international trade statistics support the idea where gross product by all foreign affiliates accounted for an estimated around 10.6% of world GDP in 2009, while exports by these affiliates represented nearly 33% of total world trade, UNCTAD (2010). Hence, complementarity between exports and FDI could naturally found in vertical FDI (fragmentation or splits). In these models, differences in relative factor endowments between countries and specializations between sectors are determinants for either exports or FDI as a two possible strategies of MNEs, especially between developed and developing countries Helpman (1984), Grossman and Helpman (1991).

The knowledge capital models presented previously predict several combinations of vertical and horizontal multinationals and imply that horizontal FDI is more prevalent for countries with similar factor endowment and with high trade costs. In addition, vertical FDI arises when countries differ substantially in terms of factor endowments and when trade costs are low. Trade and FDI between developed countries, therefore, could be consider as substitutes while trade and FDI between developed and developing countries are likely to be complements. Thus, the theoretical arguments (either international trade theory or theory of firm) do not provide, a priori, a clear-cut relation between outward FDI and exports. Both a substitution and complementary relationship are possible depending on various factors such as tariffs, relative size and endowments between countries, type of goods, and type of FDI, Falk and Hake (2008).

Finally, the factors that influence the exports versus FDI strategy choice are, trade cost which should be positively related to FDI, but negatively related with exports, at the same time, fixed cost and home country comparative advantage should be positively related to exports and negatively to FDI. Foreign market increase causes many effects, first, it will increase companies' number that follow the overseas production and decrease the number of exporters. Second, it will increase the overseas production of MNEs even the small. Third, it will increase the export levels of the exporters who continue to export. FDI increases as the foreign market expands, but the total effect on exports could exhibit a positive correlation with foreign production, which could show an evidence of complementary relationship between exports and FDI, Head and Ries (2004).

The recent analysis to multiproduct companies shows that, even the products horizontally related, the companies engaged in the two strategies to avoid competition between their products. However, the vertical FDI model shows complementary relation between the two strategies, based on the trade increasing of upstream and downstream, and the nature of the vertical model that normally occurs between the developed and developing countries because of factor endowments differences. All of this is strongly enhancing the idea of the dominance of vertical FDI in the Mediterranean area.

The theoretical literature concentrates on the MNEs strategy alternatives concerning the different FDI type's relationship with exports (trade), and what is the reasons cause complementary or substitution relationship between FDI and exports. In fact, different effects recognize on home and host country, which are different between countries, in regarding exports and FDI. The home exports is host imports, and the home outward FDI could be leakage, but could considered an injection for the host country, vice versa.

Finally, the overall and final effects on the home country could be show by knowing the overall relationship between the exports and FDI (both types, vertical and horizontal). Hence, the dominant relationship between exports and outward FDI shows the final effects of the multinational activities (and the relation between them) on the local economy, (employments and growth).

According the previous literature, firstly, we study the relationship at company level, through the effects of the company characteristics including productivity on the multinational strategy



choice between the activities, either exports or FDI. This determines the relationship between exports and FDI; in addition, it determines the micro determinants of the multinational activities.

Hence, Oberhofer and Pfaffermayr (2011) is a new theoretical model, which we use in the first empirical part in the thesis. They extend Helpman et al. (2004) to one home and two hosts' country framework. The model is embedded in a monopolistic market structure with one production sector produce differentiated products using labor  $L$  that face a given wage rate  $W$ . Consumers in the three countries prefer choosing a wide variety of brands according the love of variety approach, which introduced by Dixit and Stiglitz (1977). The utility function for differentiated demand product assumed to be symmetrically concave with constant elasticity of substitution (CES). Home country served by domestic companies, and the other two countries supplied by brands produced domestically and by companies from home country. Under symmetric costs, each location brands produced there have the same price. Symmetry of the utility function ensures that varieties with equal prices consumed in the same quantity. Home demand depends on consumers' income  $E_1$  and the number of other brands produced in the domestic market  $N_1$ . An increase in produced varieties leads to smaller market shares for all competitors. In the foreign countries, the demand for a brand depends on several components. There are different prices for domestically produced and imported brands due to transportation costs. Consumers' income will play a similar role as in home country (country 1). Companies face fixed entry cost  $F_E$ , then it decides whether to produce at all, and how to serve the foreign markets. If it decides to produce, it faces additional overhead costs  $F_D$ ,  $F_X$  and  $F_I$  for locally, exporting or overseas production, respectively.

We apply the model on the French companies and we study their strategy choice for serving the foreign market. We concentrate on the productivity role; hence, we apply it separately on large, very large and all the companies (both large and very large group). This is to investigate the productivity role besides the other companies' characteristics, where we use two different proxies to measure the productivity.

Secondly, in chapter five, we study the relationship at the macro level, and the macro determinants of the multinational activities, in the Mediterranean area. We estimate bivariate dynamic gravity equations using a new econometric method that the Dynamic Panel Data

system (DPDsys), in addition, to other static methods. This will participate to the very limited work in the area, and determine the trade and FDI determinants, as well as the relationship nature between French exports and FDI.

### **3.4 Empirical evidences**

The theoretical literature widely adopted the substitutive relationship between exports and FDI, on the other hand, the empirical studies appear the two possibilities, and the majority of the studies predict a positive relationship between outward FDI and exports, as two possible strategies of serving the foreign market, while the other part supports the theory prediction. The empirical literature can be dividing according the aggregation level used as shown in the table (3.3). Therefore, it can be arranging into country level studies, industry level studies, company level studies, and product level studies, Falk and Hake (2008).

Mundell (1957) investigates the role of capital mobility in the two-sector HO static model, he sets up an extreme case where capital is perfectly mobile and labor immobile completely. He concludes that FDI and exports are substitutes.

Brainard (1993b) depending on the proximity concentration trade off introduced transportation costs and economies of scale at the plant level, to get substitution relationship between exports and FDI.

Contrary to that in a long empirical list, Markusen (1983) found that FDI and exports are complements. He based his analysis on H-O and with free movement of factor movements between countries. Exports and FDI appear in a complementary way if differences in production technology, product market distortion (production taxes, monopoly and increasing returns to scale) or factor market distortion exist.

The theory of international capital markets that considered an important determinant for FDI and consists of two main models. The first, Capital Asset Pricing Model (CAMP), and the second is the Arbitrage Pricing Theory (APT). The two models considered substitutional relationship between exports and FDI, Heckelei and Weissleder (2008).

The analysis on the country level shows a dominant complementary effect, Clausing (2000) investigates the operations of US MNEs in 29 host countries from 1977-1994, and finds a

strong positive influence of FDI on exports. This complementary relationship becomes even more pronounced when multinational activity and intra-firm trade are considered. The intra-firm trade enforces the complementarity relationship, which supports that the complementarity in vertical FDI enhanced more than the horizontal.

Falk and Hake (2008) investigate also 15 European countries at the country level using panel data causality testing method from 1973-2004, they got strong complementary relationship between outward FDI and exports in both directions similar to Pfaffermayr (1994, 1996) using causality testing method.

In the otherwise, Andersen and Hainaut (1998) find a complementary relationship for the USA, Japan, and Germany but not for the United Kingdom.

Pfaffermayr (1994, 1996) employs the Granger causality method testing Austrian exports and FDI relationship using time series data, and obtained a positive causation runs in both directions. The methods used by Pfaffermayr (1994, 1996) based on Granger (1969) that proposed a time series data based approach in order to determine causality, where,  $x$  is a cause of  $y$  if it is useful in forecasting  $y$ . In this framework, "useful" means that  $x$  is able to increase the accuracy of the prediction of  $y$  with respect to a forecast, considering only past values of  $y$ . This strongly supports the economically complement relationship and strongly decrease ability of spurious relationship especially that the causation runs in two directions.

Fontagne and Pajot (1997) analyze the French and US FDI and trade at industry level and, they find complementarity effects to be stronger in the case of the USA. In total, they also argued that a large share of the complementarity between trade and FDI, at the macroeconomic level, could be explained by large spillovers between industries.

The studies at a country level data show stronger evidences for complementarity than the substitution relationship, and the using of Granger causality test in case of times series data is widely used to test the nature of the relationship between the FDI and exports.

The empirical studies on the industry level have mixed results with a dominance of complementary results.

Lipsey and Weiss (1981) one of the oldest empirical studies at the industry level regarding the FDI exports relationship, they regressed US exports to 44 destination countries on the sales of locally produced goods of US owned affiliates in those countries in 1970. They reported coefficients for 14 industries for developed and less developed countries separately.

They had some missing data for less developed countries, there are 25 estimators of the impact of US FDI on US exports, 20 of these are significantly positive and the rest are positively so. They were interested to the correlation effect could be driven by the omitted data and variables. The outstanding part of their work is that, they also regressed the same regression on exports for other 13 major exporting countries to the same destinations, just one of 25 coefficients is significantly positive meanwhile 13 are significantly negative. They show that overseas production complements exports of the parent company, but substitutes for exports of rival companies based on the 13 countries. This is a very interesting result that why the affiliate sales complement the parent exports while substitute the competitors, meanwhile they produce the same goods because they are competitors. That means the affiliate sales are able to increase the parents exports through increasing their competition, and control even partially of the competitors market share. That means, it is more efficient than the competitor, and productivity could be the answer that decrease the marginal cost and increase the productivity and market share control, which is new approach of explaining the relation. They find also that a dollar of additional affiliate sales leads to an increase from 2 to 78 cents of additional exports to the corresponding market.

Head and Ries (2004) argue that the two variables may be substitutes for each other, but unobserved variation possible in the extent that customers prefer the particular goods produced by American companies. When this demand is relatively high, US exports and affiliate production sales will tend to be high. Conversely, exports by other less preferred companies will be lower. The destination country characteristics are their size (measured by their GDP converted to dollars by exchange rates, or their total imports of manufactures), their membership in the European Economic Community (EEC), and their distance from the United States and from Germany (representing distance from most of the other major exporters).

Marchant et al. (2002) also demonstrate a complementary relationship between FDI and trade for the US food processed industry in Free Trade Area of Americas (FTAA) countries. Graham (1996) use a gravity model and the findings generally support the complementary relation between the US outward FDI and US exports but he also finds confirmation of the substitution hypothesis. Furthermore, Brainard (1997) finds a strong confirmation for the “proximity-concentration trade-off” on the industry level for 27 US markets and identifies that when the income per capita of the partner country catches up to the US level, FDI tends

to substitute for exports, which the “proximity-concentration trade-off” seems to be best theoretical explanation for complementary relationship. Fontagné and Pajot (1997) find complementary effects between FDI flows and trade on the sectoral level. Furthermore, they appoint an even a larger impact of FDI on exports when the spillovers between sectors are taken into account. In other words, trade and FDI are complements at the macro economic level. This is partially due to spillovers between companies within industries and between industries within the manufacturing sector.

At the same time, Blonigen (2001) shows a substitution effect between the production of Japanese automobile parts in the US and the Japanese exports of automobile parts to the USA. Furthermore, the relation between the production of Japanese automobiles (final goods) in the USA and Japanese exports of automobile parts turns out to be complementary. Turkan (2006) also identifies a strong complementary relation between US trade and FDI stocks of intermediate goods exports, whereas there is a slight negative relation between FDI and trade in final goods.

Considering the company level data, the complementary relationship still dominant but less clear than the previous levels, Lipsey and Weiss (1984) examined also the relationship between exports and FDI expressed it also by US foreign affiliate’s sales, they used cross section data of destination areas in 14 industries in 1970 for the same region. The study used company level data. They find out that a dollar of additional production in the host country induces 9 to 25 cents of additional exports from the home country. They conclude that there is strong complementary relationship between exports and FDI for intermediate goods, but weaker for final goods and possible substitution effects for final goods. It clears that, the including of the final goods bring the relationship weaker and even negative and the vertically related through intermediate goods prove a stronger complementary relationship as shown in more than one place.

Representing the degree of integration as presenting in Altomonte and Guagliano (2003) between every Mediterranean country with the European Union reflects essentially the role of distance of affecting the exports of the European MNEs.

Oberhofer and Pfaffermayr (2011) also submit a confirmation for the complementary relationship in turn providing evidence for the deterministic characteristics including

productivity, which shows a negative effect, on the choice between FDI and exports and stating that companies use a combination of both FDI and exports to serve foreign markets, which means the existence of both strategies. They use a closely related theoretical model to Helpman et al. (2004) and extend it to three countries and they show that the optimal mode of serving foreign markets can differ across host countries. They studied companies from 10 European countries, at company level data. In contrast, Head and Reis (2001) examined the FDI exports relationship using a panel data set containing 25 years of data period 1966-1990 on 932 Japanese manufacturing companies. They lagged FDI variables one year (dynamic analysis) to remove the influence of shocks that contemporaneously influence FDI and exports. For the full sample of companies, they found complementarity relationship, however, varies across companies. Those that are unlikely to ship intermediates to overseas production affiliates exhibit substitution (the horizontal FDI), meanwhile, Oberhofer and Pfaffermayr (2011) tested for the horizontal FDI and found an evidence for complementary relationship. They estimate the productivity effects on the probability to invest abroad or to export; we use a bivariate probit model that allows for both modes of serving foreign markets.

Hence, companies' profits in foreign markets depend on firms' productivity, transportation costs, demand level and different additional fixed costs as presented before and the profits determine the strategic behavior for MNEs.

Finally, as shown before, while the theoretical justifications to suggest both complementary and substitutive relationships, unless, the substitutive reasons are wider theoretically, and this may return to the basic assumptions and limitations on traditional theoretical models.

On the other hand, empirical literature shows widely and net justifications for complementary relationship between exports and FDI affiliates sales (outward FDI and exports), through different types of works which switching or diverging theoretical results.

The investigation in different researches to the relationship between FDI and trade that is diversified by destination country or region and by industry or company level or by deterministic company characteristics, all is an under researched issues and ongoing discussions in the empirical literature. Some studies investigate the relationship between FDI and exports from developed to developing countries find them to be complementary. Furthermore, the same relation found to be substitutive between developed countries. The next table summarizes different empirical work on the subject.

Table 3.3: Selected empirical research on FDI and exports relation

<b>Author (Year)</b>	<b>Aggregation level</b>	<b>Data</b>	<b>Method</b>	<b>Results</b>
Blomstrom et al. (1988)	Industry level U.S and Sweden	Cross section data	OLS	Complementary relationship
Clausing (2000)	Country-level data (29 countries)	Two-panel data set, 1977-1994 Panel-data	regression with and without specific fixed country effects based on gravity type model	Complementary effect from FDI to exports, especially when intra-firm trade included
Pfaffermayr (1994)	Country level data (Austria)	1969-1991	Time series, OLS, Granger causality tests	complementarity relationship between FDI to exports in both directions
Lipsey and Weiss (1981)	Country and industry level (14 country)	1970	OLS	Complementary relationship.
Lipsey and Weiss (1984)	Firm-level data	1970	OLS	Strong complementary relationship for intermediate goods, weaker for final goods, possible substitution effects for final goods
Pfaffermayr (1996)	Country-level data (Austria)	1980-1994, Time series cross section Data	Dynamic fixed effects model, GMM estimation	Stable bi-directional complementarity results
Alguacil et al. (2002)	Country-level data Spain (FDI flows)	Quarterly Data 1970–1992	Time series, VAR with Granger causality	Positive long-term Granger causality from FDI to Exports

Bajo-Rubio and Montero-Munoz (1999)	Country-level data (Spain)	Quarterly Data 1977-1992	Cointegration, Granger causality tests	Long-run Granger causality from outward FDI to exports, no short-run effects
Blonigen (2001) Product-level data	Product level data (automobile parts)	1978-1994 Japanese automobile parts to US market	Time series, SUR regressions	Complementarity effect for Vertical production and substitution otherwise
Fontagne and Pajot (1997)	Country-level data (21 countries)	Panel data set	Time series Fixed Effects	Positive effect from FDI on exports with different magnitude for various countries, with strongest effect in the case of US
Graham (1996)	Industry-level data US and Japan	1983, 1988, 1991	Gravity Model	Predominant complementary Relationship
Turkan (2006)	Product-level data (USA)	Panel Data, 1989-2003	Gravity Equations, Fixed Effects, Random Effects	Complementary effect for intermediate goods, slight substitution effects for finished goods
Marchant et al. (2002)	Industry data (US processed food industry)	Pooled data, 1989-1998	Full-information maximum likelihood (FIML) method	Complementary relationship
Falk and Hake (2008)	Country level, 15 EU countries	panel data 1973-2004	Causality testing method, GMM estimators	Strong complementary relationship between outward FDI and exports in both directions
Girma et al. (2005)	Firm level productivity data	Cross section 5332 firm from 1990 -1996 in UK	Tests of Stochastic Dominance and the non parametric one-	MNEs are the most productive type the domestic exporting and



			sided and two-sided K-S tests	finally the domestic non-exporting, Sig. positive relationship of MNEs vs. exporters
Arnold and Hussinger (2005)	Firm level data	Germany, 1996–2002	K-S tests of stochastic dominance rather than just comparing first moments	Sig. positive relationship of MNEs vs. exporters
Castellani and Zanfei (2007)	Firm level data	Italy, 1994–96	OLS	Sig. positive relationship of MNEs vs. exporters
Girma, Goërg and Strobl (2004)	Plant level data	Ireland, 2000	K-S tests of stochastic dominance	Sig. positive relationship of MNEs vs. exporters
Oberhofer and Pfaffermayr (2011)	Firm level data	19079 companies from 10 countries, Amadeus database	Bivariate probit Model with Maximum Likelihood approach	Complementary relationship between both strategies
Kimura and Kiyota (2004)	Panel data of Japanese firms	Japan, 1994–2000	OLS	Sig. positive relationship of MNEs vs. exporters
Helpman et al. (2004)	firms data in 38 country and 52 industry	US data from the 1997 U.S. Census of Manufacturing.	OLS	Least, middle and high productivity firms serve market locally and the foreign by exporting and FDI respectively.
Head and Ries (2003)	Company level	1070 publicly listed Japanese	OLS	No significant effect of MNEs vs. exporters

	productivity.	companies, 1989		
Wagner (2005)	German establishment level data	Germany, 1995	K-S tests of stochastic dominance	Sig. positive relationship of MNEs vs. exporters
Martínez-Martín (2010)	Country level	Spain 1993-2008	Multivariate cointegrated model (VECM)	evidence of a positive (Granger) causality relationship running from FDI to exports
Egger (2001)	Panel data Country level	EU exports and outward FDI	Arellano & Bond GMM	Substitutes respect to transports cost change, and complements respect to the other determinants
Brainard (1997)	Industry-level data (27 countries)	1989 Cross section	2SLS	Predominant substitution Effect

Remark: other recent work at macro level reviewed at the chapter five, concerning the gravity model, and the panel dynamic analysis.

Table (3.4) shows the different types that representing the FDI and exports, these different types could be partially responsible for the complementarity relationship in the empirical studies, Head and Ries (2004).

Table 3.4: Data types' represents FDI and exports between different studies.

Study example	FDI Data	Exports Data
Brainard (1997)	Sales of home owned affiliates in each foreign country	Total exports amount for parents and affiliates
Brainard (1997)	Sales of foreign owned affiliates in country of study (home).	Imports from cross section of origin countries to home
Head and Ries (2001, 2003)	Overseas affiliates employments instead of sales	Exports

In addition, the different types of data that could be used, table (3.4), or lack of using sufficient group of explanatory variables to study the relationship between exports and FDI may lead to spurious statistical complementarity, which results from unobserved demand causing increasing in the FDI and exports, and the economical relationship does not exist, Head and Ries (2004).

New breakthrough researches, which are shown lately in the table, focus on productivity differences that determine the preferred strategy in models with heterogeneous companies, Helpman et al. (2004) and Oberhofer and Pfaffermayr (2011). I.e. companies that are more productive will do FDI to serve foreign markets, while the less productive companies will export their goods. This is our first empirical part, which is the first application on the large French companies.

In addition, the company level studies in table 3.3 show that the dominant methodology on testing the relationship between FDI and exports is either ordinary least squares (OLS) that compares the mean value of productivity or the Kolmogorov Smirnov test of stochastic dominance which compares the cumulative distribution of productivity for different types of companies and not just the mean. Oberhofer and Pfaffermayr (2011) is the first that used a bivariate probit model with a maximum likelihood approach that we follow in the first empirical part of this thesis.

In fact, the relationship between exports and FDI tends to be positive, but comparing a small number of studies isn't easy, especially with the bias in some studies toward large companies and therefore a bias against finding significant productivity differences, which the question stands is the . For example, Head and Ries (2003) used publicly listed data of Japanese manufacturing firms; their empirical work shows that the relationship between productivity and the FDI versus export decision depends very much on the proxy used to measure productivity.

Oberhofer and Pfaffermayr (2011) model is limited to horizontal FDI, but as we mentioned before, but, to know the overall effect on the local economy. Thus, we include all FDI types. Therefore, we do not empirically separate between the two types of FDI in our work. We will test how MNEs' serving strategy could differ according to the company characteristics. Moreover, could productivity differences influence the probability of using FDI and exports

modes. In addition, the influence of company, the industry characteristics on the market serving strategy.

An important aspect of empirical research on the effects of FDI on exports is addressing the issue of a spurious statistical relationship (complementarity relationship). It defined according, Greenaway and Kneller (2007) that exports and FDI become positively correlated if there are horizontal or vertical complementarities across product lines. Specifically, it would be incorrect to interpret a simultaneous rise in exports and foreign investment resulting from an exogenous increase in foreign demand as evidence of a complementary effect. Likewise, it may be the case that companies with superior products both export and invest overseas more than other companies, but this does not imply that more FDI generates higher exports, Head and Ries (2001). Saggi (1998), and Rob and Vettas (2003), show that in a given market uncertainty about demand could also lead to a complementary use of both strategies in horizontally integrated MNEs. In this case, FDI and foreign production under lower variable costs are used to satisfy proven demand and exports are used to explore uncertain demand, Oberhofer and Pfaffermayr (2011).

The companies ship intermediates to overseas production affiliates or vertically integrated exhibit substitution more than other companies. Generally, trade and FDI are complements at the macro economic level. Spillovers between companies, inter and intra industries and within the manufacturing sector, are a key issue to specify the real nature of relationship between FDI and exports (complementary or spurious correlation causes complementarity).

Trade and FDI are complements at the macro economic level. This is also partially due to spillovers between companies within industries, and between industries within the manufacturing sector. This also partially due to biased estimates when models do not control for the fact that trade and FDI are the two faces of the same coin: the competitiveness of industries, Fontagne and Pajot (1997).

As mentioned in the table, the different studies used various approaches, time series variation and cross sections of destinations and companies, of dealing with the data and the problem of unobserved variables that could simultaneously promote FDI and exports. So, avoiding the problem of endogenous determination of FDI without an appropriate instrumental variable for affiliate production which this instrument must be, correlated with FDI, can't be determined

simultaneously with exports, excludable from the exports equation. That is mean holding FDI constant; and the instrument has no effect on exports, Head and Ries (2004). Two studies illustrate that, it is difficult to satisfy these conditions. Blomstrom et al. (1988) they used the membership of the EEC, as an instrument for affiliate sales, which is not appropriate since EC levies a common external tariff that should affect exports directly. The same way with Clausing (2000) used average employee compensation that does not affect export decisions by changing FDI. Higher wages in the destination country can stimulate exports regardless of the level of FDI in the host country by making the exporters more competitive relative to domestic companies in that country. In other words, higher wages can stimulate exports by changing the relative prices for the benefit of exporter country.

The previous discussion shows that, the type choice of the data is a problematic issue that could affect the relationship type between exports and FDI, as shown in the different papers. Also, using a control variable must lead to unobserved variation in firm level demand that has the tendency to create spurious positive relation between exports and FDI even the two variables are substitutes. Studies can mitigate this tendency by using variety of controls, Head and Ries (2004).

There is a large literature comparing productivity levels of multinationals against non multinationals, and exporters against non exporters, but there are only a small number of studies that compare exporters and investors, that because it's a relatively new question, Greenaway and Kneller (2007). So, the current work we intend to know, why the enterprise chooses to export or to engage in overseas investment, at the company and the country level.

### **3.4.1 Empirical work in the Mediterranean area**

In this part, we review the empirical studies in the Mediterranean area, regarding the FDI theories, and those related to trade and FDI relationship.

The empirical work in the Mediterranean area regarding the FDI, in general and especially that regarding the trade (exports) and FDI relationship is very limited.

The Mediterranean process of integration either with the Europe union or intra the Arab area analysed by many studies, which focussing mainly on trade flows, Peridy (2005a), Fazio (2006), Gavin (2005), Grethe et al., (2005).

Heckelei and Weissleder (2008) analyses the European FDI determinants in the Mediterranean area, it also offers an empirical analysis of the connection between trade and FDI in the agribusiness sector in the context of Euro-Med partnership, using the OLS method for the period 1960-2005. Moreover, they compared to analysis with EU-15 and the Mercosur countries. Their results show significant evidence for vertical and horizontal FDI with more evidences for the vertical type, which shows a complementary relationship between trade and FDI. The impact of the size of the host country market is positive and highly significant. Investment costs prove to be relevant only for the Mediterranean countries. In addition, they found no significant influence of trade agreements on FDI flows could be detected. Their model used one specific equation, which able to determine the FDI flows, but cannot capture the interconnection between the trade and the FDI, even in the agribusiness sector.

Altomonte and Guagliano (2003) compared the FDI flow between central and eastern Europe (CEE) and the Mediterranean area over 1990-1997 using random effect probit model. The estimation technique based on a generalized maximum-likelihood estimating equation (GEE) approach applied to a generalized linear model (GLM). They include three general FDI determinants; demand related, comparative advantage, and institutional variables. The CEE area structurally displays a greater potential in the attraction of FDI flows with respect to the Mediterranean area, it found an increasing in the degree of integration in the Euro-Med area with the essential improvements of the legal framework in the area. They observed that the real capital flow in the Mediterranean area near to that predicted based on the gravity model.

Bolbol and Sadik (2001), study the role and significance of FDI in the economic performance of the Arab countries. They showed the FDI global distribution in the Arab countries, which analyzed the effect of FDI on technological development and total factor productivity (TFP). They recommend of overall improvement in the quality and environment of investment, which would increase the social productivity.

Ferragina and Pastore (2006) examine the FDI flow in the Mediterranean and Central and Eastern (CEE) areas, from the Europe Union from 1994 to 2004. They found that the bilateral FDI flows in the Mediterranean countries follow the rest of the sample. This study concerns the determinants of the bilateral FDI, basing on gravity model analysis.

Other papers analyzed the MENA potential exports, especially under the integration process with Europe Union. Söderling (2005) analyzes export performance in the MENA countries using a panel gravity model. Their results suggest that several MENA countries are under exploiting the United States as an export market. Moreover, the impact of integration efforts with the European Union has been moderate overall but significant in individual cases.

Peridy (2005b) studies the trade resistance and exports potentiality between USA and Middle east, which found that the implementation of the US-MENA FTA improve the position of exports regards the Maghreb countries. In addition, without implementing this agreement, the US could suffer from the trade diversion due to the completion of Euro Mediterranean Free Trade Agreement (Euromed FTA), which would reinforce the share of the EU in MENA countries exports.

Sekkat and Varoudakis (2004) study using fixed and random effects of panel data from 72 countries, which include eight MENA economies. They found that during the 1990s, the low level of total FDI in the MENA economies, particularly in manufacturing due to the low level of trade, and foreign exchange liberalization. They compare it to other developing areas (East Asia and Latin America), which played a determinant role. They also highlights the role of other factors, such as physical infrastructure, political environment and macroeconomic conditions, in explaining total FDI flows to the different regions. Their results confirmed the importance of accelerating the pace of reform in the MENA economies

Haddad and Harrison (1993) finds some evidence of spillover in Moroccan companies, which is confirmed by Balamoune and Mina (2004), which examines the relation between FDI, exports, and economic growth in Morocco. They find that FDI contributes directly and indirectly to economic growth through exports.

AbuAl-Foul and Soliman (2008) examines the effect of both FDI inflows and stock on manufacturing exports in four MENA countries (Morocco, Tunisia, Egypt and Turkey). They used OLS at country-level panel data, from 1975 to 2003. Their findings suggest that FDI activity has a positive effect on both merchandise and manufacturing exports. Nevertheless, the magnitude of the coefficient suggests that exports are not highly responsive to FDI activity. For the host countries in their sample, a 10 percent increase in FDI inflows may lead

to a 1.2 percent increase in manufacturing exports. Similarly, a 10 percent increase in FDI stock may lead to a 3.4 percent increase in manufacturing exports.

Favara (2004) a non-econometrical study investigated the relationship between FDI and trade in the MENA countries. The FDI received by MENA countries is very small both in absolute term and relative to the size of their economies, and the FDI can both substitute and complements the trade. Two explanations are possible: one related to the MENA region as being a newcomer to the international market of capital flows; the other related to the substitution issue between FDI and trade.

It suggests that the weak FDI record of the region can largely explained by the lack of economic reforms rather than to the presence of a substitution relationship between FDI and trade. It found that MENA countries score one of the lowest ratios of export to GDP among all regions of the world, but Sub-Saharan Africa, and imports from Europe grew more strongly than exports. It returns that to structural and constitutional reasons.

Peridy and Utama (2010) shed lights on the FDI complex determinants in the MENA area. Their empirical application with a spatial panel data model shows that both bilateral and third-country FDI variables are significant for explaining FDI inflows in MENA countries, whereas country size, similarity in size, relative capital and skilled labor endowment have a positive impact on FDI in MENA countries. Conversely, the capital-size interaction term, unskilled labor and tariffs correlated negatively with FDI. In addition, they found that export platform FDI is widely used as FDI strategy.

Finally, from the previous work in the Mediterranean area, we cannot find any serious study concentrates on the relationship between the FDI and exports, in the Mediterranean basin.

The second part of our empirical work tests the Mediterranean area especially that, this area has not a sufficient concentration in the current subject. Hence, we test the relationship between the inward FDI and exports in the Mediterranean basin from France, which means the French exports and outward FDI. We test this relationship just with France that helps to know the final possible effects on the local economy.



### **3.5 Summary and Conclusions:**

The chapter reviews the main theories of the FDI, and the main existing explanation for the relationship nature between exports and FDI. It focuses on the multinationals strategy decision literature between these variables, and the main determinants influence these decision choices, basing on the different theories. On the other side, it reviews the major country level determinants could affect and measure the relationship between the strategies. Empirically, we reviewed the main literature at the country, industry, and company and product level.

We summarize the main ideas and contributions included in this chapter, which leads to the forthcoming empirical parts, as follows:

The traditional trade theory shows a full substitution between the both strategies, which this hypothesis is strongly supported theoretically. However, many empirical studies show a complementarity between the strategies, which impose the theoretical justifications as follows:

Firstly, the representative company with single product, which in case of the countries have identical endowments, preferences and technology, the complementarity relationship could stands. In the other hand, the companies continue entering the foreign market as investors until satisfying the foreign market capacity, which starting to crowd out partially and decrease profits. The last case also allow for the co-existence of the both strategies.

Secondly, the single product with heterogeneous companies, which productivity categories allow to switch from local, exports and FDI, respectively for the more higher categories. The switching process maybe not clear-cut, which allows the existence for both strategies. In the other hand, in the case of the trade off between a large-high cost market and a small-low cost market the profits associated with foreign centralization, exceed those of home centralization with low-productivity level companies. Therefore, they are seeking low-cost and invest abroad, which allows for the exporters and investors to co-exist in this scenario.

Thirdly, company produces more than one product, for multi-product companies, if a company's products were horizontally related, it pursued a home centralization strategy for

one product but duplication strategy for the other in the foreign market; so, it's simultaneously export and conduct FDI, to avoid competition with each other. In addition, to complementarity case exist between raising the vertical FDI and the intermediate goods exported from the company affiliates.

The empirical parts show dominance for the complementarity relationship, and little of these studies concentrated on the productivity and the company characteristics role of choosing between the both strategies. In addition the Mediterranean area has a very poor applications relating the subject (relationship between exports and FDI), and a limited work relating to FDI and exports determinants in the area.

It has shown that the multinationals strategy choice between the exports and the FDI depends on two different characteristics groups, which would explain the multinationals strategy decision.

The two possible strategy of serving the foreign market are the exports and the FDI, which the productivity, company economies of scale and the other company characteristics influence the strategy decision at the company level.

On the other hand, the similarity between countries, relative factor endowments, market size and others influence the strategy decision on the country level. These country determinants are the driving forces behind the horizontal and vertical FDI, and the both nested as a knowledge capital model with the same incentives forces.

Finally, we can know the overall and final effects, on the home country, by knowing the overall relationship between the exports and FDI (both types, vertical and horizontal). Hence, the dominant relationship between exports and outward FDI shows the final effects of the multinational activities (and the relation between them) on the local economy, (employments and growth).

According the previous literature, firstly, we can study the relationship at company level, through the effects of the company characteristic including productivity on the multinational strategy choice between the activities, either exports or FDI. This determines the relationship between exports and FDI; in addition, it determines the micro determinants of the multinational activities. Secondly, we can study the relationship at the macro level to

determine the overall relationship, and the macro determinants of the multinational activities, in the Mediterranean area.

This chapter contributes to the limited literature work, which discusses the relationship between the home country outward FDI and exports. This provides an overview and explanation of the theoretical views of the different possible relationships between the mentioned strategies. In addition, it presents the overview on relevant theories, and the new trends of explaining the strategy choice, with the conclusion. It also provides reviews of the different determinants and variables applied and proxies derived to carry out econometric analysis, either at company or country level.

# Chapter Four

## **Companies' strategy choice between FDI and Exports:**

### Theoretical considerations and Empirical analysis

In this chapter, we introduce a theoretical model and empirical analysis for the French companies' strategies choice of serving the foreign market between foreign direct investment (FDI) and exports, and the nature of the relationship between the exports and FDI.

We start presenting the theoretical considerations and the empirical model. We introduce the empirical and econometrical methodology. Then, the data description provided and followed by the empirical assessment, and finally we introduce the results of the empirical part tests and the conclusions for this part.

## **4.1 Introduction**

As presented in chapter two and three, in recent years, we find that exports and FDI have been among the fastest growing economic activities around the world. This is because of more and more companies have started to operate in the international markets. One of the most important members of international trade is these companies, as a producer of goods. Companies often sell their products not only to domestic customers. The companies also deliver the goods in local markets as well as in foreign markets. Hence, we actually focus on the different strategies for companies to sell their goods and products in foreign markets. In doing so, companies can choose between two major strategies to serve foreign markets and participate in the global economy. The more traditional mode is to do exports of the produced goods to foreign markets; in this case, variable costs called freights needed. Another strategy is to engage in FDI and duplicate or setting up a new production facility in foreign country through FDI to serve the foreign demand locally. In the last case, fixed costs of duplication are needed which higher than the variable costs of freights. This idea called the proximity

concentration trade off and firstly introduced by Brainard (1997). Companies, which are able to pay high fixed costs, will use the FDI strategy and the others will export to foreign markets. Focusing on these two choices and the relationship between the choices at micro level are again our work in this chapter.

Previous and most recent empirical researches in this field mainly focus on evidence and effects of productivity differences between those exporting or those producing locally abroad, Head and Ries (2003); Girma et al. (2005). They describe Export and FDI as alternative strategies for serving foreign customers. The economic and theoretical interpretation of exports and FDI in this sense would be that both are substitutes, Head and Ries (2004); Girma et al. (2005); Greenaway and Kneller (2007); Oberhofer and Pfaffermayr (2011). In addition, productivity differences that determine the preferred strategy in models with heterogeneous companies describe that the more productive companies will do FDI to serve foreign markets while the less productive companies will export their goods, Melitz (2003); Helpman et al. (2004). In fact, we focus here on the companies' characteristics besides productivity, which these variables influence the probability of doing one strategy instead of another or doing both.

Baldwin (2005) categorizes three types of companies: non-producer, local producer or seller and exporters, whereas each company has its own marginal cost. We extended this idea to include the investors, as shown in chapter three. This idea argues that there are cut-off points, which determine if a company local producer abroad, exporter, local producer or does not.

The critical trait of the company is its marginal costs, whereas strongly explained by the productivity. Hence, the smallest marginal cost company has the higher probability to invest abroad; sequentially the higher marginal cost company has less probability to serve the foreign market, so it exports. Then the local producers have higher marginal costs, and the highest marginal cost company at all is non-producer, whereas it is not break even and none produces. I.e.  $MC_{Investors} < MC_{Exporters} < MC_{Local} < MC_{Exiters}$ , where MC refers to the company marginal costs.

For our estimation we use the bivariate probit model which measures how the productivity and other characteristics influence the probability of using exports and FDI; the probability of

using one choice instead of another, which allows for examining both strategies of choice, either exports or FDI. Furthermore, we show the marginal effects of these characteristics and variables on the different strategies, and we test for the multicollinearity to have the robust results.

We introduce the first empirical analysis at company level data on the large, very large and all French companies' strategy choice through either exports or locally producing abroad. Moreover, we try to bring more lights into the nature of the relationship between these choices, are they complementary or substitute.

As mentioned previously, the productivity is the main variable explaining marginal costs differences between companies and consequently, it explains the companies' ability to serve the foreign markets. If the productivity increases, the companies' ability to export and then the FDI increases.

Hence, the separation between the different companies groups is necessary to distinguish between the more productive companies (the large companies), and the most productive companies (the very large companies). In this way, we get more lights on the behaviour of these companies to choose the strategy of serving the foreign market, and the role of productivity, besides the other variables to control this behaviour. In other words, we don't just testing the strategy choice of the companies to serve the foreign market, but we also test this across the companies categories, which brings more lights on the role of productivity and other variables.

French company's level data used in the empirical analysis based on the AMADEUS database. The empirical analysis is divided for the large companies, the very large companies and all companies also, according to Amadeus classification, where we analyse across the large and very large size (the more productive and the most productive companies), as explained above. This empirical test get more robust results, which we do it in one specific country with internal common characteristics, one unified legal, statistical and economical environment gives us, in fact, more interesting, trustable and confidence results. I.e. using data from different areas is not useful as much as using data from the same country with unified data environment.

The major goal of this chapter is examining the choice between different strategies to serve foreign market and the nature of relationship between these strategies (exports and FDI), which is a new discussion and promising field in the economic research.

Finally, this chapter proceeds as follow: we present the theoretical considerations that explain the general framework and focus on the main variables. Then, we present the empirical model that explains and includes all variables in our test. Later, we present data, data processing methodology, econometric methodology and empirical analysis for the three groups of companies. In the empirical analysis, we run the bivariate probit regression and variables marginal effects for each category. Finally, we explain the results for each category of companies, their marginal effects results and then conclude.

## 4.2 Theoretical model

There are two main strategies for companies to serve foreign markets called: exports and FDI. We follow Oberhofer and Pfaffermayr (2011) model, which based on Helpman, Melitz and Yeaple (2004). We use the mentioned model and start to describe it in details in this section. The model based on a monopolistic market structure. In the model, there are three countries, one home and two host countries and one production sector, which produce differentiated products using labour  $L$ . The companies in the sector face given wage rates  $W$ .

We start from the productive sector, which is producing the differentiated products, and let this sector be  $H$ , and now a new company starts business. To enter the market in the country  $i$ , which is the home country, the company faces the fixed costs of entry. This denote with  $f_E$  for entry costs, which  $E$  refers here to entry. The company enters the market and has to decide if it produces or not. The entrant then draws an output coefficient ( $a$ ) from a distribution  $G(a)$ , where the output coefficient can be seen as labour per unit output coefficient, because labour is the only production factor. The random draw decides whether the company produces or not, Baldwin (2005). The unit labour per output coefficient has to exceed a critical cut off point. A company, which produces for the domestic market faces additional fixed labour costs  $f_D$ . In the domestic market, no other fixed costs are relevant, because transport cost can be ignored in the domestic market. A company can choose to

export into a foreign market. This company faces additional fixed costs  $f_x$  for every foreign market.  $X$  denominates to Export. These costs reflect additional expenses for example for creation of distribution networks in the foreign country.

A foreign market also can be served via foreign direct investment (FDI). A company, which chooses FDI to serve a foreign market, bears additional fixed costs  $f_I$ .  $I$  denominates to FDI. The additional fixed costs  $f_I$  includes the costs for building a distribution network in every country as  $f_x$  and costs for building a subsidiary company in a foreign market for each country. Hence, we can summarize the different fixed costs for each type as follows:  $FDI = f_I + f_E$ , and  $Exports = f_x + f_E$  and  $Local = f_D + f_E$ , where  $f_D < f_x < f_I$ .

The company, which chooses to export goods to foreign markets, is confronted with melting iceberg transport costs for exporting from country  $i$  (home) to country  $j$ , which  $j$  is one of the host countries,  $\tau_{1j} > 1$ .  $\tau_{1j}$  units of a product are exported to the other country  $j$  and only one unit arrives. All the costs for shipment are contained in the melting iceberg transport costs. Melting iceberg transport costs increasing with the distance could be further promising research, Martinez-Zarzoso and Suarez-Burguet, (2005) shows that a greater distance increases transport costs. As we stated before, the marginal costs of production is the relevant decision variable for companies which control the productivity, and hence the strategy choice decision. Companies produce the quantity, which equals marginal costs and marginal revenue. The companies also have to gain profits to pay the average costs, as we show later in the profit maximization part.

Hence, the productivity differences (besides the other company characteristics) is the main determinant for the company strategy choice, these differences determine the marginal costs, which are influence essentially the strategy decision.

Therefore, we develop the role of the marginal costs to include all companies types based on (Baldwin et al. 2005), which explained by the productivity differences between the companies. Hence, the companies' strategies decisions will be taken according the productivity differences, which cause differences in the marginal costs. This is important because, we investigate empirically, the horizontal differences effect between all companies types (the local, exporter, investor and both investor and exporter company), and vertically between the large and very large companies. In addition, we use two different proxies for



investigating the role of productivity differences<sup>18</sup>. Many other important company characteristics are included in the tests besides the productivity.

We use this model of three nations, one home and two host countries. The theoretical framework drives a clear theoretical prediction for the choice between the two decisions. This leads to estimate the bivariate probit model using AMADEUS database to analyze the probability of using each strategy.

#### 4.2.1 Consumer Preferences and different Demand:

The consumers' preferences result from demand function whereas we have consumers from the three countries. These consumers shown in the model as ( $j = 1, 2, 3$ , where  $\rightarrow j = i = 1$ ),  $i$  is the home country and ( $j = 2, 3$ ) are the foreign countries (hosts). They prefer choosing from a wide variety of brands of a product, rather than having only single choice, which they love to choose between different supplies or varieties. The love (preferences) of variety approach that introduced by Dixit and Stiglitz (1977), which also called Dixit Stiglitz preferences. The according utility function for variety preferences is given by:

$$U = U(u(D_1, \dots, D_n)) = [u(D_1, \dots, D_n)]^{1-\alpha} Y^\alpha$$

The value  $D_H$ , with  $H = 1, \dots, n$  shows the consumed quantity of the brand  $H$  of the differentiated product.  $\alpha$  measures the elasticity of substitution between varieties.  $Y$  is the homogeneous product, and produced from companies in only one sector. The consumption of the heterogeneous product improves sub-utility, which increases the whole utility for the consumers. The utility function  $U$  is assumed to be increasing in  $u$  and homothetic in  $u$  and  $Y$ . An increase in  $u$  increases  $U$ , and preferences do not change if  $u$  and  $Y$  are linearly transformed. The preferences are homothetic, so the path of expansion is linear. This introduction to the function is to think about the preferences across different brands for one product that concern the model. Let us take the utility function for the demand of the differentiated product  $H$ . Firstly, it assumed to be concave, which is standard in every utility function, because it reflects the substitution relationship for two goods. Secondly, it assumes

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<sup>18</sup> Head and Ries (2003) conclude that the relationship between productivity and the FDI versus export decision depends very much on the proxy used to measure productivity.

to be symmetric utility function, this implies that price equality between varieties cause consumption at the same quantity. The third assumption is constant elasticity of substitution (CES) assures that every variety endows utility, and every variety can be substituted with the same elasticity.

For simplicity and data availability, the model explains the home country companies' strategy decision to serve the hosts countries<sup>19</sup>. In our case, the French companies that tend to serve the foreign market in the other countries by either exports or FDI or the two strategies together. We assume that the home country only served by domestic companies, so that the next form gives the utility function for domestic residents, which achieves the stated assumptions above according to Helpman and Krugman (1985):

$$u(D_{111}, \dots, D_{N11}) = \left( \sum_{h=1}^{N_i} D_{h11}^\beta \right)^{\frac{1}{\beta}} \quad (1)$$

With:  $\beta = 1 - \frac{1}{\varepsilon}, \varepsilon > 1$

Note: these indexes represent that the first index refers to the company, the second to the location of production and the third index stands for the country of consumption.  $\varepsilon$  denotes price elasticity.  $D_{111}$  is the consumed quantity in home country for the first company in home country.

In a monopolistic market, the elasticity of substitution has to be larger than one, because otherwise, the marginal revenue of the company is negative, and so companies will not offer the product. I.e. in the case,  $\varepsilon < 1$ ,  $\beta$  becomes negative, and so the demand elasticity between two brands of a product becomes negative. Negative demand elasticity conduct to negative marginal revenues, and in the monopolistic case (MR = MC), whereas the brands would not be offered, because there is no realistic situation where marginal costs are negative.

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<sup>19</sup> The empirical model is more widely, whereas investigates the marginal probabilities of serving the local market, in addition, to the external strategies (exports and FDI).

Consumers in the two other countries are confronted with domestically produced varieties and brands supplied by companies of country "1". The consumers' preferences in countries  $j = 2,3$  are given:

$$u^2(D_{112}, \dots, D_{N12}, D_{122}, \dots, D_{N22}) = \left( \sum_{i=1}^2 \sum_{h=1}^{N_i} D_{hi2}^\beta \right)^{\frac{1}{\beta}} \quad (2)$$

$$u^3(D_{113}, \dots, D_{N13}, D_{133}, \dots, D_{N33}) = \left( \sum_{\substack{i=1 \\ i \neq 2}}^3 \sum_{h=1}^{N_i} D_{hi3}^\beta \right)^{\frac{1}{\beta}} \quad (3)$$

$u^2, u^3$  refer to the utility functions in the foreign countries. As noted before the utility function is symmetric. Every brand of the product endows utility by itself, because consumers love variety. Under symmetric costs at each location, brands produced there have the same prices, so, it assumed that every brand has the same price. In this case, the symmetry of the utility function ensures that the varieties with equal prices consumed in the same quantity, because it maximizes the utility. Thus, the consumers will divide their income into same parts for every available variety of the product.

Utility maximization of equation (1), (2) and (3) skipping  $h$ , due to price equality, under budget constraint leads to the final functions. The demand for one brand of the product  $H$  in the home country (the home local demand) given by:

$$D_{11} = \frac{p_{11}^{-\varepsilon} E_1}{N_1 p_{11}^{1-\varepsilon}} = p_{11}^{-\varepsilon} A_1, \quad \text{with: } A_1 = \frac{E_1}{N_1 p_{11}^{1-\varepsilon}} \quad (4)$$

Home demand depends on price of brand  $p_{11}$ , consumers' income  $E_1$  and the number of other brands produced in the domestic market  $N_1$ .  $A_1$  denotes the demand level for the brand. An increase in produced varieties leads to smaller market share for all competitors. An

increase in the price of the brand  $H$ , the producer does not lose entire demand whereas the demand function is downward sloping.

The home demand function on the local produced variety  $D_{11}$  holds for products, where consumers do not have to pay transport costs. Typically, products from domestic producers fulfil this requirement. Domestic producers can also be multinational companies. The consumers face a different utility maximization problem, when confronted with imported products from foreign companies. As noted above exporting companies have to pay melting iceberg transport costs  $\tau_{ij}$ . According to Feenstra (2004), the prices of imports calculated based on cost, insurance, and freight (C.I.F), while the prices of domestic produced brands are on a free or freight on board (F.O.B) basis. The foreign demand for domestic brands then depends on the prices in the domestic country plus the transport costs, which contain cost, insurance and freight.

Now we look about the foreign demand for the differentiated products, which is the foreign local demand on the brand of the home country. I.e. it is the export of the brand  $H$  of the heterogeneous product from country  $i$  (home country (1)) to country  $j$  (foreign countries (2, 3)). It assumed that the entire quantity of the exports consumed in the country  $j$ .

In the foreign countries, the demand for a brand depends on several components. There are different prices for domestically produced and imported brands due to transportation costs. The demand for the brand “ $h$ ” depends on the c.i.f. price. Consumers’ income will play a similar role as in country “1”. Demand function for a brand produced in country “1” and consumed in countries 2, 3 are:

$$D_{12} = \frac{p_{12}^{-\varepsilon} E_2}{(N_1 p_{12}^{1-\varepsilon} + N_2 p_{22}^{1-\varepsilon})} = p_{12}^{-\varepsilon} A_2 \quad (5a)$$

$$\text{With: } A_2 = \frac{E_2}{(N_1 p_{12}^{1-\varepsilon} + N_2 p_{22}^{1-\varepsilon})}$$

$$D_{13} = \frac{p_{13}^{-\varepsilon} E_3}{(N_1 p_{13}^{1-\varepsilon} + N_3 p_{33}^{1-\varepsilon})} = p_{13}^{-\varepsilon} A_3 \quad (5b)$$

$$\text{With: } A_3 = \frac{E_3}{(N_1 p_{13}^{1-\varepsilon} + N_3 p_{33}^{1-\varepsilon})}$$

And, the demand for a domestically produced brand is:

$$D_{22} = \frac{p_{22}^{-\varepsilon} E_2}{(N_1 p_{12}^{1-\varepsilon} + N_2 p_{22}^{1-\varepsilon})} = p_{22}^{-\varepsilon} A_2 \quad (5c)$$

$$D_{33} = \frac{p_{33}^{-\varepsilon} E_3}{(N_1 p_{13}^{1-\varepsilon} + N_3 p_{33}^{1-\varepsilon})} = p_{33}^{-\varepsilon} A_3 \quad (5d)$$

#### 4.2.2 The supply side and profit maximization:

Firstly, we present an analysis of companies types distribution from Baldwin (2005) model, which discussed the impact of greater openness at the company level focusing on changes in the number, and the three types of companies (exporters, locally producers and non producers). Moreover, the companies' rapid growth involving in the international activities (exports and FDI) requires concentrating on the companies types changes. Therefore, we modify and add the fourth type to this idea, which is the foreign direct investors' type.

Each company associated with a particular labour input coefficient denoted as “ $a_j$ 's” for company  $j$ , which is a potential entrant into the market, has to pay the “variety development cost” as in the standard Dixit Stiglitz model, Dixit and Stiglitz (1977). After paying entry cost, the company is randomly “assigned” an “ $a_j$ ” that is generated from a density function  $G[a]$  whose support is  $0 \leq a \leq a_0$ . Wages are unity and all heterogeneity in companies marginal

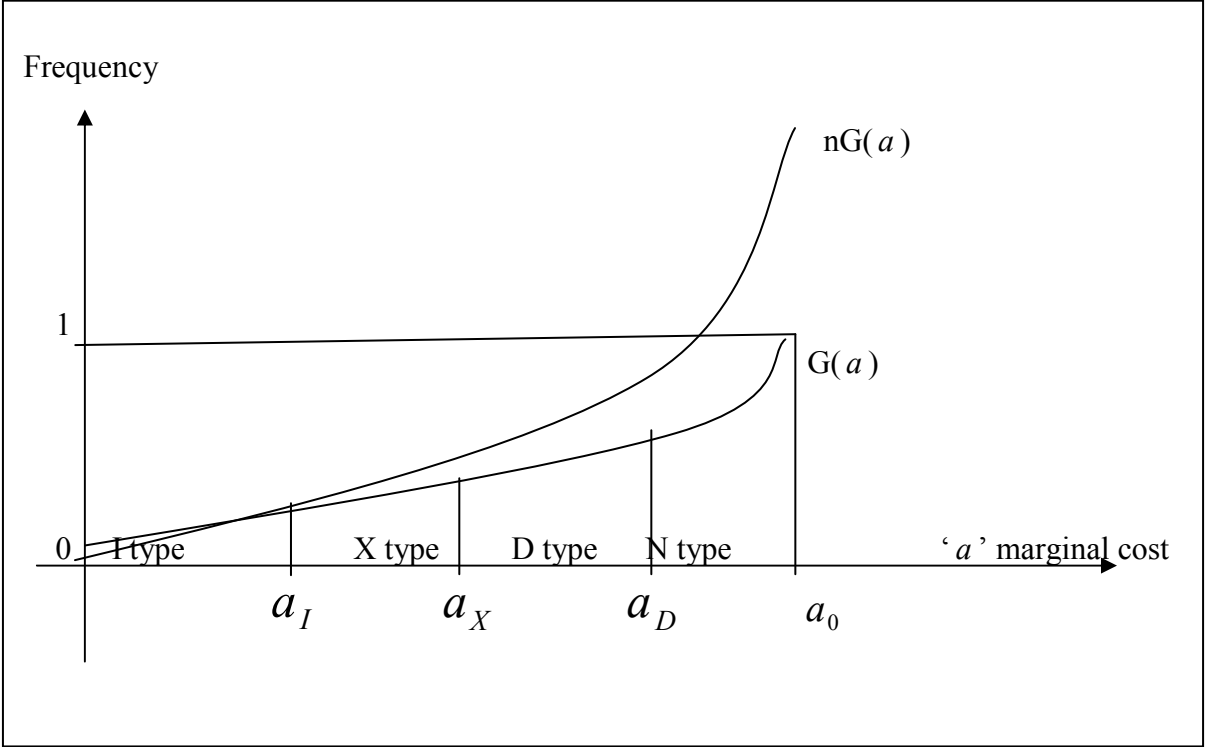
costs stem from differences in companies unit labour requirements, which are denoted as “ $a$ ”, which refer without ambiguity to companies marginal costs.

Therefore, companies face fixed costs of entry ( $f_E$ ), when entering the market in country  $i$ . The company enters the market and then decides whether to produce or not, and how to serve the foreign markets. The entrant then draws an output coefficient “ $a$ ”, which the output coefficient seen as labour per unit output<sup>20</sup> coefficient because labour is the only production factor.

The random draw decides whether the company enters, and arrives to break-even point or not, figure 4.1, which is the case if the unit labour output coefficient exceeds a critical “cut-off” point. Baldwin (2005) draws and explain the types distribution of failures that none produce, entrants that locally producing and the exporters to serve the foreign market.

Again, we extended this idea as shown in figure 4.1 to include the investors (FDI executers) which is the type of the lowest marginal costs, highest productive type and the longest (oldest) age in the life cycle companies, to serve the foreign market.

Figure 4.1: Different companies types (I, X, D and N) distribution.



Modified from, Baldwin (2005).

<sup>20</sup> Empirically, we deal with it, in addition, such as labour cost per unit output, through a new proxy.

The standard Dixit Stiglitz trade model results tell us that a companies' operating profit, call this  $\pi$ , is proportional to its revenue.

As explained before, the level of a company's sales increases as its relative price falls, and its relative price falls as its relative marginal cost falls, (relative here means relative to that of its competitors). Given this, the standard logic of fixed costs tells us that only companies with sufficiently low marginal costs will enjoy operating profits that justify paying the beachhead (fixed) costs. Since there are three beachhead costs,  $F_D$ ,  $F_X$  and  $F_I$ , there will be three cut-off levels, i.e. thresholds, for marginal cost. Following the notational procedure, the marginal cost cut-offs are labelled,  $a_D$ ,  $a_X$  and  $a_I$ .

Consistency with the stylized fact that not all companies in a sector export, we need  $a_I < a_X < a_D$ , i.e. the maximum marginal cost threshold for overseas sales companies is below the maximum marginal-cost threshold for exporting companies, and these in turn is below the maximum marginal cost threshold for companies that sell domestically.

It is instructive to consider the innovation outcomes in more detail. Some unlucky innovators companies will have paid  $F_I$ , which  $F_I$  is the costs for innovating new variety, to get a new variety with a marginal cost higher than the maximum marginal cost that is consistent with breaking-even point in the local market, i.e. with marginal costs that exceed  $a_D$ . Such companies never produce, i.e. they are N-types. That is to say, ex-post they find out that they wasted their  $F_I$ .

Other companies are more efficient. They receive a blueprint for a new variety that is related with a very low marginal cost, i.e. an " $a$ " that is low enough to gain profits from the foreign market entrance, export and local market serving. Similarly, some companies will draw intermediate marginal costs, so, they find it worth paying  $F_D$  to sell in the local market. On the other hand, it is not worth to pay  $F_X$  to export to the foreign market, or  $F_I$  which is required to produce a new variety and to sell locally in the foreign market, regarding to, the huge amount of the fixed cost that exceed the capacity for the intended companies.

To summarize, companies that draw “ $a$ ’s” above  $a_D$  will be N-types, those with “ $a$ ’s” between  $a_D$  and  $a_X$  will be D-types and those with “ $a$ ’s” between  $a_X$  and  $a_I$  will be X-types, those with “ $a$ ’s” below  $a_I$  will be I-types.

Each new variety is an independent and identical draw from the underlying marginal cost distribution  $G[a]$  and there will be, in general, more than one company with each level of marginal cost. If innovators continuously draw from  $G[a]$ , and companies continue dying according to the Poisson process, and the steady state distribution of “ $a$ ’s” will be  $G[a]$  times “ $n$ ”, whereas “ $n$ ” is the mass of companies with each level of “ $a$ ”.

To think about this, suppose that the answer is right and consider whether it would be self-sustaining. The “ $a$ ’s” are continuously distributed, but intuition is served by making it discrete with, say, “ $m$ ” equal length categories of “ $a$ ’s” between “0” and “ $a_0$ ”, Baldwin (2005). Given the Poisson company death process, the chance of a company “leaving” (i.e. dying) is proportional to the mass of existing companies in each category, which, by hypothesis is equal to “ $nG[a]/m$ ”.

Moreover, given the innovation process, the chance of a new company arriving in a given category is dictated by “ $G[a]/m$ ”. Thus on average, we know that the company “deaths” and “births” will match in every single category, at least in the long run, Baldwin (2005).

Finally, recall that we are working with a continuum of goods, so there is an uncountable infinity of companies. Consequently, there will be an uncountable infinity of company deaths each period and an uncountable infinity of company births each period. Thus, the death birth matching by category will be perfect at every moment, as per the law of large numbers applied to each category. Thus, the shape of the distribution of “ $a$ ’s” will be exactly  $G[a]$  in steady state. Of course, after a shock to the system, it may take a while for the actual distribution of existing companies to reach the new equilibrium distribution, Baldwin (2005).

What all this means is that the distribution of the “ $a$ ’s” for “N, D, X and I” types will be “ $nG[a]$ ”. It would be obviously hard to observe the ‘failures’ in real world data (i.e. the N-type) since they are the varieties that never make it off the drawing board, but in the other



side, the distribution of the active companies “ $a$ ’s” would be a reduced edition of  $G[a]$ , (Baldwin 2005).

In our research, we concentrate on a company produces locally and choose between the, I, X types to work for the foreign market. This company, which produces for the domestic market in country “1”, faces additional overhead costs ( $f_D$ ). In the domestic market, no other fixed costs are relevant and the transportation costs can neglected. A company can choose to export into a foreign market. This company faces additional fixed costs ( $f_{X_j}$ ) for every foreign market ( $j = 2, 3$ ). These costs reflect additional expenses for the creation of distribution networks in the foreign country. A foreign market also can be serving via foreign direct investment (FDI). A company, which chooses FDI, bears additional fixed costs ( $f_{I_j}$ ). ( $f_{I_j}$ ), includes the costs for building a distribution network in every country equal to ( $f_{X_j}$ ), and costs for building a subsidiary company in a foreign market and the duplicate fixed production costs.

Melting iceberg is the necessary transport costs that should paid by the company, which decides to export goods to one of the foreign markets. To export from country “1” to country  $j$ ;  $\tau_{1j} > 1$ .  $\tau_{1j}$  units of a product are exported to country  $j$  and only one unit arrives. All the costs for shipment are contained in the “melting-iceberg” transport costs. Some main results indicate that real distance is not a good proxy for transportation costs, Martinez-Zarzoso and Suarez-Burguet (2005). Therefore, the transport cost will not increase with distance. Company maximizes profits separately in the market, where it works, and both the revenues and costs separated between countries.

In this section, we concerned about profit maximization of companies. The companies work under a monopolistic competition conditions in the market. The companies’ behaviour in the short run is that each company act similar to a monopolist, because differentiated products allow the maximization of profits. According to the consumers preference every differentiated product can be sold in a different market, because consumers love variety. Each company, acting as a monopolist, produces the quantity that maximizes the profit. Each company produces the quantity, where the marginal revenue (MR) equals the marginal costs (MC). In a situation, where  $MR > MC$  the company will enlarge its production, because it will earn additional profits for every additional unit and vice versa for  $MR < MC$ . At the point, which

MR = MC the profit is at its maximum. As noted above in the short term the companies act like monopolists.

In the models of international trade and foreign direct investment, the companies produce with the factor  $L$  in every country. The production only depends on labour and how efficient it is used. The cost function depends on the wages, which paid for the used labour. Variable production costs depend on the labour costs  $\omega$ , the labour quantity needed in production and that needed for exporters to transportation costs  $\tau_{1j}$ . The necessary labour input for one unit of the brand is " $a$ ". I.e. the coefficient " $a$ " specifies how much labour has to be used to produce one unit of output<sup>21</sup>. A smaller coefficient " $a$ " implicates that one unit can be made with lower input. In this sense " $a$ " measures the efficiency of companies, and the company's productivity measure is  $\frac{1}{a}$ .

A company, which acts as monopolist in the short term has next first order conditions of profits, and will offer its brand of the differentiated product at a price:

$$p_{11} = \frac{w_1 a}{\alpha}, \text{ where: } \alpha = \left(1 - \frac{1}{\varepsilon}\right) \quad (6)$$

In the home country the will follow the equation " $\alpha$ ", where again  $\varepsilon$  denotes price elasticity in the home country. A small  $\varepsilon$  implicates inflexible demand and would lead to high mark ups in the home country.  $\frac{1}{\alpha}$  is the mark up factor could be present as:  $\left(1 - \frac{1}{\varepsilon}\right)^{-1}$ . As it shown in the previous equation, the price of one brand depends on the wage rate in the producing country, the labour coefficient and the mentioned mark up.

A company, headquartered in country "1", may also serve the foreign markets in countries "2" and "3". The effective consumer price of the product depends on the place where the brand produced, which is the home country. A company who serves a foreign market has to pay the melting iceberg transport costs  $\tau_{1j}$ . A company, which duplicates its production

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<sup>21</sup> In the context of the new proxy, which we use, it should be, how many currency unit should spent on labour to produce one unit of output. This should give better measurement for the productivity.

network in the host country, has to pay the highest fixed costs  $F_I$ . The decision of companies to serve foreign markets through exports or foreign direct investment depends on the costs for them.

The costs of companies exporting to a foreign country are affected by the melting iceberg transport costs. The transport costs also affect the demand for the exported brand as seen in equation (5a and 5b). The profit maximization of companies depends on the demand for the brand. The price for one unit shipped into country 2 and 3, respectively, given by:

$$p_{12} = \frac{\tau_{12} w_1 a}{\alpha} \quad (7)$$

$$p_{13} = \frac{\tau_{13} w_1 a}{\alpha} \quad (8)$$

The exporting company offers its brands at prices different from the domestic company. The local producer prices depend on wage costs  $w_i$ , labour inputs per unit output coefficient “ $a$ ” and the mark up factor  $\frac{1}{\alpha}$ . The price of the exporting company depends on the same variables but it has to pay also the melting iceberg transport costs as shown in equations 7, 8.

If the company produces domestically in both foreign countries, the unit prices are:

$$p_{22} = \frac{w_2 a}{\alpha} \quad (9)$$

$$p_{33} = \frac{w_3 a}{\alpha} \quad (10)$$

### 4.2.3 The profits functions and the cut off points:

The profit functions now can be established. We have the demand function in the home country for the brand, which used to determine the marginal revenue. From equations (4) and

(6) the output of the brand in the home country is  $A_1 \left( \frac{w_1 a}{\alpha} \right)^{-\varepsilon}$ . The variable costs then are

$\alpha A_1 \left( \frac{w_1 a}{\alpha} \right)^{1-\varepsilon}$  where the costs depend only on the labour costs and the revenue

is  $A_1 \left( \frac{w_1 a}{\alpha} \right)^{1-\varepsilon}$ , Helpman et al. (2004). Consequently, the operating profit in the home country is:

$$\pi_D = a^{1-\varepsilon} (1 - \alpha) A_1 \left( \frac{w_1}{\alpha} \right)^{1-\varepsilon} - f_D. \quad (11)$$

Profits from serving the foreign markets through exports given by:

$$\pi_{x_j} = (\tau_{1j} a)^{1-\varepsilon} (1 - \alpha) A_j \left( \frac{w_1}{\alpha} \right)^{1-\varepsilon} - f_{x_j} \cdot \text{For: } j=2,3. \quad (12a)$$

Profits from serving the foreign market through producing abroad given:

$$\pi_{I_j} = a^{1-\varepsilon} (1 - \alpha) A_j \left( \frac{w_j}{\alpha} \right)^{1-\varepsilon} - f_{I_j} \cdot \text{For: } j=2,3 \quad (12b)$$

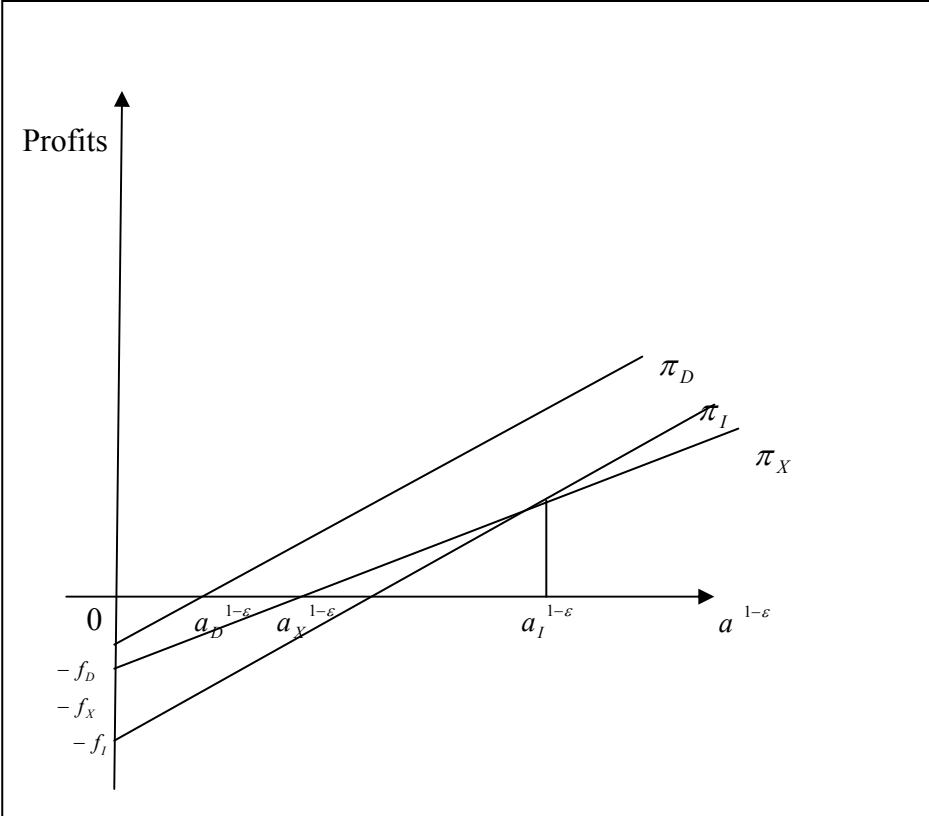
The three previous functions are shown in figure 4.2, which are domestic, exports and FDI profits functions, and we can see the profits from selling in the domestic markets or the profits in the foreign market through either exports or FDI. From the other side, the additional fixed assets (costs) are plotted. The FDI and home domestic profits functions have the same slope, but exports profits function steeper and the reason is the existence of transport costs  $\tau_{1j}$ . A company who decides to export products has to compensate the transport costs, which are different from the costs situation in the domestic market.

The profit lines are drawn under the assumptions of equal demand levels and the same wage level between the three countries (home and foreign). The three co-joint fixed costs with the

three options are seen as  $f_D < f_x < f_I$ . Actually, the intersection points between each profits functions lines and the horizontal axis represent the three points of zero profits situation for each different strategy. The companies seek to maximize its profits by choosing between alternatives, the best alternative depend on the labour inputs for unit output coefficient as shown in the figure 4.2. A smaller coefficient means a higher output using the same labour inputs, or the same output using lower labour input. Companies have the highest labour per unit coefficient will loose and exit the market.

Companies with smaller and smaller coefficient will increase profits and shift the strategy of serving the foreign market. Companies with a labour per unit coefficient between  $a_D^{1-\varepsilon}$  and  $a_X^{1-\varepsilon}$  will only serve the domestic market, because they will not gain profits in the foreign market neither with exports nor with foreign direct investment. Companies placed between  $a_X^{1-\varepsilon}$  and to the left of  $a_I^{1-\varepsilon}$  will serve the domestic market and the foreign market through exports, because the profits of exporting are higher than using FDI, which in this situation they realize the highest possible profits. The best decision for all other companies is to produce for the domestic market and to serve the foreign market through FDI.

Figure 4.2: The different possibilities for the market serving.



The companies seek to maximize profits, which determines by many variables as the demand level  $A_j$ , the different additional fixed costs  $f_{x_j}$  for exports function or  $f_{I_j}$  in the foreign investment function, productivity  $a$ , which also vary between companies and reduced by the transportation cost  $\tau_{1j}$  in the exports function.

The companies start working locally and choose the foreign market serving strategy, so the company profits through serving the domestic market and one strategy to serve the foreign market are  $\pi_D + \pi_{X_j}$  or  $\pi_D + \pi_{I_j}$ . According to that, companies maximize profits in each market separately; the profits in the home market not affected by the strategy choice of serving the foreign market.

The choice between the two strategies will depend on the realized profits through exports or overseas production. The point that the two strategies profits get equal represents intersection point the two functions, where the company switches the strategy choice without affecting their profits.

At the productivity level of the “cut-off” point, the additional profits of both strategies are equal and so the company is indifferent between both strategies. The “cut-off” point is established by equating the additional profit functions for export and FDI, for each country  $\pi_{x_j} + \pi_{I_j}$ , under the assumption of unit wages in all countries ( $w_1 = w_2 = w_3 = 1$ ).

$$a^{1-\varepsilon} - (\tau_{1j}a)^{1-\varepsilon} = \frac{f_{I_j} - f_{X_j}}{(1-\alpha)A_j \left(\frac{1}{\alpha}\right)^{1-\varepsilon}} \quad \text{With: } j = 2, 3. \quad (13)$$

First the companies’ productivity influences the country specific “cut-off” point. A higher  $a^{1-\varepsilon}$  increases the left hand side, since  $0 < \tau_{1j}^{1-\varepsilon} < 1$ , where exports productivity smaller than the overseas production productivity. Because exports productivity reduced by the trade costs that, none exists in establishing an affiliate abroad. I.e. an increase in the transport costs leads to more FDI multinationals.

The difference in additional fixed costs ( $f_{Ij} - f_{Xj}$ ) reflects the differences in initial expenditures before one single unit of the brand is sold. If there is a huge difference, a company has to sell a huge quantity to earn higher profits through direct investment, because the foreign investment fixed cost bigger than the exports fixed cost. This actually shows the importance of the market size to break-even the extra cost. The market size of the foreign country affects the “cut-off” point as well. In a relatively large market, the demand for the brand  $A_j$  is larger which causing higher turnover allows to paying higher fixed costs and compensates the overhead increments and shifts the intersection point to a lower  $a^{1-\varepsilon}$ .

In other words, a smaller difference in term  $f_{Ij} - f_{Xj}$  will make FDI more profitable comparison (relatively) to exports, and vice versa in case of the larger difference.

#### **4.2.4 Changes at and differences in the ‘cut-off’ Points:**

At the productivity level that represents the cut-off point between the functions (the intersection point), the companies are indifferent about the strategy chosen to serve the foreign market either exports or FDI. The intersection point between the two strategies function profits given in equation (13).

A company, which can be situated at “cut-off” point in one country and outside it in another. At different country conditions, and changes in the conditions, can thus affect the profits function, and thus explain different market serving strategies choice.

Therefore, the changes at the cut-off point can influence by fixed cost difference, a changes in demand and changes in  $a^{1-\varepsilon}$  as stated before. Productivity increasing as measured by  $a^{1-\varepsilon}$ , increasing demand  $A_j$  (market size) and the decreasing of the difference between the two fixed costs ( $f_{Ij} - f_{Xj}$ ) have a positive relationship with the probability of doing FDI.

In other words, the decrease of the fixed cost difference leads to substitute FDI instead of exports. Increasing productivity should increase the ability of using the FDI strategy, also the increasing of the market or demand should increase the possibility of FDI because the company more able to cover the high fixed cost.

This off course explains that, the company choice depends on these factors. Therefore, a company with a specific level of productivity  $a_h^{1-\varepsilon}$  and different market size  $A_j$  and different fixed costs  $f_{Ij}, f_{Xj}$  between countries will adopt different strategies (decisions). These decisions of the companies will differ between these countries according the biggest possible profits. Company with a given productivity level can use different strategies in different countries to maximize profits. Increasing productivity induces the company to serve the foreign country either exports or FDI instead of just serve the local market. Nevertheless, more increasing in productivity  $a^{1-\varepsilon}$  induces the company to replace FDI instead of exports that is more profitable because of transport costs included in exports. Decreasing in the differences between  $f_{Ij}, f_{Xj}$  will increases the probability of doing the FDI, which is relatively less costs and more profitable, in this case.

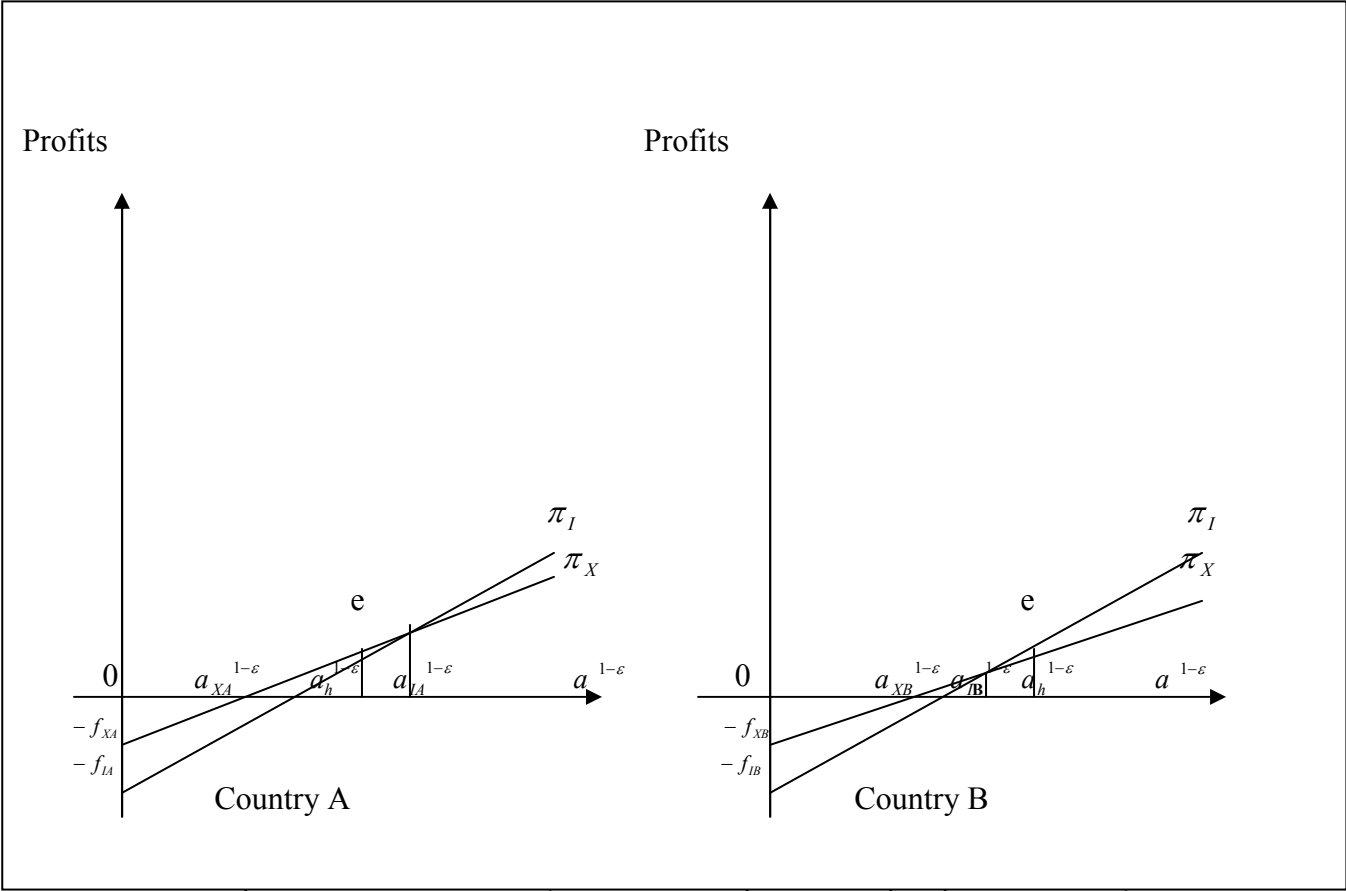
In figure 4.3, we find two identical foreign countries with one only difference that causes different decisions to the same company between the two countries. In this case, the best strategy could be to serve one market through exports and the other through FDI.

Figure 4.3 illustrates the case that the export profit functions are different because of unequal distance, and consequently different transportation costs. This is because the shape of export function depends on the distance between the production and consumption country. The profits from FDI are assumed to be equal. In this case, the company will decide to export its products to country A and will set up a new local production facility in country B. Therefore, the company uses different strategies between the two identical countries at specific productivity level because of changing of the transportation costs (unequal distance), that represented by changing of exports profits function slope.

Higher transport costs do not affect the FDI function, but it affects the relative profits between the two options, and thus, it can affect the choice between them.



Figure 4.3: Different strategy choice with different distances, and same productivity level



Company chooses to export to country A at the point “e”, which exports function higher than the FDI one. On the other side, the company chooses to do FDI in the country B, where the productivity level at point “e” shows higher profits than the exports.

Finally, the main variables affect the choice between the different strategies shown in the model. They are the market size, transports costs, the fixed costs effect and the productivity. The key variable is the profits where the strategy decision chosen, follow it. Hence, the productivity is a key variable, which affect the marginal effects and corollary the profits. In addition, the market size and the demand affect the strategy choice to cover the fixed costs, which is higher for the FDI. Trade costs variable is essential and increases the FDI probability as long as increase, although the data restrictions do not allow using it, empirically.

Other variables and company characteristics are still important, and we use and introduce them in the empirical model, besides the proxies for the variables introduced in the theoretical model, as we see later.

### 4.3 The Empirical Model:

Following the original model, we use the bivariate probit model to analyze the discrete exports versus FDI decision. The data used for our analysis is from the biggest 250 thousand European companies in the (AMADEUS) database, which provides information on the exporters and non-exporters, and for the company that has a foreign affiliate abroad. The database does not include the countries or regions where the company exports. The database can provide us information about the local affiliates, foreign affiliates in either a specific country or region, but it still includes foreign affiliates with unknown destinations. In other words, the data could show the company that works in specific area for example Algeria, MENA, OECD or Central and South America, but in each case we just know if the company has an affiliate or not. In contrast, the whole amount of exports for the company known, but there is not any indication about the exports destination. It is right that we need just to know if the company has or has not a subsidiary in a specific area or country to use it in our dependent dummy variable. However, at the same time, the shortage about the exports information is limiting the researches to done for a specific area as the Mediterranean area. For example, a company has hundreds of subsidiaries, as a “TOTAL” company, around the world and it could just have one or few subsidiaries in a specific area under study. Parallel, company’s exports turnovers by countries are total and its not divided according countries or regions, so we can’t determine the countries final destination of the company exports, and we can’t also know whether the company exports into specific region or not.

Again, for these reasons, the empirical analysis is to test the influence of company and industry characteristics on the market serving strategies. The empirical model we apply closely related to the theoretical model described above.

Empirically, we use the total FDI amounts and types executed by the MNEs. As we mentioned before, we seek to determine the relationship between exports and FDI, whereas it is necessary to know the final impacts on the local economy. If they are substitutes, the FDI increase will decrease the local production and employment, and increase the unemployment. On the other side, if they are complements, the FDI increase will induce and reflect positively on the local economy, where increase the employment and the economic growth. Hence, the

importance of using the all FDI types executed is to know and determine what could be the total, final or net effect on the local economy.

As explained in the previous chapter, uncertain demand in a given market could lead to a complementary use of the both strategies, especially in the horizontal integrated MNEs. In this case, FDI and foreign production under lower variable costs used to satisfy certain demand, and exports will used to explore uncertain demand, Head and Ries (2004)<sup>22</sup>.

Another explanation shown for the division of production between two identical facilities comes from the assumption of increasing marginal costs. If we consider increasing marginal transport costs then a company will face an export quantity restriction due to increased marginal costs.

According to Horst (1971), overall costs for companies can lowered by dividing production between two production facilities, and they only export as long as marginal costs are sufficiently low in this case.

The presented theoretical model could test the decision of a company located in the local market and serve the foreign markets of its brands of heterogeneous goods. One of these markets is near the local market and the other is far away. For this purpose, we need the transport cost which is not provided by the database. Hence, based on the variables from the theoretical model, we use measurable variables which could be used as proxies as shown in the table. With these available variables (proxies) in the data, we can predict about the influence of these measurable variables on the company decision whether decide to export or to do FDI.

Table 4.1: The variables shown in the theoretical model and their proxies.

<b>Variable in theoretical model</b>	<b>Proxy used from data</b>
Fixed costs	Employees number
Market power	Market concentration
Productivity	Operating revenue per employee
	Cost of employee/ operating revenue
Fixed cost in average between industries	MES
Stock of Fixed cost (liquidity)	Age
Trade costs <sup>23</sup>	Location or distance

<sup>22</sup> See chapter three, for additional explanations and literature review.

<sup>23</sup> The data limitation do not allow for specifying the exports destinations, so we cannot proxy the trade costs, as we mentioned before.

Table (4.1) shows the main variables that introduced in the theoretical model, but other variables should play role of company strategy decision. Hence, in addition to the previous variables, we add other variables, which control for the various possible differences between companies and their industries. These differences could relate to the differences between the companies industries, companies' independency degree, legal aspects or others, as we show later. These variables aim to improve the results by including more company characteristics in the empirical model. Hence, for better measure of the company strategy decision, we control for other unobserved company characteristics by adding the control variables. In addition, we use the large and very large companies separately, as we explain later in details.

The empirical model is elaborated as a bivariate probit model<sup>24</sup> with export and FDI decision, as two binary dependent variables. As we use the bivariate probit model, so we use the same explanatory variables of industries and companies characteristics that affect the probability choice of serving the foreign market, either exports or FDI, which the right hand side is always the same.

Therefore, the first equation of bivariate probit model specifies the probability that a company  $i$  in industry  $k$  exports  $ex$  into foreign markets:

$$\begin{aligned}
 ex_{ik} = & \gamma_0 + \gamma_1 \log \text{ age}_{ik} + \gamma_2 \log \text{ size}_{ik} + \gamma_3 \text{productivity}_{ik} + \gamma_4 \text{mes}_k \\
 & + \gamma_5 \text{herfindahl index}_k + \gamma_6 \text{int .assets}_{ik} + \sum_{i=1}^4 \gamma_{control} (\gamma_7 \text{affiliate}_{ik} + \\
 & \gamma_8 \text{consolidate}_{ik} + \gamma_9 \text{independence}_{ik} + \\
 & \sum_{i=1}^{10} \gamma_{10+i} \text{industry dummy variables}_k) + v_{ik} .
 \end{aligned} \tag{14}$$

The second equation measures the influence of the same “right side” variables on the probability that companies become MNE's:

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<sup>24</sup> We will introduce the econometric methods (bivariate probit model and the marginal effects) later in the methodology section.

$$\begin{aligned}
mne_{ik} = & \gamma_0 + \gamma_1 \log \text{ age}_{ik} + \gamma_2 \log \text{ size}_{ik} + \gamma_3 \text{productivi ty}_{ik} + \gamma_4 \text{mes}_k \\
& + \gamma_5 \text{herfindahl index}_k + \gamma_6 \text{int .assets}_{ik} + \sum_{i=1}^4 \gamma_{control} (\gamma_7 \text{affiliate}_{ik} + \\
& \gamma_8 \text{consolidat e}_{ik} + \gamma_9 \text{independen ce}_{ik} + \\
& \sum_{i=1}^{10} \gamma_{10+i} \text{industry dummy variables}_k) + v_{ik}.
\end{aligned} \tag{15}$$

In this section, we introduce the empirical model variables (company characteristics), which applied on the large companies group, very large companies group and both groups together. The companies' separation to very large and large companies for the test is very important. Actually, the tests concentrate on the internal characteristics of company effects on the strategy choice, and because each country has its own company's characteristics. Hence, testing for one country should be more homogeneous than including other companies that belong to other countries. Therefore, the separation between countries companies and use data from one specific country ensure to get data that are more accurate and gives more trusted results<sup>25</sup>.

Despite, the general common characteristics that could be available in the Europe union (EU), but the differences in general exist, such as criteria of size classification, legal system and other measurements at the country level. Thus, it would be better unified for one country more than the whole (EU). In brief, there are in general a technological, organizational, financial and institutional considerations more common or have more unification in each country (France in our case) more than the whole European Union, which these criteria built for each country separately that has to justify one country empirical test.

Therefore, testing one country and separate company group size is better than testing all countries and companies groups. This allows us to discover the different characteristics across the size for chosen country.

In addition, company heterogeneity, productivity in heterogeneous companies is a new explanatory variable or field, which explains the strategy choice and develops the multinationals strategy from exports to FDI<sup>26</sup>.

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<sup>25</sup> In the data section (4.5), we show more reasons, according the data availability, for the choice of the French companies.

<sup>26</sup> Additional reasons for separating the companies in groups are for productivity testing purposes.

Operating revenues, total assets and employees' number are the main variables in Amadeus database to distinguish between the large and very large companies. These variables are very important in our empirical part variables. Hence, the separation between the high-level values and low-level values of these variables, (as we show later in the definitions of large very large companies), is necessary for better explanation of the company behaviour.

### **4.3.1 Main explanatory variables**

As explained in chapter three, new trend rose in the economic literature that explains the difference of strategy choice between companies according to characteristics of company. These variables shown in the equations 14, 15 present the trend where company depends on the productivity, Helpman et al. (2004) and the other internal characteristics of the company to explain the strategy choice of serving the foreign market, Oberhofer and Pfaffermayr (2011).

The company age included as a variable has positive theoretical relationship with transforming the company to MNEs, where the MNEs should be older on average as they gained experience in foreign market, Rob and Vettas (2003) and Saggi (1998). Pradhan (2004) found a positive impact of age on FDI activities. He explains this with an increasing stock of intangible assets of the company in the course of a company's growth process. So we predict a positive effect of age on either exports or FDI in either large or very large companies, meanwhile we predict a stronger effect on FDI. The older company has a higher stock of intangible assets, which allow the company to pay the FDI higher fixed costs, and to prefer the more profitable strategy (FDI).

In large companies, age effects on exports should be stronger than that of very large companies. In contrast, the very large company's age effect on FDI should be stronger than that of the large companies, as the very large companies have a bigger accumulated intangible assets level. In addition, the very large companies have a higher age average than the large companies.

Improvements of efficiency can be one reason for the growth of the stock of intangible assets; also, the progress of R & D activities and innovative ability of the company during the company life cycle could reflect a positive effect of age on FDI, and exports. We can also expect, as the mentioned literature, that the age of a company influence positively the

probability of the FDI and age will also positively affect the exports. This is because the age will decrease the marginal cost of the company because of experience, and accumulated intangible assets.

The marginal effect of age expected to be positive for the probability of the FDI strategy, but we expect a negative marginal effect on exports, especially, in the high age level companies (very large companies). Moreover, it could be negative on the probability of doing the local strategy. This is because the older company has a higher ability to execute the most profitable (FDI) strategy; hence, it tends to substitute the FDI strategy (most profitable) instead of local and exports strategies (less profitable).

The second variable included in the empirical model is the number of employees in a company. This variable is a proxy for size and therefore a proxy for fixed costs of a company. Companies with more employees produce and sell more and so they have more liquid funds to pay additional fixed costs for doing a foreign direct investment. Meanwhile, we predict less ability in the large companies comparing to the very large companies to provide sufficient liquid funds to support the both strategies. In other words, the company size effect is notably stronger in the very large companies comparing to the large companies, and at the same time, it is notably stronger on the FDI comparing to exports.

The marginal effect of size expected to be positive in general on both strategies, but maybe it ought to be negative on exports generally, and especially in the very large companies which certainly tend to serve the foreign market through FDI instead of exports. However, the marginal effects are stronger in the very large companies comparing to the large companies.

Third variable, as shown before, there is a higher probability for more productive companies to do FDI than less productive companies. Our proxies' variables for the third variable (productivity) are:

- The operating revenue per employee, (traditional proxy).
- The percentage of cost of employees compared to operating revenues, (new proxy).

The new proxy is preferable as it takes under consideration the cost of employees instead of just the number of employees as we explain later in this chapter.

Head and Ries (2003) concluded that the relationship between productivity and the FDI versus export decision depends very much on the proxy used to measure productivity. Hence, we use two proxies and confirm their results. In addition, we prove that our new proxy shows better results than the traditional one.

New productivity proxy used in addition to the traditional one, because it allows showing the role of the productivity through the different proxies and across different company levels, as follows.

Show the importance of productivity and the magnitude of this importance through testing for the lower productive companies “large companies” and for the most productive “very large companies”. This could show the role of the productivity as a new and important variable plays an essential role to explain the strategy of serving the foreign market, Helpman et al. (2004), especially, that we use two different proxies of productivity. We can explore also the main strategy followed by each group, i.e. are the more productive companies use FDI strategy to serve the foreign market, and are the less productive companies prefer the exports strategy to serve the foreign market.

These answers also could not achieve without the separation between the two groups.

According to theory, we would expect that higher productivity increases the probability of using the direct investment possibility and decreases the probability of companies choosing only to export, Helpman et al. (2004). The marginal effect of the productivity variable is positive for the FDI strategy and negative for the export strategy, Oberhofer and Pfaffermayr (2011). Therefore, it expected to have the same effects as previous most recent researches regarding the productivity effect on the strategies of serving the foreign market.

The fourth variable (MES) measures the average size of a company in the NACE industry classification and it is another proxy for fixed costs, i.e. the higher average size has a higher probability of serving the foreign market. We should take under consideration that the MES measures the effects of the differences in company’s average size between the different industries (where each industry require or has a specific average size that should affect the choice between the different strategies). Therefore, this variable is very different from the number of employees as a proxy to company size. We expect companies in industries with a higher average size to serve foreign markets. The MES will affect the probability to export and the probability to invest abroad in a positive way. Industries with small MES, on average,



will be industries, which produce non-tradable goods, especially in the service sector. In addition, this gives us an additional reason to separate testing the large and the very large companies in our empirical part.

Although, the effect is positive on exports and FDI in either large or very large companies, but the company average size between industries in the two groups (large, very large) should be different, which justify the separation between the groups. Another presumption could be that in those industries the competition between the companies is more intense.

The fifth variable is the market concentration, which gives information about the market power of companies. We measure market concentration using the Herfindahl index defining all companies in the sample as a one common market. Actually, it measures the concentration of each industry, based on the company's revenues in each industry divided on the whole revenues in the market. It derived from the companies in the sample, and thus, is only a proxy

of the true market concentration and ranges from  $\frac{1}{n}$  to "1". An index value of "1" denotes one company, which acts as monopolist. Therefore, we calculate the revenues according the following equation:

$$HI = \frac{\sum_{i=1}^{10} R_i}{\sum R_M} \rightarrow \text{where}$$

$i = \text{industry} = 1, \dots, 10$   
 $M = \text{Market}$   
 $R = \text{revenues}$

We would expect that companies, which do not have many competitors, will have a higher mark-up. Such companies will find it easier to pay the additional fixed costs of a direct investment or to pay the melting iceberg transport costs. They will more probably serve the foreign markets, because they will not have to compete with others, so we expect a general positive affects on exports, and so the FDI.

As we see, the positive effects on the exports should be always greater than the FDI, because the increasing in the market concentration (HI value) increases the company power in the market to the tested companies. More and more, in company concentration or power causes gains (profits) to the company and these profits occurs as a result to the concentration in the

local market where fewer competitors exist. Hence, these companies tend to produce in the local market and exports more than doing FDI. This is because the exports strategy more profitable because of the concentration and dominance in the local market. On the other side, using the FDI strategy doesn't much benefit from these gains of concentration as much as exports strategy, but anyway producing locally abroad is still supported (benefited) by the dominance power of the headquarter company in the local economy.

The sixth and last variable of special interest is intangible assets which might be a potential proxy for the research and development (R&D) activities. Companies with higher intangibles assets, such as software or patents could possibly dispose of an ownership advantage, which might lead to increased probability of doing FDI. Therefore, we expect a negative (positive) influence of intangible assets on the export (FDI) probability doing. Especially, in the very large companies, which have a high level of intangible assets, allows for the substitution between the strategies.

Meanwhile, we expect a positive effect on exports and FDI in the large companies for the following:

The largest category in the market is not the large companies group, and hence, they do not have a high level of intangible assets. The increasing of intangible assets in this category induced exports which these companies have not high accumulated level of intangible assets. In addition, because, they did not get the highest possible level or capacity of intangible assets, so, exports induced by intangible assets level less than that level required to FDI. So at this level in this category the companies just enforce their export and of course the FDI strategy. When these companies arrive to the highest possible levels of intangible assets, they start to substitute FDI instead of exports, such as the very large companies do. We use values of intangible assets to avoid a potential endogeneity problem, Oberhofer and Pfaffermayr (2008). Companies' current amount of intangible assets could possibly depend on their degree of multinational activity as a research and development (R&D) activities indicator.

Finally, we find many different effects of some variables on the different companies groups (across the groups), which justify the separation between the groups; and we summarize them as follows<sup>27</sup>:

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<sup>27</sup> These differences and other differences between the strategies are shown in table 2.

Firstly, the age variable has a stronger effect on exports in large companies comparing to exports in very large group; and it has stronger effect on FDI in very large group comparing to FDI in the large group (between groups).

Secondly, the company size has a stronger effect on FDI in the very large companies comparing to FDI in the large companies.

Thirdly, the HI variable has a stronger effect on exports in the large companies comparing to the exports in the very large companies.

### **4.3.2 Control variables**

The last variables are the main variables (company characteristics) that explain the company strategy choice between exports or FDI. Other unobserved characteristics at the company or industry level could not capture yet. Hence, we add other control variables, which control for the other legal, ownership, administrative and industrial differences in our dataset companies. These variables are mainly dummy and nominal variables control for the mentioned differences and stated by, Oberhofer and Pfaffermayr (2008), and we expect better results for adding these variables.

The first control variable measures a company's relationship to other companies. It takes on the value "one" if a company is an affiliate of another company and "zero" otherwise. We predict that the French companies which are affiliate to other companies or not, they will do the same strategies of the owners. Moreover, the company will be a multinational company itself, and it will serve the foreign markets by export strategy. As we include both horizontal and vertical FDI, the affiliates re-export their inputs of the multi-stages production to the parent company at home country, or export the final good to an another country and it may set up an affiliates in the other markets. This expected to be in general the strategy of French enterprises in the other countries.

Actually, we also find that the number of French companies' foreign subsidiaries abroad is the same, with the shareholder percentage or "the Global Ultimate Owner percentage (GUO)" with either 50.01% or 25.01%. In other words, the total number of French companies' affiliates abroad does not change in the case of French companies' ownership percentage to their affiliates abroad equal 50% or 25%. In fact, we find the large companies foreign

subsidiaries number is 3107, either with 50.01% or 25.01. At the same time the very large companies' foreign subsidiaries number is 2221, with either 50.01% or 25.01% of (GUO).

Therefore, we predict that the company takes either “1” or “0” to have a positive effect on the both strategies. However, we have to control for the company ownership, which should affect the strategy decision for the companies.

Furthermore the model includes a variable, which distinguishes between “ten” different industries to control for other unobserved industry specific effects. In fact, this variable controls for the differences between the industries to get results that are more robust in the other main variables. Especially, the bivariate probit model measures the mean change in the probability considering the situation of the other variables. This allows improving the results by using this control variable. This variable does not aim to check the effect of each industry, but to control the differences between the different industries, which should affect the choice between the strategies. Therefore, we use it as a nominal variable for the control matters.

Another variable controls different effects between consolidated, unconsolidated and consolidated & unconsolidated companies, which they are the companies' types available in Amadeus database. Company consolidation status (differences) is an important characteristic of the company could affect the company choice, which should be controlled to observe these differences and to get results that are more robust.

We also control different levels of autonomy of companies. The four different levels, which reported in the AMADEUS database, are very independent, independent, not independent and unknown. This variable controls for the different autonomy levels as a characteristic of the company, which should affect the choice between the different strategies. We control for the ownership dependency differences to get results that are more robust in our estimation. As we explain in details later in data processing section.

In the next table we summaries the theoretical expectations of the major variables effects on the FDI and exports for the two different categories of companies, the large companies and the very large companies.

Table 4.2: The variables predicted effects on the two strategies.

The strategy variables/ Groups	Exports		FDI	
	Large	Very large	Large	Very large
Age*	++xx	+x	++x	++xx
Employees	+	+	+x	++ xx
Affiliate	+	+	+	+
Productivity	-	-	+	+
MES	+	+	+	+
Herfindahl	++xx	+x	+	+
Intangible Assets	+	-	+	+

++ Stronger effect across strategies.

X is indicating stronger effect across the companies groups.

\* The age effect has a stronger effect on FDI comparing to exports (across strategies). In the other hand, the age variable has a stronger effect on exports in large companies comparing to exports in very large group; and it has stronger effect on FDI in very large group comparing to FDI in the large group (between groups).

## Hypothesis:

- **Companies' productivity increase substitutes FDI instead of exports.**
- **Company that is more productive tends toward more internationalization.**
- **Increasing in age, size and productivity led to more FDI.**
- **Productivity proxy includes the labour quality is more coherent.**

We can see that the variables effects directions on both strategies in the two companies groups are in general approximate. Four differences, related to the direction of intangible assets and the magnitude of size and age, which are differences between strategies. On the other side, there are three differences in the magnitude of age, size and HI, which are differences between groups. This could provide more understanding for the differences (direction and magnitude) between the groups and the role of the variables.

The differences of pre-expected signs and coefficients magnitudes, between the large and very large companies are not the unique reason for the separation between the groups.

Also the main strategy followed by each companies group, where we expect that the main strategy is different between the two groups. In addition, we expect that the very large companies concentrate more on FDI; on the other hand, the large companies group concentrates more on exports.

Helpman et al. (2004) consider that the increasing of productivity induces the company to change their strategy from serving the local market to serve the foreign market. Moreover, more increasing of productivity will change the strategy of serving the foreign market from exports to FDI. Hence, the separation between the companies groups to large companies (productive) and very large companies (more productive) allow detecting the role of productivity on the decision choice.

In addition, testing the empirical difference between the two proxies of productivity in each group and between the two different groups, allows testing the role of productivity to explain the choice between the strategies and the relative effectiveness for each productivity proxy comparing to the other.

Table 4.3: The variables, and their proxies and the role of the variables.

Variables	Proxy	Other proxies	Role of the variable
Age	Increasing stock of intangible assets	Marginal effect of age	
Employees	Proxy for size	Proxy for fixed costs	Have more liquid funds
Productivity	Operating revenue per employee.	Cost of employees / operating revenues	-Role of productivity across companies groups. -Effectiveness of proxies. -Role of productivity on strategy choice.
MES	The average size of a company in the NACE industry classification.	proxy for fixed (sunk) costs	Role of companies' average size between industries.
Intangible	Research and development		Different role between the

assets	(R&D) activities.		companies groups.
Herfindahl Index	Market concentration.	Mark-up for the company	Role of market concentration and competition level in each industry.
<b>Control variables.</b>			
Affiliate	Ownership	Control for the possible differences between owned and independent companies.	
Industry dummies		Control for the differences between different industries.	
Independence	Autonomy of the company	Control for types of independency in companies	

Table 4.4: Some differences between the two groups (large and very large companies)

Criteria	Large	Very large
Differences in productivity level	More productive	Most productive
Differences in the accumulated level of intangible assets	Low level	High level
Age (in average)	Old	Older
Size (in average)	Big	Bigger
MES (in average)	Big average size in each industry.	The biggest average size in each industry.
Affiliates and independence	More independent	Most independent companies.

Table 4.4 shows some differences between the large companies group and the very large companies group. These differences are additional justifications the separation between the two groups.

In fact, we apply the empirical model on the large French companies firstly, and on the very large French companies secondly, for the following expected reasons.

- More productive companies will do FDI to serve foreign markets while the less productive companies will trade their goods (Melitz 2003; Helpman, Melitz and Yeaple 2004) as reviewed on third chapter. So the empirical model expected that the variables effects on the two strategies will be different between the different companies groups, the large companies (more productive) and the very large (most productive). Hence, the separation between the groups should be applied, especially the differences in the characteristics (size, productivity, etc...) still huge between the two groups.

In other words, this chapter tests mainly the role of productivity to explain the company choice of serving the foreign market, which requires the separation between the different productivity levels in these companies (large and very large). This separation allows checking if the productivity plays essential role to explain the choice or not. Therefore, the estimation for both groups together will gathering the biggest very large companies and the smallest companies in the large companies group, which may bias the estimation and negatively affect the results.

- Our two estimation groups are the large companies with nearly 37185 company and very large companies with nearly 6721 company, and they intuitively are different in their characteristics structure, for example the unrecorded consolidate codes for large companies 90% meanwhile, its 65% for the very large, so we separate tests for each group.
- Many predicted effects of the explanatory variables are different on the different strategies between the different groups. In addition, we expect different main strategy adopted by each group.

## **4.4 Data:**

The data used come from AMADEUS database, which contains micro data for large and very large sets of European companies. Moreover, it makes it possible to analyze export and FDI strategies at company level. The ‘AMADEUS top 250,000’ database offers financial statements, profit & loss accounts, many different ratios, information about the shareholders and subsidiaries either total or just foreign, and it can provide information about the subsidiaries in a specific area or country. It provides also information of a company’s organizational structure for the large and very large companies in Europe. AMADEUS



provides possibility to simple analysis of companies and provides reports but for companies group not more than five hundred companies, but anyway, we do not use this facility.

We distinguish between the companies as exporters and none exporters according to the export turnover data information. This variable takes many possible values, firstly, positive values that mean the company is exporter. Secondly, it could take “zero” which means the company is not exporter. Thirdly, it could be missing values, which should be dropped during the test. Finally, it could be none available, which means that AMADEUS or their data sources did not collect the companies’ exports information.

We introduce the data available in AMADEUS database concerning the subject and variables. The data are in the total company’s number, which the real tested company’s samples will be different after the data processing, because of dropping the missing observations.

The quality of reported data vary intensively, and so our targeted companies group which is the French companies, and we can collect general information on export and MNE status for 43906 companies, as all available large and very large French companies, for the last available year (2009).

In France, companies’ data are available for 43906 under the large category (large and very large), where 17211 companies with positive values, and the rest divided between 22051 companies with “zero” exports turnover, which means, none exporters and the others are none available data.

The available data for the other European countries regarding exports vary intensively. These data have not the same high percentage of available data comparing to the total number of companies, such as the French data. Also for the big European economies, the exports data not well provided. They are available just for exporter companies in some countries as we see later.

We expect that the companies’ data are more homogeneous in each European country than the homogeneity that could realize at the completely union level. As long as we study the variables that affect the foreign market serving strategy choice of these companies, we prefer

homogeneous data for one country. This homogeneity should be achieved in the data at least by:

- Statistical methods of gathering data that could not be similar between countries.
- Data availability just for exporters in some countries with no data about none exporters, and adding these data will produce bias in the results.
- The companies with data available for all the twelve countries mentioned below represent nearly half the French companies with available data.

We check available exports data for the different European countries as follows:

The data that none available will be considered zeros in some countries cases, for example:

In Germany and Italy, AMADEUS does not provide any information about German and Italian companies' exports. Exports data are not available in these two countries, which does not allow including them, in this research.

The other European countries, which have a small number of the large and very large companies comparing to France, and they have problems of the exports data and confusing between the missing values and the non exporters, as shown in the tables 4.5, 4.6 and 4.7. Adding these countries could bias the results; hence, we choose the French data for the reasons mentioned before.

Table 4.5: Exports data availability in total companies in the European countries

Country	Total companies	Exports data available	Companies data available percentage
France	43906	39359	89.6%
Greece	3481	3436	37%
United kingdom	46860	8077 *	17%
Switzerland	5637	890 *	16%
Bosnia and Herzegovina	604	544 * + 2 zeros	90%
Croatia	1889	1889	100%
Hungary	3579	2227	62%

Iceland	509	507	99%
Ireland	5964	23	.003%
Liechtenstein	41	7	17%
Malta	272	266	97%
Monaco	2	2	100%
Slovenia	1030	14	.013%

\* Just the positive values

Table 4.6: Exports data availability in the very large companies in some European countries

Country	Very large companies	Exports data avail.	Percentage
France	6721	5833	87%
Greece	534	212	39%
United Kingdom	14587	2403	16%
Switzerland	1215	352	28%
Bosnia and Herzegovina	417	405	97%
Croatia	431	431	100%
Hungary	375	271	72%
Iceland	107	107 with 0 value	100%
Ireland	1673	22	.013%
Liechtenstein	7	5	71%
Malta	46	46 with 0 values	100%
Monaco	2	2	100%

Table 4.7: Exports data availability in the large companies in some European countries

Country	Large companies	Exports data avail.	Percentage
France	37185	33526	90%
Greece	2903	1066	36%
UK	32273	5674	17%
Switzerland	4422	538	12%
Bosnia and Herzegovina	187	139	74%

Croatia	1458	1458	100%
Hungary	2938	1738	59%
Iceland	402	400 with 0 values	99%
Ireland	4291	1	0%
Liechtenstein	34	2	0.05%
Malta	226	220 with zero values	97%

Hence, the majority of European countries divided in three groups:

Firstly, countries have not available data of none exporters.

Secondly, countries mix the data of none exporters with none available data exporters.

Thirdly, countries have not available data of exporters at all.

In addition, all these countries companies structures have low availability exports data percentage comparing to French companies. In addition, these groups could not be reliable to construct the dependent variable (exports), and continue the research.

According the previous discussion, the empirical test applied on the French companies, whereas we get robust results, because of the homogeneous data. This is because, we do it in one specific country with internal common characteristics, one unified legal, statistical and economical environment gives us, in fact, more interesting, trustable and confidence results. I.e. using data from different areas is not useful, especially with the mentioned heterogeneity data, as much as using data from the same country with unified data environment.

## 4.5 Data processing methodology

We present in this part the methodology of processing the variables, the building of the dummy variables and the different proxies of the different variables.

The same methodology applied on both groups (the large and the very large companies). The data is available for the last available year (2009). Therefore, we present each variable and the source of the data used to have the variables that directly used in the estimation.

The definitions for the large and very large companies are required before introducing the variables. According to the differences and varieties between companies, it requires many criteria's to distinguish between them. Amadeus uses different criteria to define and distinguish between the large and the very large companies as follows:

Companies in Amadeus are considered “very large” when they have:

- Operating revenues  $\geq$  100 million EUR (Euro). OR.
- Total assets  $\geq$  200 million EUR. OR.
- Employees  $\geq$  1000. OR
- Listed<sup>28</sup>

Companies with ratios operating revenue per employee or total assets per employee below 100 EUR are excluded from this category.

Companies in Amadeus are considered large when they have:

- Operating revenues  $\geq$  10 million EUR. OR.
- Total assets  $\geq$  20 million EUR. OR.
- Employees  $\geq$  150. AND NOT.
- Very large.

Companies with ratios operating revenue per employee or total assets per employee below 100 EUR are excluded from this category.

The huge difference of the criteria's amounts between the large and the very large show again the importance of the separation between the two groups. The ability of each group to provide the liquidity or pay the fixed costs required for executing serving strategy of the foreign market, either by exports or FDI is different between the groups. Hence, the behaviour and the strategy choice should be different.

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<sup>28</sup> A company which is listed on a public stock exchange for public trading and whose shares can be traded on the stock exchange, it also called quoted company.

**4.5.1 First: The main variables<sup>29</sup>**

**First variable: (company age)**

The available data is the “date of incorporation” which data are not unified for all companies (it takes different forms for establishment date) or for example (01/01/2008; 04/1950; 1800). We calculated the age that is the difference between the current year (2010) and the year of establishment. We calculate the log values in new variable as shown in the empirical model to be used directly in our regression. Concerning, the use of the log value of company age just monotonically transforms the variable and make it being “more” normally distributed and, therefore, it does not change the qualitative results of the empirical analysis. Moreover, it usually allows a straightforward interpretation of economic effects.

Table 4.8: The age variable in the large companies.

Variable	Observation	Mean	Std. Dev.	Min	Max
Age	27208	26.6	19.3	1	225

Table 4.9: The age variable in the very large companies.

Variable	Observation	Mean	Std. Dev.	Min	Max
Age	3704	34.17	26.4	2	210

**The second variable: (employee number) as a size proxy**

Company number of employees, as a proxy for size and fixed costs. We use the log value of the number of employees, we transform of the log value of company number of employees, for the same reasons mentioned before.

The variable already available and we transform it to the log value as mentioned before in the equations 14, 15.

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<sup>29</sup> In this section, we introduce a summary for each variable. The summaries indicators, such as the Mean, are for the whole sample that includes the four company’s types. Hence, it could not be a strong indicator for the strategy choice, and the characteristics real differences between the companies groups, whereas it includes the local companies. However, the bivariate estimation is done for the strategy choice between exports and FDI.

Again, the low minimum company number of employees which is “one” worker doesn’t contradict the size company, which the size definition consider many company criteria’s to be “large” company as shown in definitions before.

Table 4.10: The number of employee variable in large companies.

Variable	Obs. No.	Mean	Std. Dev.	Min	Max
Employee no.	27208	97.8	116.2	1	992

Table 4.11: The number of employee variable in the very large companies.

Variable	Obs. No.	Mean	Std. Dev.	Min	Max
Employee no.	3704	2642.8	15435	1	475976

**The Third variable: (productivity)**

- “Revenue per employee” as proxy for company productivity, according to the available data, we have two possible options: the first is using “operating revenue per employee” which is available in thousands of Euro, and it should be comparable.

Other promising possibility of using better proxy is still standing, as follows.

- In fact, revenue per employee is recently used as a productivity proxy in econometric researches, but this could not take under consideration the quality of employees that it just considers the number of employees.

Meanwhile, we expect high differences in labour qualifications especially within the large companies (large and very large). Specifically, in the very large companies that have high R&D activities on their labour. In addition, these companies also have different intangible expenses on labour to improve their efficiency and increase productivity. One can imagine the difference within the whole large group (large and very large).

Other variables could be more able to reflect or include the real quality of employees better than the simple relationship between employee’s number and operating revenues. Therefore, we include the relationship between cost of employee (the number of employees and their wages, which wages reflect their quality, that determined according their qualification and the

quality of their activities) and operating revenue. According to Kremer (1993), company size should be positively correlated with the wage per worker, and this is an important implication, where our empirical parts run testing on the large and very large companies. His results show that larger companies have more qualified personnel (staff), and it also suggests a positive correlation between the level of available human capital and company size, see also Kumar et al. (1999).

This is because the higher wage implies a higher quality worker, and the output of the company depends on the products of the skill levels of all workers, Kremer (1993). In addition, Lucas (1987) and Rosen (1982) give a way for an equilibrium with sorting of workers with the same human capital. All of this shows the importance of including the employees' quality in the productivity proxy by including the (wages) through cost of employees' item.

In other words, the percentage of cost of employees comparing to operating revenues, and the importance of this percentage is taking under consideration the wages of employees that reflect the quality and qualifications of employee, i.e. how much is the weighted average of the total cost of employees comparing to the operating revenues.

This variable (cost of employee/operating revenue) should present more coherent proxy for productivity than operating revenue per employee. Hence, we use both of them separately, and compare between them and see which one is more suitable and significant in our empirical parts.

The mentioned variable "cost of employee/operating revenues" is the number of employee \* wages / operating revenues, or any additional cost on employees included in the cost of employee part should improve the presentation of employees' quality<sup>30</sup>.

Finally, this new proxy reflects the wage-weighted importance of number of employees on operating revenues, i.e. it should consider the number of employees weighted by wage from one side, and the operating revenues from the other side, not just the simple number of employees. Hence, the increasing or decreasing of employees costs affect the revenues in the

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<sup>30</sup> The cumulative distribution graphs for both proxies show that the new proxy is strongly better representative for the theoretical productivity curve, than the traditional one. In addition, the econometric results, and Kernel density estimate. See the graphs at the end of the chapter.



same direction. I.e. employees cost has to have a positive relationship with revenues, ceteris paribus.

Table 4.12: The productivity proxies in large companies thousands Euro.

Variable	Observation	Mean	Std. Dev.	Min	Max
Cost of employ/oper. Rev. (percentage)	27208	20.3	17.6	4.7	100
Oper. Rev. per employ	27208	848.4	2514.2	100	66911

Table 4.13: The productivity proxies in very large companies thousands Euro.

Variable	Observation	Mean	Std. Dev.	Min	Max
Cost of employ/oper. Rev. (percentage)	3704	25.6	15.9	10	96.2
Oper. Rev. per employ	3704	1422.5	4702.3	100	66355

**The Fourth variable: (MES)**

It measures the average size of a company in NACE industry classification, which is proxy for average fixed costs in each industry. This variable measures the average company size in each industry, which industries classified according NACE code. We determine this variable as follows:

$$MES = \frac{\sum_{i=1}^{10} VA_i}{\sum_{i=1}^{10} N_i} \rightarrow \text{where } i = \text{industry} = 1, \dots, 10$$

Where numerator represents the value added summation in each industry, and the denominator represents the total company’s number at the same industry.

Actually, sales, output or the value of output sold are sides of the same coin, which are suitable to be used to determine the size of company, but value added is clearly preferable to output, because the company size determination has to be done with the values of company contribution, not with the value of output sold.

Some previous reports about enterprises in Europe show that value added per employee is fairly stable across different size-classes, so a measure of average company size based on value added is likely to be very similar to the measure that based on number of employee (the most common, famous and traditional measure), Kumar et al. (1999). In addition, measuring this variable based on value added should be more trustable; especially, we used the number of employees in another variable.

We build this variable for each industry to achieve the company average size in its industry. Therefore, we separate the companies in groups according to NACE industry classification, then we get the company average size in each industry that is the total value added in each industry divided on the number of companies. Then, we get a new variable represent the company average size in NACE industry code, based on their value added.

**The Fifth variable: (Herfindahl Index)**

Herfindahl index is a proxy for the true market concentration. We use two different formulas for calculating this index as follows:

Firstly, we use a Herfindahl index based on revenues, which takes range from 1/n to “one” for each industry. Increasing the index amount means that it has not a lot of competitors, and we measure the market concentration that gives information about market power of companies, which is a proxy for the true market concentration. We use this index log value, and we use this index for the large and very large company’s regression, respectively.

Table 4.14: The Herfindahl index used in our regression for the large companies.

Herfindahl Index	Frequency	Percent	Cumulated percentage
.004644	180	0.51	0.51
.0069844	230	0.65	1.16
.0144637	1,811	5.10	6.26
.0148551	519	1.46	7.72
.0217205	4,198	11.83	19.55
.0419106	1,262	3.56	23.11
.0751279	2,668	7.52	30.63
.0853669	3,582	10.09	40.72
.2700045	7,238	20.40	61.12

.4649223	13,799	38.88	100.00
Total 0.9999999	35,487	100.00	

We calculate the second formula of the index according the following equation, and we use it specifically for the third regression part that include the whole companies, which takes under consideration the relative weight for each company by the sum of squares of the market share (company revenues / total revenues in the industry). We have to use this formula to distinguish between the high power companies (the very large group) and the less power companies (the large companies group).

$$HI = (H - 1/N) / (1 - 1/N) \text{ Where } H = \sum_i^N S_i^2 ,$$

S= market share = company revenues / total companies revenues in the same industry. Increasing the index value for a specific company means that there are not a lot of competitors. I.e. the increasing in the Herfindahl index generally indicates a decrease in competition, thus, an increase of company market power. We calculate the index for each company in our dataset, and company with higher index will be more able to serve the foreign country by either FDI or exports, especially with exports.

We apply the previous equations to get the index by getting the some of squares of the market share of each company, and then we apply the main equation. The company market share equals the company revenues divided on the whole revenues in the industry.

We expect a positive effect on both exports and FDI, the effect size on exports should be bigger than the effect on FDI. Actually, the increase in the index, which means more concentration of the company in the market, increases the company profits from the producing in the market. Hence, the company tends to serve the foreign market by the exports more than FDI. Anyway, the FDI strategy benefits from the company concentration in the local market.

The marginal effects should be positive on exports, which is the most profitable strategy. Exports strategy regarding this variable is more profitable than FDI strategy, so HI could be negative on FDI. Similarly, the foreign strategy, especially, the exports could be more profitable than serving the local market, which could reflects negatively on the local strategy.

**The Sixth variable: (intangible assets)**

Intangible assets is used as a proxy for research and development (R&D) activities. The large (large and very large) companies have a high accumulate level of intangible assets comparing to small and medium enterprises (SMEs) that affects the marginal cost of these companies, hence, the profits of these companies. The level of profits will determine the strategy choice, and the market that should be served by these companies, as presented in the theoretical model.

We expect a positive effect on both strategies in the large companies. The large companies have a low level of intangible assets, comparing to the very large companies. Hence, any increase in the intangible assets will affect positively the both strategies, and the company will change from serving the local market to the foreign market.

In the very large companies, the very high levels of intangible assets will change the company strategy from serving the foreign market by exports, to serve it by FDI. Hence, the company substitutes the FDI instead of exports. Therefore, we expect a positive effect on FDI and negative on exports for the very large companies.

Table 4.15: The intangible assets variable in thousands in large companies.

Variable	Obs. No.	Mean	Std. Dev.	Min	Max
Intangible assets	27208	922.3	3814.6	1	138137

Table 4.16: The intangible assets variable in thousands in the very large companies.

Variable	Obs. No.	Mean	Std. Dev.	Min	Max
Intangible assets	3704	162296.4	1631570	1	4.35e+07

**4.5.2 The control variables:**

**First variable: (affiliate)**

This variable is a dummy variable called “affiliate” which measures the company relationship to other companies. It takes “1” if the company is an affiliate of another company and “0”

otherwise; in Amadeus database, there are three possible ways to get the suitable data for this variable.

1- Data analysis by STATA by checking BvDEP ID numbers, (it is an identification number for each company and affiliate in Amadeus database), for each observation (company), with the same number (BvDEP ID number) for subsidiaries included in the sample (the French large and very large companies). Hence, we can determine if the company is an affiliate (owned) of another company. Nevertheless, there are some serious restrictions in this way.

- Our database companies are French (and registered in France), and the Amadeus data sources are French. Hence, we believe that it is not possible for an affiliate to be register as a separated company or MNEs, and at the same time, to be an affiliate for another company. Because, this means that this company officially registered as French Company, and officially registered as an affiliate of another French company.

Especially, these affiliates usually use export strategy to serve the foreign market will not become a MNEs itself, as predicted in Oberhofer and Pfaffermayr (2008).

- One of these companies in the sample could be an affiliate for another none French company (European or international), but not all these companies data are available. Moreover, we need to know if the company is an affiliate of another or not, and it does not matter if it owned to French, European or another international company. Either it ultimately owned or partially, but more than 50.01%, so we check for another possibility.

2- We can use BvDEP independence indicator which classifies these companies to five categories which considered as follows:

Indicator A: very independent

It is attached to any company with known recorded shareholders but none of which having more than 25% of direct or total ownership, so, it considers as very independent. In other

words, no one of the company shareholders owns more than 25% between the known shareholders. The indicator also classified as A+, A and A-, which they mean as follows:

A+: companies with six or more identified shareholders of any type whose ownership percentage is known. Therefore, it is if the company has six shareholders or more of any ownership type (direct, total or calculated total) and his ownership percentage known and does not exceeding 25%.

A: as above, but includes companies with four or five identified shareholders.

A-: as above, but includes companies with one or three identified shareholders.

Therefore, we do not need to divide these types for the current variable “affiliate” which all are very independent, and this means that the companies with this indicator are not affiliate of another company.

The logic behind these qualifiers is that the probability of having unknown ownership percentage over 25% is the lowest when the greatest number of shareholders is known; hence, the company’s degree of independence is more certain. In other words, this classification of “A” indicator according to the number of shareholders known is, an additional guarantee that the probability of existing shareholder owns more than 25% is the lowest.

As it can be seen from the above definitions, the qualifications “+” or “-“ do not refer to a higher or a lower degree of independence, but to the degree of reliability of the indicator that is attributed.

Indicator B: independent

It is attached to any company with a known recorded shareholder none of which with an ownership percentage (direct, total or calculated total) over 50%, but having one or more shareholders with an ownership percentage above 25%. In other words, no one of the company shareholders owns more than 50% but one or more can own more than 25% between the shareholders which known.

The further qualification as B+, B and B- is assigned according to the same criteria relating to the number of recorded shareholders as for indicator “A”. Therefore, this type of companies is not an affiliate of another company.

#### Indicator C: dependent

It is attached to any company with a recorded shareholder with a ***total*** or a calculated total ownership over 50%. Therefore, this type of companies is an affiliate of another company.

#### Indicator D: not independent

This is allocated to any company with a recorded shareholder with a ***direct*** ownership of over 50%, so this type of companies is dependent and controlled by other companies and will be considered as an affiliate of another company.

The two indicators C and D in the current variable are equal, because the companies that belong to the mentioned indicators are dependable anyway of its strategy on the other companies, which can be considered an affiliates to other companies.

#### U: Unknown

This is allocated to companies that do not fall into the categories A, B, C or D which indicating an unknown degree of independence. For this type, we do not include it in the calculation regarding this variable “affiliate”, and it will be eliminated. Any other missing data, which do not have any of the previous five indicators will be dropped, BvDEP (2008).

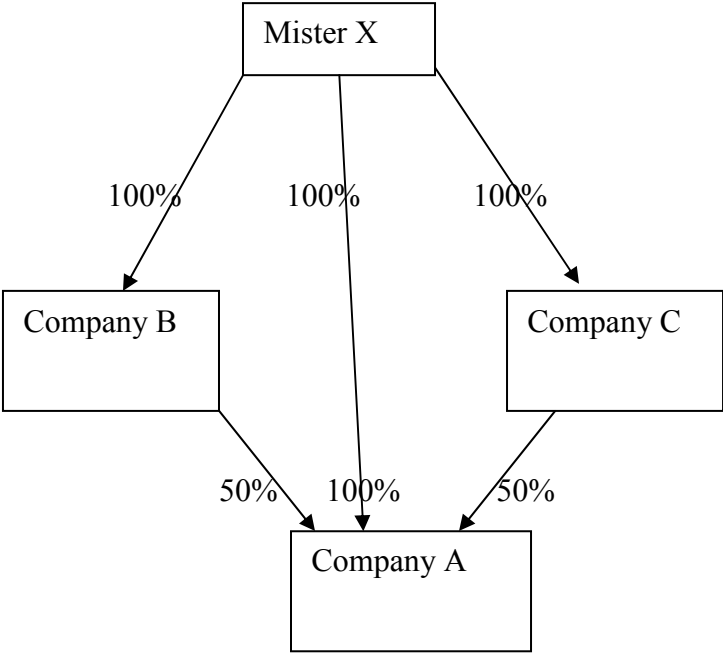
According to above, we use this row variable data to determine the companies relationship with others, that if the company is an affiliate of another or not. We state that if the company has an indicator of A or B, so it’s independent and the dummy variable got “0” value, otherwise, if the company has an indicator C or D so it’s dependent or owned (controlled) by another company or companies and the variable value is “1”.

In other word, we distinguish between two groups of companies; the first group (A and B) has not a shareholder/s with a high share, which can control the company. The second group (C and D) has a shareholder/s with a high share, which can control the company.

We depend on this analysis for these important reasons:

- In BvDEP database, the total ownership percentage used to define the independence indicator and ultimate ownership as shown before, so using the independence indicator is useful to determine the ultimate owner (this mean, is the company an affiliate of another or not?)
- We cannot depend on aggregating or calculating shareholders because in some cases an ultimate owner will never be displayed as a shareholder as the following example.

Figure: 4.4: one case which the ultimate owner cant be displayed



- Company “A” is jointly owned by companies “B” and “C”.
- Companies “B” and “C” are both owned at 100% to Mister “X”.
- As Mister “X” controls “B” and “C”, the calculated ownership percentage between Mister “X” and company “A” is 50% + 50% =100%, but it will never be displayed as a shareholder, that for many reasons, one of the most



important of these that because certain ownership structure can be very complex. The previous example is very simplified but these types of ownership structure can be very complex, so these types are not included in Amadeus database ownership data.

Therefore, we present the variable from the large companies' original sample to show the variable data processing procedure. Similar process is done with the other variables. Therefore, we calculate the variable affiliate as follows:

Table 4.17: Large companies' classification according the independence indicator in the original database:

Independence Indicator	Frequency	Percentage	Cumulated percentage
-	1,567	4.21	4.21
A	97	0.26	4.47
A+	386	1.04	5.51
A-	954	2.57	8.08
B	7	0.02	8.10
B+	1,998	5.37	13.47
B-	471	1.27	14.74
C	163	0.44	15.18
C+	194	0.52	15.70
D	24,183	65.03	80.73
U	7,165	19.27	100.00
Total	37185	100.00	

We group the variable classification for "A" and "B" types, and drops the rested companies, which they are unavailable data, and unknown degree of independence, respectively. The companies with classification of "A" to "B" type's take "0" in affiliate variable where they are independent and classification of "C" and "D" type's take "1" which companies are dependent. The current variable "affiliate" distinguishes between the companies according their independency, which has two values "zero" and "one", which they represent the independent and dependent companies, respectively.

## Second variable: (Dummy industries)

We add dummy (nominal) variable for ten different industries to control for other unobserved industry specific effects. The industries classified according to the following sections in NACE Rev.2.

Table 4.18: The ten industries classification and their own sections in the NACE Rev.2.

	NACE Rev. 2 sections	Description
1	A	Agriculture, forestry and fishing
2	B,C,D and E	Manufacturing, mining and quarrying and other industry
3	F	Construction
4	G,H and I	Wholesale and retail trade, transportation and storage, accommodation and food service activities
5	J	Information and communication
6	K	Financial and insurance activities
7	L	Real estate activities
8	M and N	Professional, scientific, technical, administration and support service activities
9	O,P and Q	Public administration, defense, education, human health and social work activities
10	R,S,T and U	Other services

The following table shows the industries sections (the board structure), which used to classify the “ten” industries used in the current variable.

Table 4.19: Broad structure of NACE Rev. 2

Section	Title	Division
A	Agriculture, forestry and fishing	01 – 03

B	Mining and quarrying	05 – 09
C	Manufacturing	10 – 33
D	Electricity, gas, steam and air conditioning supply	35
E	Water supply; sewerage, waste management and remediation activities	36 – 39
F	Construction	41 – 43
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	45 – 47
H	Transportation and storage	49 – 53
I	Accommodation and food service activities	55 – 56
J	Information and communication	58 – 63
K	Financial and insurance activities	64 – 66
L	Real estate activities	68
M	Professional, scientific and technical activities	69 – 75
N	Administrative and support service activities	77 – 82
O	Public administration and defence; compulsory social security	84
P	Education	85
Q	Human health and social work activities	86 – 88
R	Arts, entertainment and recreation	90 – 93
S	Other service activities	94 – 96
T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	97 – 98
U	Activities of extraterritorial organizations and bodies	99

This variable aims to capture the unobserved specific effects between the different industries. Hence, the variable does not measure the effect of each industry, but it controls for the differences between industries characteristics to get results that are more robust.

### **Third variable: (consolidated company)**

Consolidate is another variable controls different effects between consolidated and unconsolidated companies. In fact, four data types are available in this variable; consolidated, unconsolidated, consolidated & unconsolidated and no recent record. So, we control for these four types to capture any unobserved characteristics, and get best possible results.

### **Fourth variable: (independence)**

In fact, we already distinguished between the dependent and independent company in the affiliate variable, but, and following to Oberhofer and Pfaffermayr (2011), many levels of company independency should be controlled, which affect the company strategy decision. This additional variable is to ensure results that are more robust. Hence, we add another variable controls the different levels of the autonomy of the companies as mentioned before in the first control variable, which we re-present these types briefly as follows:

- 1- A: very independent, that it's attached to any company with known recorded shareholders but none of which having more than 25% of direct or total ownership which considered as very independent. In other words, this company is very independent on another company or companies (shareholders). Hence, their strategies of serving the foreign market totally done by the same company. So, we interest of adding this variable.
- 2- B: Independent, which it's, attached to any company with a known recorded shareholder none of which with an ownership percentage (direct, total or calculated total) over 50%, but having one or more shareholders with an ownership percentage above 25%. Again, this type of companies is also still independent to other companies of decision making regarding the foreign markets serving strategies.
- 3- C: dependent, which it's, attached to any company with a recorded shareholder with a ***total*** or a calculated total ownership over 50%. Therefore, this type of companies is an affiliate of another company. However, as long as we measure the company independency, so we consider this type dependant partially of his strategy on the owner, and it could have a different strategy, which it could be indirectly owned.

- 4- D: not independent, which it's, allocated to any company with a recorded shareholder with a ***direct*** ownership of over 50%. Therefore, this type of companies is dependent and controlled by other companies, and it considered as an affiliate of another company. This type is the lowest independent and directly owned to other company.

This variable controls the dependency level of the company, and we separate between the types of companies according to their autonomy. Actually, we have two levels in the dependent companies and two levels in the independent level. This should improve the results by capturing the differences of company autonomy that should affect the strategy choice decision.

## **4.6 Econometric Methodology**

In this section, we present the procedure to apply the bivariate model. We start with the nonparametric test before the bivariate test and the postestimation of the model for more robust results. The procedure for the presentation and analyse the different empirical parts.

The bivariate probit model is a new methodology used in the current subject, which is a new method to test the multinationals strategy choice, and it shows considerable results.

Many econometric testing is required to determine the nature of the relationship of the different strategies, so testing for different categories of companies, large and very large, firstly each alone and the two categories together, secondly.

We choose a very wide range of companies for testing the strategy choice that helps to get the most robust results, which the bivariate probit model measures the probability of using one strategy instead of or comparing with another. In other words, the bigger sample gives results more robust, especially, with the models use the probability methodology.

Also for discovering the role of the variables that determine strategy choice, so it would be more interesting, trustable and confidence to use the widest range of companies from the

same characteristics and criteria<sup>31</sup>, (large or very large) and country (France). This provides us of more confidence in the results, so we choose France instead of more than one country, and separate between the large and very large companies.

## 4.6.1 The Method: The Bivariate Probit Model

The companies we analyze decide whether to export, to do invest abroad, or to use a combination of those two. The model describes the simultaneous decision making process. At one point of time, the company has to think about the export strategy and the investment strategy or both. This section describes an econometric model to measure interrelationships with “Limited Dependent Variables” (LDV). The model, which is used, is a bivariate probit model.

### 4.6.1.1 The Bivariate Probit Model and Estimating

We now turn to the bivariate model and present the likelihood function, which establish the estimation. The difference to the standard probit case is that now two endogenous variables are dichotomous. The structural model then is:

$$Y_1^* = X_1\beta_1 + \mu_1 \text{ (The first endogenous (dummy) variable)}$$

$$Y_2^* = X_2\beta_2 + \mu_2 \text{ (The second endogenous (dummy) variable)}$$

$$Y_k = \begin{cases} 1 \rightarrow \text{if } Y_k^* > \tau \\ 0 \rightarrow \text{if } Y_k^* < \tau \end{cases} \quad k = 1,2$$

With:

$$E(\mu_1) = E(\mu_2) = 0$$

With variance:

$$Var(\mu_1) = Var(\mu_2) = 1$$

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<sup>31</sup> Since, the criteria of defining the large and the very large are hugely different.

And, covariance:

$$\text{Cov}(\mu_1, \mu_2) = \rho$$

According to Greene (2008), the bivariate normal cumulative density function C.D.F. is:

$$P(Y_1 = 1, Y_2 = 1) = \Phi_2(X_{1,2}, \beta_{1,2}) = \int_{-\infty}^{X_1\beta_2} \int_{-\infty}^{X_2\beta_2} \phi_2(z_1, z_2, \rho) dz_1 dz_2$$

The density of the joint distribution of the two normally distributed variables is:

$$\phi_2(z_1, z_2, \rho) = \frac{1}{2\pi\sqrt{(1-\rho^2)}} \exp\left\{-\frac{1}{2}(z_1^2 + z_2^2 - 2\rho z_1 z_2)\right\} / (1-\rho^2)$$

To construct the log likelihood function let  $q_{i1} = 2y_{i1} - 1$  and  $q_{i2} = 2y_{i2} - 1$ . In case,

$q_{ij} = 1 \rightarrow \text{if} \rightarrow y_{ij} = 1$ , and  $-1 \rightarrow \text{if} \rightarrow y_{ij} = 0 \rightarrow \text{for} \rightarrow j = 1, 2$ ,

$z_{ij} = x_{ij}\beta_j$  and  $w_{ij} = q_{ij}z_{ij}$ ,  $j = 1, 2$ , and the covariance is  $\rho_{t^*} = q_{i1}q_{i2}\rho$ .

To clarify the notation: The subscript 2 in  $\phi_2$  and  $\Phi_2$  describes the bivariate normal probability density function (P.D.F.), which is a function describing the relative likelihood for a continuous random variable to occur at a given time. In addition, the cumulative density function (C.D.F.), which describes the probability that a real valued random variable x with a given probability distribution will be found at a value less than or equal to x. The other subscripts 2 describe the variables of the second equation for the bivariate probit model.

According to Greene (2000) the probabilities that enter the likelihood function then are:

$$\text{Pr ob}(Y_1 = y_{i1}, Y_2 = y_{i2}) = \Phi_2(w_{i1}, w_{i2}, \rho_{t^*}).$$

The expression (the log-likelihood) takes into account all the necessary sign changes to calculate probabilities for the dependent variables either equal to one or zero then is:

$$\log L = \sum_{i=1}^n \ln \Phi_2(w_{i1}, w_{i2}, \rho_{t^*})$$

The partial derivations then are:

$$\frac{\partial \log L}{\partial \beta_j} = \sum_{i=1}^n \left( \frac{q_{ij} g_{ij}}{\Phi_2} \right) X_{ij}, \rightarrow j = 1,2$$

With:

$$g_{i1} = \phi(w_{i1}) \Phi \left[ \frac{w_{i2} - \rho_{t^*} w_{i1}}{\sqrt{1 - \rho_{t^*}^2}} \right] \quad (16)$$

The indices 1 and 2 in the equation 14 inversed to get  $g_{i2}$

$$g_{i2} = \phi(w_{i2}) \Phi \left[ \frac{w_{i1} - \rho_{t^*} w_{i2}}{\sqrt{1 - \rho_{t^*}^2}} \right] \quad (17)$$

And:

$$\frac{\partial \log L}{\partial \rho} = \sum_{i=1}^n \frac{q_{i1} q_{i2} \phi_2}{\Phi_2}$$

The estimates for the maximum likelihood are computed by simultaneously setting the three partial derivations to zero.

$$\sum_{i=1}^n \left( \frac{q_{i1} g_{i1}}{\Phi_2} \right) X_{ij} = 0$$

$$\sum_{i=1}^n \left( \frac{q_{i2} g_{i2}}{\Phi_2} \right) X_{ij} = 0$$

$$\sum_{i=1}^n \frac{q_{i1} q_{i2} \phi_2}{\Phi_2} = 0$$

#### 4.6.1.2 Marginal Effects in a Bivariate Probit Model

This section presents the marginal effects in a bivariate probit model. Marginal effects measure the influence of a 1 % change of each of the explaining variables on the marginal probability that the dichotomous variable takes on the value of 1 (that occurs). For example, marginal effects should measure the ***change in marginal probability*** of the expected value of “exports” as “age” variable increases by unity while all other variables are kept constant.



According to Greene (2008), that defines one vector  $X$  which unites both vectors of explaining variables.

We get the vector  $X = X_1 \cup X_2$ . We also redefine  $y_1^* = X_1\beta_1 + \mu_1$  as  $y_1^* = X\gamma_1 + \mu_1$ .

We assure that  $\gamma_1$  contains all elements, which take on a nonzero value of  $\beta_1$ . There might be also zero values in positions of variables, which only appear in the second equation. For the second equation  $\gamma_2$  is defined in the same way ( $X_2\beta_2 = X\gamma_2$ ). From these definitions the bivariate probability is:

$$P(Y_1 = 1, Y_2 = 1) = \Phi_2(X\gamma_1, X\gamma_2, \rho)$$

The marginal effects of change in the vector of explaining variables  $X$  on the probability are:

$$\frac{\partial \Phi_2}{\partial X} = g_1\gamma_1 + g_2\gamma_2$$

With  $g_1$  and  $g_2$  defined such as the equations 16, 17. The marginal effects are the same as in the univariate case, if the covariance is zero ( $\rho = 0$ ).

Now the unconditional mean function given by the univariate probabilities:

$$E(Y_j | Y_2) = \Phi(X\gamma_j), \rightarrow j = 1, 2$$

The conditional mean function of  $Y_1$  under condition  $Y_2 = 1, X$  is:

$$E(Y_1 | Y_2 = 1, X) = P(Y_1 = 1 | Y_2 = 1, X)$$

$$E(Y_1 | Y_2 = 1, X) = \frac{P(Y_1 = 1, Y_2 = 1 | X)}{P(Y_2 = 1 | X)}$$

$$E(Y_1 | Y_2 = 1, X) = \frac{\Phi_2(X\gamma_1, X\gamma_2, \rho)}{\Phi(X\gamma_2)}$$

The marginal effects then come from the partial first derivation to the vector  $X$ . The marginal effect is:

$$\frac{\partial E(Y_1 | Y_2 = 1, X)}{\partial X} = \left( \frac{1}{\Phi(X\gamma_2)} \right) \left[ g_1\gamma_1 + \left( g_2 - \Phi_2 \frac{\phi(X\gamma_2)}{\Phi(X\gamma_2)} \right) \gamma_2 \right]$$

## 4.6.2 Econometric Estimation Procedure

The empirical analysis of the discrete export versus FDI decision uses the bivariate probit model. The bivariate probit model is an extension of the binary probit model. Its model of two dependent variables, which each variable is assumed a linear function of a set of independent variables, and each equation contain a constant and an error term. These error terms are assumed to be normally distributed, but they come from a joint or bivariate normal distribution. The bivariate distribution allows for non-zero correlation between the errors. In other words, the error terms are not assumed to be independent of each other. In contrast, they assumed to be correlated, where it is assumed that there are some correlation between exports and FDI. This allows the model to be estimated by maximum likelihood methods, because the outcomes are estimated jointly. Hence, the model identify the slope coefficients for each of the two sets of the explanatory variables, and the coefficient of correlation of the two error terms ( $\rho$ ) or (rho), Andrew (2007); Greene (2003). Hence, the bivariate probit model provides a way of dealing with two separate binary dependent variables. Essentially, it takes two dependent binary probit models and estimates them together, allowing for a correlation between the error terms of the two equations. The bivariate probit model tests the probability of one choice (dependent variable) instead of another choice (another dependent variable) with using the same group of independent variables. The interpretation of betas estimated represents the mean change in the dependent variable (choice probability) given a unit change in the independent variables, and  $\hat{Y}$  reflects the mean response given a combination of independent values.

We remind again, the analysis is based on a large, very large and both large and very large French companies database available in (AMADEUS). AMADEUS provides information on whether a company exports or not, and whether a company runs foreign affiliate abroad or not, which reflects the two dependent variables. However, as in almost all companies' databases, it remains unknown in which countries a company exports and/or has a subsidiary unless providing that the subsidiaries of the companies in a specific area, as it could be shown in Amadeus database.

Firstly, we introduce a statistics about the number and the percentage of companies under each different strategy. These strategies followed by the companies are local, exports, FDI and both exports and FDI, for which including the local strategy bring more lights to strategy

choice and the independent variables. Then, a descriptive statistical test of Kruskal Wallis is done for the different groups. The Kruskal Wallis test is a nonparametric test, which is a distribution free test, the test used to compare three or more groups of sample data. This method used for testing equality of population medians among groups. Since, it is a nonparametric method; the test does not assume a normal population.

We present the bivariate probit regression results for the three companies groups (large, very large and all companies). We follow it by the interpretation (model fitness, parameters and comparison with the theoretical pre-expectations). We follow it with the multicollinearity tests results, which we use the Variance Inflation Factor (VIF) method. The “variance inflation factor” method is used to calculate an index, which measures how much the variance of a coefficient is increased due to multicollinearity.

The marginal effects of the main six variables on the four different strategies, (local, FDI, exports and both strategies), are introduced and discussed for each group separately. The marginal effects results represent the regression position of the bivariate probit regression, which the marginal effects tests must be done directly after the bivariate regression.

Finally, we introduce a general interpretation for the main strategy adopted by each group, and the results and conclusions of the chapter. Therefore, we test the choice between two strategies (dependent variables) which explained by the independent including control variables as follows:

Table 4.20: The variables, which are included in the tests.

<b>Dependent variables</b>	<b>Independent variables</b>
Exports, and FDI	Age
	Size (company employees number)
	Productivity (two proxies)
	Herfindahl Index
	Average company size in the industry
	Intangible assets
	<b>(control variables)</b>
	Industry dummies
	Affiliate
	Consolidate
	Independence of the company

## 4.7 Estimation part:

### 4.7.1 Bivariate probit regression:

Firstly, we present the collected data about the different strategies (local, exports, FDI and both strategies) followed by the different groups of French companies (large, very large and all companies). The data shows the total number of companies for each strategy in each group, and the percentage of these companies to the total companies in the group.

Table 4.21: The chosen market serving strategy in the different companies' datasets.

Large companies						
Exporters	Investors				Total	
	No	percentage	Yes	percentage		
No	13438	49.4%	531	1.9%	13969	51.34%
Yes	11520	42.3%	1719	6.3%	13239	48.66%
Total	24958	91.74%	2250	8.26%	27208	100%
Very large companies						
Exporters	Investors				Total	
	No	Percentage	Yes	percentage		
No	1156	31.2%	752	20.3%	1908	51.5%
Yes	1126	30.4%	670	18.1%	1796	48.5%
Total	2282	61.6%	1422	38.4%	3704	100%
All companies						
Exporters	Investors				Total	
	No		Yes			
No	12750	40.9%	1302	4.2%	14052	45.1%
Yes	14705	47.1%	2418	7.8%	17123	54.9%
Total	27455	88%	3720	12%	31175	100%

We present the different data types of the variables dependent and independent in the dataset. The same variables with the same types are included in the different companies' groups' datasets.

Table 4.22: The types of the test variables in the model.

<b>N.</b>	<b>Variable name</b>	<b>Type</b>
<b>1</b>	Number of recorded foreign subsidiaries	Dummy (dependent)
<b>2</b>	Exports data	Dummy (dependent)
<b>3</b>	Age	Integers & non integers
<b>4</b>	Number of employees (size)	Integers & non integers
<b>5</b>	MES	Integers
<b>6</b>	Herfindahl Index	Non integers
<b>7</b>	Operating revenue per employee (productivity)	Integers
<b>8</b>	Costs of employees/ operating revenues (productivity)	Integers and non integers
<b>9</b>	Intangible assets	Integers
<b>Control variables</b>		
<b>10</b>	Industrial dummies	Nominal variable
<b>11</b>	Affiliate	Dummy
<b>12</b>	Independence	Nominal variable
<b>13</b>	Consolidate	Nominal variable

### **Descriptive statistics:**

We present descriptive statistics, which illustrate the main characteristics of data. The Kruskal Wallis one-way analysis of variance by ranks is a non-parametric method for testing equality of population medians among groups. It is identical to a one-way analysis of variance with the data replaced by their ranks. It is an extension of the Mann Whitney test to three or more groups. We use Kruskal Wallis tests for four variables (age, number of employees, productivity and intangible assets). In fact, the Kruskal Wallis test for just one variable is sufficient and trustable; and it is not possible to use the test with the control variables. The other main variables, we exclude two variables, which are not an original company data.

Firstly, the Herfindahl index which, is representative to the company competition. Secondly, the MES that, is the average company size in the industry. Therefore, we include the rest four variables (age, size, productivity and intangible assets) in the Kruskal Wallis test.

According to the Kruskal Wallis tests, the four groups of companies (only local producers companies, exporters, foreign investors and both strategies users) are significantly different, in the three companies groups. The  $X^2$  test, clarifies that for the companies making up one homogeneous group, is strongly rejected for all four variables of interest in the different three companies groups. The rejection is clear-cut and strongest regarding the companies' productivity, in the large companies group. The intangible assets show the strongest clear-cut rejection for the hypothesis of homogeneous group, in the very large and all companies group. The productivity also shows the second strong rejection for the same hypothesis, in the very large and all companies group.

The nonparametric Kruskal-Wallis test, in addition, indicates that the four groups are different according to their productivity, age, size and intangible assets. Hence, the strategy will be followed by each companies group should be different. This justifies going ahead for the bivariate probit regression in the different companies groups. In addition, these results could be the first empirical indication justifies the companies' separation (large and very large).

Table 4.23: Kruskal-Wallis equality of populations rank test

<i>Large companies</i>				
<i>Variables</i>	<i>Age</i>		<i>Employees</i>	
	$X^2$	<i>P value</i>	$X^2$	<i>P value</i>
<i>K-W test</i>	527.294	0.0001	1127.802	0.0001
<i>Observations</i>	27208		27208	
<i>Variables</i>	<i>Productivity</i>		<i>Intangible assets</i>	
	$X^2$	<i>P value</i>	$X^2$	<i>P value</i>
<i>K-W test</i>	6629.214	0.0001	4747.973	0.0001
<i>Observations</i>	27208		27208	
<i>Very large companies</i>				
<i>Variables</i>	<i>Age</i>		<i>Employees</i>	

	$X^2$	<i>P value</i>	$X^2$	<i>P value</i>
<b><i>K-W test</i></b>	248.709	0.0001	1879.504	0.0179
<b><i>Observations</i></b>	3704		3704	
<b><i>Variables</i></b>	<b><i>Productivity</i></b>		<b><i>Intangible assets</i></b>	
	$X^2$	<i>P value</i>	$X^2$	<i>P value</i>
<b><i>K-W test</i></b>	2526.173	0.1583	2860.714	0.1649
<b><i>Observations</i></b>	3704		3704	
<b><i>All companies</i></b>				
<b><i>Variables</i></b>	<b><i>Age</i></b>		<b><i>Employees</i></b>	
	$X^2$	<i>P value</i>	$X^2$	<i>P value</i>
<b><i>K-W test</i></b>	752.343	0.0001	3619.387	0.0001
<b><i>Observations</i></b>	31175		31175	
<b><i>Variables</i></b>	<b><i>Productivity</i></b>		<b><i>Intangible assets</i></b>	
	$X^2$	<i>P value</i>	$X^2$	<i>P value</i>
<b><i>K-W test</i></b>	6481.384	0.0001	7768.405	0.0001
<b><i>Observations</i></b>	31175		31175	

The next table shows the econometrical results to the bivariate probit regression for the different groups of the companies. The results in general have high significant values; the model fitness tests also presented, which show highly significant.

We show the exports strategy equation first with their correspondent values (coefficients, significance and Z values). Similarly, it followed by the foreign investment equation which we present the all “ten” variables used in the regression, in addition, to the constant values. Hence, we have “twenty four” coefficients in each group. The traditional proxy of the productivity also is shown for each strategy in separated table<sup>32</sup>.

<sup>32</sup> We include the new productivity proxy in the estimations, meanwhile, the traditional proxy is estimated separately and it just presented to compare it with the new one.

Table 4.24: The bivariate probit estimation.

Strategy/variables	Coefficient (large)	Coefficient (very large)	Coefficient (all companies)
Exports			
Age	0.076*** (6.98)	0.022 (0.77)	0.004*** (9.54)
Size	-0.019** (-2.36)	0.042*** (2.64)	-0.00002*** (-2.71)
Affiliate	0.13*** (3.41)	0.3** (2.46)	0.22*** (6.1)
Independence	-0.048** (-2.37)	0.05 (0.72)	-0.06*** (-3.24)
Consolidate	-0.11*** (-4.14)	0.5*** (15.02)	0.77*** (16.47)
HI	0.38*** (32.72)	0.27*** (9.57)	0.03*** (4.22)
MES	0.00024*** (36.27)	1.10 <sup>e</sup> -06*** (3.48)	0.00001*** (31.3)
Ind. Dummy	-0.09*** (-17.52)	-0.11*** (-6.01)	-0.22*** (-43.29)
New productivity proxy <sup>^</sup>	-0.002*** (-3.91)	-0.01*** (-6.03)	-0.007*** (-13.62)
Intangible	7.92e-06*** (3.78)	-2.09 <sup>e</sup> -07*** (-2.9)	-1.50 <sup>e</sup> -07 * (-1.81)
Constant	0.21 (1.32)	-1.67*** (-6.71)	-1.73*** (-11.82)
<b>N. of observations</b>	<b>27208</b>	<b>3704</b>	<b>31175</b>
FDI			
Age	0.17*** (10.66)	0.25*** (8.47)	0.006*** (14.04)
Size	0.008 (0.75)	0.09*** (6.04)	0.00002*** (4.34)
Affiliate	0.5***	0.3**	0.49***



	(8.19)	(2.51)	(9.2)
Independence	-0.38*** (-11.25)	-0.25*** (-3.39)	-0.37*** (-12.23)
Consolidate	-0.36*** (-12.62)	-0.36*** (-11.58)	-0.7*** (-16.52)
HI	0.034** (2.21)	-0.046 (-1.63)	0.2*** (29.48)
MES	0.0001*** (14.72)	3.37 <sup>e</sup> -06*** (10.45)	0.00001*** (24.97)
Ind. Dummy	-0.04*** (-6.02)	-0.17*** (-9.38)	-0.14*** (-20.69)
New productivity proxy <sup>^</sup>	0.004*** (4.52)	0.001 (0.78)	0.003*** (4.19)
Intangible	0.00002*** (9.17)	1.19 <sup>e</sup> -07** (2.18)	4.85 <sup>e</sup> -08 (0.76)
Constant	-0.074 (-0.41)	-0.008 (-0.03)	1.42*** (9.59)
Model Fitness			
athrho	0.41*** (25.34)	0.1*** (3.36)	0.327*** (23.52)
Rho	0.37	0.1	0.316
LR chi2 (20)	4011.56***	1651.27***	6958.07***
Likelihood-ratio test of rho=0; chi2 (1)	685.877***	11.2847 ***	578.057***
Log likelihood	-24199.128	-4205.8819	-29270.574

Traditional productivity proxy <sup>^</sup> (Exports)	9.39 <sup>e</sup> -06*** (2.82)	8.90 <sup>e</sup> -06* (1.7)	0.00002*** (7.75)
Traditional productivity proxy <sup>^</sup> (FDI)	-4.46 <sup>e</sup> -06 (-0.71)	0.00001** (2.43)	5.73 <sup>e</sup> -06 (1.56)

- The symbols \*, \*\*, \*\*\* stand for the 10%, 5% and 1% significant.

- Z values are given in the parenthesis.

<sup>^</sup> New productivity proxy (cost of employees/operating revenues), and the traditional (operating revenues per employees).

### **4.7.1.1 Results analysis:**

Firstly, we introduce the statistical robustness of the model, which includes the maximum likelihood test and the multicollinearity test. Secondly, we introduce the economical analysis for the model tests.

#### **4.7.1.1.1 Statistical robustness:**

Maximum likelihood methods have desirable mathematical and optimality properties which become minimum variance unbiased estimators, this means that the estimator has the smallest variance, and thus the narrowest confidence interval, of all estimators.

Likelihood ratio (LR) test is used to compare the fit of two models, one of which is nested within the other. This often occurs when testing simplifying assumption for a model is valid, as when two or more models parameters are assumed to be related.

The Likelihood ratio tests in our model significant at 1% level that means the model fits the data tested, i.e. the bivariate probit model is suitable to test these data for the choice between the two dependent variables. The model parameters related, and explain the dependent variables (both strategies). Thus, the estimators have the smallest variance and narrowest confidence interval of the parameters.

From the hypothesis testing of bivariate probit, the result is significantly different from zero of ( $\rho$ ) which ( $\rho$ ) equals to 0.37, 0.1 and 0.31 for the three groups, respectively. This means that there is some covariance of error terms, between the probability of doing exports, and of doing FDI, strategies. This result could be implied to indicate for the interdependence of the two strategies decision, which helps the companies decision makers to run the suitable strategies combination. In addition, its empirical evidence that the exporters and the investors learn from each other, this allows to use each variable as an explanatory variable for the other, in the other researches<sup>33</sup>.

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<sup>33</sup> In chapter five, we use a bivariate gravity panel data framework, whereas we use each strategy as an explanatory variable for the other. This is to interconnect the both gravity equations, which we use to explain the relationship between the strategies, at the country level.

In the exports strategy equation of large companies group, all the variables are significant at 1% level except size and independence, which are significant at 5% level. In the very large companies group, all variables are significant at 1% level except affiliate and traditional proxy of productivity, which are significant at 5% and 10% respectively; age and independence are not significant. In all companies group, all variables are significant at 1% level except the intangible assets, which is significant at 10% level.

In the foreign direct investment equation, in the large companies, all variables are significant at 1% level except HI which is significant at 5% level, and, size and traditional productivity proxy aren't significant. In the very large companies group, all variables are significant at 1% level, except affiliate, intangible assets and the traditional productivity proxy, which are significant at 5%; new productivity proxy and HI are not significant. In all companies group, all variables are significant at 1% level except the intangible assets and the traditional productivity proxy, which are not significant.

**Multicollinearity tests:**

We also test for multicollinearity to ensure a precision and robustness of predictions. The presence of multicollinearity among variables leads to bias econometric results i.e. unreasonable coefficient estimates, wrongly higher standard errors and consequently insignificant interpretation and inference. Ignoring the effects of multicollinearity could lead to model misspecification. To detect the multicollinearity, the variance inflation factors (VIF) method is used to calculate an index that measures how much the variance of a coefficient is increased due to multicollinearity. In practice, a VIF greater than 10 would indicate a presence of multicollinearity, whereas a VIF greater than 30 becomes potentially problematic requiring specific corrections (Kennedy, 2003).

Table 4.25: The variance inflation factor (VIF) to detect multicollinearity

Variable	VIF (large)	VIF (very large)	VIF (all companies)
Age	1.06	1.04	1.06
Employees	1.46	1.29	1.66
Affiliate	2.40	3.92	2.54
Independence	2.38	3.64	2.50

Consolidate	1.05	1.43	1.26
HI	2.00	1.88	1.42
MES	1.64	3.62	1.80
Ind. Dummy	1.48	2.97	1.61
Productivity	1.67	1.41	1.55
Intangible	1.03	1.13	1.05
Mean VIF	1.62	2.23	1.64

The tests show a very low VIF mean equal 1.62, 1.64 and 2.23 for the large, very large and all companies group respectively, which do not arrive even to five. This clarifies none presence of the multicollinearity problem. In addition, the VIF for each variable is low, and we do not find any potential multicollinearity problem regarding any variable or group.

#### **4.7.1.1.2 Economic results:**

The interpretation of the results aims to explain the effects of the company characteristics on the choice between the strategies of serving the foreign market from one side. In the other side, we explain the differences between the different groups of companies (large and very large), i.e. how could an independent variable affect differently the choice between strategies in the different groups, basing on the predicted differences between groups.

As predicted in the table (2), the age variable is positive which has stronger effect on FDI strategy comparing the exports strategy. The coefficients values in exports and FDI equations respectively present the values 0.08 to 0.17, 0.022 (NS) to 0.25 and 0.004 to 0.006 in the large, very large and all companies groups respectively. This shows that each group seeks to run an affiliate abroad, which is more profitable than the exports strategy, as predicated in the theoretical model, but the very large group still more able to do that, as we see below.

In the exports equation, the age effect is larger in the large group than the very large group, for which the accumulated intangible assets, liquidity<sup>34</sup> and the age average level in large group are lower than the very large group. Therefore, the large companies prefer to

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<sup>34</sup> The accumulated intangible assets and liquidity increases as long as time increasing, which allows paying the fixed cost to serve the foreign market.

concentrate of serving the foreign market on exports comparing to FDI, with the mentioned low levels, as predicted previously.

In the FDI equation, the age effect in the very large group larger than the large group, which the very large companies have a higher accumulate intangible assets, liquidity and age average level. Therefore, it is more able to pay the fixed costs required to run an affiliate abroad, which is more profitable as predicted in the theoretical model, as long as the age longer.

The size variable shows an effect in the absolute value greater on FDI than exports, either in the large or very large companies groups. The variable effect is negative on exports, and it is positive on FDI in the large and all companies group. The size variable effect has a positive sign on FDI and exports in the very large companies.

Hence, the very large companies have a higher employee's number in average than the large companies, which can provide more liquid funds to serve the foreign market by both strategies. In the other side, the large companies have low number of employees in average and they prefer to substitute FDI instead of exports, as long as it more profitable and it has not the ability to do both strategies because of their low liquid fund available.

This could show the strongest effect of size in the very large group comparing to the other groups, and the very large group has more ability to serve the foreign market.

We can explain the unexpected negative sign of the number of employees on exports in large companies group, which are a proxy for size and, therefore a proxy for fixed costs of the company, as follows. Companies with more employees produce and sell more and so they have more liquid funds to pay additional fixed costs for serving the foreign market. Large companies are not the largest companies, and hence, this group is not the most productive. Therefore, it has not the high share of market, or it has not a high sales level that could provide ability to do exports besides the FDI. Therefore, it prefers to do the more profitable strategy (FDI), although, the coefficient is not significant on FDI. In addition, the competition level between the large companies do not serve to do exports, and it maybe more useful to serve the foreign market by the other strategy, which size has a positive relationship with FDI.

As predicted previously, the Herfindahl index has a stronger effect on exports than the FDI in the large and very large groups. HI variable is proxy for the market power shows coefficients

values 0.38 to 0.03, and 0.27 to -0.05 (NS) respectively on exports and FDI, from one side, and in large and very large groups, from the other side. So, the increasing in the company power or concentration causes gains (profits) for the company and these gains just realized in the local market, where the concentration occurs and fewer competitors exist. Hence, both groups tend to produce locally and concentrate on the exports more than the FDI, which realize more dominance on the local market and realize more gains and profits from the concentration.

The concentration power (dominance) of the very large companies is stronger which allows substituting exports instead of FDI because the very large companies high dominance on the local market justifies concentrating on the exports strategy in these companies. Hence, this variable pushes the very large group to do export which is more profitable than FDI.

Meanwhile, using the FDI strategy doesn't much benefits from concentration gains as much as exports strategy, but anyway producing locally abroad is still supported by the dominance power of the headquarter in large companies.

The HI effect on exports strategy in the large companies is stronger than the effect on exports in very large companies, as predicted previously. This could show that the exports strategy is the major strategy used by the large companies.

The company average size in the industry has a positive effect on both strategies in the three companies groups, but this effect is small. Hence, the increase in the company average size in the industry causes a positive and small increase of serving the foreign market by either exports or FDI.

As predicted previously, the new productivity proxy has a negative effect on exports and positive effect on FDI, for the three companies groups. The new proxy has a permanent negative effect on exports in the three groups, and positive on exports in the three groups. In the very large companies, the negative effect on exports is stronger than the negative effect on exports in the large companies. This is because the high productivity level in the very large companies allows for strongly abandoning of exports than that happens in the large companies.

The strongest negative effect on exports is in the very large companies, this agrees with the theory that the more productive companies shifts from exports to FDI, Helpman et al. (2004). Hence, the increasing in the productivity decreases the mean probability of using exports as strategy for serving the foreign markets, where the company has lower marginal cost, and tends to serve the market by the other strategy (FDI).

The cumulative and density distributions in the large, very large and both groups are shown in the figures 4.6 - 4.11 (A&B), for both proxies of the productivity. Our new proxy shows a better representation for the productivity either in the cumulative distribution graph, or density estimation graph for all companies groups. These curves in the figures show the theoretical shape of the productivity, which stated by the economic theory. In addition, the cumulative distribution for the new proxy shows the same shape that explained later to justify the changes of signs between the bivariate probit and marginal estimations, see section 4.7.2.

The traditional productivity proxy has a positive and small effect on FDI in the three groups, but on exports, it has a negative effect (NS) just in the large companies; and in the other two groups, it has a positive effect. This shows the importance of including the labour quality in the productivity proxy (the labour cost) in addition to the employees' number. I.e. the new proxy that includes the cost of employees' is better representative to productivity than the traditional proxy that just includes number of employees.

Hence, we find the new proxy has a negative effect on exports and the traditional has a positive effect whereas the new is better to represent the productivity, for the three groups. On the other side, the values of the traditional proxy is much smaller than the new proxy, which the new captures the labour productivity better than the traditional.

Intangible assets also agree the theoretical prediction, which has a positive effect on both strategies in the large companies; because the large companies have a low level of intangible assets comparing to the very large. Hence, the intangible assets affect both strategies positively in the large companies, in addition, the effect on FDI stronger than the exports. In the very large companies, intangible assets affect the exports negatively and positively on the FDI, where the high level of intangible assets allows substituting the FDI instead of exports.

Finally, the previous variables (company characteristics) show stronger influence on exports in the large companies, on one hand; on the other hand, it shows, in general, stronger influence on the FDI in the very large companies.

### **Control variables**

Affiliate variable has a positive effect on both strategies in the three companies groups. This is because that the companies that owned to another companies follow the same strategies of the owners (headquarters), which the variable affects positively the both strategies.

On the other hand, we find that the French companies own their affiliates with ultimate owner percentage (UO) higher than 50%. This indicates that the affiliate strategy submit totally to the headquarter company strategies. Hence, these affiliates run exports to serve the foreign market, and it could include an exports-platform. These affiliates also run a FDI following to their headquarters. This is because the affiliates owned totally to their headquarters, as shown in the Amadeus database.

The other three control variables, (consolidate, independence and industry dummies) are used to control the differences in consolidate type, independency of the company and different industries characteristics. These variables are significant, which show that the control variables robust the results, and capture other unobserved characteristics in these fields.

Hence, these variables are really control real differences between the industries and also in the consolidated and independence companies' characteristics; which can affect the choice between the strategies of serving the foreign market.

### **4.7.2 The marginal effects:**

We follow the standard interpretation of the linear statistical models, the marginal effects should measure the change in marginal probability of the expected value of  $y$  as one independent variable increases by unity while all other variables are kept constant, Bartus T.

(2005). Marginal effects can be defined as  $\frac{dF(x)}{d(x)}$ . Andrew (2007) defines it as the impact of



change of one of the explanatory variables on the marginal probability of each outcome. Hence, these marginal effects measure the probability of each explanatory variable on doing each strategy, where we measure it on the four possible strategies, (local, exports, FDI and both strategies). We measure the marginal effects after bivariate probit regression on four types of companies or strategies. In other words, we show the marginal effects of the independent variables on companies do both strategies, the exporters only, locally producers abroad only and finally locally producers, respectively. We intend to measure the marginal effects on these companies' types by the six main variables (age, employees' number, Herfindahl index, productivity, average company size in NACE industry code and intangible assets). We take under consideration that, we included all other control variables when we run the bivariate regression before calculating the marginal effects. Because, running the marginal effects should be done after a specific regression test. In other words, the marginal effects commands in "STATA" calculate the marginal effects from the last regression analysis, which is bivariate probit regression, which includes all the variables in the tests.

However, in the marginal effects, it is not necessary to have the same effect direction or sign of the main variables coefficients in the regression; which the regression coefficients represent the actual position or level of the characteristics (variable) on the different strategies. On the other hand, the marginal effects measure the change of the variable level on the marginal probability of doing a specific strategy. Hence, the marginal effects could have a different sign from the bivariate probit coefficients of the same variable.

For example, and from the basic economic theory, we find four different positions of marginal productivity, as follows<sup>35</sup>:

- At the low productivity level, we have a positive marginal productivity with an increasing rate.
- At a higher productivity level, we have a positive marginal productivity with a decreasing rate.
- At the highest possible level of productivity, we have a zero marginal productivity.
- At a decreasing level of productivity, which is positive, we have a negative marginal productivity.

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<sup>35</sup> The new productivity proxy graph shows exceptional results, whereas representing the traditional shape as stated by the economic theory. On the other hand, the traditional proxy does not show a satisfying graph. See the graphs 4.6 - 4.11 (A&B), which shows the density and cumulative distribution of both proxies.

Hence, the marginal effect could have a different sign from its main economic variable, for either productivity or any other economic factor. In addition, we measure the marginal effects for four different strategies, and not just for two strategies used in the bivariate regression.

Another possible explanation through the figure 4.5, which shows with the clear cut-offs that the investor company with the lowest productivity level must be more productive than the exporter with the highest productivity level. Similarly, the least productive exporters must have a higher productivity level than the most productive company choosing to sell in the local market, and so on. On the other side, Girma et al. (2005)<sup>36</sup>, argue that the cut-off point similar to  $a_I$  have been substituted by uncertainty area. In this zone, the relationship between productivity and international activities is not as deterministic as in graph 4.1. For instance in the right uncertainty region it is likely to observe company exporting to the foreign market having around the same productivity as those deciding to sell in the foreign market locally, and so on. Hence, the marginal effects could change their signs as a result to company's lies in these uncertain areas, as shown in the figure below.

Figure 4.5: None deterministic cut-offs between the different types.

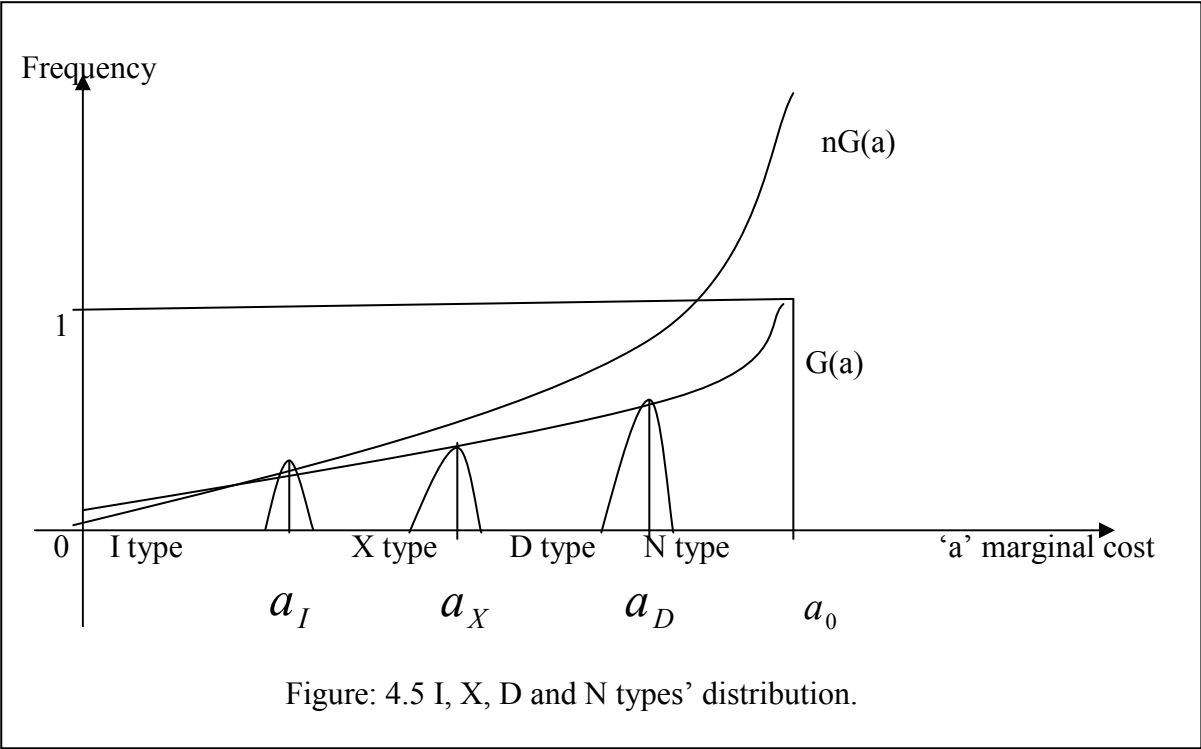


Figure: 4.5 I, X, D and N types' distribution.

<sup>36</sup> Girma et al. shows the uncertain areas from the productivity point of view, but we show these uncertainty cases from the marginal effects point of view.

We applied the idea of none deterministic cut-offs on the marginal costs point of view, and on the same figure, which we extended previously from Baldwin (2005). This is instead of the productivity point of view, as shown in, Girma et al. (2005).

#### 4.7.2.1 Marginal effects after bivariate probit in the large companies.

The following table shows, results for the four strategies, we find that all variables measured are significant at 1% level, except size in FDI and local strategy, which are significant at 10% and 5% respectively. Intangible assets variable in the exports strategy is not significant.

Table 4.26: The marginal effects on the different strategies.

Variable	Both strategies	Exports strategy	FDI strategy	Local strategy
Age	0.02*** (11.35)	0.012*** (2.87)	0.005*** (7.5)	-0.035*** (-8.31)
Employees	0.006*** (5.43)	-0.008*** (-2.61)	0.0008* (1.69)	0.007** (2.18)
HI	0.012*** (7.55)	0.14*** (32.01)	-0.007*** (-11.19)	-0.14*** (-31.97)
MES	0.00002*** (20.05)	0.00008*** (31.06)	-5.06e-07 (-1.45)	-0.00009*** (-37.09)
Productivity	0.0003*** (2.67)	-0.0012*** (-5.48)	0.0002*** (6.03)	0.0007*** (3.17)
Intangible	2.16e-06*** (9.25)	9.96e-07 (1.29)	6.05 <sup>e</sup> -07*** (6.66)	-3.76e-06*** (-4.64)

(\*) dy/dx is for discrete change of dummy variable from 0 to 1

Age variable has a positive effect on the first three strategies, which serve the foreign market, and negative effect on the local strategy. This agrees the previous predictions, where the older companies tend to serve the foreign market, and the increasing in the age increases the probability of doing exports, FDI or both, meanwhile, it decreases depending on the local market.

The effect on exports is stronger than FDI, and the marginal probability of doing both strategies is bigger than either exports or FDI. This means that age increases the probability of doing exports or both strategies, more than just doing the FDI strategy in the large companies.

Company size (number of employees) shows a positive effect on all strategies including the local strategy, which reflects the importance of local market; the exception is the negative relationship with exports strategy. This refers that the large companies' size effect cannot provide sufficient resources (financial resources and liquidities) to serve the foreign market by exports in the presence of the important local market importance, and prefer the FDI strategy, which is more profitable. However, the effect on FDI has a small size comparing to the other strategies.

The company average size in NACE industry code show a very small marginal effect on the different strategies. These effects are positive on exports and both strategies, which they are negative on local and FDI strategies. The increasing in the industry average size will induce the large companies to tend more to use the exports or both strategies; and it will reduce the tendency to serve local market and foreign market by FDI strategies.

The productivity has a positive marginal effect increases all companies' strategies types except the exports, which plays a substitutional role between exports and FDI. The increasing in productivity increases the probability to do FDI instead of exports; because of decreasing marginal cost, which agrees the previous predictions and studies. Again, the productivity positive marginal effect on serving the local market is positive, which reflects the importance of the local French market to the large companies.

The herfindahl index shows a very strong positive effect on exports comparing the both strategies. The increasing of HI increases the company concentration and dominance on the market, which serves to serve the market by exports but not FDI. In other words, the company concentration in the local market decreases the marginal cost and increases the profits from the local production. Hence, the company prefers to produce locally and serve the foreign market by exports instead of FDI.

In addition, the exports strategy is more profitable to the company which serving the foreign market by exports more profitable than the local market.

The intangible assets marginal effect is positive on all strategies except for local strategy, which refers the importance of R&D activities and patents, to induce the serving of the foreign market by either exports or FDI.

Finally, we find that the general probability trend to do the different strategies for the large companies group as follows:

Table 4.27: The general probability of doing each strategy in the large companies group.

Companies types	Data set probability to do specific strategy
Domestic companies	50.3%
FDI strategy	1.6%
Exports strategy	42.7%
Both strategy	5.5%
Total	100%

The previous table reflects the high importance to do the domestic and exports strategy, which the large companies in general tend strongly to serve the domestic market and serve the foreign market by exports. Hence, the dominant strategies in the large companies are the local and exports strategies with nearly 50% and 43%, comparing to FDI and both strategies. These probabilities confirm the real statistics about the percentage of the companies' types, in table 4.21. These previous results show the importance of testing the different companies groups (large and very large) separately. This will be more clearly with the results of the very large companies.

**4.7.2.2 The marginal effects after bivariate probit in the very large companies.**

As the previous part, we check for the marginal effect on the different companies' types or strategies for the very large companies.

As the following table shows, we find the marginal effects of all variables measured are statistically significance at 1% level except the intangible assets in both strategies and local strategy, and HI in exports strategy, which are not significant.

Table 4.28: The marginal effects on the four different strategies.

variable	Both strategies	Exports strategy	FDI strategy	Local strategy
Age	0.05*** (6.78)	-0.04*** (-4.94)	0.046*** (6.52)	-0.06*** (-5.86)
Employees	0.023*** (6.12)	-0.006 (-1.3)	0.013*** (3.28)	-0.03*** (-5.64)
HI	0.03*** (4.74)	0.07*** (8.9)	-0.05*** (-7.08)	-0.06*** (-6.16)
MES	7.60 <sup>e</sup> -07*** (9.94)	-3.24 <sup>e</sup> -07*** (-3.43)	5.16 <sup>e</sup> -07*** (5.56)	-9.51 <sup>e</sup> -07*** (-9.08)
Productivity	-0.0012*** (-3.38)	-0.0025*** (-5.59)	0.002*** (4.47)	0.002*** (4.22)
Intangible	-1.02 <sup>e</sup> -08 (0.70)	-7.27 <sup>e</sup> -08*** (-3.69)	5.53 <sup>e</sup> -08*** (3.58)	2.76 <sup>e</sup> -08 (1.31)

(\*) dy/dx is for discrete change of dummy variable from 0 to 1

As predicted in the theoretical model, the age variable shows a positive effect on FDI strategy and the both strategies. The effects on these strategies in the very large companies are stronger than the similar effects in large companies, which the very large companies have a higher age average and a bigger accumulated intangible assets, as presented before.

The age also reflects negatively on local strategy, similarly to the large companies group, which the age increasing increases the probability of serving the foreign market. In exports strategy, we have a negative effect of age which the very large companies more able to do and to concentrate on the FDI or both strategy; and the exports strategy is less profitable than the other two internationalization strategies (FDI and both).

The size effect shows positive effects on the FDI and both strategies, which shows that the very large companies are more internationalize than the large companies. This is because of that the size effect on the local strategy is positive in the large companies, and negative in the very large one. This shows a higher tendency to serve the foreign market in the very large comparing to the large, regarding this variable.

Hence, we can conclude that the increasing of company size in average leads to more internationalization of the company, which agrees the theoretical predictions and proof the hypothesis.

The size effect is negative on exports (NS); however, it could be negative theoretically in the very large companies.

In addition, we find that the effect magnitude of the size effects FDI and both strategies are stronger in the very large companies comparing to the large one.

The Herfindahl index shows a positive effects on exports and both strategies, and stronger effects on exports strategy. A negative effect on FDI and local strategy show that serving the foreign market is more profitable and preferable than serving the local market. In addition, serving the foreign market by exports or both strategies is more profitable than doing the FDI. The HI effect on exports is stronger in large companies, and the HI effect on both strategies is stronger in the very large companies. This is because of that each group use its market power to serve or concentrate on its main strategy, which chosen by all characteristics combination, (its choice). The HI effect on FDI and local strategy is always negative either in the large or very large companies, which shows that the increasing of market power strongly supports exports, and both strategies in smaller way, but anyway, not the FDI.

The marginal effects of the company average size (MES) show a very small effect, which is positive on FDI and both strategies, but it negative on exports and local strategy.

The MES marginal effect reflects positively in either the large or the very large companies. In the other hand, MES marginal effect supports exports in the large companies, and FDI in the very large companies. This agrees the general results and the theoretical predictions.

Productivity marginal effects show a positive sign just in the FDI strategy and local strategy. The high productivity level allows the very large companies to do FDI, which is the most profitable strategy, that instead of doing export or do the both strategies. The local French market is still important for the very large companies, which the marginal effect is positive.

The marginal effect on exports is negative similarly as the large companies, and as predicted previously. The marginal effect on FDI is stronger in the very large companies comparing to the large companies, where it is the main strategy followed by the very large companies. The unexpected results concern the negative effect on both strategies, which the very large companies substitute the FDI strategy instead of exports, and instead of doing both strategies.

The intangible assets marginal effects are very small, and positive just on FDI strategy and the local strategy, similarly as the productivity. The very high level of the intangible assets in the very large companies induces to follow the most profitable strategy (FDI) instead of exports, and instead of the both strategies. This is because of that the high level accumulated of intangible assets decreases the marginal cost, and increase the productivity. However, the marginal effect is negative on exports and positive on FDI, which follows the normal expected effect of the intangible assets. The other two coefficients are not significant.

Finally, we find that the general probability trend to do the different strategies for the very large companies group as follows:

Table 4.29: The general probability of doing each strategy in the very large companies group.

Companies types	Data set probability to do specific strategy
Domestic companies	36%
FDI strategy	19%
Exports strategy	26%
Both strategy	19%
Total	100%

The most interesting results are the changing in the probability structure of doing the different strategies. The FDI strategy rise from 1.6% in large companies to 19% in the very large companies, similarly, both strategies rise from 5.5% in large companies to 19% in the very large companies. In the other hands, the large companies use local strategy and exports strategy with 50% and 42.7% comparing to 36% and 26% in the very large companies, respectively. Hence, we can conclude that:

- The very large companies are more able to serve the foreign market, which use FDI and both strategies in a high percentage comparing to the large companies.
- The very large companies are more productive, which 64% serve the foreign market comparing to 49.7% in the large companies. These percentages are the aggregation of the three strategies (exports, FDI and both).



- The local market is an important market for both groups, but it is more important to the large companies, where the very large companies more able to exploit the opportunities of the foreign markets.
- Exports strategy is still used strongly by both groups, but it is still more important to the large companies.

This proves the stated hypothesis that the increasing in the productivity substitutes FDI instead of exports, and tends to more internationalization.

These previous results show again the importance of testing the different companies groups (large, very large), separately.

#### 4.7.2.3 The marginal effects after bivariate probit in the group of all companies.

As the previous parts, we check for the marginal effect on the different companies' types or strategies for all companies. This part actually to show that the gathering of both (large and very large companies) could not present the real characteristics effects on the strategy choice. In the other words, the separation between groups can show the effect of age or productivity on the less average companies (large), and the high average companies (very large) of these characteristics; and so on for the other variables.

Statistically, the first five variables (age, employees, HI, MES and productivity) are all significant at 1% level, unless the productivity on the both strategies which is not significant. The intangible assets variable is significant at 10% level on FDI and local strategy; on exports strategy it is significant at 5% level and it is not significant on the both strategies.

Table 4.30: The marginal effects on the four different strategies.

Variable	Both strategies	Exports strategy	FDI strategy	Local strategy
Age	0.0008*** (15.2)	0.0006*** (4.66)	0.0002*** (8.79)	-0.002*** (-11.58)
Employees	0.63e-06*** (2.92)	-8.23e-06*** (-3.69)	1.66e-06*** (5.36)	4.93e-06*** (2.16)

HI	0.022*** (26.56)	-0.012*** (-4.85)	0.01*** (22.05)	-0.02*** (-8.59)
MES	1.84 <sup>e</sup> -06*** (29.95)	3.10 <sup>e</sup> -06*** (20.76)	3.60 <sup>e</sup> -07*** (11.07)	-5.30 <sup>e</sup> -06*** (-34.72)
Productivity	0.00007 (0.96)	-0.003*** (-14.96)	0.0004*** (9.68)	0.002*** (12.22)
Intangible	3.30 <sup>e</sup> -10 (0.04)	-6.01e-08** (-1.98)	7.48 <sup>e</sup> -09* (1.81)	5.23 <sup>e</sup> -08 * (1.68)

(\*) dy/dx is for discrete change of dummy variable from 0 to 1

The age variable shows a positive effect on the first three strategies, which serve the foreign market; and negatively on the local strategy.

This agrees the predictions and the previous results. Actually, it is different from the high age average companies (very large companies), which the latter reflects negatively on exports, and tend to the most profitable strategies.

The age reflects negatively on the local strategy in the current group test and the previous groups, which agrees the theoretical predictions regarding this variable.

Company size marginal effect coefficients are very small, and positive on all strategies unless the exports strategy. The negative relationship with exports follows the previous tested groups; but the current group cannot show, the stronger company size marginal effect that led to more internationalization in the very large companies. This justifies again the separation between the groups.

Herfindahl index marginal affects positively both strategies and FDI strategy, and affects negatively exports and local strategy. The strongest effect is on both strategies and both previous groups do it. Unexpected results of the negative effect on exports and local strategy, which could show unreal representation to the market power, because of merging the both groups together.

Company industry average size show a negative effect on the local strategy similarly to the previous groups and theoretical predictions. The variable shows a positive effect on the other strategies of the multinationals activities that agrees the theoretical predictions. The separation between the large and very large companies able to show that, the MES variable substitute

exports instead of FDI in the large companies; and it substitutes FDI instead of exports in the very large companies. Hence, without the separation between groups, such results could not be shown, which again justifies the chapter methodology.

The productivity marginal effect follows the theory, which is negative on exports and positive on the other multinational strategies. The positive effect on the local strategy shows the important weight of the local French market, even for the large companies, similarly to the previous results.

The separation between the groups is still more able to show that, which multinational strategy is more important to each group. As shown before the productivity marginal effect increases the probability of doing the FDI and both strategies in the large companies. On the other hand, the productivity marginal effect increases just the probability of doing the FDI strategy, in the very large companies.

The intangible assets variable shows a positive effect on all strategies except the exports strategy. This agrees the predictions and the previous results.

Finally, we find that the general probability trend to do the different strategies in this category group as follows:

Table 4.31: The general probability of doing each strategy in the very large companies group.

Companies types	Data set probability to do specific strategy
Domestic companies	49.2%
FDI strategy	2.6%
Exports strategy	42%
Both strategy	6.2%
Total	100%

The previous table results show that, the probability of doing each strategy in this group lies between the probabilities that regarding the previous two groups. These results show the importance of separating the groups, which could not show the real position of each group, and which strategy is more adopted by each company's group.

Hence, the separation between groups detects the strategy choice differences between, those that have low characteristics levels, and those that have high levels of the same characteristics. In addition, we capture the effect of the increasing of each characteristic on choosing the strategy for serve the foreign market.

All large French companies serve essentially the local market, and serve the foreign market by different strategies. The exports strategy is the most important strategy followed by these companies. Those companies with a higher average of size, age, average industry size, productivity and so on, are more able to run an affiliate and sell locally abroad.

Finally, the productivity is the key variable which playing an essential role of choosing between the different strategies. However, age, size, company average size in NACE industry code, Herfindahl index and intangible assets play important role to determine the choice between the strategies.

Table 4.32: The effect direction of the company characteristics on exports and FDI, in the different companies groups.

<b>Exports</b>	Age	Size	MES	HI	productivity	Intangible
Large co.	+	-	+	+	-	+
Very large	+ (NS)	+	+	+	-	-
All co.	+	-	+	+	-	-
<b>FDI</b>						
Large	+	+ (NS)	+	+	+	+
Very large	+	+	+	- (NS)	+ (NS)	+
All	+	+	+	+	+	+ (NS)

The table shows permanent productivity negative and positive effect on exports and FDI, respectively. The age, size, MES and intangible assets increasing increase the marginal probability of doing the FDI. On the other side, the HI, age, MES increasing increase the marginal probability of doing exports. Finally, productivity and intangible assets increasing tend to substitute FDI instead of exports. Age and MES increasing tend to complement the both strategies. The other variables play varieties roles on the strategies, and companies groups.

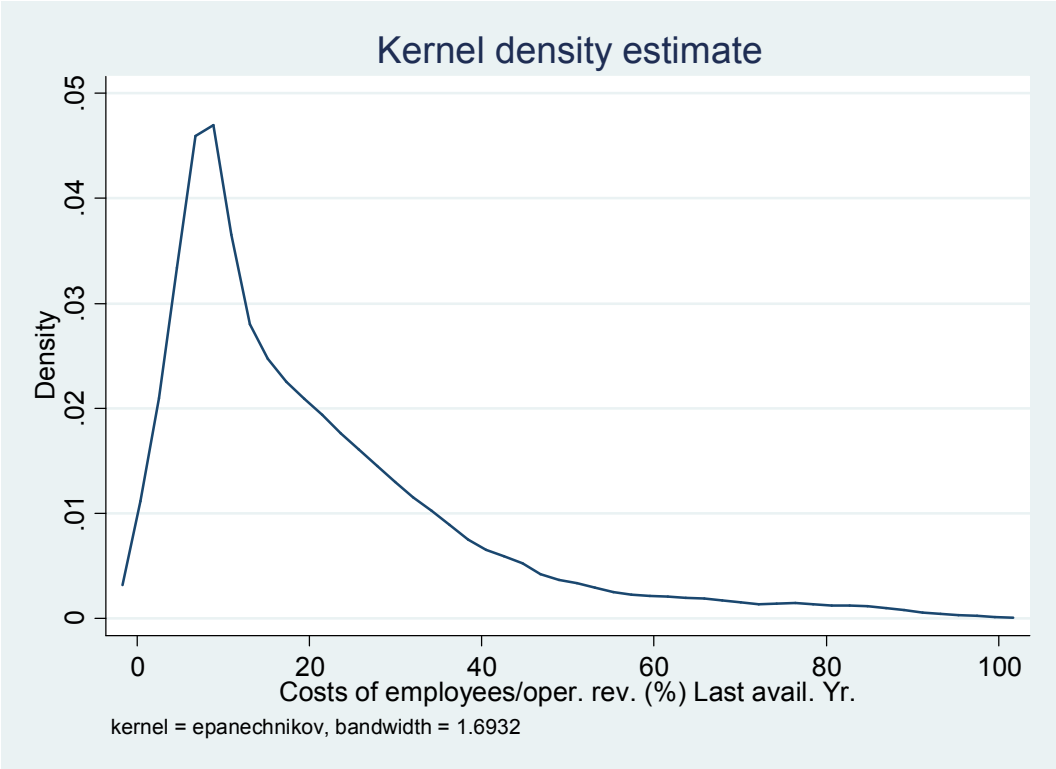
## 4.8 Conclusions

In the current chapter, we examined the effect of the company characteristics on the company internationalization, and on the choice between the internationalization strategy, either exports or FDI. Many main characteristics used to test the company strategic choice of serving the foreign market, which play different roles, as follows:

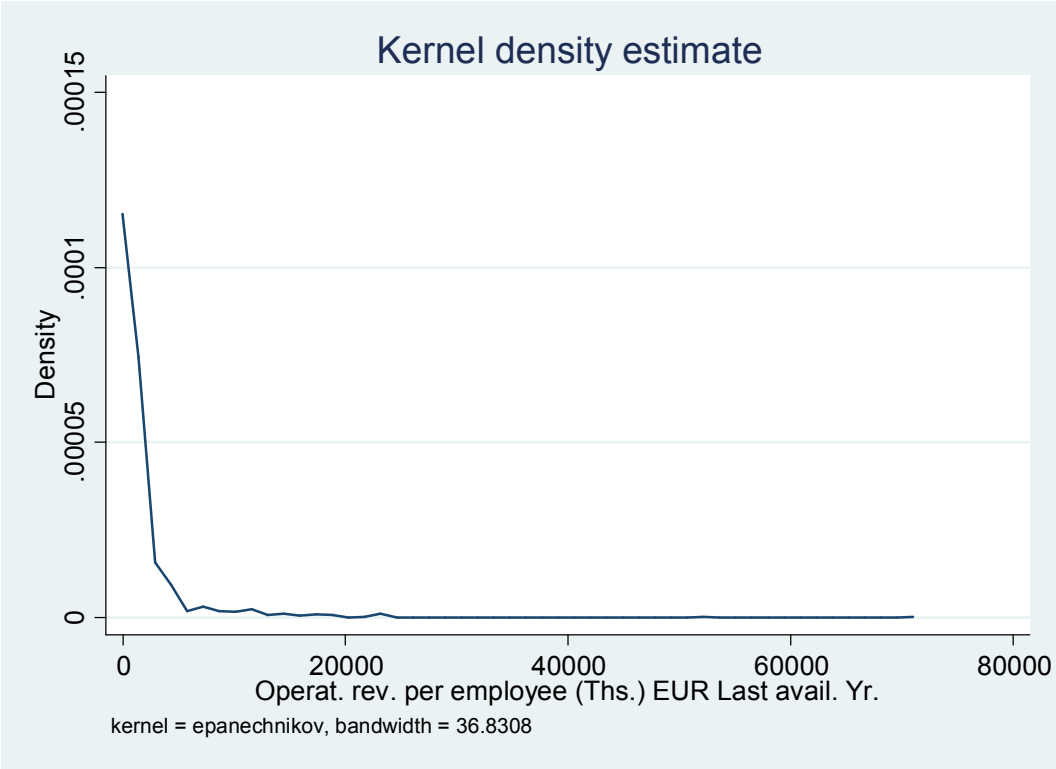
- 1- The productivity proxy who represents the labour quality is more able to detect the role of productivity.
- 2- The productivity increasing leads to more internationalization to the company, which substitutes FDI instead of exports.
- 3- Age and average company size in NACE industry code have a complementarity effect on doing both strategies.
- 4- Intangible assets have permanent positive impact on FDI and positive on exports in the large companies, but negative effect on exports in the very large companies. In other words, this variable complements the strategies in the low intangible assets companies, and substitute's FDI instead of exports in the high intangible assets level companies.
- 5- Herfindahl index has a permanent positive impact on the exports and FDI, unless it reflects a negative impact on exports in the very large companies.
- 6- Number of employees as a proxy for company size reflects substitution relationship in large companies, but a complementary relationship for the very large companies.
- 7- Oldest, biggest and most productive companies in each group tend to do the both strategies, which show the existence of the complementary relationship between the strategies.

- 8- Separating the companies groups to large and very large (productive and more productive) allow to detect the average characteristics (age, size ...etc.) level effect on the strategic choice of serving the foreign market.
- 9- The main strategy adopted by each group is different which the large companies follow the exports and the very large companies follow the FDI strategy, besides the other strategy for each group. In addition, both strategies are still used especially by the very large companies.
- 10- The marginal effect for each variable (characteristic) on each specific strategy of serving the foreign market could changes between the different categories. In addition, it could differ according to the accumulated level of the characteristic in the category.
- 11- Examining the strategy choice at company level with including the trade costs is a promising future research in this field.

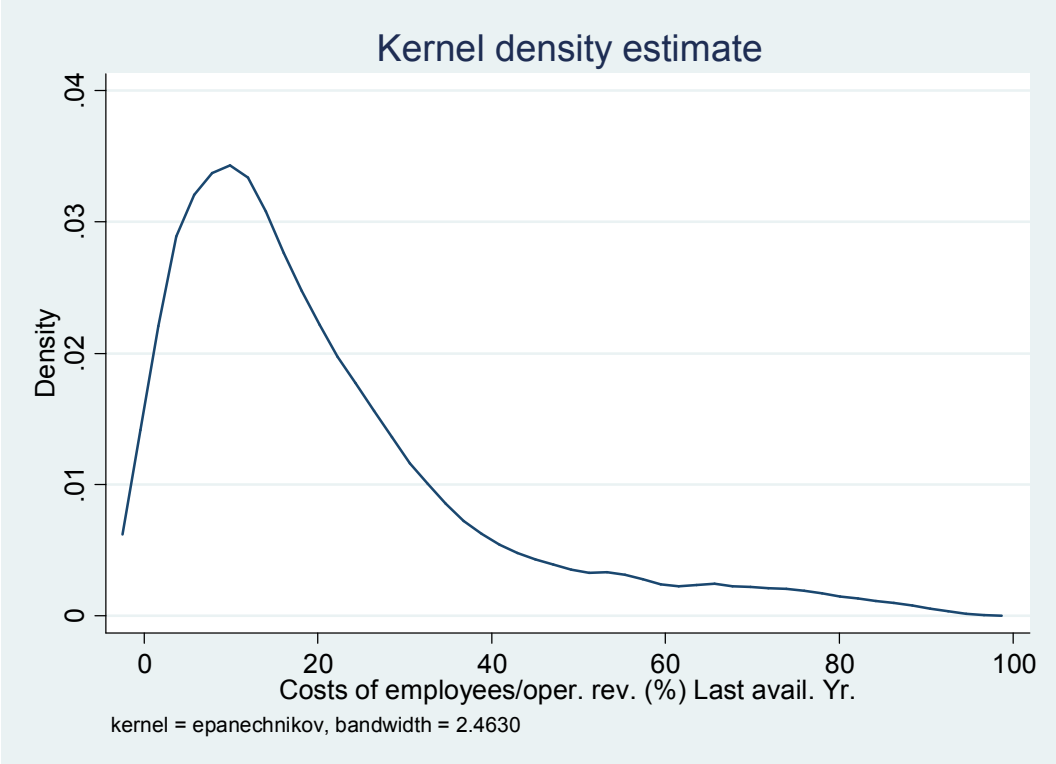
4.6 A: The density (kernel) estimation graph in large companies (new proxy)



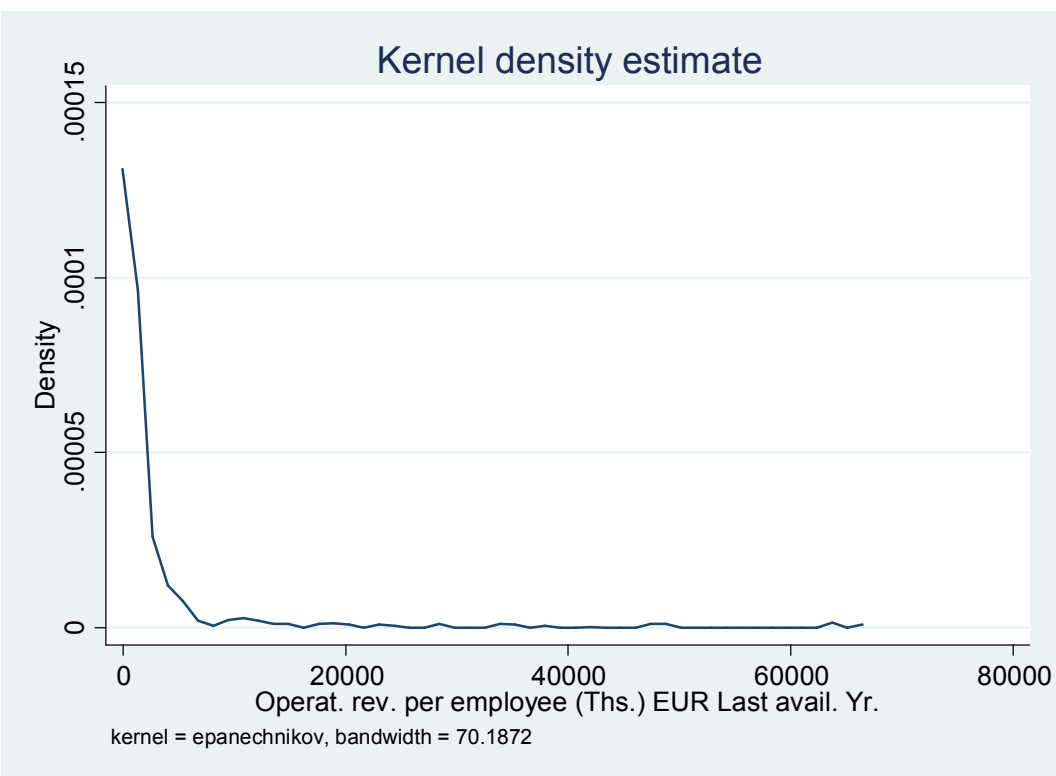
4.6 B: The density (kernel) estimation graph in large companies (traditional proxy)



4.7 A: The density (kernel) estimation graph in very large companies (new proxy)

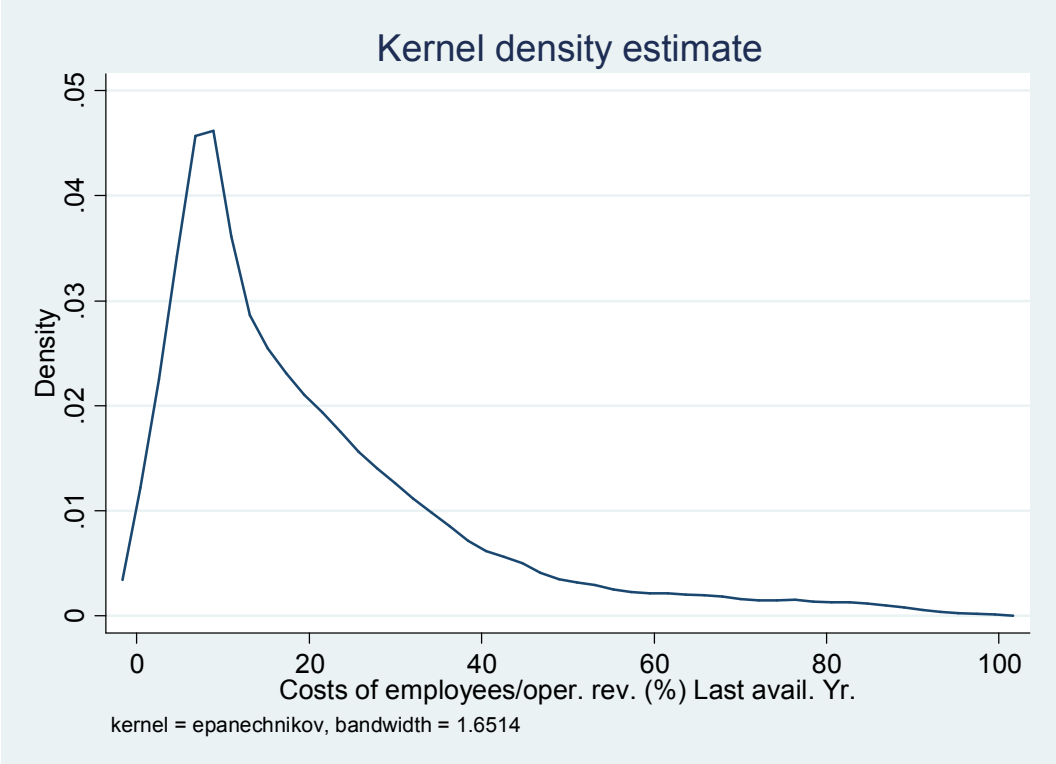


4.7 B: The density (kernel) estimation graph in very large companies (traditional proxy)

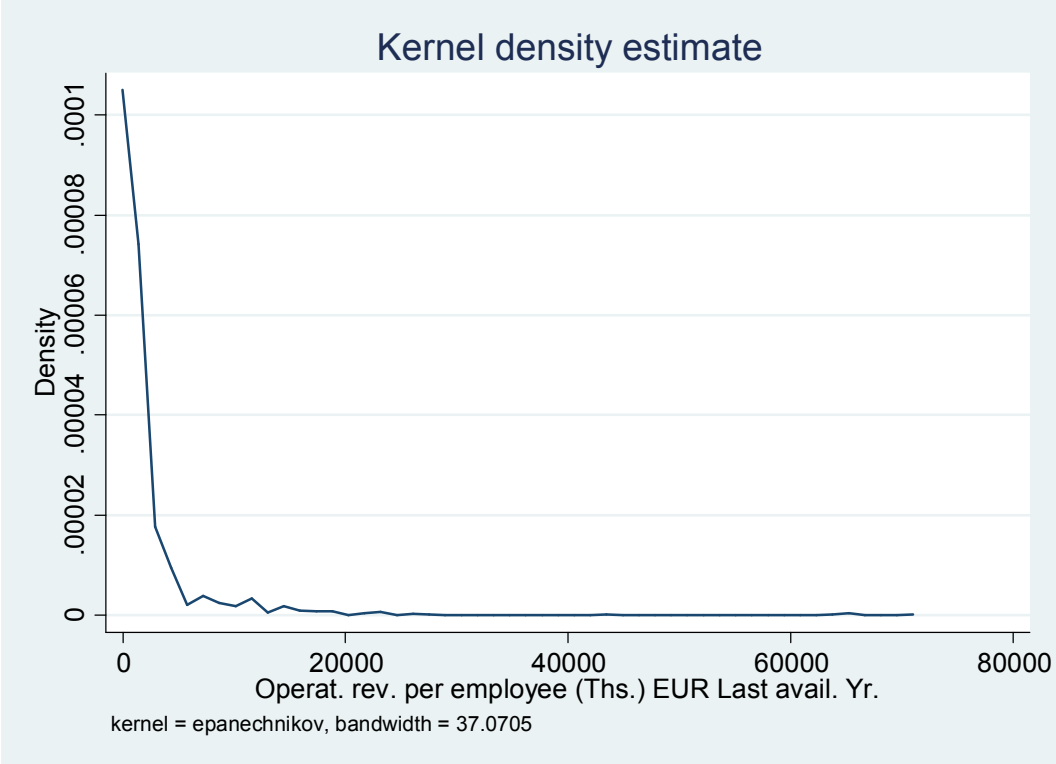




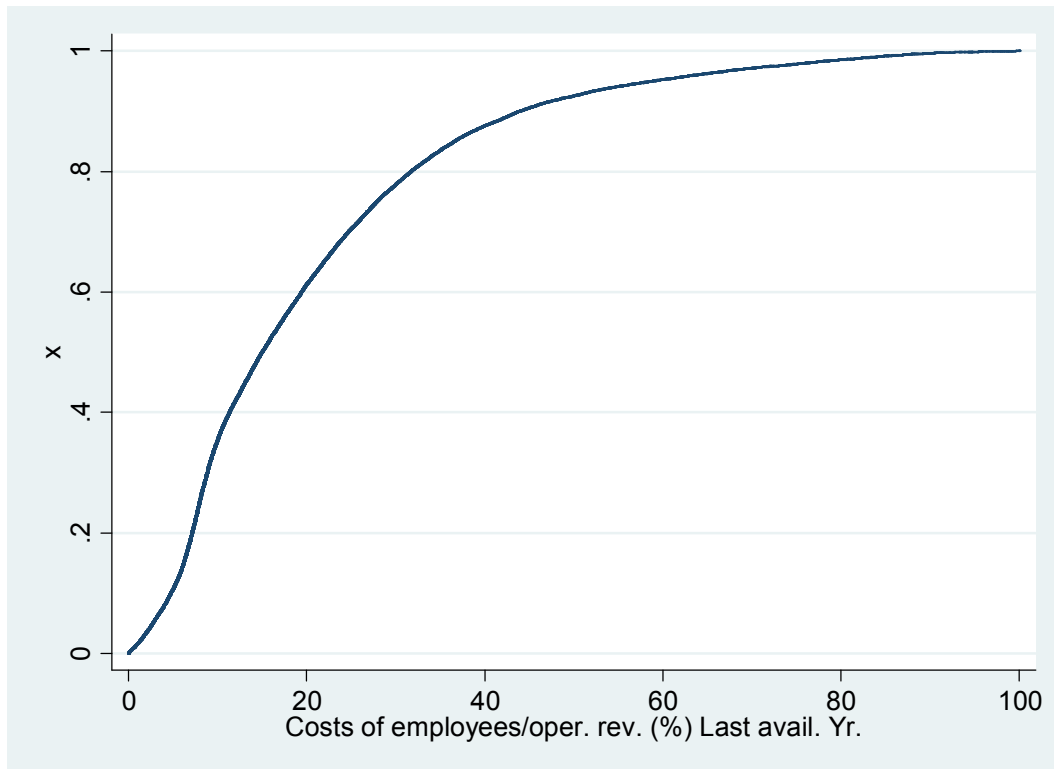
4.8 A: The density (kernel) estimation graph in all large companies (new proxy)



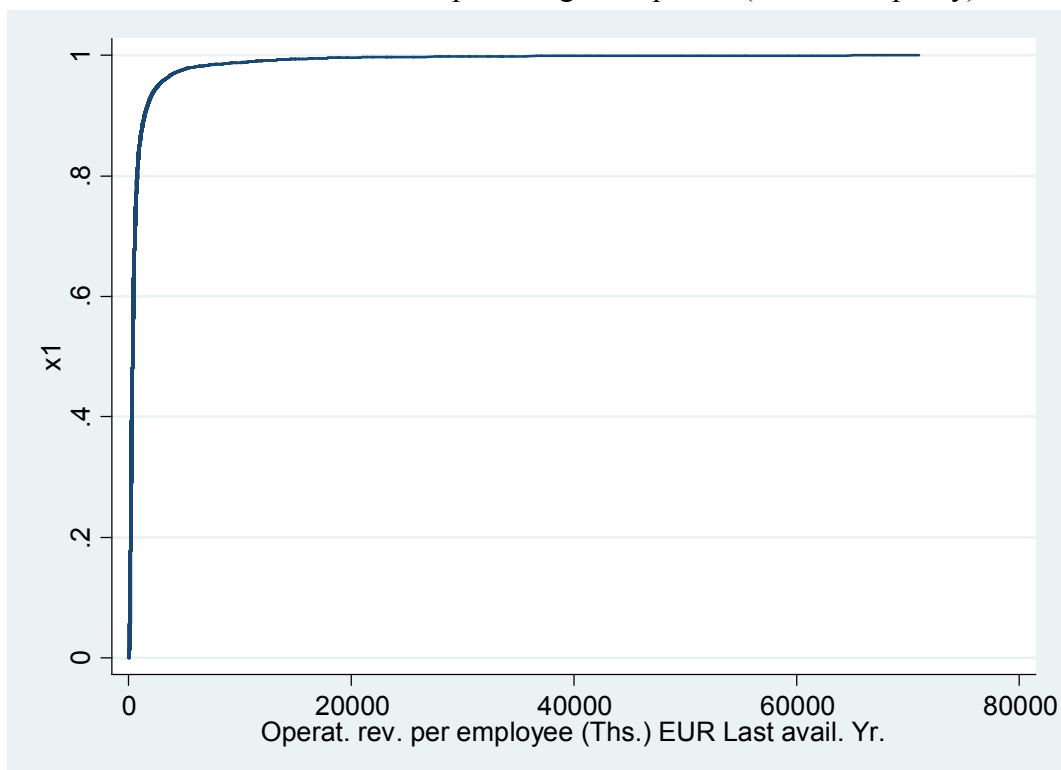
4.8 B: The density (kernel) estimation graph in all large companies (traditional proxy)



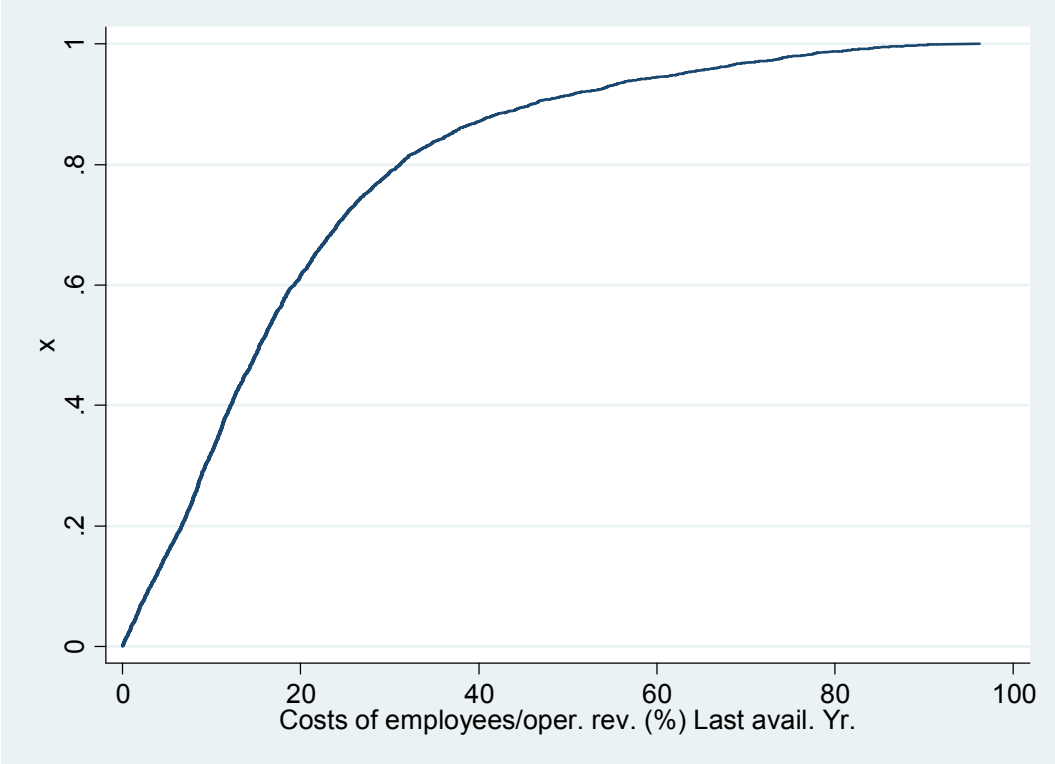
4.9 A: Cumulative Distribution Graph in large companies (new proxy)



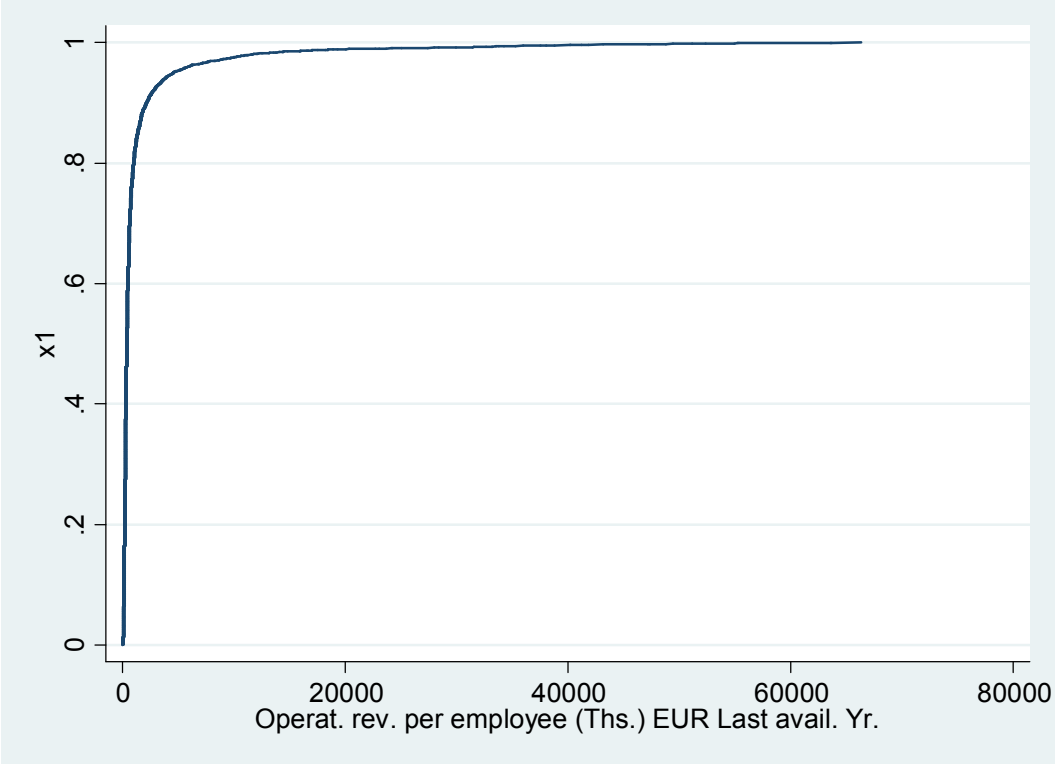
4.9 B: Cumulative Distribution Graph in large companies (traditional proxy)



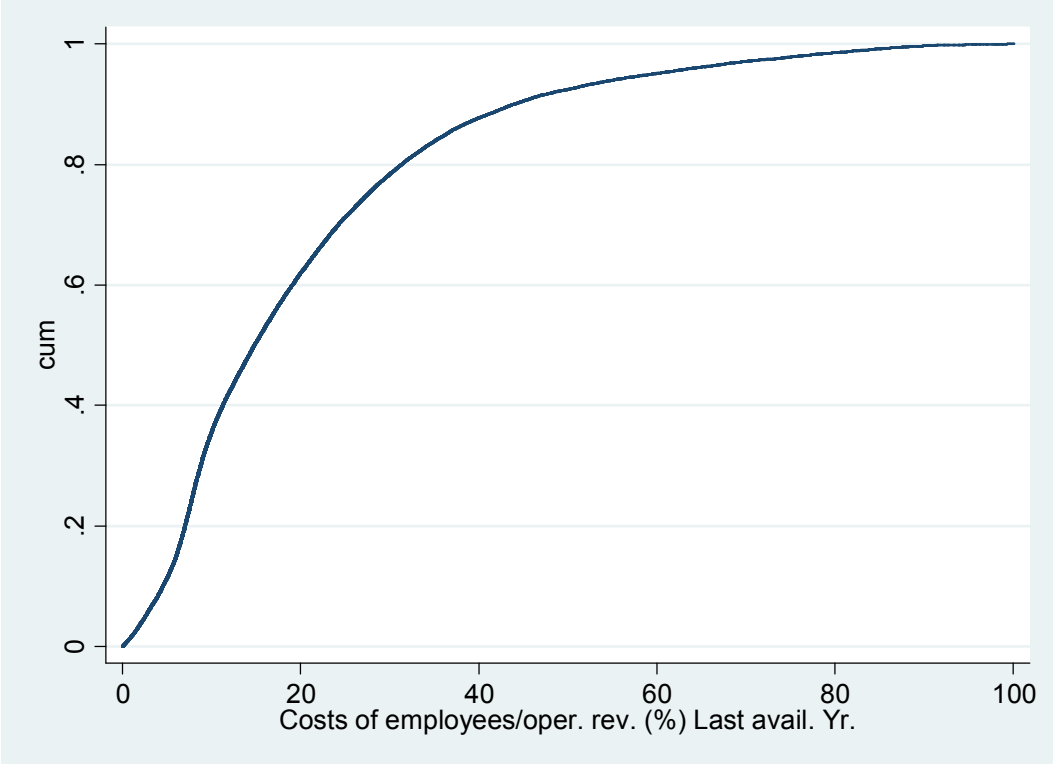
4.10 A: Cumulative Distribution Graph in very large companies (new proxy)



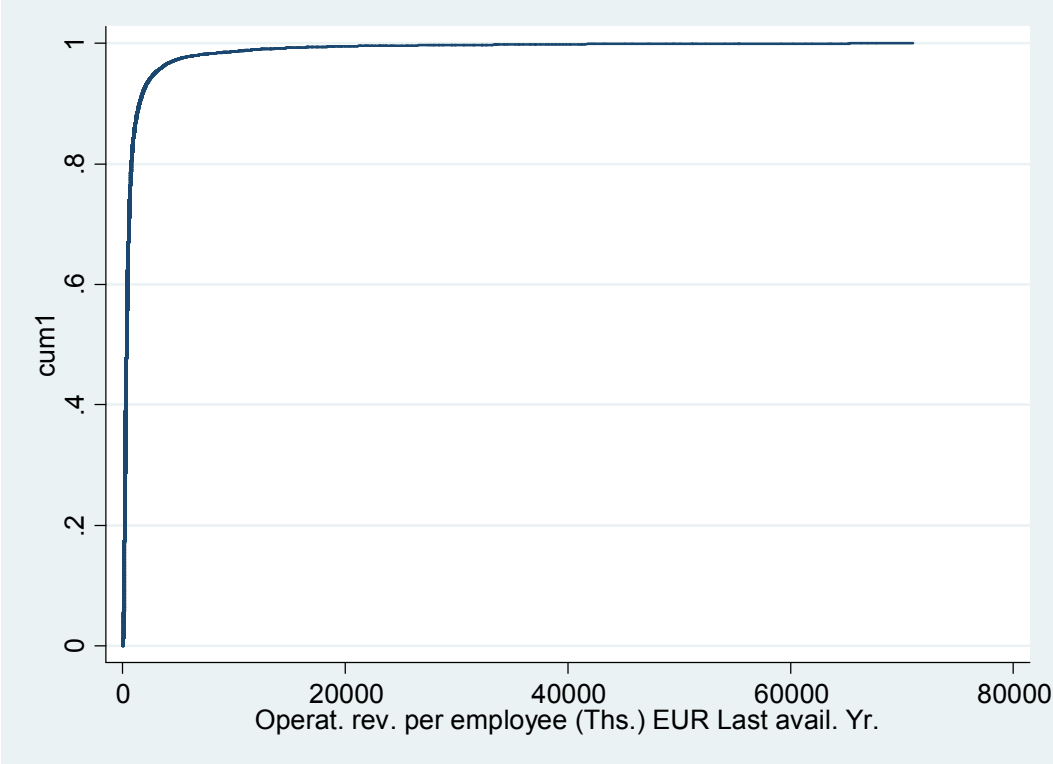
4.10 B: Cumulative Distribution Graph in very large companies (traditional proxy)



4.11 A: Cumulative Distribution Graph in all large companies (new proxy)



4.11 B: Cumulative Distribution Graph in all large companies (traditional proxy)



# **A Gravity panel analysis of French exports and outward FDI in Selected Mediterranean countries**

## **5.1 Introduction:**

Export is in the focus of economic researches and decision makers due to its multiple positive contributions to improve the macroeconomic indicators. In addition, it contributes to achieving the macroeconomic stability and alleviating the macroeconomic problems, such as unemployment and trade deficit, accelerating economic growth and increasing the international competitiveness of local economy.

Similarly, companies' internationalization and increasing outward FDI improve the access for the external resources and markets, for which increases the foreign affiliates' employment and financial transfers to the local economy.

Therefore, the nature of the relationship of the two variables is very essential for policy making, whereas the substitutional relationship should decrease the output and raising the unemployment in the long run, in case of FDI increasing. In contrast, the complementary relationship would stabilize the local economy and improving employment, growth, the foreign economic presence and competitiveness, and in turn boosting a positive relationship with each other.

The relationship between FDI and exports is complex since there are several aspects that must be taken into account. In addition, controversial literature discussion about the nature of the relationship exists; where the theory supports the substitutional hypothesis, meanwhile, the complementary case supported by many empirical researches, others doubt that the later relationship is spurious statistical complementarity relationship, Head and Ries (2004).

This chapter is continuous to our work in this thesis, and studies the relationship between the French outward FDI and exports in the selected MENA countries, which France is one of the

main exporters and investors in the Mediterranean area. The Mediterranean area is one of the most important areas, which has high potential trade and investment in the future, in case of more economic integration progress within the area. Hence, this work would participate in understanding the economic effects of these international activities, at the country and region levels.

We introduce a new empirical dynamic econometric model (form and methods), which hope to capture the real effects and relationship between the variables. In fact, we use new econometric methods, in the subject, such as the dynamic panel data system (Arellano-Bover/Blundell-Bond), and the fixed effect vector decomposition. This is a new contribution, which studies the subject specifically in the Mediterranean area.

Hence, in this chapter, we study the relationship between French, exports and outward FDI into the  $j$  countries (Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia and Turkey), as examining the relationship for these countries helps to detect the further effects of the Union for the Mediterranean process, and the execution of this process on the local economy. This shows that if the investors and exporters learn from the experience of each other or not. If this right, this could enhance the international activities. Moreover, how much these activities could influence each other.

**This chapter proceeds as follows:**

Firstly, we review the related researches, which used gravity model and the dynamic panel data analysis, either those examine the relationship of trade and FDI, bilateral trade between countries or the determinants of FDI. In fact, we do not find a new specific model, which could be able to test the mentioned relationship. Hence, we start with the basic gravity model, and review the evolution of the economic theory background concerning the gravity model, to be able to build our model.

In other words, we review the gravity model literature starting with Anderson (1979), especially, that related with trade, FDI or both. This review allows us to determine the most important and newest explanatory variables, which affect each dependent variable and the relationship between them. The literature review also allows us to choose the best proxy from the different proxies that usually used for the each explanatory variable, besides the best and

recent formulas used to develop the variables. We seek also to determine the best econometric methodology, and how process the variables, such as; the number of lagged periods that should be used in some variables, basing on the theoretical discussion, which also widely helps to avoid any possible endogeneity problem.

Secondly, we determine the different variables and proxies should be used in the model. In this way, we construct the empirical model with the most recent structure to run the estimation of the relationship between exports and FDI. The empirical model of two equations also determines and measures the gravitational factors affect the FDI and exports movements. In addition, we predict the different effects of the variables on each dependent variable, basing on the theory and previous related empirical researches.

Thirdly, we present the data and data sources used in the estimation, which covers “ten” Mediterranean countries ( $j$  countries mentioned before), besides France, and the period of estimation which is from 1994 to 2009.

Fourthly, we discuss some related econometric models (methods) to choose the best methods, which should cover the static and dynamic methodologies. In the static estimation, we use Hausman-Taylor (HT) and the Fixed Effects Vector Decomposition (FEVD). On the other hand, we use Dynamic Panel Data system (DPDsys) of Arellano-Bover/Blundell-Bond estimation, which covers the most recent dynamic panel data analysis.

Finally, after running the estimations, we present and discuss the results including the calculated long run parameters, and compare the results and the variables effects with the predicted effects, and we conclude.

Hence, we start getting the theoretical considerations and determine the variables. Then, we construct the empirical model and determine the predicted signs based on the theory introduced. We construct a bivariate dynamic gravity framework, and present the data. Then we determine the econometric methodology used for testing the empirical model. Finally, we run the estimation, and then present the results interpretation and the conclusions.

## **5.2 The theoretical considerations:**

In this part, firstly, we seek to review the historical use of the gravity model in the economic matters. Secondly, the gravity model is stated to explain some economic relations, since thirty years, although, the theoretical foundations of the model are developed during the time. Therefore, we try to review the theoretical developments of the model. Thirdly, the model is used recently and widely to explain the trade and FDI flows, and relationships between them. Hence, we review this recent literature to be able to derive the empirical model, and the equations of the estimation of the current chapter.

### **Background and development of the gravity model:**

The gravity equation is one of the most empirical successful equations in economics. The gravity model is based on the interactions of various potential powers, which are economic resources and variables, across borders between origins and destinations. It has been widely used to infer trade flow effects of various variables such as customs unions, exchange rate mechanisms, ethnic ties, linguistic identity and international borders, Anderson and Wincoop (2003). The model also is designed to account for the behaviour of large groups of people, migration, commodities, trade, equity and investment, Anderson and Wincoop (2003), which is appropriate to investigate exports and FDI flows. The gravity theory has been applied to wide variety of goods, trades, and factors moving across regional and national borders under differing circumstances, Anderson, (1979); Deardorff, (1995, 1998); Pelletiere and Reinert, (2004, 2006). Therefore, the gravity model is a static or dynamic formulation, which is able to explain factors that attract French outwards FDI and exports into Southern and Eastern Mediterranean countries. The model interconnection would allow detecting the relationship between the two variables, which includes the lagged value of each dependent variable in the other equation.

The gravity model initially is proposed by Tinbergian (1962) to explain the international bilateral trade, which analogies with Newton's universal law of gravity. Anyway, we start from Anderson's (1979), which is the basic work of theoretical foundation of the gravity equation. He proposed the assumption of good differentiated by the region. Anderson's (1979) provided theoretical justification for the gravity equation applied to commodities'



transfers. The gravity equation can be derived from the properties of expenditure system. Anderson (1979) presented the gravity model based on constant elasticity of substitution (CES) preferences and goods that are differentiated by region of origin. Bergstrand (1985, 1989, and 1990) have preserved the CES preference structure and added monopolistic (imperfect) competition or a Heckscher Ohlin structure to explain specialization as a first pillar. Second pillar is the identical, homothetic preferences, approximated by a CES utility function. So, as  $c_{ij}$  is the consumption by the region  $j$ , then, consumers of goods from region  $i$ , and from region  $j$  maximize:

$$\left( \sum_i \beta_i^{(1-\sigma)/\sigma} c_{ij}^{(\sigma-1)/\sigma} \right)^{\sigma/(\sigma-1)} \quad (1)$$

Subject to the budget constraint:

$$\sum_i p_{ij} c_{ij} = y_i.$$

Here  $\sigma$  is the elasticity of substitution between all goods,  $\beta_i$  is a positive distribution parameter,  $y_j$  is the nominal income of region  $j$  residents, and  $p_{ij}$  is the price of region  $i$  goods for region  $j$  consumers. Prices differ between locations due to trade costs that are not directly observable, Anderson and Wincoop (2003). The new empirical literature on the export behaviour of companies, Roberts and Tybout (1997); Bernard and Wagner (1998) emphasizes the large costs facing exporters. Martinez-Zarzoso and Nowak-Lehmann, (2004) identifying the common determinants of FDI across countries. Martinez Zarzoso and Suarez Burguet (2005) showed, that greater distance increases transport costs and lowers trade.

Anderson (1979) also provided a theoretical explanation for the gravity equation applied to commodities that later became popular in the studies on trade and FDI. He identified some estimators such as tariffs and transport costs used in gravity model as follows:

$$M_{ijk} = \alpha_k Y_i^{\beta_k} Y_j^{\gamma_k} N_i^{\zeta_k} N_j^{\varepsilon_k} d_{ij}^{\mu_k} U_{ijk} \quad (2)$$

where  $M_{ijk}$  is the dollar flow of good or factor  $k$  from country or region  $i$  to country or region  $j$ ,  $Y_i$  and  $Y_j$  are incomes in  $i$  and  $j$ ,  $N_i$  and  $N_j$  are population in  $i$  and  $j$ , and  $d_{ij}$  is the distance between countries (regions)  $i$  and  $j$ , respectively.  $U_{ijk}$  is a logarithmically distributed error term with  $E(\ln U_{ijk}) = 0$ . This shows the essential role of the distance to explain the flow of capital or goods, where distance also has presence in all the following equations. Hence, we have to include it in our model.

Before going forward in presenting the related literature, we introduced one of the most important theoretical developments on the gravity model. Anderson and Wincoop, (2003) discussed and criticized McCallum (1995), and they estimated the model basing on the theory. Hence, McCallum (1995) used the gravity model to explain the effect of a trade bloc on trade patterns between Canada and the US. The estimated equation is given as follows:

$$x_{ij} = a + by_i + cy_j + ddist_{ij} + eDUMMY_{ij} + u_{ij} \quad (3)$$

where  $x_{ij}$  is the logarithm of shipments of goods from region  $i$  to region  $j$ ,  $Y_i$  and  $Y_j$  are the logarithms of gross domestic products in regions  $i$  and  $j$ , respectively,  $dist_{ij}$  is the logarithm of the distance from  $i$  to  $j$ ,  $DUMMY_{ij}$  is a dummy variable equal to one for interprovincial trade and zero for province to state trade, and  $u_{ij}$  is an error term.

Wincoop (2000) argues that even though McCallum controls for the province and the states size in the gravity equation, but his trade diversion measure gives an exaggerated impression of home bias in global trade because it calculates the bias from the perspective of the small country, Canada, rather than from the perspective of the large country, which is the USA.

McCallum used a simple gravity model of trade<sup>37</sup> to answer his propositions and suggested that national borders continue to matter. McCallum conducted a sensitivity test that focused on specification issues and econometric questions relating to heteroskedasticity and a possible simultaneity problem. McCallum found trade among individual Canadian provinces was 20 times greater than trade between individual Canadian province to US states trade. The

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<sup>37</sup> He used a Tinbergen (1962) simple gravity model of trade, which led to developing the gravity model by Anderson and Wincoop (2003).

evidence suggested that national borders continue to have a decisive effect on trade patterns. Yet, to the extent that the rising trade share has been driven by reduced tariff protection, the impact of free trade will be quite modest.

Anderson and Wincoop, (2003) claimed that contrary to what is often stated, the empirical gravity equations do not have a theoretical foundation. They aimed to estimate the gravity equation correctly based on the theory, which also be close to McCallum's gravity equation. This is for, firstly, develop a method that consistently and efficiently estimated a theoretical gravity equation. Secondly, use the estimated general equilibrium gravity model to conduct the comparative static of the trade barriers on trade flows. Thirdly, apply the theoretical gravity model to resolve the border puzzle. Anderson and Wincoop (2003) argue that McCallum's regression model, (and the subsequent literature following him), cannot validly be used to infer such border effects. In contrast, their theoretically grounded approach can be used to compute the impact of borders both on *intra* national trade (within a country) and *inter* national trade. The implementations of the theory were both in the context of both US and Canada as two industrialized country model, and a multi country model. Their results show that borders reduced bilateral national trade levels by substantial magnitudes. Intuitively, the more a region is resistant to trade with all others, the more a nation is forced to trade with a given bilateral partner.

Bergstrand, (1985); Helpman, (1984, 1987); Ratnayake and Townsend, (1999) present the relationship between trade and FDI using the monopolistic competition as mentioned before. Bergstrand (1985) applied the constant elasticity of substitution (CES) utility in the demand function similarly to Anderson (1979) and the constant elasticity of transformation (CET) joint production surface in the supply function to estimate the equilibrium of the actual trade flow from region  $i$  to  $j$ . He continued using the existing price index, contrary to Anderson and Wincoop (2003), which used the relative prices. He includes a trade analysis of Heckscher Ohlin Samuelson model of inter industry trade and formal models of intra industry trade in the bilateral gross aggregate trade flow. In addition, he presented the reduced form from a partial equilibrium subsystem of a general equilibrium model with nationally differentiated products, which is given as follows:

$$PX_{ij} = \beta_0 (Y_i)^{\beta_1} (Y_j)^{\beta_2} (D_{ij})^{\beta_3} (A_{ij})^{\beta_4} u_{ij} \quad (4)$$

$Y_i$  and  $Y_j$  are incomes in country  $i$  and country  $j$ ,  $D_{ij}$  is the distance factor from economic centre of country  $i$  to country  $j$  (resistance factor), and  $A_{ij}$  is a resistance factor such as the grouping effect from economic centre of country  $i$  to country  $j$ , and  $u_{ij}$  is a log normally distributed error term with  $E(\ln e_{ij}) = 0$ . As mentioned before, the distance and the income are essential factors, which explain the economic gravity forces. Thus, these factors are included and still part of the forthcoming equations.

Ratnayake and Townsend (1999) applied the gravity model in analysing the geographical pattern of New Zealand's international trade. They estimated an equation, which includes multiple dummy variables explain a specific relationship between the origin and the destinations. This type is frequently used later to control the bilateral trade with multiple countries or regions. They used the concept of basic Anderson (1979) gravity model and present a function of set variables, which control the trade flow of the exporters and importers, trade resisting and promoting factors. They used a basic model includes the distance, income, populations and a set of dummy variables representing the specific bilateral trade relationship between New Zealand and other partner countries or regions. Their extended empirical model estimated as following equation:

$$T_{ij} = a \cdot D_{ij}^{\beta_1} \cdot Y_i^{\beta_2} \cdot Y_j^{\beta_3} \cdot N_i^{\beta_4} \cdot N_j^{\beta_5} \cdot APEC^{\beta_6} \cdot SOC^{\beta_7} \cdot COM^{\beta_8} \cdot CER^{\beta_9} \quad (5)$$

Where  $T_{ij}$  = value of exports from country  $i$  to country  $j$ ,  $a$  is a constant,  $D_{ij}$  is the distance between country  $i$  and country  $j$ ,  $Y_i$  and  $Y_j$  are the GNP of the exporter and importer respectively.  $N_i$ ,  $N_j$  are the populations of the exporter and importer, respectively. APEC, SOC, COM and CER are dummy variables equal to one when New Zealand's trading partner is a member of one of the associations. They found that distance, GNP of exporter and importer and population coefficients are significant.

Rose and Spiegel, (2004) estimate a gravity of international trade on international debt, which shows that, the gravity model used in examining the different aspects relating to the international trade. They show that the positive effect of bilateral trade on bilateral lending

patterns is significant, i.e., debtors tended to borrow more from creditors with whom they shared more international trade ties. This shows that the gravity model discusses, and estimates many different aspects, which related to the international trade.

The majority of the studies concentrate on the FDI flow in a specific country or region, exports or the relationship between exports and FDI are not included in these studies. In the last decade, the researches have been concerned on the bilateral flows or the inward FDI flows. A small body of literature discusses the relationship between the outward FDI and exports. In addition, the gravity model approach is used with success in many related researches. Hence, the current chapter participates in the limited research in this field. Now, we review some researches discussed the relationship between the FDI and trade, which are more related to our subject.

Brenton et al. (1999) uses a gravity model approach to measure the impact of the deepening integration between the EU and the CEECs on FDI flows from Austria, Finland, France Germany, the Netherlands, Norway, Switzerland, UK, US, Japan, and South Korea as the sourcing countries, in terms of three key issues. First, they estimate the expected long-term level of FDI in the CEECs. Second, they investigate whether FDI in the CEECs, in one hand, and source country exports and imports, on the other hand, are complements or substitutes. Finally, they enquire whether an increase in the attractiveness of the CEECs to foreign investors has affected the magnitude of FDI going to other European countries. The results showed that the CEECs are an attractive location and both horizontal and vertical FDI increased for, especially, the product sourcing mainly for European rather than Japanese or US companies. There was no link between FDI and trade for France, Germany, Netherlands and Switzerland. In fact, this could show that the static and basic gravity models are not able to capture the bilateral relationship of international activities between countries. For the other remaining countries, FDI and trade found to be complementary. There was no evidence to suggest that FDI in particular countries or regions had affected the FDI flows to other countries in Europe. Brenton et al. (1999) estimation equation has the following basic form:

$$\ln X_{ij} = \alpha + \beta_1 \ln Y_j + \beta_2 \ln POP_j + \beta_3 \ln Dist_{ij} + \sum \gamma_k D_{kij} \quad (6)$$

Where  $X_{ij}$  is the value of any flow (FDI, imports or exports) or stock (FDI) from country  $i$  (source or home country) to country  $j$  (host country),  $Y_j$  is the income of country  $j$ ,  $POP_j$  is the population of country  $j$ ,  $Dist_{ij}$  is the distance between country  $i$  and country  $j$  and  $D_{kij}$  are dummy variables representing preferential relationship between  $i$  and  $j$  which stimulate the flow / stock taken into account.

Africano and Magalhaes (2005) investigate the relationship between the stock of FDI and the geographical pattern of trade flows in the Portuguese economy. Recently, the FDI stock is used also in other studies instead of the flow. They applied gravity model to bilateral trade between Portugal and OECD countries plus Brazil from 1998 to 2000. The stock of inward FDI is positively related to trade suggesting the existence of complementary between the two variables. They found that this effect is stronger on exports than on imports resulting in a positive impact on trade balance. They also found that the stock of outward FDI has no significant relation with either Portuguese exports or imports. They used the following equation:

$$\ln T_{ij} = \beta_0 + \beta_1 Y_i Y_j + \beta_2 \ln Y_{pc_i} Y_{pc_j} + \beta_3 \ln Dist_{ij} + \beta_4 Bord_{ij} + \beta_5 Lang_{ij} + \beta_6 EU + \beta_7 CC + \beta_8 Asia + \beta_9 America + \beta_{10} Oceania + \beta_{11} FDIin_{ij} + \beta_{12} FDIout_{ij} + \mu_{ij} \quad (7)$$

Where  $T_{ij}$  is the value of country  $i$  exports from (or imports to) country  $j$ ,  $Y_i Y_j$  stands for the GDP of countries  $i$  and  $j$  respectively, and  $Dist_{ij}$  is the geographical distance between countries capitals,  $Y_{pc}$  is per capita income included to capture the degree of similarity between countries in terms of economic development. Also the existence of a common border  $Bord_{ij}$  and a common language  $Lang_{ij}$  is seen as reducing transaction costs which favouring trade.  $FDIin_{ij}$  is FDI stock of country  $j$  in country  $i$  (Portugal); and  $FDIout_{ij}$  stock of FDI of country  $i$  Portugal in country  $j$ .

Xing and Xuan, (2008) analyzed the impact of FDI on the Vietnamese exports using the gravity equation. They used the FDI flows from 23 origins into Vietnam for the period 1990-2004. Their empirical results show that inward FDI is one of the major factors driving the rapid Vietnamese exports growth. The FDI home countries were significantly the main

importers of Vietnam's exports. In particular, the empirical analysis shows that a "one" percent increases in FDI inflows will be expected to give rise to a 0.13 percent increase in Vietnam's exports to these countries. This type of research is widely used to detect the impact of inward FDI on local exports and the economic growth.

Using the following basic structure of the conventional gravity models, they define a gravity model with FDI as:

$$\ln Ex_{ijt} = \beta_0 + \beta_1 \ln Y_{vt} + \beta_3 \ln FDI_{jv(t-1)} + \beta_4 RE_{ijt} + \beta_5 d_{vt} + \beta_6 \delta + \beta_7 FTA_A + \beta_8 FTA_{US} + \varepsilon_{ijt} \quad (8)$$

Where  $Ex_{ij}$  is the exports from Vietnam to its trading partner  $j$ ,  $Y$  is real GDP,  $FDI_{jv(t-1)}$  is country  $j$ 's direct investment in Vietnam which used in one period lagged to avoid the endogeneity, which caused by the dual causality between FDI and GDP.  $RE_{ij}$  real bilateral exchange rate between Vietnam and trading partners currencies.  $d_{vt}$  is the distance from Vietnam to its trading partners,  $\delta$  is the dummy variable for testing the border effect which equals "one" if the trading partners share borders with Vietnam.  $FTA_A$  and  $FTA_{US}$  are dummies to represent the free trade agreements (FTA) signed between Vietnam, from one side and each of ASEAN and US, from the other side.

Turkcan (2006) examines the relationship between outward FDI stocks, with finished and intermediate goods exports in the US economy over the period from 1989 to 2003, which using the gravity equation method. The empirical results show that the disaggregation of bilateral trade flows into finished and intermediate goods provides meaningful information for the analysis of the relationship between the US intermediate goods exports and outward FDI stocks. In contrast, the results found a weak evidence of substitution effects between the US finished goods exports and outward FDI stocks. The study estimated a model of the following logarithmic form:

$$\ln X_{it} = \alpha_i + \mu_t + \beta_1 \ln FDI_{it} + \beta_2 \ln AGDP_{it} + \beta_3 \ln AGDPP_{it} + \beta_4 \ln DGDP_{it} + \beta_5 \ln DGDPP_{it} + \beta_6 \ln RER_{it} + \beta_7 \ln WDIST_{it} + v_{it} \quad (9)$$

Where  $X_{it}$  is total manufactured goods exports, either final goods exports or intermediate goods exports from the US into country  $i$  at time  $t$ ,  $FDI_{it}$  is the US stocks of outward FDI into sample OECD countries,  $RER_{it}$  is the real exchange rate between foreign country  $i$  and the US at time  $t$ .  $AGDP_{it}$  and  $AGDPP_{it}$  express the average GDP and average per capita GDP of the US and its trading partner  $i$  at time  $t$ , respectively.  $DGDP_{it}$  and  $DGDPP_{it}$  indicate the absolute difference in GDP and per capita GDP of the US and its trading partner  $i$  at time  $t$ , respectively.  $WDIST_{it}$  is the weighted distance between the US's capital and its trading partner's capital at time  $t$ . In addition,  $\alpha_i$  is the country effect,  $\mu_t$  is the time effect, and  $V_{it}$  is the usual white noise disturbance terms, which are distributed randomly and independently.

The disaggregation of bilateral trade is supported strongly by the FDI theories, which complementary with the intermediate goods, and substitute with the final goods. Hence, our main question is still standing, whereas we discuss the final effect on the local economy.

Fonseca et al. (2009) discuss the empirical relationship between the outward FDI and trade balance in Portugal. They used panel data analysis within a framework of gravity equations for exports and imports, with a sample composed by EU 15, US, Brazil, Angola, Japan and China, for the period 1996-2007. The results state that Portuguese outward FDI is related negatively to exports suggesting a substitution effect, and thus a negative trade balance effect, for the majority of countries in the sample. The exceptions to this tendency were Angola and, in a lesser extension, Spain, for which the effect on exports outweighs that on imports, and consequently direct investments abroad have a positive contribution to the trade balance of Portugal with these countries. They used many variables in logged values which “l<sub>exp</sub>” is Portuguese exports for host country, “l<sub>imp</sub>” is Portuguese imports from host country, “lgdpcap” is host country's GDP per capita, “lpop” is host country's population, “ldist” is distance between Lisbon and the host country's capital city, “inv” is Portuguese direct investment in host country, with “ang=Angola”, “bra=Brazil”.

Bevan and Estrin (2004) used a panel dataset of bilateral flows of FDI; they studied the determinants of FDI from developed western countries, mainly in the European Union (EU), to several transition countries from Central and Eastern European. They studied the



determinants of both investment and location choice, and found that the most important influences to be unit labour costs, gravity factors, market size (host country GDP), and proximity. Interestingly, they found the host country risk none a significant determinant. The empirical work also indicates that announcements about EU accession proposals have an impact on FDI for the future member countries, which are evaluated positively. Their estimation equation is as follow:

$$FDI_{ij}^t = f(GDP_i^t, GDP_j^t, ULC_j^t, r_{ij}^t, trade_j^t, risk_j^t, dist_{ij}, Dummy_j) \quad (10)$$

Where “ $GDP_i^t$ ” is the size of the source (host) country, “ $ULC_j^t$ ” is unit labour costs in the host country, “ $r_{ij}^t$ ” measures the interest rate differential between the source and host countries, “ $trade_j^t$ ” measures the openness of the host economy, and “ $risk_j^t$ ” captures a vector of institutional, legal, and political factors in the host country. “ $dist_{ij}$ ” distance presented as a measure of the transactions costs of undertaking foreign activities. For example, the costs of transport and communications, the costs of dealing with cultural and language differences, the costs of sending personnel abroad, and the informational costs of institutional and legal factors, e.g., local property rights, regulations and tax systems all are assumed to increase with distance. Despite the none significance of the country risk variable in their model, but it still important besides the other aspects of the economic freedom indicators; especially, between the developed and developing countries, such as France and MENA countries, which expected to have a significant difference in this field.

Jaumotte (2004) investigated whether the market size of a regional trade agreement (RTA) is a determinant of inward FDI to participant countries in the RTA. He tested the hypothesis on a sample of 71 developing countries during the period 1980–99. He found that the RTA market size has a positive effect on the inward FDI. One of many variables to proxy the market size is the real GDP growth, which the growth of domestic market size has a positive significant effect on FDI. The study used the following dynamic model:

$$\ln FDI_{(i,t+1)} = \lambda \ln FDI_{i,t} + \alpha \ln Y_{i,t} + \beta gY_{i,t} + \gamma \ln educ_{i,t} + \delta \ln stabfin_{i,t} + \phi \ln tv_{i,t} + \Theta res(X/Y)_{i,t} + \mu_i + \omega_{t+1} + \varepsilon_{i,t+1} \quad (11)$$

Where FDI indicates the stock of FDI, “ $Y$ ” indicates real GDP, “ $g^Y$ ” indicates real GDP growth, “ $educ$ ” is the average years of education of people over age 15, “ $stabfin$ ” is the financial risk index of the political risk services group,  $tv$  is the number of televisions per capita,  $res(X/Y)$  is the measure of trade openness,  $\mu$  is the country’s fixed effect, and  $\varepsilon$  the time effect.

Hong and Hsieh (2005) estimated a dynamic panel data model with fixed effect, which employed to analyze the determinants of FDI inflows in four Southeast Asia countries for the period of 1990 to 2001.

$$\begin{aligned} \ln FDI_{i,t} = & a_i + \beta_1 \ln FDI_{i,t-1} + \beta_2 CRISIS_{i,t} + \beta_3 \ln ER_{i,t} + \beta_4 \ln WAGE_{i,t} + \beta_5 \ln gdp_{i,t-1} \\ & + \beta_6 GDPGW_{i,t-1} + \beta_7 OPEN_{i,t-1} + \beta_8 GE_{i,t-1} + \beta_9 \ln HC_{i,t-1} + \varepsilon_{i,t} \end{aligned} \quad (12)$$

Where “FDI” refers to foreign direct investment and “CRISIS” is denoted to Asian financial crisis at 1997. “ER” denoted to the market exchange rate, WAGE is the real wage rate, “gdp” is the GDP per capita, “GDPGW” is the real economic growth rate and “OPEN” refers to openness which is (exports + imports) / GDP. “GE” is the government budget balance / GDP, and “HC” is government expenditure on education / population.

Di Mauro (2000) uses the gravity model to deal with FDI and exports as main activities of economic integration. They show that, the non-tariff barriers have a negative impact on FDI; and show a greater role of sunk costs for foreign investors, as opposed to exporters. In contrast to the impact on exports, exchange rate variability does not have a negative impact on FDI, since it partially can be overcome by directly investing in the host country. In addition, at the aggregate level, the results show that a complementary relationship between exports and FDI. It used the following equation:

$$\begin{aligned} \ln Y_{ij} = & \alpha + \beta_1 SUMGDP_{ij} + \beta_2 SIMSIZE_{ij} + \beta_3 RELENDOW_{ij} \\ & + \beta_4 DIST_{ij} + \sum \gamma_k D_{kij} + \varepsilon_{ij} \end{aligned} \quad (13)$$

$$SUMGDP_{ij} = \ln(GDP_i + GDP_j) \text{ (Market size)}$$

$$SIMSIZE_{ij} = \ln \left[ 1 - \left( \frac{GDP_i}{GDP_i + GDP_j} \right)^2 - \left( \frac{GDP_j}{GDP_i + GDP_j} \right)^2 \right] \quad (\text{Similarity between countries})$$

$$RELENDOW_{ij} = \left( \ln \frac{GDP_i}{POP_i} - \ln \frac{GDP_j}{POP_j} \right) \quad (\text{Relative factor endowments})$$

$DIST_{ij}$  is the relative distance between countries  $i$  and  $j$ .

$D_{kij}$  are dummy variables (mostly country dummies) used when appropriate and  $\varepsilon_{ij}$  is the usual error term.

Lately, the variables represent the size similarity between countries and the relative factor endowments, with the formulas mentioned above are used extensively in the gravity models. These formulas are important to capture the different gravity factors between the home and host countries, which we use in our model.

Péridy (2004) derives two dynamic equations, which do comparative estimation of trade and FDI potentials between USA and countries from many groups (Southern African Customs Union (SACU), ASEAN, MENA and Australia), which are new USA trade partners, at the study period. These equations are estimated with the GMM method, and the trade potential then estimated with out of sample technique.

$$\begin{aligned} \ln EXP_{jt} &= \alpha_0 + \alpha_1 \ln EXP_{jt-1} + \alpha_2 \ln FDI_{jt} + \alpha_3 \ln SGDP_{jt} + \alpha_4 \ln DGDP_{jt} \\ &+ \alpha_5 \ln SIMI_{jt} + \alpha_6 \ln DIST_j + \alpha_7 \ln REG_{jt} + \alpha_8 \ln LANG_j \\ &+ \gamma_j + \delta_t + \varepsilon_{jt} \end{aligned} \quad (14a)$$

$$\begin{aligned} \ln FDI_{jt} &= \beta_0 + \beta_1 \ln FDI_{jt-1} + \beta_2 \ln EXP_{jt} + \beta_3 \ln SGDP_{jt} + \beta_4 \ln DGDP_{jt} \\ &+ \beta_5 \ln SIMI_{jt} + \beta_6 \ln DIST_j + \beta_7 \ln REG_{jt} + \beta_8 \ln LANG_j \\ &+ \gamma'_t + \delta'_t + \varepsilon'_{jt} \end{aligned} \quad (14b)$$

The variables “*SIMI*” and “*DGDP*” represent similarity between countries and the relative factor endowment, respectively, using the same formulas shown in equation (13). The variable “*SGDP*” represents the sum of US GDP and each partner. “*REG*” and “*LANG*” represent the regional agreements, and the common language, respectively.

On of the most interesting and closing articles to our work is Egger (2001), which examines the determinant of (and the relationship between) bilateral economic activities, trade and FDI, between the EU countries. He implemented a dynamic panel data model using GMM estimators, to be able capturing the relationship between the variables. He did not found a clear-cut relationship between the variables. He estimated the following model:

$$DX_{ijt} = \alpha_0 + \alpha_1 DX_{ij(t-1)} + \alpha_2 DF_{ij(t-1)} + \alpha_3 DGDT_{ijt} + \alpha_4 DSIMI_{ijt} + \alpha_5 DRLFAC_{ijt} + \alpha_6 DRLTAX_{ijt} + \alpha_7 DTDCF_{ijt} + \delta_t + u_{1ijt} \quad (15a)$$

$$DF_{ijt} = \beta_0 + \beta_1 DX_{ij(t-1)} + \beta_2 DF_{ij(t-1)} + \beta_3 DGDT_{ijt} + \beta_4 DSIMI_{ijt} + \beta_5 DRLFAC_{ijt} + \beta_6 DRLTAX_{ijt} + \beta_7 DTDCF_{ijt} + \delta_{2t} + u_{2ijt} \quad (15b)$$

Where the indices  $i$ ,  $j$  and  $t$  refer to origin, destination (countries) and time respectively. “F” and “X” refer to outward stock FDI and exports. “GDT” is the sum of both  $i$ ,  $j$  countries; “SIMI” and “RLFAC” indicate the similarity between countries and the relative factor endowments, which calculated according the formulas shown in equation (13). “RLTAX” is the relative corporate tax rates between countries, which must be interpret as influencing the fixed and variable costs; and “TCF” is the transport cost variable. The last two variables reflect the exports and investment impediments.

His dynamic model is designed to obtain answer about the relationship between the international activities, according to changes in different exogenous variables. He used the two-step GMM model<sup>38</sup>. He found a substitution relationship between the variables respect to the transport costs, and complements respect to the other determinants.

However, the Arellano Bond (1991), which he used, is not able to detect the long run relationship between the variables. This is at the presence of different exogenous and endogenous variables, as the Dynamic Panel Data system (DPDsys) cans, which we use in our estimation. In addition, the type of transformation of the endogenous variables either with two lags levels or higher are suitable instruments to overcome the estimation problem, and the absence of the serial correlation, Egger (2001).

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<sup>38</sup> Egger (2001) used Arellano Bond (1991), which is not able to detect the long run relationship between the variables as the dynamic GMM system do, which we use, because of the weak instruments. Higher lags periods in FDI than the exports is necessary, theoretically, to start influencing the exports. Other important determinants are not included in Egger (2001).

In the next section, we derive the variables, the equations and the estimation form of the equations. We start with determining the variables or the proxies, which cover the determinants of the exports and FDI flows, from one area to the other. Then, we create two dynamic equations which are able dynamically to determine the effects of the independent variables on the dependent variables (exports and FDI stocks), and determine the relationship between the outward FDI and exports. Hence, we summarize the basic outlines concluded from the theoretical considerations.

Firstly, we can conclude that, many variables are necessary and essentially in the gravity model, which the distance is the main anti-gravitational or resistant factor. Other variables (gravitational forces) control the flow of the international activities (FDI and exports) or (the capital and goods), such as relative market size, production factors prices and the economies potentiality. The most interesting variables, which are used recently to represent these factors, are similarity between countries and the relative factor endowments. Hence, the similarity variable captures the relative size between the economies markets, where induces (attracting) the horizontal FDI. The relative factor endowments variable captures the production factors relative prices, which induces the vertical type of the FDI.

Additional variables are less important, but these variables can determine different aspects concerning the multinationals activities movements, these variables influence financial, risks and policy aspects between countries. The last variables essentially are used for the host's countries, whereas we study the multinationals activities in one way from France to the  $j$  countries. In other words, they can determine the financial, risks and policy of  $j$  countries attractiveness to the French multinationals activities. For this set of variables, we use the exchange rate, which reflects the bilateral (and international) financial and monetary policies between the home and host countries. In addition, openness and economic growth that reflect the market potentiality and the macroeconomic (including trade) policy. The last variable is the economic freedom index, which reflects the different type's risks, and economic freedom in  $j$  countries.

Secondly, the static analysis cannot capture all effective determinants rather than the relationship between the variables, where each multinational activity influences by its previous history. In addition, today's FDI project should be related to yesterdays rather than

today's exports. Thus, we have to examine the relationship between both multinationals activities transversely in dynamic bivariate panel framework, Egger (2001). Hence, although we run a static estimation but we relay on the dynamic analysis in results and conclusions.

In addition, the period necessary to the FDI to start influencing the FDI or exports, similar to that regarding the exports. Hence, we conclude that the necessary lags periods of FDI must be higher than that concerning the exports. As we must include exports lagged in one period, so, it has necessarily to include the FDI lagged in two periods, to be higher lag level.

Thirdly, many different econometric methodologies used for examining the determinants and the relationship between them. We clarify later in section 5.6 that, the random and fixed effects models lead to biased and inconsistent estimators, because of the correlation between the endogenous lagged variables with the error term. In addition, the overall effects of the exogenous and endogenous in system could not be captured by Arellano Bond (1991), see section 5.6. Hence, we use the dynamic panel data system, which is the best possible econometric methodology, could be used in similar subject, and can give better results. Hence, the current work is a new additional contribution to the work in this field by using a new method and model structure; in addition, it is a new additional contribution to the very limited work in the Mediterranean area concerning the subject.

Finally, we present the general equations form, which used for the static estimation. For the dynamic estimation, we include the exports and FDI in various lagged periods, as we introduce more justifications later. This is because; we aim to interconnect these two equations transversely to be able to determine the relationship between the two dependent variables (exports and FDI), and how could each variable affect the other.

### 5.3 The Empirical Model:

Firstly, we derive two dynamic equations basing on the previous theoretical considerations and the gravity model literature, which deals with the flows of FDI and exports, and the relationship between them.

Initially, the two dependent variables are the exports for the first equation, and the FDI for the second equation. These equations should show the main independent variables affect these multinationals activities. In addition, they also should detect the relationship between the two dependent variables, for the tested area and period.

Empirically, we run a static analysis in this chapter besides the dynamic; we use two static models, which are the Hausman Taylor, and the Fixed Effects Vector Decomposition (FEVD), (see section 5.6, (methodology)). These two models use the standard equations shown in (16) and (17). In the dynamic estimation, we use the Dynamic Panel Data system (DPDsys), which uses the dynamic equations (18) and (19) with transversely interconnecting between both dependent variables with lags periods, as follows<sup>39</sup>:

Firstly, the two dynamic equations include each dependent variable in the same equation as an explanatory variable, with one lagged period, similarly as shown in the dynamic equations (14 and 15 (a and b)).

Secondly, we detect the relationship between the exports and the FDI by the transversely interconnection between the two dynamic equations, this interconnection is done by using each dependent variable as an explanatory variable in the other equation with lags periods, similarly as shown in (8) and (15 a & b) equations. These variables are used in lagged periods firstly, to avoid the endogeneity problem, secondly, to ensure that each variable has started influencing the other; which the FDI needs time to affect the exports, and vice versa. Moreover, the lagged period of the independent FDI variable in exports equation, should be higher than that of the independent exports variable in the FDI equation, as explained before. However, we interconnect these equations and include the lagged variables basing on the theory, which, states that FDI explain exports, and vice versa; and the investors and the

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<sup>39</sup> The static equations (16) and (17), in addition to the dynamic equations (18) and (19), shown at the end of this section, pages 22, 23.

exporters learn from each other's; and to detect the relationship between them. However, this procedure is better explained and, in more details, in the model specification.

The dynamic process is more trustable and we rely on the dynamic analysis more than the static models. Therefore, we are more confidence of the dynamic results, which we rely on it in the conclusions.

Hence, we derived two independent variables, so far. The first is the same independent variable lagged in one period, as an explanatory variable. The second is the dependent variable of the second equation in lagged periods, which also includes as an explanatory variable.

Continuing, from Anderson (1979), we include the basic explanatory variables in the gravity models, which affect the movements of the trade, and consequently, the FDI. So, and from the equations (2, 3, 4, 5, 6 and 7), we add the distance which is the anti-gravitational force (the adverse effect or the resistant factor), which has a negative effects on both exports and FDI.

Hence, we add the distance between the home and each host (France and  $j$  countries) in kilometre, as it used in previous equations, which include either the simple or weighted distance<sup>40</sup>. We use the weighted distance, which is better representative for distances between people distribution and economic canters between countries.

Important variables, which used recently and widely, are similarity between the economies (home and host) and the relative factor endowments between the economies (home and host). These two variables capture the goods and capital movements. The similarity variable captures the relative size of the markets, which induce the horizontal FDI. The relative factor endowments variable captures the production factors relative prices, which induces the vertical type of the FDI. These types of FDI also influence the types (intermediate and final) and movements (exports and imports) of the goods.

We used the same formulas and definition of these variables similarly to (13) and (14 and 15 (a & b)) equations.

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<sup>40</sup> The weighted distance measure use city-level data to assess the geographic distribution of population inside each nation, which calculates distance between two countries based on bilateral distances between the largest cities of those two countries, those inter-city distances being weighted by the share of the city in the overall country's population.



The two gravitational areas in this chapter are firstly France, and secondly Southern and Eastern Mediterranean countries ( $j$  countries), which also are developed and developing areas, respectively. The different types of risk (social, economical and political) and economic freedom are different between (inter) these areas and within (intra) the second area. Hence, and from equation (10), we add another independent variable represents the mentioned types of risk and economic freedom intra the second area ( $j$  countries). Because these countries, which are included in the panel data, and attract the French goods and FDI. Numerous types of risk could be represented by the Economic Freedom Index (EFI), see the model specifications and data. In fact, we do not study the bilateral FDI and trade movements between the two mentioned areas, which had widely researched in the past decade. The chapter studies the gravitational effects of the  $j$  countries economic factors that determine the French goods and capital flows, in the area. Hence, we need just to include the varieties of risk and economic freedom indicators in the  $j$  area.

The GDP growth rate is the national income indicator of the local economy potentiality, which, is related to total of production, consumption, and distribution of goods and services of the country, Bevan and Estrin (2004); Hsiao and Hsiao (2006). Hence, from the equations (11) and (12), we include the GDP growth rate. This variable is proxy for the market potentiality, which has a positive effect on both exports and FDI. See the model specifications.

Openness is another independent variable, which shows the openness in each  $j$  country. The openness degree influencing exports flow from France to  $j$  countries, in addition to the FDI. Therefore, we add this variable from the equation (10) and (12), which reflects positively on the both variables. The same formula is used, which is the exports plus imports divided on the GDP.

The bilateral exchange rate also derived from the equations (8), (9) and (12). The exchange rate affects French exports to the  $j$  area, as same as, it affects the fixed costs real values of setting up French affiliates in the  $j$  countries. This variable represents the bilateral exchange rate between French currency and each  $j$  country currency for sixteen years period from 1994-2009.

Hence, the estimation of the relationship between the exports and the FDI is done in two dynamic equations. Each dependent variable will be used in lagged period in the same equation. In addition, each dependent variable is used as lagged independent variable in the other equation, besides the other variables mentioned above (distance, openness, GDP growth rate, similarity between the countries, relative factors endowments, exchange rate and the economic freedom index).

We build the equations and present them in the general form. The following equations include the static variables, which we derived previously. These equations are used in two static estimations (methods) of the panel data, in the  $j$  countries. The equations take the following forms<sup>41</sup>:

$$\begin{aligned} \ln ex_{Fj} = & \beta_0 + \beta_1 \ln FDI_{Fjt} + \beta_2 \ln Yg_{jt} + \beta_3 \ln RLF_{Fjt} \\ & + \beta_4 \ln SIMI_{Fjt} + \beta_5 \ln DISTW_{Fj} + \beta_6 \ln Exch_{Fjt} + \beta_7 \ln OP_j + \beta_8 \ln EFI_j \\ & + \mu_j + \nu_{Fjt} \end{aligned} \quad (16)$$

And

$$\begin{aligned} \ln FDI_{Fj} = & \beta_0 + \beta_1 \ln ex_{Fj} + \beta_2 \ln Yg_{jt} + \beta_3 \ln RLF_{Fjt} \\ & + \beta_4 \ln SIMI_{Fjt} + \beta_5 \ln DISTW_{Fj} + \beta_6 \ln Exch_{Fjt} + \beta_7 \ln OP_j + \beta_8 \ln EFI_j \\ & + \mu_j + \nu_{Fjt} \end{aligned} \quad (17)$$

Where  $F$  refers to France, and  $j$  refers to the selected Southern and Eastern Mediterranean countries, and  $t$  is time,  $FDI_{Fj}$  is the outward French FDI stock into  $j$  countries,  $ex_{Fj}$  is the French exports into  $j$  countries, which both are the dependent variable. The formulas regarding openness, similarity between countries and the relative factor endowments similar to these presented in the literature.

$$SIMI_{Fj} = \ln \left[ 1 - \left( \frac{GDP_F}{GDP_F + GDP_j} \right)^2 - \left( \frac{GDP_j}{GDP_F + GDP_j} \right)^2 \right]$$

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<sup>41</sup> The formulas used in calculating the SIMI, openness and RLF variables are the same to the previous literature, see (Di Mauro, (2000), Egger, (2001) and Péridy (2004).

$RLF_{Fj} = \ln\left(\frac{GDP_F}{POP_F} - \frac{GDP_j}{POP_j}\right)$  as a proxy for relative factor endowments.

$OP_j$  is the openness of  $j$  country which calculated by the following formula:

$$OP_j = \frac{\text{exports}_j + \text{imports}_j}{GDP_j}$$

$Yg_{jt}$  is the gross domestic product growth of each  $j$  country.

$DISTW_{Fj}$  is the weighted distance from France to each  $j$  country.

$Exch_{Fjt}$  is the exchange rate between the French currency (Euro) to each  $j$  country currency.

$EFI_j$  is the economic freedom index for the  $j$  countries.

$\mu_j$  represents the unobserved country specific effects.

$\nu_{Fjt}$  is the standard error.

The dynamic panel analysis includes the mentioned lagged variables. The following equations are used to run the dynamic panel data system, which calculates the first difference of the variables between the periods  $(t, t_{-1})$ . Hence, the equations are:

$$\begin{aligned} \Delta \ln ex_{Fj} = & \beta_0 + \beta_1 \Delta \ln ex_{Fj(t-1)} + \beta_2 \Delta \ln FDI_{Fj(t-1)} + \beta_3 \Delta \ln Yg_{jt} + \beta_4 \Delta \ln RLF_{Fjt} \\ & + \beta_5 \Delta \ln SIMI_{Fjt} + \beta_6 \Delta \ln DISTW_{Fj} + \beta_7 \Delta \ln Exch_{Fjt} + \beta_8 \Delta \ln OP_j + \beta_9 \Delta \ln EFI_j \\ & + \mu_j + \Delta \nu_{Fjt} \end{aligned} \quad (18)$$

And,

$$\begin{aligned} \Delta \ln FDI_{Fj} = & \beta_0 + \beta_1 \Delta \ln FDI_{Fj(t-1)} + \beta_2 \Delta \ln ex_{Fj(t-1)} + \beta_3 \Delta \ln Yg_{jt} + \beta_4 \Delta \ln RLF_{Fjt} \\ & + \beta_5 \Delta \ln SIMI_{Fjt} + \beta_6 \Delta \ln DISTW_{Fj} + \beta_7 \Delta \ln Exch_{Fjt} + \beta_8 \Delta \ln OP_j + \beta_9 \Delta \ln EFI_j \\ & + \mu_j + \Delta \nu_{Fjt} \end{aligned} \quad (19)$$

The variables included represent the same variables shown in the equations (16) and (17), and they are calculated by the same formulas mentioned before.

**The current chapter tries to answer the following questions:**

The main theoretical discussion of the thesis is the relationship between exports and outward FDI, which applied empirically on the French case.

Hence, in what direction and size could the French exports and FDI affect each other, in the  $j$  countries? Moreover, how could the French investors and exporters learn from, or affect, each other's in the  $j$  countries.

Which are the main and significant gravitational factors affect the goods and capital flows in the Mediterranean basin.

What are the future potential internationalization activities in the  $j$  countries area?

**5.4 Model specifications:**

Basing on the literature review, and the model theoretical considerations, we specify that the French outward FDI and exports are functions of the followings. The GDP growth rate, similarity between both countries France and each  $j$  country, the weighted geographical distance between France and each  $j$  country, the bilateral exchange rate series of Euro (French currency) and each  $j$  country currency and the economic freedom, which an index includes the different risk types of political or and economical risk. Finally, the French outward FDI and exports in lagged periods as they need time periods to affect each other, (the previous experience with FDI and exports).

To avoid the problem of the zero exports or FDI values, we transform these values as follows<sup>42</sup>:

$$\ln ex_{Fjt} = \ln(ex_{Fjt} + 1)$$

or

$$\ln FDI_{Fjt} = \ln(FDI_{Fjt} + 1)$$

We also interpolate the missing values by the following formulate:

$$AGR = \left( \frac{\text{Ending} \cdot \text{value}}{\text{Beginning} \cdot \text{value}} \right)^{\left( \frac{1}{(N \cdot \text{of} \cdot \text{years}) - 1} \right)}$$

Where, *AGR* is the average growth rate.

We discuss each of these variables, and state the predicted relationship (sign) for each explanatory variable with the dependent one. The hypothesised sign of the variable specify the role of the host area to attract the French FDI or receive the French exports.

#### 5.4.1 Foreign direct investment:

We use the stocks volume of FDI instead of flows, actually; several researches recently start to use the stock instead of the flows for the following reasons:

- 1- As long as, the FDI simultaneously affected by the same economic variables as exports flow, so we use the stock rather than flow to avoid the multicollinearity problem. I.e. each dependent variable is an endogenous variable for the other.
- 2- As long as the FDI flow have impact on exports with a time lag (examples: exporters learn from investors, and the case of complementarity), so using FDI stock capture these lagged effects which is not possible with the flows.

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<sup>42</sup> The data sample has a very small zero observations, whereas no need for other methods such as Heckman correction method.

- 3- FDI stock has an accurate measure in the economy, as such the extent to which FDI stock facilitates or obstructs trade flows, Africano, and Magalhaes (2005).
- 4- Barrios et al. (2005), also stress that the cumulative FDI stock variable is a better choice than FDI inflows, thus, the cumulated FDI matters. The same effect could possibly be achieved by using FDI inflows, but this would require using many lags of FDI variable comparing with less lags with the stock volumes, which reducing the number of observations in case of FDI flows. Therefore, as we use two lags periods with the FDI stocks, it requires more than two with the FDI flows, which reduces the observations number.
- 5- Using the stock volume will include the level of multinational activity, since it does not include operations financed by funds raised from outside the home country, i.e. by the investor.
- 6- The FDI flows could be a negative value, which can be avoided by using the FDI stock volume.
- 7- The presence of adjustment costs, since FDI does not react immediately to the changes in the foreign demand because of the presence of investment plans, capacity constraints, etc, Camarero and Cecilio (2003). Therefore, the FDI flow could not be measured instantly, hence, we prefer to use the FDI stock instead of flow.

#### **5.4.2 Lagged variables for exports and FDI:**

We use variables in one lagged period in each equation; the dependent variable in each equation lagged, as explanatory variable, for the dynamic analysis purposes. In addition, we include the other dependent variable in lags, which allows capturing the relationship between the two variables (FDI and exports), through the transversely intersection. The coefficient has to be positive for the dependent lagged variables in the right hand side of the equation.

The using of these lagged based on many theoretical considerations as follows:

1- As we mentioned before, the number of lags required to achieve the effect of FDI on acquired domestic companies or for the foreign affiliates, export oriented foreign investment should takes time more than the exports. One can assume that building a new plant and achieving a desired level of production takes time, Girma et al. (2007). In addition, to detect the relationship between exports and FDI should allow for the presence of adjustment costs, since neither exports nor FDI react immediately to changes in foreign demand because of the presence of investment plans, capacity constraints, etc, Camarero and Cecilio (2003). Moreover, some of the information becomes available only with a lag, e.g. statistics, Bevan and Estrin (2004).

2- The linkage effects between exports and FDI can be accounted by the inclusion of lagged variables, which is one of the main goals of the current work.

3- Transferring technology accompany FDI such as patents taken out in the home country companies take time to be placed in their affiliate in the host country. As there may be a lag before the innovations come into operation, for example, the patents registration.

4- Lagged measures of FDI and exports are used in the equations an attempt to avoid any problems with potential endogeneity. The validity of such an approach rests on the assumption that there is a unique long run relationship between the exports and FDI, Pain and Wakelin (1997). In addition, there is a potential endogeneity issue, when regressing exports on FDI, and vice versa. Hence, using FDI stock with lags should alleviate this problem (Girma et al. 2007).

In addition, the problem of endogeneity occurs as there a dual causality between FDI from one side and GDP from another, which used in constructing some of the tested variables. Similarly with exports, so to avoid this problem, we use period's lags.

5- The lagged exports variable included to take into consideration the fact that, the export performance in one year would normally act as a good predictor for the next year's exports. In addition, when foreign investors decide to build new production facilities overseas, they are influenced strongly by location decision of previous foreign investors. Hence, exporters are

relatively well developed learning capability is likely to reap the early benefits from their association with a multinational company (Girma et al. 2007; Pain and Wakelin, 1997; Roberto 2004). In other words, the exporters and investors learn from the previous activities of each other's. The nature of FDI can thus feature complementary/substitutive (positive or negative) spatial dependence with respect to previous FDI to the related countries. Hence, we have also to include a lagged dependent variable to account for the fact that, FDI decisions are part of a dynamic process, i.e. more FDI in a host country seems to attract more FDI in the same host country, Kukenova and Monteiro (2008).

### **5.4.3 GDP growth rate:**

Most previous FDI empirical studies take into consideration the positive relationship between the size of the host country or region market ( $j$  countries) and the inward FDI volume in the same area (French outward FDI to these countries), which GDP growth rate captures the market dimension (potentiality). Moreover, market potentiality and the national income level are important to consider for the host country, especially for market seeking FDI, (Bevan and Estrin (2004); Gopinath and Echeverria (2004); Jaumotte (2004); Hong and Hsieh (2005); Hsiao and Hsiao (2006); Nguyen (2006)).

The volume of the French flows into a  $j$  country is explained by the level of GDP growth of the  $j$  country, since both exports and FDI are attracted by high growth domestic markets.

We aim to measure the relationship between exports and FDI during specific period (1994-2009), the GDP growth is more able to capture the growth variance and macroeconomic stability during the period, but not the GDP level. Bevan and Estrin (2004) state that the GDP growth captures the macroeconomic stability, e.g. the variance in growth rates, inflation or exchange rate stability, institutional stability reflected in policies towards FDI or international trade, which the market size of the host economies in the country is a proxy for product demand and the potential growth and the capacity to supply. Nguyen and Nguyen (2007) found GDP per capita, and GDP growth rate are able to capture the effect of market factors. In addition, income/output measures such as GDP per capita and/or GDP growth rate in various previous empirical studies, Nguyen (2006). Brenton et al. (2004) consider that the key determinants of the growth of FDI to the region will be the pace of income growth and the success of the governmental oriented policies to be conducive to business.



In fact, the GDP growth rate can be characterised as FDI-led and it is used often as proxies for the size and growth of market demand and supply. The GDP growth rate also is the national income indicator of the size of economies, which is related to total of production, consumption, and distribution of goods and services of a country, Bevan and Estrin (2004), Brenton et al. (2004).

GDP and population also are used usually as proxies for the market size, similar to the GDP growth rate, but they could not capture the market potential, such as the GDP growth. Hsiao and Hsiao (2006) studied the nexus of FDI- exports and GDP, which shows the possibility of using GDP and GDP growth rate as proxies for each other's.

This variable showed a significant positive relationship with FDI in several related researches, Brenton et al. (2004). Hence, the GDP growth rate expected to have positive effects on both FDI and exports.

#### **5.4.4 Distance:**

Distance is the most important determinant of transaction flows, (as a proxy for trade costs), of FDI and trade preferences. Theory suggests that companies will tend to prefer FDI to exports as trade costs, which it proxy is distance, rise. More distant markets will tend to be served by overseas affiliates rather than by exports, Portes and Rey, (2005); Di Mauro, (2005). Therefore, distance may cause French companies to change from exports to invest overseas and produce locally in order to reduce transportation and production costs.

Therefore, the geographical distance represents the distance between France and the economic centre of partner's countries  $j$ 's . Distance can play the role as a proxy for transaction costs of foreign activities. For example, transportation, insurance, public infrastructure, communication costs, and costs of employing abroad and operating costs such as costs of institutional and legal factors, costs of local tax laws and property rights regulations. Distance assumed to increase all of the above mentioned costs, Bougheas et al., (1999); Brenton et al., (1999); Limao and Venable, (2001); Bevan and Estrin, (2004); Borrmann et al. (2005).

So, distance coefficients in the two equations expected to be negative either on the exports or FDI, which the increasing of distance increases the trade barriers, and all other cost such as transportation and transaction costs.

Given the ambiguous character of distance as an FDI determinant, it is obvious that empirical testing is confronted with severe problems. If distance comes out to be insignificant, this does not necessarily mean that distance is unimportant. Insignificance may simply result from a positive effect on some investors and a negative one on others. These problems are aggravated by unsatisfactory specification of the variables, i.e. by similar problems faced when testing trade theories, Borrmann et al. (2005).

#### **5.4.5 Openness:**

Openness, namely the sum of exports and imports to gross domestic product (GDP), has been considered one of the main determinants of economic growth. I.e. the growth of exports causes output and economic growth, which known in the literature of export-led growth. This postulates that exports consists the principal channel through which the liberalization process can affect the output level and eventually the rate of economic growth and facilitate a better environment for FDI, Adamopoulos, et al. (2004). Hence, more open trade regime is supposed to be conducive to stronger growth effects in the host country, thereby attracting more FDI Basu and al. (2003).

In the other hand, export expansion can increase productivity, offering greater economies of scale. Exports are likely to alleviate foreign exchange constraints and can thereby provide greater access to international markets and greater entrance to the local market because of the liberalization, Jayachandran and Seilan (2010).

Therefore, FDI and the openness of the economy are should be related positively because FDI is encouraged if the trade regime of the host economy is liberal. This is because, given internalization advantages for investing companies, multinational companies have a higher propensity to export, Bevan and Estrin (2004). Hence, we predict a positive coefficient sign for the openness variable. In addition, many early studies of the links between exports and growth confirm a positive statistical relationship between export growth and output growth, Jayachandran and Seilan (2010). This increases the income and the market size, and hence, increases the exports from and to the market. Consequently, the higher the level of openness in the  $j$  economies, the easier it is for French investors to invest in, and exporters to export into, these countries.

Most likely, FDI and exports reacts to this explanatory variable only with a lag because the process of choosing and implementing investments abroad is time consuming. Hence, FDI flows or executing new exports to the market take some time after decisions have been made.

Moreover, some of the information becomes available only with a lag, e.g. statistics, Bevan and Estrin (2004). As we already include the FDI and exports in lagged periods, so we do not lag the openness variable.

#### 5.4.6 Exchange rate:

$Exch_{Fjt}$  represents the bilateral exchange rate between the European Euro and the currency of  $j$ 's countries partners in the period  $t$ . Exchange rate is one of the important components affecting FDI and exports. In the short to medium run, nominal exchange rates also have a significant impact on the ratio of price levels across related countries. It is expected that the French export increases, when the European Euro depreciates versus the importing  $j$  country's currencies and vice versa. Thus, one would expect the coefficient to be positive or negative for goods exports, in case of decreasing and increasing the exchange rate, respectively. Since the exchange rate in this chapter is defined as the number of foreign  $j$  country currency units per European Euro. This means that the increasing in the exchange rate increases the number of the  $j$  country currency units per Euro, and the Euro is appreciated and the exports decreases, and vice versa.

The economic reasons behind, the supposed relationship between exchange rate and exports flow come from, the fact that the exporters pay some production costs in their own currency, while the future revenues are expressed in a foreign one. Any change in the exchange rate during the period before payment is therefore a potential loss or benefit for the exporter. Of course, forward currency markets (options) exist and can be used, but generally they are unavailable for periods longer than one year, Di Mauro (2000), and they are practically non available in developing countries such as countries in our sample. Hence, the exchange rate variable is more important to explain the exports flow than that concerning the FDI, which the FDI fixed costs could be paid in an international currency, or from outside the home country in other currency<sup>43</sup>.

The exchange rate affects the relative currency prices of closely matched manufactured goods produced in different countries. In terms of trade, an increase in the value of an importing country's currency implies a depreciation of the Euro, and it is expected to have a positive

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<sup>43</sup> This variable does not show significant effect on FDI, in our dynamic analysis.

impact on exporting products that are produced in France. A higher value in Euro currency enables French investors to invest in the  $j$  economies more inexpensively, thus the amount of FDI will rise, and vice versa, which reflects positively and negatively on FDI, in case of the Euro appreciation and depreciation, respectively. A higher value in  $j$  currencies also makes exporting French products more expensive to  $j$  countries consumers, so FDI in these countries would be stimulated to overcome this cost disadvantage, which reflects positively on the FDI. Anyway, the Euro appreciation or the  $j$  countries depreciation overall effect could be positive or negative on the FDI, whereas the exchange rate may also reduce the investment, Bergstrand (1985, 1989).

In addition, *Exch* as the exchange rate index is a good measure that would capture the competitiveness between and within the two areas (France and  $j$  countries), Njong (2008); Turkcan (2006). The index of exchange rate construct in a way that an increase in *Exch* denotes the appreciation of the Euro currency. Thus, it is expected that the coefficient is negative or positive on exports and FDI.

Table 5.1: The exchange rate impacts on the French exports and outward FDI.

Exchange rate	French Exports	Outward FDI	Euro	The $j$ currency
Decreasing	Positive	Negative	Depreciation	Appreciation
Increasing	Negative	Positive	Appreciation	Depreciation

**5.4.7 The Economic Freedom Index (EFI):**

The Heritage Foundation, the Wall Street Journal and Washington’s preeminent think tank have tracked the march of economic freedom around the world with the influential index of economic freedom.

They define the economic freedom as the fundamental right of every human to control his or her own labour and property. In an economically free society, individuals are free to work, produce, consume, and invest in any way they please where the governments allow labour, capital and goods to move freely, and refrain from coercion or constraint of liberty beyond the extent necessary to protect and maintain liberty itself.

They measure “ten” components of economic freedom, which represent different indices assigning a grade in each using a scale from 0 to 100, which 100 represent the maximum freedom. A score of 100 signifies an economic environment or set of policies that is most conducive to economic freedom. Overall index is calculated from the last indices. So, the “ten” indices scores are then averaged to give an overall economic freedom score for each country. These “ten” indices of economic freedom are:

- Business freedom
- Trade freedom
- Fiscal freedom
- Government spending
- Monetary freedom
- Investment freedom
- Financial freedom
- Propriety rights
- Freedom from corruption
- Labour freedom

Hence, we use the Economic Freedom Index (EFI). The index ranks annually more than 150 countries. The mentioned indices are calculated basing on the last factors and many others as prices, wages and regulation and black market activity. It is therefore an indicator of the “market friendliness” of economic policies in the host country and from its definition; we expect a negative sign if countries have a less favourable environment to foreign investors or exporters. The index also could show different relationships on exports and FDI. The indices are available regionally and by country.

#### **5.4.8 SIMI: similarity between countries:**

We add explanatory variables in order to capture different factors that facilitate or obstruct exports and FDI flows into  $j$  countries. SIMI (as defined in the equations) is included to capture the degree of similarity between France and  $j$  countries in terms of economic development. It would capture the relative economic size between the two areas. In addition, as would be predicted by the “Linder hypothesis”, that when the investment conditions in

developing countries such as insufficient infrastructure systems are discouraging, the companies in developed countries avoid shifting their low skilled production stages into developing countries. Since, the trade off between the extra costs due to these unpleasant conditions and the cost savings due to cheap labour is not favourable, Ethier (1982); Frankel et al. (1995); Africano and Magalhaes (2005); Turkcan, (2006).

Therefore, it is expected to have a positive impact on FDI and exports flows from France into  $j$  countries with higher levels of development, which tend also to have similar demand structures.

#### **5.4.9 RLF: relative factor endowments:**

The absolute difference in GDP per capita is taken often as a proxy for the difference in relative factor endowments (as shown in the equations). Many other variables have been used as a proxy of labour availability or relative factor endowments, which are labour related factors such as labour availability, capital labour ratio, wage rate, quality of the workforce and other as shown below.

Endowment related variables:

- Skilled employees in host country.
- Wages in host country.
- GDP per capita as an indicator of technological and general development level.
- Agglomeration forces.

Labour variables are often included in empirical studies in many forms. In the other side, labour costs are one of the most important variables since they are part of total production costs. In addition, the unemployment rate and the total population are used often as indicators of labour availability.

Moreover, the detailed specification of various other variables is impeded by multicollinearity. This holds, for example, GDP per capita, which often goes along with differentiated demand, wage costs and openness, (Borrmann et al. 2005; Xing and Xuan 2008). But, the GDP per capita differences still different from the mentioned variables, and it has also been used as a most direct measure of relative factor endowments, hence, we use the formula as shown in the model.

According to Helpman and Krugman (1985), a greater differential in per capita incomes would imply a greater disparity in the relative factor endowments, which would be reflected in the lower relative levels of intra industry trade. Thus, there is an expected negative relationship between bilateral inequality in per capita GDP and the trade in final goods (exports). Markusen (1983) argued that factor movements could give rise to trade, if it was based not on relative factor difference, but on external economies of scale and different production technologies. In addition, the included variable capturing variations in demand and in supply sizes. According to Helpman and Krugman (1985), differences in market size indicates differences in their ability to manufacture differentiated products; as countries become more similar in terms of their market size, the potential for overlapping demand for differentiated products is enhanced. Therefore,  $RLF_{Fj}$  is expected to be negative for exports (trade is intra industry nature, and positive for inter industry). In addition, while the final goods exports are expected to vary negatively with the bilateral inequality in per capita GDP ( $RLF_{Fj}$ ) between two areas, the sign for intermediate goods exports is positive. Linder (1961) and other studies use per capita income differences as proxies for consumer tastes and preferences. It has been argued that as per capita incomes of two countries become equal, their tastes and preferences also become similar. Hence, the trade in final goods rises as the difference in per capita declines, Turkcan (2006).

The expected sign of GDP per capita differences on FDI may be positive or negative depending on the strategic factors (sectors) attracting FDI (a capital or labour intensive industry). According to Buch et al. (2003), and Limao and Venables (2001), if the FDI is attracted by domestic service market in  $j$  countries, the effect should be negative, since it targets the higher purchasing power in these countries. On the other hand, if the FDI encouraged being exports platform, the effect should be positive, for which these countries have relatively low labour cost in  $j$  countries. Hence, GDP per capita differences may be increase trade relative to FDI based production.

### **Regional trade agreements:**

Regional integrations are political or semi-economic, in nature, and governments, which pursue integration or preferential policies to attract the FDI as a favour to decrease barriers among members and political uncertainty.

Regional trade agreements promise to raise international trade volume through trade creation. By engaging in bilateral as well as multilateral trade agreements, the country hope that the resulting trade creation will induce more FDI inflows. Gain from trade will be enhanced and pushed up to its potential via increasing country’s competitiveness if trade and FDI are complementary, Chaisrisawatsuk (2007).

Although the importance of this variable and widely used in the gravity related models. We do not include this dummy, where all countries in the panel data engaged in the Barcelona process that lanced in 1995, and the current panel data started from 1994 to 2009. Therefore, there is no need to include it, because the data period nearly falls within the Barcelona period.

Finally, we summaries the predicted effects of the previous variables on the FDI and exports, with brief explanation of the prediction reasons, in the following table:

Table 5.2: The expected effect of the explanatory variables on exports and FDI.

Variables	Exports		FDI	
Lagged exports	+	The same variable but lagged (previous trends).	-/+	Positive if complement, negative if substitute.
Lagged FDI	-/+	Positive if complement, negative if substitute.	+	The same variable but lagged (previous trends).
Openness of host countries.	+	Higher access for the multinational activities into the area.	+	Higher access for the multinational activities into the area.
Similarity between countries.	+	Expected pleasant development conditions for investors and exporters between the two areas.	+	Expected pleasant development conditions for investors and exporters between the two areas.
Relative endowments between countries	-/+	Negative for intra industry nature, and positive for inter	+/-	Positive with relatively low labour costs, and negative if attracted by



		industry nature.		service sector.
Bilateral exchange rate	+/-	Positive if Euro depreciated, negative if Euro appreciated.	+/-	Positive if Euro appreciated, negative if Euro depreciated.
GDP growth of the host countries	+	GDP growth attracts FDI and exports.	+	GDP growth attracts FDI and exports.
Distance between the two areas.	-	Negative which increases the trade barriers, transportation and transaction costs.	-	Negative which increases the trade barriers, transportation and transaction costs.
Economic Freedom Index (EFI).	+/-	Positive if environment favourable to FDI and exports into the area, and vice versa.	+/-	Positive if environment favourable to FDI and exports into the area, and vice versa.

From the previous discussion and presentation for the independent variables, we consider that five independent variables (two independent lagged, three other independent) are the most important, basic and essential variables, which affect either FDI or exports, as follows:

- The lagged variables of exports and FDI, which include two types:
  - The one period lagged dependent variable as an explanatory variable (at the right hand side), which strongly and positively predict the expected flows of the dependent variable in the future, basing on the previous time series.
  - The second lagged type is the dependent variable of one equation as an explanatory variable in the other equation, which detects the relationship between our two dependent variables (transversely interconnection). In addition, each can predict of the future flow of the other, which they are endogenous (explained by the same explanatory variables) for each other.
- Similarity between countries reflects the relative economic development, which also includes the market demand (power) for each economy in comparison to the other.

This variable can explain and present, a wide group of theories explain the trade and FDI flows basing on the GDP, development levels and gravitational weight between two economies, especially, those concerning to horizontal FDI.

- Relative factor endowments reflect the relative labour attractiveness and production costs for each economy in comparison to the other. This variable can explain and present, a wide group of international trade and capital theories, which explain the trade and FDI flows basing on the costs and factor abundance between the economies, especially, those concerning to vertical FDI.
- Distance is an essential variable affect the flows of the FDI and exports, which represent also many types of costs. In addition, this variable plays an essential role of the choice between the strategies.

## **5.5 Data:**

We use the dependent variables data of outward French FDI and French exports to Southern and Eastern Mediterranean countries, which are (Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia and Turkey).

In addition, we use the GDP data of each  $j$  country, which used with the French GDP to calculate the similarity between France and these countries, (SIMI variable), according the formulas introduced previously concern SIMI variable).

GDP per capita data of France and the other countries also are used to calculate the proxy of the relative factor endowments between countries, which is the absolute difference of GDP per capita between France and these countries, according the formulas introduced previously concern RLF variable).

Exports and imports of each  $j$  country also are used to calculate the openness, which used as explanatory variable. The exchange rate of Euro currency to each local currency of the  $j$  countries, one exception of Palestine, which the US dollar used, as it officially indicated in the UNCTAD database.

All the previous data reached from the UNCTAD data base except the outward French FDI stocks from OECD database, whereas it is available by country.

The weighted distance<sup>44</sup> between France and each of the mentioned countries are also included as an explanatory variable. We got the data for the weighted distance variable from, <http://www.cepii.fr/anglaisgraph/bdd/chelem.htm>.

Economic Freedom Index (EFI) is included as an independent variable, the data collected from Heritage organization website (<http://www.heritage.org/Index/>).

The overall panel data for the “ten”  $j$  countries from 1994-2009, hence, our database has time series of sixteen observations for cross section of ten  $j$  country, with 160 observations for the overall panel data sample.

Variables are used in logarithm. We use the variables in algorithm to reduce multicollinearity, the possible problems of endogenous variables, which should carefully deal with the dynamic panel data analysis.

## **5.6 Econometric Methodology:**

Standard estimators for the static panel data model, which control for the existence of individual effects, are the Fixed Effects Model (FEM) and Random Effects Model (REM) approaches. The econometric analysis with these two models addresses several biases, these biases related to heterogeneity across countries and time. The problem with standard FEM is that, it cannot estimate parameters, which are time invariant, such as the distance variable in our panel data. On other hand, the problem of standard REM is the biases caused of endogeneity problem due to the potential correlation between one or several explanatory variables and the residuals. However, choosing among the FEM and REM estimator rests on an all or nothing decision with respect to the assumed correlation of right hand side variables (explanatory variables) with the error term. In empirical applications, the truth may often lie in between these two extremes, Mitze (2010).

Hausman and Taylor (1981) specify a model as a hybrid version of the FEM and REM using instrumental variables (IV) techniques. The HT approach therefore simply splits the set of

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<sup>44</sup> The weighted distance measure use city-level data to assess the geographic distribution of population inside each nation, which calculates distance between two countries based on bilateral distances between the largest cities of those two countries, those inter-city distances being weighted by the share of the city in the overall country's population. They use latitudes, longitudes and population data of main agglomerations of the countries. The distance formula used is a generalized mean of city-to-city bilateral distances developed by Head and Mayer (2002), which takes the arithmetic mean and the harmonic means as special cases.

time varying variables into two subsets  $X_{it} = (X1_{it}, X2_{it})$ , where  $X1_{it}$  are supposed to be exogenous with respect to  $\mu_i$ , which is country specific effect and  $V_{it}$ , which is the error term.  $X2_{it}$  variables are correlated with  $\mu_i$  and thus endogenous with respect to the unobserved individual effects. The basic idea of HT model is to find appropriate internal instruments to estimate all the model parameters including the invariant variables, in empirical terms the HT model is estimated typically by Generalized Least Squares (GLS), Mitze (2010). *Finally*, the order condition for the HT estimator to exist is  $K \geq g$ . That is, the total number of time varying exogenous variables  $K$  that serve as instruments has to be at least as large as the number of time invariant endogenous variables  $g$ . In case that  $K > g$  the equation is said to be over identified and the HT estimator obtained from a Two Stage Least Squares (2SLS) regression, which is generally more efficient than the within estimator (FEM), Baltagi (2008). In the empirical application of the HT approach the main points of critique focus on the arbitrary IV selection as well as the poor small sample properties of IV methods when instruments are weak, as well as similar small sample problems of the GLS estimator.

One recent and interesting estimator makes it possible to address these problems. Plumper and Troeger (2007) developed the Fixed Effects Vector Decomposition (FEVD). This three stages FEM (two-step non IV alternatives) allows estimating parameters of time invariant variables, while addressing the endogeneity problem. Since, the unobservable individual effects capture omitted variables including time invariant variables, so, FEVD estimates a first stage FEM to obtain an estimate of the unit effects in the first stage. Therefore, in the second stage, it implements an instrumental regression of proxy of the individual effects (decomposing the fixed effect vector), obtained from a first stage, on the time invariant variables to obtain estimates for these variables from one side, and on the term error. In the third and last stage, the model re-estimated by pooled Ordinary Least Squares (OLS), including all explanatory variables, time invariant variables and the error term. This allows firstly controlling the collinearity between time invariant and variant variables at the right hand side, and secondly, correcting the number of degrees of freedom for the use of a generated regressand in this second step, Greene (2010), Mitze (2010).

Hence, for the static analysis of the panel data, we estimate Fixed Effects Vector Decomposition (FEVD), and Hausman Taylor (HT) model instead of FE Model and RE Model.

However, we test essentially the relationship between FDI and exports through the transversely connection between the equations. Theoretically, the controversy about the nature of the relationship between exports and FDI is still standing. Hence, each variable according the theory and the previous researches has an affect on the other variable. These effects needs time to execute an influence on each other's, as explained before. These lagged effects should be included in the equations. Therefore, we have to run a Dynamic Panel Data analysis, which allows executing these requirements and achieving these goals.

An appropriate econometric treatment of dynamic FDI and exports includes lagged values of FDI and exports among the explanatory variables. With panel data, one can do so, while maintaining the convenient property that unobserved country specific effects may be control for it. In this case, there is source of persistence over time: lagged FDI and exports capture the sluggish adjustment of FDI or exports over time.

The OLS estimates of  $\mu_{Fjt}$  and  $V_{Fjt}$  in the empirical model are biased and inconsistent, as explained before. Arellano and Bond (1991) proposed the Generalised Method of Moments (GMM) estimators of the first differenced model that brings significant efficiency gains estimators through exploiting additional orthogonality conditions associated with higher lags of the endogenous variable in the set of instruments, Egger and Merlo (2007).

The generalized method of moments (GMM) technique has been widely used in the estimation of dynamic panel data models, and in the empirical analysis.

However, subsequent examinations of the finite sample performance of the GMM estimators have shown that it is substantially biased. One source of the bias, first is weak instruments Nelson and Startz, (1990 (a & b)), Hayakawa, (2005). Staiger and Stock, (1997) have shown that the instrumental variables estimators would be inconsistent under weak instrument, Stock et al. (2002); second, the magnitude of the bias is proportional to the relative size of the number of instruments to the sample size. Hence, as more as using many instruments cause trade off between the efficiency and the bias of the estimators.

The first differencing models the bias is sizable when the parameter concerning the lagged dependent variable is close to unity, Alonso-Borrego and Arellano (1999).

Blundell and Bond (1998) have shown that, this due to weak instruments, and to overcome the inconsistent instrumental variables estimators caused by weak instruments. They proposed the system GMM estimators. They first showed that the level GMM estimators by Arellano and Bover (1995) are free from weak instruments when the parameter concerning the lagged variable is close to unity, and then combined the moment conditions, which are used in the first differencing, and the level GMM estimators to improve the efficiency of the estimators, Hayakawa, (2005).

The GMM systems approach that estimates the parameters from a system of equations: the first differenced model using lagged levels of FDI and exports as instruments for the lagged difference of FDI and exports, and the level model using lagged differences of FDI as instruments for the lagged level of FDI firstly (similarly for exports). Secondly, use the difference instrumental variables in the model, see, Arellano and Bover, (1995); Arellano and Bond (1998); Blundell and Bond, (1998).

Hence, for the dynamic analysis, we use Arellano-Bover/Blundell-Bond (ABBB) method, which is the Dynamic Panel Data System (DPDsys). This is the analysis, which we count on, for explaining the results. Moreover, we use it to state the relationship between exports and FDI for the panel data, in the areas and time zone stated before.

## **5.7 Results:**

We run the estimation and show the results for the different models, two static (Hausman Taylor Models (HTM)) and the Fixed effects vector decomposition (FEVD), and the Dynamic Panel Data System (DPDsys). In addition, we calculate the long run coefficient for the different variables, according the following formula:

Long run parameter (coefficient) = estimated ABBB parameter/ (1- parameter corresponding to the lagged variable). The ABBB refers to the Arellano Bover/ Blundell Bond model, which we use the ABBB estimators in the long run parameters calculation.

Lately, we introduce the Variance Inflation Factor (VIF) for the multicollinearity test.

We test for multicollinearity to ensure a precision and robustness of predictions. The presence of multicollinearity among variables biasing the econometric results i.e. unreasonable coefficient estimates, wrongly higher standard errors and consequently insignificant interpretation and inference. Multicollinearity presence causes misspecification of the model. Therefore, we use the variance inflation factors (VIF) method to calculate an index, which measures the variance increasing of the coefficients due to multicollinearity. In practice, a VIF greater than 10 would indicate a presence of multicollinearity, whereas a VIF greater than 30 becomes problematic requiring specific corrections (Kennedy, 2003).

In addition, we introduce the covariance matrix of coefficients after the (DPDsys) analysis. The matrices show the covariance between each variable and all the other variables, theoretically, none related variables have zero covariance, but empirically, that is impossible. The covariance should be weak and not affect the robustness of the different estimations and inferences.

The following table shows the different models estimators, in addition to the long run coefficients.

Table 5.3: The models estimators and the long run parameters.

Exports equation	DPDsys	Exports to <i>j</i> countries		
		Long-run parameter	Hausman-Taylor	FEVD
Lagged 1	0.74*** (14.58)			
FDI	0.058** (2.03)	-	-0.004 (-0.19)	-0.00008 (-0.01)
Lagged 1	0.0003 (0.01)			
Lagged 2	-0.064** (-2.23)	-0.18		
RLF	0.244* (1.86)	0.94	0.59*** (4.91)	0.60*** (6.64)
SIMI	0.403*** (3.85)	1.55	0.88*** (7.03)	0.83*** (22.43)
GDP growth	0.064* (1.84)	0.25	0.0006 (0.08)	0.0012 (0.17)
Exchange rate	0.0003** (1.97)	0.0012	0.14*** (3.32)	0.11*** (13.6)
Openness	0.156 (1.01)	0.6	0.73*** (3.10)	0.46*** (6.15)

Distance	-0.25* (-1.81)	-0.96	-2.11*** (-2.67)	-2.11*** (-28.03)
EFI	0.46** (2.44)	1.77	-0.01 (-1.58)	-0.44*** (-4.01)
Constant	2.81* (1.73)		19.62*** (3.19)	19.2*** (20.35)
N. of observations	150		160	160
	Wald chi2(11) = 54305.66***		Serial corr. (Rho) = 0.94	adj. R-squared= 0.98
FDI equation	<b>Outward Foreign Direct Investment Stock</b>			
FDI lags (1)	0.56*** (8.73)	-		
Exports	0.49 (1.6)	-	-0.14 (-0.48)	-0.011 (-0.08)
Exports lags (1)	-0.50* (-1.66)	-1.14		
RLF	0.80* (1.93)	1.82	2.04*** (4.38)	1.14*** (3.80)
SIMI	0.83*** (2.89)	1.89	3.35*** (7.26)	3.93*** (11.79)
GDP growth	0.07 (0.53)	0.16	0.026 (0.94)	0.27** (2.12)
Exchange rate	0.0008 (1.55)	0.002	-0.28* (-1.75)	-0.5*** (-9.83)
Openness	1.62** (2.33)	3.7	2.54*** (2.87)	1.6*** (4.32)
Distance	-1.06** (-2.08)	-2.41	-1.53** (-1.89)	-0.7** (-2.46)
EFI	0.99 (1.61)	2.25	1.8* (1.73)	1.5*** (3.17)
Constant	-0.26 (-0.04)		-15.13 (-0.73)	-26.5*** (-6.7)
N. of observations	150		160	160
	Wald chi2(10) = 3170.21***		Serial corr. (Rho) = 0.91	adj. R-squared= 0.85

- The symbols \*, \*\*, \*\*\* stand for the 10%, 5% and 1% significant.

We present the variance inflation factors tests for the multicollinearity problem for the both equations. The GDP, GDP per capita, openness and GDP growth are variables used directly and indirectly in the model. Although, we used the relative size, the difference between the GDP per capita, growth rate and all used in logarithm to avoid and reduce the multicollinearity, but the multicollinearity could present.

The presence of multicollinearity among variables biasing the econometric results; and causes unreasonable coefficient estimates, and causes wrongly higher standard errors and consequently insignificant interpretation and inference. The multicollinearity presence causes



misspecification of the model, as explained before. Thus, the variance inflation factor less than “3” shows none presence of the multicollinearity problem.

We present the VIF tests for both equations as follows:

Table 5.4: The variance inflation factors (VIF), for the two equations.

	Exports equation	FDI equation
Variables	VIF	VIF
Exports	-	3.13
FDI	3.01	-
Similarity	4.28	2.18
Relative Endowments	1.52	1.36
Exchange Rate	1.33	1.42
Openness	2.81	1.85
GDP growth	1.10	1.17
Distance	1.98	2.38
Economic Freedom Index	1.18	1.11
Mean VIF	2.15	1.82

In addition, we run Sargan test, which detect any possible problems with the instruments used in the dynamic analysis. The results showed in table 4 clarify that, we are long away from rejecting the null hypothesis.

Although Sargan test done after the dynamic panel data analysis, but, it proves that, the HT Model equations estimations are over identified, and the HTM estimators obtained from a Two Stage Least Squares (2SLS) regression which is generally more efficient than the within estimator (FEM), Baltagi (2008), As we mentioned before in the methodology.

In addition, we test for the autocorrelation after the test of the two equations. The results for both equations are significant to accept the null hypothesis, which is none existence of the autocorrelation.

Table 5.5: The Sargant test:

	Exports	FDI
H0: overidentifying restrictions are valid	120.8***	116.08***

Table 5.6: Arellano-Bond test for zero autocorrelation in first-differenced errors

	Exports (z)	FDI (z)
Level 1	-1.956**	-1.8738**
Level 2	1.2733***	1.4523***

H0: no autocorrelation

As shown in the table, the hypothesis that first-differences residuals are first and second order serially correlated can be rejected in all specifications. This is a necessary condition for valid instrumentation and can be seen from the robust test for first and stronger in second order serial correlation, as well as Sargan test shown before in table, which shows that all moment restrictions are satisfied for the dynamic specifications is not rejected (null hypothesis) at “1” percent significance level.

Hence, all the possible posttest for our estimations is done. These tests strictly prove the robustness of the results, and no any serious related problems.

### 5.7.1 Interpretation of results:

Statistically, we find robust results for the different models; the DPDsys model shows a high Wald test values, 54305.7 and 3170.2 on exports and FDI, respectively, and significant at 1% level, which the dependent variables are highly explained by the explanatory variables. The HT model shows a high (rho) values for the both equations, which are 0.94 and 0.91, for exports and FDI equations, respectively. The adjusted  $R^2$  in FEVD model are high also, which present 0.98 and 0.85 for the exports and FDI, respectively.

The previous results show the models robustness, which fits the data and able to explain the relationship between the variables.

The coefficients of the FEVD model in exports equation are significant at 1% level, except the FDI variable, which is an endogenous variable and should be treated dynamically with

lags periods. FDI and distance reflect a negative relationship with exports, in addition to the EFI.

The coefficients of the FEVD model in FDI equation are significant at 1% level, except GDP growth and distance, which are significant at 5% level. The exports variable is not significant because of the endogeneity problem, which should be solved dynamically. Exports and distance reflect a negative relationship with FDI, in addition to the exchange rate.

The coefficients of the HT model in exports equation are significant at 1% level, except GDP growth and EFI, and except the endogenous FDI variable, which should be treated dynamically with lags periods. FDI and distance reflect a negative relationship with exports, in addition to the EFI.

The RLF, SIMI and openness coefficients of the HT model in FDI equation are significant at 1%. Distance is significant at 5%, and exchange rate and EFI are significant at 10%. GDP growth is not significant. Exports and FDI show a negative relationship with FDI, besides EFI.

In the previous two static models, the exports variable has negative relationship with FDI, and vice versa, similarly to the dynamic model as we see below.

### **The lagged variables:**

The one lagged period of exports in exports equation is significant at 1% level with 0.74 coefficient value, and stronger than the lagged period of FDI in FDI equation, which is 0.56 and significant at 1% level. This indicates that the French exports to  $j$  countries area influenced strongly by the previous exports experience to the same area. The outward French FDI at the same area is less influenced by the previous investors' activities, comparing to the exporters with the previous exporters activities, but FDI also still influences strongly. I.e. the exporters learn from the previous exports experience in the area, more than the investors do with the previous investment experience.

In exports equation, the lagged FDI volume is significant at 1% level with two lagged period, which FDI needs a comparatively longer time than exports to influence the future exports and to be executed, as we explained previously. From the results, it is clear that the theoretical and significant relationship between exports and FDI in the exports equation could be discovered

with the DPD system analysis which is negative (substitute), because of solving endogeneity problem (the two lagged FDI periods). At the same time, if we do not considered the lags periods in the transversely variables, positive (complement) relationship between the two variables, at the presence of the endogeneity problem.

Similarly, in the FDI equation, the one lagged exports period shows significant coefficient at 5% level, and 0.50 coefficient negative values. Hence, the substitutional relationship between both variables proved by the lagged value in the dynamic panel.

The both variables (strategies) show a substitutional relationship in both static models (the HTM and FEVD), but this relationship is not significant because of the endogeneity problem.

Similarity of country size between France and  $j$  countries has strong positive significant values on either FDI or exports, as previously predicted. These values are significant at 1% level either with dynamic or static panel analysis.

The relative factor endowments (RLF) variable shows a positive sign, which reflects the nature of inter industry between France and the  $j$  countries. The positive relationship with FDI refers to low labour costs in the  $j$  countries, which case the increasing of the FDI, as explained before. These values are also significant at the 10% level.

The distance coefficients are negative in the two equations, which increases the trade barriers, and other costs, such as, transportation and transaction costs. This variable is significant in both equations and the three models.

The Economic Freedom Index (EFI) shows a positive relationship with exports and FDI, which means that the  $j$  countries area policies tend to be more liberal and attract the foreign investment. The static models show a negative sign in the exports equation, but we relay on the DPDsys results.

The exchange rate variable shows positive effects either in the static or the dynamic analysis in exports equation, which are significant at 1% level in the static models, and at 5% in the dynamic. This shows that the French currency overall depreciated comparing to the other

currencies during the whole period. Similarly, the depreciation shows negative effects on the FDI in the static models, which agrees the previous prediction. The effect on FDI, in the dynamic is not significant.

The GDP growth shows positive effects on either exports or FDI, which has nearly the same positive weight on both variables. The GDP growth reflects the economic stability and the potential demand increasing, which reflects positively on both strategies.

The variables coefficients, in general, and specially, the long run parameters, show a strong effects of the main variables, which we mentioned before, on both strategies.

The SIMI, RLF, distance and the lagged variables show the strongest effects and biggest influence on the FDI and exports movements, than the other determinants included in the model.

Finally, the independent variables are in line with the predicted signs; hence, we present the empirical independent variables effects direction (signs) for the area and period mentioned before, as follows:

Table 5.7: The relationship direction between the variables, in the econometric results.

Variables	Exports	FDI
Lagged exports	+	-
Lagged FDI	-	+
Openness	+	+
Similarity	+	+
Relative endowments	+	+
Bilateral exchange rate	+	-
GDP growth	+	+
Distance	-	-
Economic Freedom Index (EFI).	+	+

## 5.8 Conclusions:

- 1- The dynamic panel data analysis emphasizes a clear-cut negative relationship between the exports and outward FDI, in the mentioned area and period.
- 2- The exports have a very strong substitutional effect on FDI, comparing to the same negative effect of FDI on exports. Hence, any bilateral trade agreement could facilitate the goods flows in the area, could affect significantly and negatively on the FDI position in the area.
- 3- Any agreements in the future, which facilitate the goods flow between the studied areas, should influence negatively the expected potential FDI in the area. This does not mean in absolute volume.
- 4- FDI and exports can explain each other, and the two variables influenced mainly by the same factors.
- 5- The different independent variables are well explaining the dependent variables, and highly explain the gravitational forces affect the exports and FDI flows, in either the static models or the dynamic one.
- 6- Openness level and economic freedom index (the  $j$  countries movements) well encourage attracting the foreign capital and trade movements, and has a positive effects in the tested area.
- 7- Similarity between countries, relative factor endowments, distance and openness are the strongest and most important explanatory variables, either on FDI or on exports. In addition, these variables have stronger effects on the FDI than the exports.
- 8- Exporters and investors influenced by their previous, or each other, activities. In addition, exporters are more trusted of the previous exports history, comparing to the investors trust of their historical activities.

9- Dynamic analysis (ABBB model) is more able to explain the dependent variables and the relationship between these variables better than the static models.

10- Openness highly attracting the foreign direct investment in the  $j$  countries.

# Chapter Six

## Conclusions

The economic theory does not show a clear-cut answer about the relationship nature between exports and FDI. The theory gives strong justifications about the relationship with exports when distinguishing between the FDI types. However, different theories have limitations basing on the pre-assumptions, which are necessary for the theoretical analysis, or data shortage in the empirical field. Such limitations as one factor production (labour), melting iceberg none increase with the distance or neglecting internal transport costs.

This thesis focused on the relationship between exports and outward FDI, and studies the exports and FDI determinants, empirically, at micro and macro level. These empirical parts aim to detect a clear-cut long relationship between the exports and overall FDI is necessary to detect the possible impacts on the local economy.

In this context, our work in the thesis concentrates on two empirical parts to achieve these goals, which accomplished as follows:

In the first part, we follow a recent theoretical model, Oberhofer and Pfaffermayr (2011), which developed from, Helpman et al. (2004). The model shows that the optimal mode of serving foreign markets can differ across host countries. Many different determinants detect the optimal choice between the strategies at company level; one of the most important variables is the productivity, in addition to the other company characteristics. This is a new trend in the literature of explaining the strategy choice of serving the foreign market according the company productivity, which is crucial factor of change the company strategy from exports to FDI.



The productivity measure is an essential for detecting the effective role of the productivity and its impact on the strategy choice. Head and Ries (2003) confirm that the productivity proxy is crucial factor to detect the productivity impact and the relationship between exports and FDI. Hence, we use two different proxies, which allows for better measure of productivity, and measure the real impact on the company strategy choice. These two proxies are, revenues per employee (the traditional one), which measure the relationship between the company revenues and the employees number; and, the cost of employees as a percentage of the company revenues (the new one). Theoretically, the new one is more able to detect the labour productivity, which includes wages and other spending on labour, not just the simple employees' number. This is true especially in the companies group, which has qualified labour force (high cost labour), and it has improved empirically.

The measure of productivity takes another dimension by measuring the productivity (with other characteristics) through different companies' groups. The comparisons between different groups, which have different levels of productivity, bring more evidences about the productivity role. This procedure shows the company characteristics, which are the strategy decision determinants, role within the same companies group and between the different groups of companies. These developments contribute and confirm many controversial questions in the theory as follows:

- The productivity shows significant substitution effect between the strategies, whereas a negative on exports and positive on FDI.
- The productivity impact shows significant differences on the strategies between the groups.
- The new proxy has better representation of the productivity than the traditional one, in the different groups, and agrees the theoretical predictions. This confirms Head and Ries conclusions that the productivity proxy is crucial to investigate the productivity role and the relationship between exports and FDI.
- The productivity determines the preferred strategy adopted by the company to serve the foreign market.

- We provide more wide justifications and explanation of the characteristics and their marginal effects at each company group (large and very large).
- The companies' separation and examining of each homogeneous group separately is essential to detect the determinants impact on the strategies and the strategy decision. This also detects the differences between the productive and most productive companies.
- The bivariate probit model may be a better choice to examine similar questions, especially, in the large samples. It is not widely used to detect the strategy decision, and it shows robust results to test similar data.
- Other determinants prove to have an important impact on the company strategy choice, such as age, size, intangible assets, HI and others.
- Herfindahl Index shows the importance of the local market structure on the strategy decision, and how could the monopoly influence the strategy of serving the foreign market.

The availability of data about companies export to specific area or measuring the distance between the production and consumption points should be important contributions for future research. The Amadeus database, which we used in this empirical part, does not provide similar information.

In addition, any improving for the productivity measuring will give better results in the companies' strategy decision of serving the foreign market. And, more separation between the large companies should improve presenting the role of productivity; taking under consideration that the very large companies include biggest very large companies, which are from the biggest companies in the world; these companies are much bigger than other companies classified as a very large companies. This is an additional work to be investigated in the future researches.

Finally, explaining the multinational activities as a function of characteristics of companies, home and host countries characteristics will be a good attempt to more understanding about the company strategy, location choice and, off course, the FDI and exports determinants at country level.

In the second part, we investigate the relationship between exports and FDI, at the macro level, in the selected Mediterranean countries. This leads to discuss the determinants of these indicators of the internationalization. There is no any study discussed this relationship specifically in the Mediterranean area. A larger panel sample to include other areas could bias the results, which impose investigating the relationship in a specific region.

The models that have been built to discuss this relationship may do not include all the theoretical requirements to detect similar relationships. We derived a bivariate dynamic gravity equations framework, which proved a negative relationship between exports and the outward FDI. We connected these equations by including the dependent variables transversely in the right hand equation side. Many previous related articles confirm that the FDI should be included in higher lags than the exports, whereas theoretically, it needs higher time to be executed, and start influencing the exports. Hence, this part contributes in different aspects as follows:

- This is the first study about the relationship between French exports and the outward FDI, in the Mediterranean area. It shows a strong substitutive relationship between the variables.
- This part could show the main determinants of exports and FDI in the selected area.
- We investigated the FDI in higher lags (two lags) than the exports, where satisfy the theoretical requirements and give better results.
- In addition, the econometric methods used in many related articles may have problems affect the results, such higher instruments in Arellano Bond (1991). Hence, we use

Arellano-Bover/Blundell-Bond, which should lead to better results in using GMM estimations.

- The estimations in this part, which included one dynamic and two static models, prove that the dynamic analysis is more reliable in such models and tests.

Although the permanent co-existence of both activities from the home country to a specific host country, the empirical findings in this thesis refer strongly to the substitution relationship between exports and outward FDI, either at micro or macro level.

This presence of both activities is due to the productive multinationals, which do exports; and the more productive one, which set up an affiliate in the foreign market. In addition, some multinationals do both the activities due to doing exports to the near markets, and running the affiliates for the far markets, whereas could be a promising research in the future by including the distances at the micro level.

Our empirical findings show strong evidences of the company characteristics, especially productivity, to change from exports to FDI as long as productivity increases in the same companies group. In addition, the more productive companies group show tendency to do more FDI than exports. However, the company should move to the different strategies in the cycle of its life (exports and running affiliates), which shows the co-existence of the strategies.

The macro investigation of the relationship proves a clear-cut relationship between French exports and outward FDI in the Mediterranean area. This relationship could differ for the other countries according the multinationals behaviour, the governmental policies, patterns of trade with partners and other macro and micro determinants.

The exports show a stronger impact on FDI than the negative FDI impact on exports. Hence, building a model of different sets of explanatory variables for each activity; or examining the equations simultaneously could be future extension for our work.

Hence, we can consider that this thesis provides strong evidences for the substitutional relationship between exports and outward FDI, or the multinationals strategies of serving the

foreign market. The negative exports effect on the outward FDI is stronger than the negative effect of the outward FDI. However, these effects proved to be strong.

Finally, as the relationship is substitutes, the increasing in the outward FDI will increase the foreign affiliate's employments, the economy presence in the international market and increase the transfers to the local economy, which impact positively on the local economy. On the other hand, this increase of the production locally abroad satisfies the foreign demand, and decreases the exports, local output and employments, which impact negatively on the local economy. These contradicted impacts will eliminate each other and cause a net negative or positive impact. This, of course, depends on the magnitude of transfers of the local economy and the foreign affiliate's employments nature (national or foreigner).

In addition, how much is the elasticity of substitution between these variables, where could depends on the development degree and the attractiveness of the economy. This is a vital question, which could be examined in the future researches.

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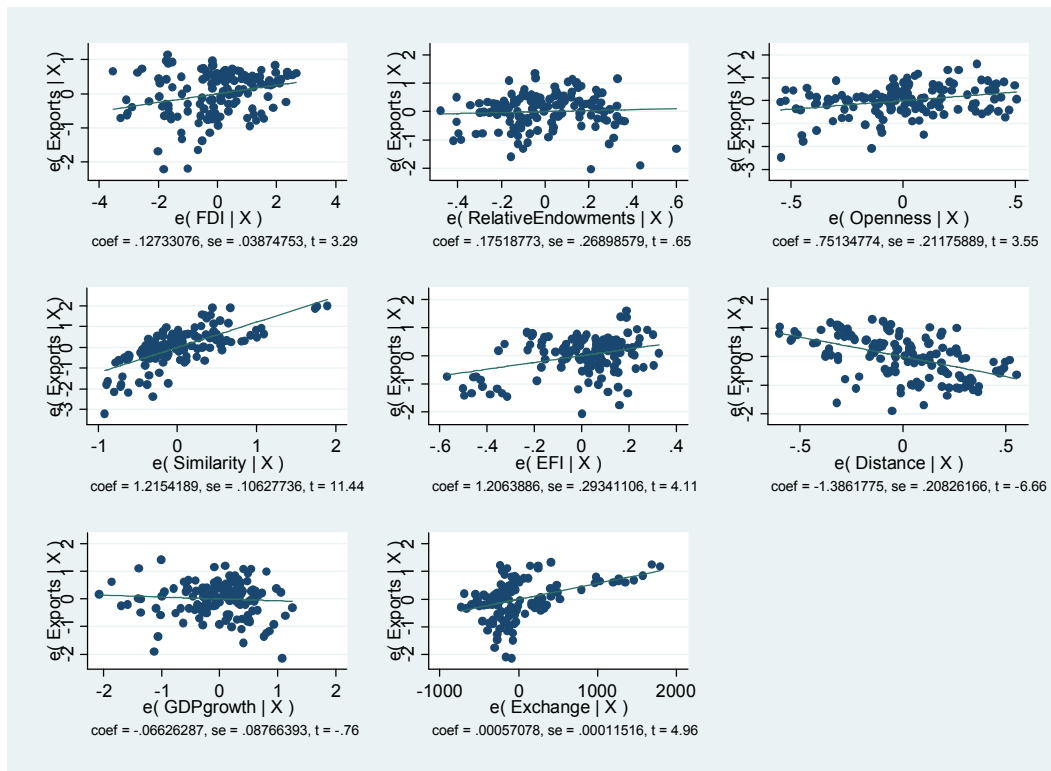
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# A Covariance Matrices and Graphs for Chapter Five Estimation

Graphs show the Exports distribution with the independent variables.



Graphs show the FDI distribution with the independent variables.

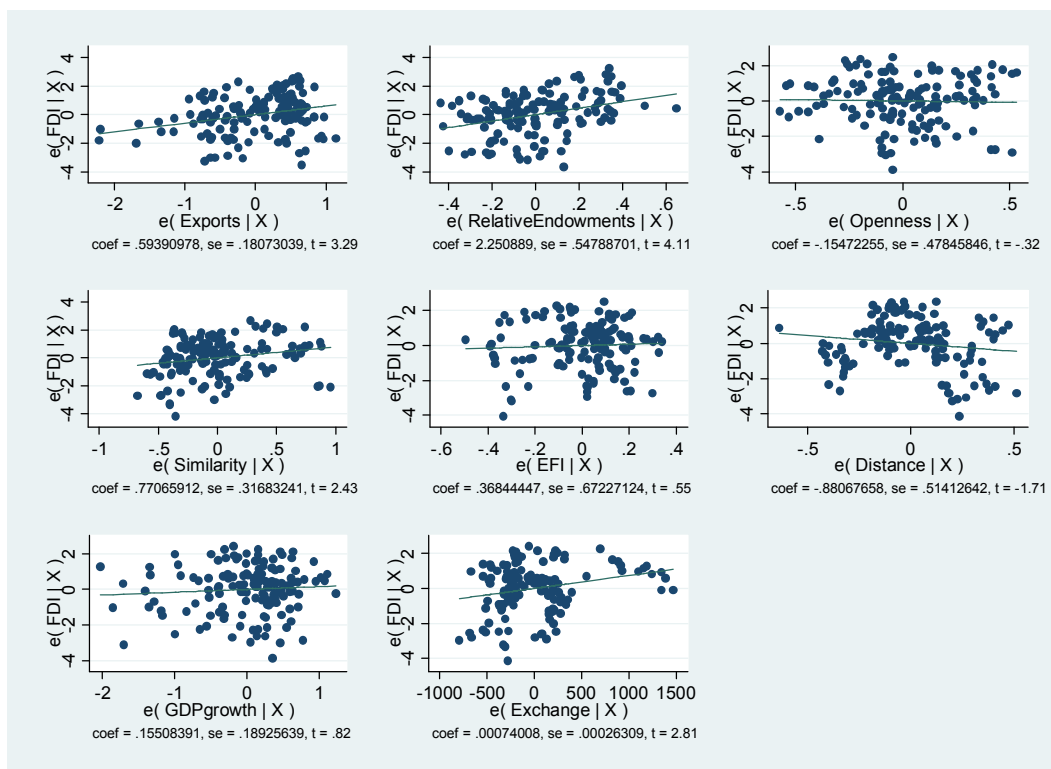


Table shows the covariance matrix of coefficients of “xtdpdsys” model  
Exports equation

	L. Exports	FDI	L1. FDI	L2. FDI	Openness	RLF	Similarity	EFI	Distance	GDP Growth	Exchange Rate
L. Exports	0.0025										
FDI	0.00029	0.00082									
L1. FDI	-0.0002	-0.00045	0.00092								
L2. FDI	-0.00004	-0.00018	-0.00031	0.00082							
Openness	-0.00109	-0.00099	-0.00004	-0.00014	0.0238						
RLF	-0.0021	-0.00017	-0.00015	-0.0008	-0.01012	0.0172					
Similarity	-0.00337	-0.0008	-0.00002	-0.0005	0.0096	0.00111	0.01097				
EFI	-0.0049	-0.0005	0.00047	-0.0007	0.00337	0.00017	0.0076	0.0359			
Distance	0.00221	0.0003	0.000086	0.00125	0.0047	-0.01447	-0.00212	-0.01245	0.01922		
GDP Growth	0.00020	-0.00004	-0.00008	-0.00005	-0.0001807	0.00032	0.000067	-0.00012	-0.0005	.00121055	
Exchange Rate	-3.5e-06	-7.3e-07	6.1e-07	-6.4e-07	3.1e-06	3.3e-06	3.8e-06	0.000011	-6.9e-06	-1.9e-07	2.05e-08

Table shows the covariance matrix of coefficients of “xtdpdsys” model  
 FDI equation

	L. FDI	Exports	L1. Exports	Openness	RLF	Similarity	EFI	Distance	GDP Growth	Exchange Rate
L. FDI	0.00409									
Exports	0.00098	0.09483								
L1. Exports	-0.00058	-0.07378	0.08943							
Openness	-0.0104	-0.0194	0.02113	0.48249						
RLF	-0.01019	-0.02438	-0.0205	-0.10669	0.17102					
Similarity	-0.0076	-0.0204	-0.0133	0.09335	0.02986	0.08204				
EFI	-0.0076	-0.04828	-0.01789	0.05393	0.0457	0.07992	0.3827			
Distance	0.012	0.0309	0.01473	0.11980	-0.18113	-0.0188	-0.16347	0.257		
GDP Growth	-0.0008	-0.00426	0.00906	-0.01340	-0.00174	-0.00528	-0.005	-0.00269	0.01495	
Exchange Rate	-8.7e-06	-0.00003	-7.9e-06	0.00008	0.000048	0.00004	0.00008	-0.00005	-1.4e-06	2.6e-07

## The econometric methods:

We are briefly presenting the econometrical methods that are used in our empirical tests in this thesis. More discussion about these methodologies is shown in the methodologies sections in chapter four and five.

### GMM system method:

The Arellano and Bond (1991) and Arellano and Bover (1995) / Blundell and Bond (1998) Dynamic models are characterized by the presence of one or more lagged endogenous variables among the explanatory variables. We take as an example where there is only one lagged endogenous variable.

$$Y_{it} = n_0 + n_i + \alpha Y_{it-1} + \beta' X_{it} + \varepsilon_{it} \quad (\text{For } i=1, \dots, N \quad t=1, \dots, T) \quad (1)$$

With  $y$  the endogenous variable and  $X$  is exogenous variable,  $(\alpha, \beta)$  are the parameters to estimate  $n_i$  which is the fixed individual effect, and finally  $\varepsilon_{it}$  is and the error term is white noise. The previous equation can be rewritten as follows:

$$Y_{it} - Y_{it-1} = n_0 + n_i + (\alpha - 1)Y_{it-1} + \beta' X_{it} + \varepsilon_{it} \quad (2)$$

Dynamic models are characterized by the presence of one or more lagged values of endogenous variable among the explanatory variables. In this model, the presence of the lagged dependent variable does not use standard econometric techniques. The estimation of dynamic models by traditional methods (OLS and within) gives estimators biased and inconsistent because of the correlation between the lagged endogenous variable  $Y_{it-1}$  and error term  $\varepsilon_{it}$ . To do this, we propose two alternative estimation methods: the method of

### Arellano and Bond (1991), and Blundell and Bond (1998).

The method of Arellano and Bond (1991) and Blundell and Bond (1998), given the simultaneity bias and endogeneity that may result from the estimation of the dynamic equation by the OLS method, the dynamic equation can be estimated using the GMM

dynamic panel Generalized Method of Moments. We use the generalized method of moment on dynamic panel to control individual and time specific effects and mitigate the endogeneity of variables. The GMM estimator in dynamic panel was developed by Holtz-Eakin, Newey and Rosen (1990), Arellano and Bond (1991) and Arellano and Bover (1995).

There are two types of GMM estimators: the estimator of Arellano and Bond (1991) that is GMM difference estimator and Blundell and Bond (1998) that is GMM system.

Arellano and Bond (1991) provides an estimate difference whose goal is to eliminate a potential omitted variable bias associated with specific effects, whose equation is in the following form:

$$(Y_{it} - Y_{it-1}) = \alpha(Y_{it-1} - Y_{it-2}) + \beta'(X_{it} - X_{it-1}) + (\varepsilon_{it} - \varepsilon_{it-1}) \quad (3)$$

Although this specification in first difference eliminates the individual fixed effect, it introduces a new bias: by constructing the new error term  $(\varepsilon_{it} - \varepsilon_{it-1})$ , which is correlated with the lagged dependent variable  $(Y_{it-1} - Y_{it-2})$ . The first differences of explanatory variables are instrumented by lagged values (in level) of these same variables. The goal is to reduce the simultaneity bias and bias introduced by the presence of the lagged dependent variable in difference.

Under the assumption that error terms  $\varepsilon$  are independent and explanatory variables  $X$  are weakly exogenous, (that mean, the explanatory variables are assumed uncorrelated with future realizations of the error terms). Arellano and Bond (1991) propose the following moment's conditions that apply to the equation in first difference:

$$E[Y_{it-s}(\varepsilon_{it} - \varepsilon_{it-1})] = 0 \text{ for } s \geq 2, t = 3, \dots, T \quad (4)$$

$$E[X_{it-s}(\varepsilon_{it} - \varepsilon_{it-1})] = 0 \text{ for } s \geq 2, t = 3, \dots, T \quad (5)$$

Using these conditions on the moments, Arellano and Bond (1991) proposed the GMM estimators in two steps. In a first step, the error terms are assumed independent and homoskedastic across time and among individuals. In a second step, the residuals obtained previously are used to construct an efficient estimator of the variance-covariance matrix by

releasing the assumption of independence and homoskedsticity. The two steps GMM estimator is more efficient than the estimator of the first stage is. It can also improve the efficiency of the GMM estimator in two steps using the iterative GMM estimator.

The problem with this estimator is that it suffers from the weak correlation of instruments with the regressors, leading to substantial biases in finite samples and asymptotically its accuracy is low. Specifically, the lagged values of explanatory variables are weak instruments for the equation in first difference. Furthermore, differentiation of the level equation eliminates variations between countries and takes into account variations within countries.

The GMM system estimator can lift this limit. It combines the first-difference equation (3) is estimated simultaneously with the level equation (1) by GMM. In the level equation, the variables are instrumented by their first differences. Blundell and Bond (1998) have tested this method using Monte Carlo simulations. These authors found that the system GMM estimator is more efficient than the difference GMM estimator is. The latter produces biased estimators for small samples. The bias is even more important that the variables are persistent over time, that specific effects are important and that the temporal dimension of the panel is low. For the level equation, we use additional conditions moments assuming the following explanatory variables are stationary.

$$E[(Y_{it-s} - Y_{it-s-1})(n_i + \varepsilon_{it})] = 0 \text{ for } s = 1 \quad (6)$$

$$E[(X_{it-s} - X_{it-s-1})(n_i + \varepsilon_{it})] = 0 \text{ for } s = 1 \quad (7)$$

The moment conditions above (4) to (7) combined with the Generalized Method of Moments allow estimating the efficient coefficients of the model. Blundell and Bond (1998) also found that the system GMM estimator performs better than the first difference, which gives biased results for samples of finite size because the instruments are weakly correlated.

The efficiency of the GMM estimator based on the validity of assumption:

- Instrument are appropriate (valid).
- Error terms are not autocorrelated, to test the validity of lagged variables as instruments.

### Sargan /Hansen tests:

Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) suggest the identification test on the Sargan /Hansen tests the validity of lagged variables as instruments. To test the hypothesis of no correlation of error terms, these authors suggest a test of autocorrelation of second order, because by constructing the error term in first difference is correlated to first order, but it must not be second order.

**Variance Inflation Factor (VIF)** and Tolerance are two measures that can guide a researcher in identifying Multicollinearity. Before developing the concepts, it should be noted that the variance of the OLS estimator for a typical regression coefficient (say  $\beta_i$ ) can be shown to be the following, see Wooldridge (2001).

$$Var(\beta_i) = \frac{\sigma^2}{S_{ii}(1 - R_i^2)}$$

where  $S_{ii} = \sum_{j=1}^n (X_{ij} - \bar{X}_i)^2$  and  $R_i^2$  is the unadjusted  $R^2$  when you regress  $X_i$  against all the other explanatory variables in the model, that is, against a constant,  $X_2, X_3, \dots, X_{i-1}, X_{i+1}, \dots, X_k$ . Suppose there is no linear relation between  $X_i$  and the other explanatory variables in the model. Then,  $R_i^2$  will be zero and the variance of  $\hat{\beta}_i$  will be  $\sigma^2/S_{ii}$ .

Dividing this into the above expression for  $Var(\beta_i)$ , we obtain the variance inflation factor and tolerance as:

$$VIF = \frac{1}{1 - R_i^2}$$

$$\text{Tolerance } (\beta_i) = \frac{1}{VIF} = 1 - R_i^2$$

It is readily seen that the higher VIF or the lower the tolerance index, the higher the variance of  $\hat{\beta}_i$  and the greater the chance of finding of  $\beta_i$  insignificant, which means that severe Multicollinearity effects are present. Thus, these measures can be useful in identifying Multicollinearity. The procedure is to choose each right hand side variable (that is,



explanatory variable) as the dependent variable and regress it against a constant and the remaining explanatory variables. We would thus get  $k-1$  values for VIF. If any of them is high, then Multicollinearity is indicated. Unfortunately, however, there is no theoretical way to say what the threshold value should be to judge that VIF is “high”. In addition, there is no theory that tells you what to do if Multicollinearity is found. Multicollinearity is a high degree of correlation among explanatory variables. The presence of multicollinearity inflates the variances of the parameter estimates. It may result in a lack of statistical significance of individual independent variables, whereas the overall model may be strongly significant. In addition, it may result in wrong signs and magnitudes of regression coefficient estimates, and consequently incorrect conclusions about relationships between independent and dependent variables. The variance inflation factor (VIF) is a widely used method for detecting the severity of multicollinearity

### **Hausman-Taylor Model (HTM):**

The Hausman-Taylor model (HTM) estimator is a tool, which preserves the advantages of both fixed and random effects model. This means that it allows considering the correlation between individual effects and regressors in favor of FEM while it identifies the effects of time-invariant regressors in favor of REM. The HTM is an instrumental variable approach that provides both the between and within variation of the strictly exogenous variables as instruments. The individual means of the strictly exogenous regressors are used as instruments for the time invariant regressors that are correlated with the individual effects.

The HT model is given by Hausman and Taylor (1981):

$$Y_{it} = \alpha + \beta_1 X_{it}^1 + \beta_2 X_{it}^2 + \delta_1 Z_i^1 + \delta_2 Z_i^2 + u_{it} \quad (1)$$

$$u_{it} = \mu_i + v_{it}$$

Where  $X_{it}^1$  and  $X_{it}^2$  are time-varying variables that  $X_{it}^1$  are not correlated with the unobservable individual effects  $\mu_i$  and the error terms  $v_{it}$  but  $X_{it}^2$  are correlated. Similarly,  $Z_i^1$  and  $Z_i^2$  are time-invariant variables that  $Z_i^1$  are not correlated with  $\mu_i$  and  $v_{it}$  but  $Z_i^2$  are

correlated. The unobservable individual effects are treated as random  $u_{it} = \mu_i + v_{it}$ . The HTM procedure is implemented in the following steps. First, equation (1) is estimated by pooled two stages least squares (2SLS), where the set of variables mentioned above acts as instruments. The main idea is that the time variant variables  $X_{it}^1$  are used as instruments for estimating time-invariant coefficients  $Z_i^2$ , where group means of  $X_{it}^1$  are used to instrument  $Z_i^2$ . Deviations from individual means of  $X_{it}^1$  and  $X_{it}^2$  are used as instruments for  $X_{it}^1$  and  $X_{it}^2$ , whereas  $Z_i^1$  are used as their own instruments. Secondly, the pooled 2SLS residuals are needed to obtain estimates of  $\sigma_\mu^2$  and  $\sigma_v^2$ , which can construct the weights for a feasible generalized least squares estimator  $\phi_i$  as:

$$\phi_i = 1 - \sqrt{\frac{\hat{\sigma}_v^2}{\hat{\sigma}_\mu^2 + T_i \hat{\sigma}_v^2}} \quad (2)$$

Where  $\hat{\sigma}_v^2 = \frac{(u' Q u)}{\sum_{i=1}^N (T_i - 1)}$  and  $\hat{\sigma}_\mu^2 = \frac{(u' P u) - (N \hat{\sigma}_v^2)}{\sum_{i=1}^N T_i}$ , Q is an operating transforming a variable into its deviations from group means, and P produce group means of a variable.

Thirdly, these weights are used to transform (by quasi-time demeaning) all the dependent variables, explanatory variables and instrumental variables. The modified model can be written as:

$$\tilde{Y}_{it} = \alpha + \beta_1 \tilde{X}_{it}^1 + \beta_2 \tilde{X}_{it}^2 + \delta_1 \tilde{Z}_i^1 + \delta_2 \tilde{Z}_i^2 + u_{it} \quad (3)$$

where  $\tilde{Y}_{it}$  denotes the transformation for a variable  $\tilde{Y}_{it} = Y_{it} - \phi_i \bar{Y}_{it}$ ; with  $\bar{Y}_{it} = \frac{1}{T} \sum_{t=1}^T Y_{it}$ .

This so-called quasi-differencing approach is equivalent to multiplying equation (3) by  $\Theta^{-1/2}$ , where  $\Theta_i = \text{Cov}(u_{it}, X_{it}, Z_i)$  is the covariance matrix of equation (3). Finally, to obtain the HT estimator  $\hat{\beta}_{HT}$ , the transformed regression again is estimated by pooled 2SLS employing the individual means over time of the time-varying regressors and the exogenous time-invariant regressors as instruments.

The HT estimator is more efficient than FE estimator, if the total number of time-varying exogenous variables  $X_{it}^1$ , that serve as instruments has to be at least as large as the number of time invariant exogenous variables  $Z_i^2$ ; that is  $k_1 \geq g_2$ , if  $k_1 > g_2$ , the model is overidentified; the HT estimator obtained from a 2SLS regression is more efficient than the FE estimator (see Baltagi, 2005).

In contrast, if  $k_1 < g_2$ , the model is underidentified; the HT estimator cannot estimate and the HT estimator of  $\beta$  is identical to the FEM.

### Fixed Effects Vector Decomposition

Recall the data-generating process (DGP) of a FE model with time-invariant variables:

$$Y_{it} = \alpha + \sum_{k=1}^K \beta_k x_{kit} + \sum_{m=1}^M \gamma_m z_{mi} + \mu_i + \varepsilon_{it} \quad (1)$$

where the “x” variables are time-varying and the “z” variables are assumed to be time invariant,  $\mu_i$  denotes the N -1 unit-specific effects (FE) of the DGP,  $\varepsilon_{it}$  is the independent and identically distributed error term,  $\alpha$  is the intercept of the base unit, and  $\beta$  and  $\gamma$  are the parameters to be estimated.

In the first stage, the FEVD procedure estimates a standard FE model. The FE transformation can be obtained by first averaging equation (1) over T:

$$\bar{Y}_i = \alpha + \sum_{k=1}^K \beta_k \bar{x}_{ki} + \sum_{m=1}^M \gamma_m z_{mi} + \mu_i + \bar{\varepsilon}_i \quad (2)$$

Where

$$\bar{Y}_i = \frac{1}{T} \sum_{t=1}^T y_{it} ; \bar{x}_{ki} = \frac{1}{T} \sum_{t=1}^T x_{kit} ; \bar{\varepsilon}_i = \frac{1}{T} \sum_{t=1}^T \varepsilon_{it}$$

and  $\varepsilon$  stands for the residual of the estimated model. Then equation (2) is subtracted from equation (1). This transformation removes the individual effects  $\mu_i$  and the time-invariant variables  $z$ . We get

$$\begin{aligned} Y_{it} - \bar{Y}_i &= \beta_k \sum_{k=1}^K (x_{kit} - \bar{x}_i) + \gamma_m \sum_{m=1}^M (z_{mi} - z_{mi}) + (\mu_i - \mu_i) + (\varepsilon_{it} - \bar{\varepsilon}_i) \\ &\equiv \check{Y}_{it} = \beta_k \sum_{k=1}^K \check{x}_{kit} + \check{\varepsilon}_{it} \end{aligned} \quad (3)$$

With  $\check{Y}_{it} = Y_{it} - \bar{Y}_i$ ;  $\check{x}_{kit} = x_{kit} - \bar{x}_i$ , and  $\check{\varepsilon}_{it} = (\varepsilon_{it} - \bar{\varepsilon}_i)$  denoting the demeaned variables of the within transformation. We run this FE model with the sole intention to obtain estimates of the unit effects  $\hat{\mu}_i$ . At this point, it is important to note that the “estimated unit effects”  $\hat{\mu}_i$  do not equal the unit effects  $\mu_i$  in the DGP. Rather, these estimated unit effects include all time-invariant variables, the overall constant term, and the mean effects of the time-varying variables  $x$  or, in other words,

$$\hat{\mu}_i = \bar{Y}_i - \sum_{k=1}^K \beta_k^{FE} \bar{x}_{ki} - \bar{\varepsilon}_i \quad (4)$$

where  $\beta_k^{FE}$  is the pooled-OLS estimate of the demeaned model in equation (3). This  $\hat{\mu}_i$  includes the unobserved unit-specific effects as well as the observed unitspecific effects  $z$ , the unit means of the residuals  $\bar{\varepsilon}_i$ , and the time-varying variables  $\bar{x}_{ki}$ , whereas  $\mu_i$  only accounts for unobservable unit-specific effects. In stage 2, we regress the unit effects  $\hat{\mu}_i$  from stage 1 on the observed time-invariant and rarely changing variables the  $z$  variables (see equation (5)) to obtain the unexplained part  $h_i$  (the residual from regressing the unit-specific effect on the  $z$  variables). In other words, we decompose the estimated unit effects into two parts, an explained and an unexplained part, which describe  $h_i$ :

$$\hat{\mu}_i = \sum_{m=1}^M \gamma_m z_{mi} + h_i \quad (5)$$

The unexplained part  $h_i$  is obtained by computing the residuals from equation (5):

$$h_i = \hat{\mu}_i - \sum_{m=1}^M \gamma_m z_{mi} \quad (6)$$

As we said above, this crucial stage decomposes the unit effects into an unexplained part and a part explained by the time-invariant variables. We are solely interested in the unexplained part  $h_i$ .

In stage 3, we rerun the full model without the unit effects but include the unexplained part  $h_i$  of the decomposed unit FE vector obtained in stage 2. This stage is estimated by pooled OLS.

$$Y_{it} = \alpha + \sum_{k=1}^K \beta_k x_{kit} + \sum_{m=1}^M \gamma_m z_{mi} + \delta h_i + \varepsilon_{it} \quad (7)$$

By design,  $h_i$  is no longer correlated with the vector of the  $z$  variables. If the time-invariant variables are assumed to be orthogonal to the unobserved unit effects—i.e., if the assumption underlying our estimator is correct—the estimator is consistent. If this assumption is violated, the estimated coefficients for the time-invariant variables are biased, but this bias is of course just the normal omitted variable bias. Yet, given that the estimated unit effects  $\hat{\mu}_i$  consist of much more than the real unit effect  $\mu_i$  and since we cannot disentangle the true elements of  $\mu_i$  from the between variation of the observed and included variables, researchers necessarily face a choice between using as much information as possible and using an unbiased estimator. The FEVD procedure thus gives as much power as possible to the available variables unless the within variation is sufficiently large to guarantee efficient estimation.



## RÉSUMÉ

Dans cette thèse, nous discutons la relation entre les exportations et l'IDE, et tentons de trouver une relation de long terme entre ces variables. Dans cette analyse, nous étudierons tout d'abord de manière empirique les déterminants des exportations et des l'IDE, à la fois au niveau micro et macro. Ceci nous permettra par la suite de détecter plus précisément la relation entre ces deux variables. Plus précisément, cette thèse comporte les points suivant : Au niveau micro (niveau de la firme), les multinationales sont susceptibles de mettre en œuvre les deux activités (exportations et IDE) pour servir les marchés étrangers, mais les choix stratégiques des multinationales permettent aussi de choisir entre exportations et IDE. Sur ce point, la productivité des entreprises multinationales ainsi que leurs autres caractéristiques ont un rôle crucial pour éclairer le mécanisme de choix entre les stratégies et la relation entre exportations et investissements. Ceci fera l'objet de la première partie qui proposera une application au cas français. Dans cette partie, nous distinguerons également les décisions stratégiques en fonction de la taille de l'entreprise (très grandes ou grandes entreprises françaises). Au niveau macro, nous chercherons à identifier les déterminants simultanés des exportations et des IDE. Pour se faire, un système gravitaire dynamique bivarié sera estimé afin d'éclairer le rôle de ces déterminants et la relation entre exportations et IDE. Ceci fera l'objet de la seconde partie, qui sera appliquée aux échanges entre la France et dix partenaires euro-méditerranéens. Le choix de ces pays s'appuie sur l'importance qu'ils revêtent dans les échanges français. Par ailleurs, l'absence de littérature appliquée à ces pays dans ce domaine constitue une motivation supplémentaire.

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**Mots-clé** : Investissement direct étranger (Foreign direct investment), les exportations (exports), les différences de la productivité (productivity differences), le choix stratégique des multinationales (multinationals strategy choice), économétrie de la gravité en panel dynamique (dynamic gravity panel econometrics), modèle bivarié probit (bivariate probit model). D22, F14, 21 and 23 ; C32 and 33.