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Heterogeneous Firms and Foreign Direct Investment Strategies

Charlie Joyez

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Charlie Joyez. Heterogeneous Firms and Foreign Direct Investment Strategies. Economics and Finance. Université Paris sciences et lettres, 2017. English. NNT : 2017PSLED061 . tel-01869031

HAL Id: tel-01869031

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THÈSE DE DOCTORAT

de l'Université de recherche Paris Sciences et Lettres
PSL Research University

Préparée à l'Université Paris-Dauphine

Heterogeneous Firms and Foreign Direct Investments
Strategies.

École Doctorale de Dauphine — ED 543

Spécialité Sciences économiques

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L'Université Paris-Dauphine n'entend donner aucune approbation ni improbation aux opinions émises dans les thèses ; ces opinions doivent être considérées comme propres à leurs auteurs.

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“If all this causes headaches for those nostalgic for the old time parables of neoclassical writing, we must remind ourselves that scholars are not born to live an easy existence. We must respect, and appraise, the facts of life.”

- PAUL A. SAMUELSON (1966)

“The orthodox teaching started from the individual’s propensity to barter; deduced from it the necessity of local markets, as well as of division of labor; and inferred, finally, the necessity of trade, eventually of foreign trade, including even long-distance trade. In the light of our present knowledge we should almost reverse the sequence of the argument: the true starting point is long- distance trade (...)

External trade is, originally, more in the nature of adventure, exploration, hunting, piracy, and war than of barter.”

- KARL POLANYI (1944)

Remerciements

Bien que la rédaction d'une thèse de doctorat comporte son lot d'heures de travail solitaires, "l'aventure" de la thèse, est indéniablement une histoire collective. Ainsi je tenais à remercier tous ceux qui l'ont rendue possible, et m'ont permis de la mener à bien. En premier lieu, je remercie mon directeur de thèse, El Mouhoub Mouhoud, pour avoir accepté d'encadrer ce projet. Outre ses précieux conseils, sa bienveillance et sa confiance répétée en mes intuitions et mes capacités, il a constamment nourri ma curiosité sur tant d'autres sujets économiques. C'est sans conteste une qualité essentielle pour la recherche, et je lui en sais gré. Je remercie évidemment l'ensemble du jury pour avoir accepté d'évaluer ces travaux, et tout particulièrement mes deux rapporteurs, Gregory Corcos et Flora Bellone, pour les excellents commentaires lors de la pré-soutenance. Je remercie également Jörn Kleinert d'avoir fait le déplacement depuis Graz, ainsi que Jean-Marc Siroën, qui m'a le premier présenté de nombreux thèmes approfondis dans cette thèse.

Puisqu'une grande partie de cette thèse s'est déroulée en CIFRE, je remercie Pramex International, et plus particulièrement André Lenquette, pour la confiance et la grande liberté qu'ils m'ont accordés lors de ces plus de trois ans en entreprise qui furent particulièrement enrichissants. Aussi, je tenais à remercier Frédéric Peltrault, qui m'a présenté ce contrat CIFRE, et accompagné lors des premiers mois de cette thèse, notamment pour obtenir les données du CASD. Ses conseils et ses encouragements tout au long de la thèse ont été précieux. Enfin, je tenais tout particulièrement à saluer Ivan Ledezma pour son intérêt répété pour mes travaux, son aide, ses conseils et sa disponibilité constante, malgré sa titularisation à Dijon et un séjour au Chili. Il m'a aussi transmis son goût pour la théorie et la modélisation, et je l'en remercie. Le premier chapitre de cette thèse notamment, lui doit beaucoup. J'espère que notre collaboration continuera après cette thèse.

Je suis surtout reconnaissant envers tous ceux sans qui ces quatre années n'auraient pas été aussi agréables et enrichissantes. Je pense en particulier aux autres doctorants de Dauphine, parmi lesquels Thao, Catherine, Mélanie et Kilian, qui m'ont invités les premiers à partager leur bureau en P.155, mais aussi tous ceux qui suivirent, et ceux des bureaux voisins : Marine, avec laquelle j'ai partagé le stress de la fin de thèse, Geoffrey, Mohamad, Yaganneh, Karine, Bjorn, Nina, Marion, Pierre-Hernan, Homero, Sandra, Leslie, Zied, Lexane et tous les autres. Au même titre, je tiens à saluer mes anciens collègues de Pramex International, à l'étranger (Diego, Catherine), et surtout ceux des locaux parisiens : Laura, Laure, Virginie, Frank, Nicolas et Jean-Luc. Je pense également à certains collègues professeurs de Dauphine, outre ceux mentionnés plus haut, dont Florence et Aude, avec qui j'ai partagé mes premières années d'enseignement, et dont j'ai apprécié le sens de l'organisation.

Enfin, je me devais de remercier tous mes proches, qui par leur présence, leur soutien et leur intérêt m'ont accompagnés durant ces quelques années. Je remercie aussi ceux qui ont eu la délicatesse de ne

Remerciements

pas m'avoir posé trop de questions au sujet de ma thèse, malgré leur curiosité. Un grand merci donc à mes amis, et notamment à Maxime et Aranone pour leurs relectures ; à ma famille en général (j'y inclus évidemment ma belle famille), et à mes parents, ma soeur Anaïs et mon frère Jules en particulier. Enfin, ma gratitude et bien plus encore, vont à Bertille pour avoir traversé avec moi ces années.

Introduction Générale

“Although the general role of multinationals in globalization is well recognized, what seems less noted is that these firms display a wide range of expansion strategies”

Hanson, Mataloni Jr, and Slaughter (2001)

“Although there are several papers exploring the importance of firm heterogeneity models in the structure of international trade, little has been done to investigate whether this body of theory improves our understanding of the aggregate structure of multinational activity.”

Yeaple (2009)

1 Panorama Général

Tout le monde peut observer que des entreprises domestiques, exportatrices et multinationales coexistent dans presque tous les secteurs économiques. La compréhension de ce constat a grandement bénéficié du développement des modèles de firmes hétérogènes depuis le début des années 2000 (Melitz, 2003; Bernard et al., 2003). Ces derniers avancent que les entreprises s’auto-sélectionnent dans l’une ou l’autre des catégories, selon leur capacité à amortir les coûts fixes. Ceux-ci étant croissants avec le niveau d’internationalisation, l’assignation de chaque entreprise dépendra alors directement de sa capacité à amortir ces coûts, déterminée par sa productivité. L’accès croissant à des données individuelles de firmes a contribué à la popularité de cette représentation, puisque la quasi-totalité des études menées dans plusieurs pays vérifient cette hypothèse, comme le montre déjà la revue de littérature de Greenaway and Kneller (2007) sur au moins six pays. Des études postérieures rejoignent ces résultats, notamment celle menée par Engel and Procher (2012) sur des données françaises. Ces articles insistent sur les différences de productivité moyenne entre les entreprises domestiques et exportatrices, pour vérifier les prédictions de Melitz (2003), mais également entre exportatrices et multinationales ainsi que le soulignent Helpman et al. (2004). Cependant, en détaillant ce qui distingue les entreprises de chaque groupe, ces travaux ont souvent négligé l’hétérogénéité restante au sein de chaque catégorie. Or nous pensons que des cadres similaires pourraient expliquer les différentes stratégies d’internationalisation des firmes multinationales.

Avant de présenter la contribution de la présente thèse à l'analyse de l'hétérogénéité entre multinationales, nous devons procéder à deux rappels importants sur le contexte dans lequel s'inscrit ce travail, pour en saisir l'importance. Le premier concerne la place qu'occupent actuellement ces entreprises dans les échanges économiques internationaux ; le second, l'évolution de leur prise en compte dans la littérature économique.

1.1 L'essor des multinationales en France et dans le monde

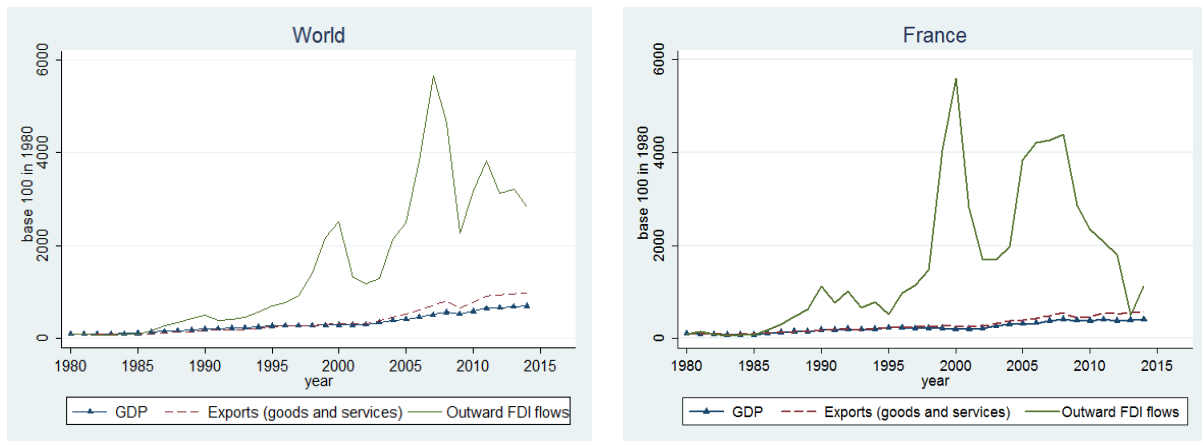
Les entreprises multinationales sont au coeur de l'économie contemporaine, aussi bien dans son fonctionnement – La CNUCED (2011) évalue à 80% la part du commerce mondial dans laquelle sont impliquées les firmes multinationales –, qu'au coeur des débats publics. Ainsi, deux professeurs de Harvard et du Massachusetts Institute of Technology (MIT) ont qualifié ces entreprises de *Léviathans* dans un livre au titre éponyme (Chandler and Mazlish, 2005). L'image est particulièrement bien choisie puisque qu'elle renvoie tout d'abord à un gigantesque monstre, dont la taille reflète l'importance, incontournable aujourd'hui; et le côté monstrueux est conforme à une certaine représentation des multinationales, courante dans le débat public, où elles ne bénéficient pas d'une bonne image¹. Plus intéressant encore, par analogie avec le titre de l'oeuvre de Thomas Hobbes (1651), le Léviathan renvoie surtout à une large structure organisée, fondée sur le contrat entre ses parties, mais dont la structure n'est pas visible de prime abord². Les multinationales, entités privées pour l'essentiel, demeurent souvent rétives à la transparence. Leurs comportements, leurs choix et leurs stratégies précises restent alors largement méconnus. L'échec en 2016 de la disposition de la loi "Sapin II" visant à obliger les multinationales françaises à déclarer leur profits par pays d'implantation (et non plus seulement au niveau du groupe consolidé) en apporte une illustration.

Dès lors, les firmes multinationales, sont uniquement définies par leur seule caractéristique commune observable: la détention d'au moins une entité à l'étranger, et sont en cela les principaux pourvoyeurs d'Investissements Directs à l'Etranger (IDE). C'est à travers ces flux qu'elles créent -ou recapitalisent- leurs filiales à l'étranger. Comme le montre la figure 1, soulignons que ces IDE représentent les flux internationaux en plus forte croissance en France comme pour l'ensemble du monde, ce qui donne une indication de l'importance des multinationales dans la mondialisation actuelle.

De même, au niveau mondial, le ratio des ventes locales réalisées par les filiales à l'étranger rapporté au volume des exportations de biens et services est passé de 0.89 en 1990 à 1.38 en 2015 (tableau 1). Ce ratio a même particulièrement augmenté au cours de ces toutes dernières années. En schématisant, nous pourrions donc dire que la façon la plus courante pour une entreprise d'atteindre un marché étranger n'est donc plus l'exportation, mais la vente locale à travers ses filiales. Ces filiales à l'étranger créent également 10% de la valeur ajoutée mondiale, part qui a doublé en 25 ans.

1. Voir Philippe Escande, *L'opinion publique, alliée des Etats contre les multinationales*, dans « Le Monde », 28 juin 2016.

2. La métaphore pourrait être filée plus longuement, en abordant l'état de nature (de guerre) dans lequel se trouvent les individus avant l'émergence du Léviathan, dont la création vise à sortir de cet état de guerre. Ainsi les auteurs insinuent que les multinationales cherchent à échapper à la concurrence, ce dont nous reparlerons en section (1.2).



Base 100 en 1980, dollars courants. Exportations de Biens & Services. Source : Banque Mondiale, World Development Indicators

Figure 1 – Production, exportations et investissements à l'étranger, dans le monde et en France, 1980-2014

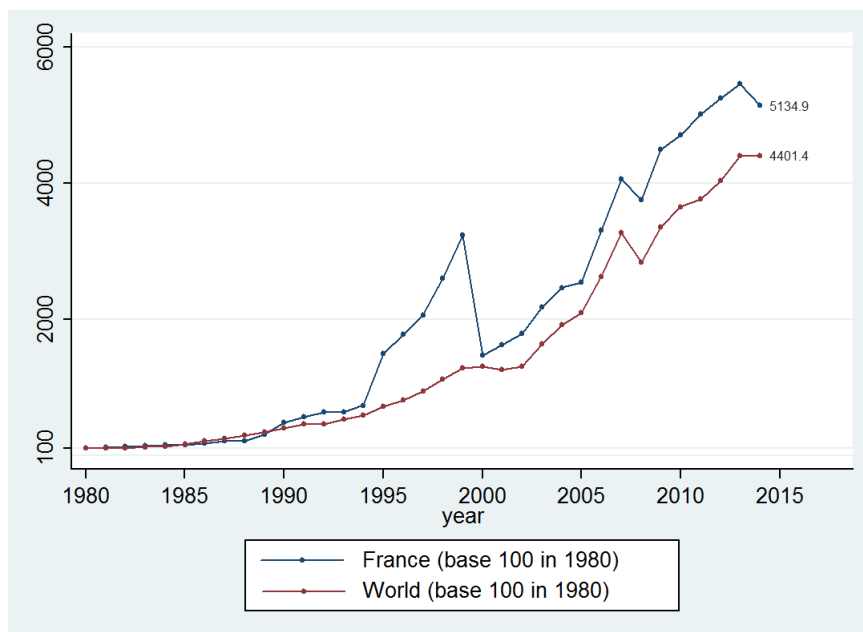
Si le rôle joué par les multinationales s'est accru dans les flux internationaux de biens et de capitaux, c'est aussi car elles sont plus nombreuses qu'auparavant. Bien que le décompte des firmes multinationales sur l'ensemble de la planète ne soit pas aisé, la Commission des Nations-Unies pour le Commerce Et le Développement (CNUCED), estime qu'elles ont été multipliées par dix en quarante ans, passant de 8000 multinationales dans le monde à la fin des années 1960, à plus de 80000 en 2006. La croissance a été particulièrement rapide sur la fin de la période puisque plus de la moitié de cette augmentation a eu lieu entre 1993 et 2006 (UNCTAD, 2007). La CNUCED a cessé son estimation du nombre de multinationales après l'édition 2007 de son rapport annuel sur l'investissement dans le monde. Cependant, nous pouvons présumer sans risques que le nombre de multinationales sur la planète s'est encore largement accru et a déjà dépassé de loin la centaine de milliers depuis la dernière estimation datant de 2006. En effet, nous savons d'une part que les IDE mondiaux sont repartis à la hausse après la crise financière de 2007-2009, dépassant dès 2010 leurs niveau de 2008. D'autre part,

	1990	2005-2007 (moy. pré-crise)	2013	2014	2015
Sales of foreign affiliates	5 101	20 355	31 865	34 149	36 668
Value added of foreign affiliates	1 074	4 720	7 030	7 419	7 903
Local sales of foreign affiliates	3 657	15 379	24 396	26 461	28 865
GDP	22 327	51 288	75 887	77 808	73 152
Exports of goods & services	4 107	15 034	23 158	23 441	20 861
Local sales foreign aff. / Exports	0.89	1.02	1.05	1.13	1.38
Value added foreign aff. / GDP	0.048	0.092	0.093	0.095	0.108

Source : UNCTAD (2016); calculs de l'auteurs. Toutes les valeurs sont en milliards de dollars courants.

Table 1 – Production internationale et Investissements directs à l'étranger

des tendances nationales – comme le nombre de multinationales françaises – témoignent d’une forte augmentation de multinationales locales sur la fin de la décennie 2000, passant en France d’environ 2200 en 2005 à 3000 en 2011, d’après l’enquête *Liaisons Financières* (LiFi) de l’INSEE.



Source : CNUCED; calculs de l’auteur

Figure 2 – Outward Foreign Direct Investments stocks (1980-2014)

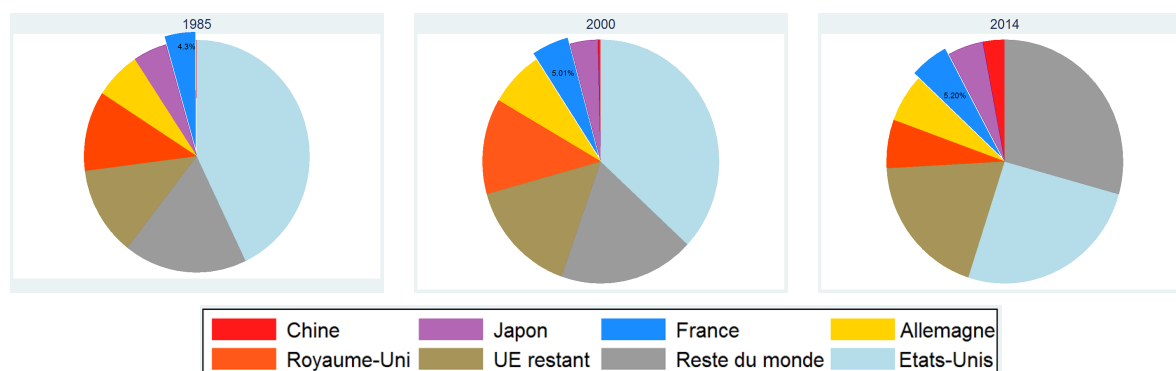
	1980-89	1990-99	2000-2009	2010-14	1980-2014
France	13.34	23.59	13.24	2.18	12.28
United States	16.21	16.26	5.39	7.06	10.45
World	14.75	13.68	12.62	4.77	11.77

Source : CNUCED; calculs de l’auteur

Table 2 – Annual average growth rate of outward FDI stock (in %)

La position de la France est particulièrement intéressante, puisque son rythme d’investissements à l’étranger a crû plus rapidement que le rythme mondial (cf. figure 2). Le stock d’IDE sortant français a fortement augmenté et s’est détaché du rythme de croissance du reste du monde au milieu des années 1990, soit un peu plus tardivement que les États-Unis, qui avaient un rythme de croissance des IDE supérieur au rythme français dans les années 1980, avant que cela ne s’inverse. Depuis 1980, la France a même connu un taux de croissance annuel moyen des IDE sortants supérieur au rythme américain (tableau 2). Cette croissance des IDE français, plus élevée que celle du reste du monde, s’est traduite par une légère augmentation de la part du stock d’IDE français dans le monde, passant de 4,3% en 1985 à 5,20% en 2014. Si cette part semble faible, elle est toutefois plus importante que la contribution de la France au PIB mondial (inférieure à 4%). En outre, durant ces trente années de mondialisation, la France a fait mieux que défendre sa part dans le stock mondial d’investissements à l’étranger, quand la plupart des autres grands pays voyaient leur importance relative diminuer, comme l’illustre la figure 3. Soulignons également la diversification géographique des pays d’origine

des IDE, avec la part croissante du reste du monde sur cette figure.



note : UE à 25 pays; la valeur de l'Allemagne en 1985 correspond à la valeur de la RFA.

Source : CNUCED, calculs de l'auteur.

Figure 3 – Part des stocks d'IDE sortant, par pays d'origine

1.2 L'incorporation des firmes multinationales dans les modèles de commerce international

Au regard de ces développements, la considération portée aux multinationales dans la littérature économique a logiquement évolué. Les premiers travaux considérant des mouvements internationaux de capitaux ne distinguaient pas formellement les IDE des autres types de transferts de capitaux que peuvent être les investissements de portefeuille (de court terme, à des fins spéculatives), ni même des crédits bancaires. Dans le modèle développé par Mundell (1957) notamment, ces mouvements conduisaient à l'égalisation internationale des taux d'intérêts. Une telle conception des flux de capitaux, dans un environnement de concurrence parfaite, de préférences et de technologies identiques entre pays, ne permet pas d'introduire les firmes multinationales comme des acteurs importants, ou du moins ne leur laisse aucun rôle particulier, si bien qu'elles n'étaient même pas représentées dans ce modèle. Assez rapidement pourtant, il a semblé incontournable d'étudier les firmes multinationales et leurs choix d'investissements à l'échelle micro-économique pour expliquer les flux d'IDE. Pour ce faire, il a été nécessaire d'introduire des imperfections de marché, au moins temporaires, pour expliquer le développement de telles entreprises, comme l'explique Kleinert (2004).

La littérature managériale a été la première à modéliser le comportement des multinationales, en introduisant des monopoles temporaires, notamment grâce à la contribution de Vernon (1966) et sa théorie du cycle du produit. L'entreprise, après avoir innové puis subi la concurrence d'entreprises copiant son produit, s'engage dans un investissement à l'étranger, dans un pays à plus faibles coûts de production pour conserver un avantage compétitif sur son marché. Par la suite certaines extensions du modèle de Vernon ont été développées, en insistant notamment sur l'évolution des avantages comparatifs des pays, expliquant comment les changements structurels des pays entraînent des IDE en cascade vers d'autres pays. Particulièrement adaptés au contexte asiatique puisque empruntant

également à la théorie dite du “vol des oies sauvages” (Akamatsu, 1962), ces modèles expliquent les IDE motivés par des avantages comparatifs, principalement depuis des pays développés vers des pays en développement.

Toujours ancrée dans la littérature managériale, l’approche dite “éclectique” des multinationales développée par Dunning (1977) pose trois conditions qui doivent être vérifiées pour que l’entreprise devienne une firme multinationale, et procède donc à un IDE. Ces trois conditions sont un avantage de propriété (*Ownership*), de localisation (*Location*) et d’internalisation (*Internalization*) d’où l’acronyme “OLI” sous lequel est également connue cette approche. Un investissement à l’étranger n’est profitable uniquement lorsque l’entreprise possède un actif spécifique, transférable sans coût de congestion, qui lui confère un avantage sur ses concurrents sur place. Un tel avantage est souvent associé à la détention d’une technologie de production innovante, et rejoint en cela les modèles précédents en sortant d’un cadre de concurrence pure et parfaite, pour se rapprocher des modèles de concurrence monopolistique. Ensuite vient le choix du pays d’implantation. Celui-ci doit présenter un avantage tant par rapport au pays domestique que par rapport aux autres localisations possibles. Enfin, l’entreprise doit avoir un intérêt à garder cette étape de production en interne, et non pas la confier à un fournisseur ou sous-traitant étranger. Ce dernier point est repris comme l’élément central du dilemme d’intégration (faire soi-même ou se procurer par le marché) détaillé dans l’approche des coûts de transaction dont les racines remontent jusqu’à la théorie de la firme développée par Coase (1937) puis Williamson (1979). Une entreprise décide d’intégrer une étape de production du produit si cela lui coûte moins que de passer par le marché. Les coûts de transaction, notamment ceux liés à la coordination des deux entités, jouent alors un rôle crucial dans le choix d’intégrer ou non l’opération à l’étranger au sein de l’entreprise mère.

Ces deux dernières approches insistent sur des imperfections de marché et présentent un cadre de concurrence imparfaite qui explique l’émergence des multinationales. Sans ces imperfections de marché, les entreprises n’ont aucun intérêt à devenir trans-nationales. Les multinationales, et par conséquent les IDE, ont par la suite été intégrées au modèle de référence en commerce international avec une concurrence imparfaite, à savoir le cadre théorique développé par Krugman (1980) où les entreprises réalisent un arbitrage entre proximité et concentration. Sa structure de marché avec concurrence monopolistique correspond assez bien à l’avantage d’*ownership* du paradigme OLI, et l’idée même d’arbitrage entre concentration et proximité suppose des coûts de transaction. Krugman lui-même incorpore les multinationales en modifiant son modèle à la marge (Krugman, 1983); puis Brainard (1993) reprend cette idée pour étudier les firmes multinationales et les investissements directs à l’étranger. Dans cette conception, des firmes multinationales apparaissent et réalisent des investissements à l’étranger si les gains que la firme obtient en étant sur place (moins de coûts de transport et de douanes notamment) font plus que compenser les pertes d’économies d’échelle liées à la centralisation la production en un point. Le modèle ne raisonne qu’au niveau d’une branche, et le choix sera donc influencé par des paramètres propres à ce secteur (notamment les comportements de demande des consommateurs), et par la taille des firmes. Kleinert (2004) propose une généralisation

de ces modèles dans des environnements plus généraux, avec notamment des pays asymétriques ou plusieurs secteurs. Ces modèles issus de l'arbitrage proximité-concentration de Krugman (1979) ou Brainard (1993) expliquant l'apparition des multinationales dans un cadre de concurrence imparfaite, ne sont valables que pour les flux d'IDE entre pays aux niveaux de développement similaires, et particulièrement adaptés en réalité aux flux croisés d'IDE entre les Etats-Unis et les pays de l'Union Européenne.

Bien que les flux d'IDE entre pays développés soient majoritaires, des études alternatives se sont intéressés aux les flux d'IDE Nord-Sud, avec comme première approche la théorie de proportion des facteurs (Helpman, 1984, 1985). Ces théories élargissent aux IDE les modèles de commerce international à deux pays, deux biens et deux facteurs, où les prix d'autarcie, déterminés par les dotations factorielles relatives, convergent au libre-échange. Dans le cas de pays trop différents, une spécialisation complète d'un ou des pays ne suffit pas pour obtenir une égalisation internationale du prix des biens. Alors les IDE sont un moyen de parvenir à cette égalisation, à travers une réallocation internationale du facteur de production qu'est le capital. Ces IDE sont motivés par les salaires plus faibles dans le pays faiblement doté en capital. Ces modèles peinent pourtant à expliquer pourquoi ce transfert de capital se fait à travers les multinationales, notamment pour la raison avancée par Krugman (1995) : les multinationales ne s'adaptent pas bien à un cadre de concurrence pure et parfaite³. L'estimation empirique des modèles dits de "knowledge-capital" (Markusen, 1997) qui regroupent à la fois les explications de proximité-concentration et les hypothèses de proportion des facteurs, a par ailleurs rejeté cette dernière explication (Carr et al., 2001).

Une nouvelle approche pouvant expliquer les flux d'IDE, aussi bien Nord-Nord que Nord-Sud, s'est donc imposée plus récemment⁴. Cette approche s'inscrit dans le cadre de la théorie de la firme initiée par Coase (1937), et de son extension de la théorie des droits de propriété développée par Grossman and Hart (1986); Hart and Moore (1990); Hart (1995) qui ont donné leur nom à cette approche dite de Grossman, Hart & Moore (GHM). En reprenant l'hypothèse centrale d'incomplétude des contrats, les droits de propriété deviennent importants, puisqu'ils donnent à ceux qui les détiennent le pouvoir de décision pour tous les états du monde non spécifiés dans le contrat initial. Grossman and Helpman (2002) puis Antràs and Helpman (2004) ont appliqué ce cadre aux firmes multinationales et aux investissements à l'étranger, où l'intégration d'une étape de production à l'international est notamment motivée par l'incitation à récupérer les droits de propriété. Cette approche reste différente de l'explication proposée par Krugman (1983); Brainard (1993, 1997) ou encore Kleinert (2004), reposant sur l'arbitrage proximité-concentration.

Les tentatives de formaliser les multinationales et les flux d'IDE dans des cadres d'analyse théoriques se sont donc heurtées rapidement à l'impossibilité de créer un cadre homogène pour tous

3. "Multinationals fit awkwardly into perfect-competition trade theory." (Krugman, 1995).

4. Si les flux peuvent être Nord-Nord ou Nord-Sud, cette approche représente des IDE présentés comme "verticaux" en ce sens qu'il s'agit d'intégration "verticale", i.e. l'intégration d'une étape de production supplémentaire. Ce terme "vertical" est polysémique. L'intégration verticale peut être au Nord comme au Sud, et même "upward" ou "downward" selon qu'elle s'applique à une tâche en amont ou en aval de l'activité de la maison mère. Un IDE vertical dans ce sens est lié à une production fragmentée internationalement, mais coordonnée par le même groupe.

les investissements directs à l'étranger.

2 Hétérogénéité des multinationales et des IDE

Nous avons convenu que les firmes multinationales sont un acteur de premier plan de la mondialisation actuelle, mais que leur conception théorique dans des modèles de commerce international n'est que récente et peu harmonisée. Cela est certainement dû au fait que la catégorie "firmes multinationales" n'est construite que par opposition aux entreprises domestiques et importatrices / exportatrices. C'est donc une construction artificielle qui regroupe des entreprises et des pratiques d'internationalisation très différentes, qui méritent d'être détaillées ici.

La question de l'hétérogénéité restante au sein de chacune de ces catégories de firme n'est pas complètement nouvelle, puisque quelques travaux notables ont déjà rendu compte de la grande concentration des exportations par une minorité d'acteurs – les "happy few" – (Mayer and Ottaviano, 2007). Entre autres résultats, les auteurs mettent en évidence le lien entre productivité des exportateurs, nombre de biens exportés et nombre de marchés visés. En France si seulement 9% des entreprises exportatrices réalisaient plus de 50% de leur chiffre d'affaires à l'étranger en 2003, celles-ci concentraient 49% des exportations françaises⁵. De même seuls 10% des exportateurs vendaient plus de 10 biens dans plus de 10 pays en 2003, mais ils concentraient plus des 3/4 des exportations françaises (76.3%).

Cependant, force est de reconnaître que les tests de différence de productivité totale des facteurs sont généralement limités à l'analyse inter-catégorielle, et non intra-catégorielle. C'est le cas pour l'une des premières études du genre, sur des entreprises irlandaises (Girma et al., 2004), ou les autres études listées dans Greenaway and Kneller (2007). En cela nous partageons le constat de Yeaple (2009) mis en exergue de cette introduction: les modèles de firmes hétérogènes se sont principalement intéressés à la compréhension du commerce international, mais peu à la compréhension des choix des firmes multinationales.

Dans cette littérature, seul l'article de Tomiura (2007) s'en démarque. Bien que les multinationales ne représentent que 3.3% de son échantillon de firmes japonaises, l'auteur distingue et compare quatre types de multinationales : celles qui sont seulement implantées à l'étranger (*I*), mais ne réalisent pas de commerce international, les exportatrices (*XI*), les importatrices (*OI*), et celles qui réalisent importations et exportations (*OXI*). Il rapporte des différences de productivité de l'ordre d'un tiers entre les types *I* (moins productives) et *OXI* (plus productives). Il analyse aussi que les multinationales seulement importatrices sont moins productives que celles qui sont seulement exportatrices.

A notre connaissance, c'est la seule étude qui révèle une variation systématique du niveau moyen

5. Leur échantillon n'est pas exhaustif, et concentre principalement des grandes entreprises.

de productivité entre catégories de multinationales⁶. Or, des trois catégories d'entreprises (domestiques, exportatrices et multinationales), les multinationales sont certainement le groupe qui abrite la plus grande diversité de pratiques, les combinaisons possibles d'implantation à l'étranger étant exponentielles, mais également la plus grande diversité entre ses membres. Cette plus grande hétérogénéité est en effet une conséquence logique de l'hypothèse souvent vérifiée de la distribution de la productivité selon une loi de puissance. La variance observée en fin de distribution est plus grande que celle observée au début de celle-ci.

En croisant les données des enquêtes EAE-industrie et LiFi de l'INSEE, nous identifions pour 2007 15,143 entreprises industrielles purement domestiques (79,4% du total), 3,177 firmes exportatrices (16,7%) et 743 multinationales (3,9%). Non seulement la productivité des firmes multinationales est plus élevée en moyenne que celle des exportateurs⁷ et des firmes domestiques, mais surtout plus dispersée comme le révèle la figure 4.

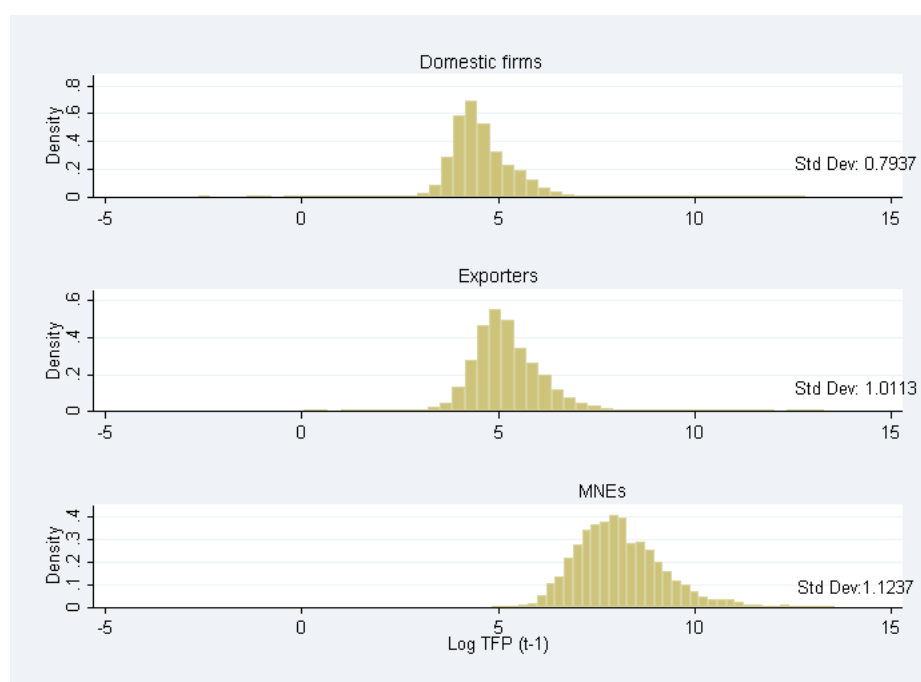


Figure 4 – Productivité des multinationales françaises par statut - 2007

Cette grande disparité s'inscrit dans une tendance où les divergences de productivité entre entreprises s'accroissent comme le souligne le récent rapport de l'OCDE sur le sujet (Berlingieri et al., 2017). En reprenant une des mesures de la dispersion qu'ils utilisent (le ratio du 90^{ème} centile sur le 10^{ème}), nous partageons leur constat sur la période observée (2001-2007), avec un passage de ce ratio de 1.71 à 2.28. Le niveau de dispersion et son augmentation étant plus marqués pour les multinationales, il convient de mieux étudier leurs différences et leurs conséquences pour anticiper les effets de la propagation de cette dispersion à l'ensemble des entreprises. De plus leur constat souligne les tendances divergentes entre les grandes entreprises et les plus petites. Il est alors légitime de se de-

6. A l'exception notable de Raff et al. (2006) qui testent la différence de productivité entre les multinationales détenant des joint-ventures ou des filiales en propre.

7. Définis ici comme les entreprises exportant plus de 5 000 euros sur l'année.

mander si les choix d'internationalisation entre les différents types de multinationales sont également divergeants.

En effet, le qualificatif de “mutlinationales” recouvre des profils d'entreprises extrêmement variés, lié à cette grande variabilité de la productivité des multinationales. Tout d'abord, leur degré d'internationalisation est loin d'être uniforme, le nombre de pays d'implantation allant de 1 à 60 dans notre échantillon. La moyenne (4,35) étant largement supérieure à la médiane (2), on a alors une distribution concentrée à gauche, retrouvant ainsi les “happy few” de Mayer and Ottaviano (2007), c'est-à-dire quelques grands groupes avec une vaste implantation internationale, et une grande partie (46.87%) avec un seul pays d'implantation (c.f. tableau (3)).

Nombre de filiales à l'étranger	1	2	3	4	5	6	7	8	9	10+
Proportion de multinationales	44.74%	17.04%	7.86%	7.72%	3.86%	2.66%	2.13%	2.40%	1.07%	9.59%
Nombre de pays d'implantation (hors France)	1	2	3	4	5	6	7	8	9	10+
Proportion de multinationales	46.87%	17.98%	8.26%	7.06%	3.33%	2.53%	2.26%	2.13%	0.67%	8.92%

Table 3 – Répartition du nombre de filiales et de pays d'implantation

Ensuite, le profil des multinationales française est bien loin de l'image souvent véhiculée. En suivant les critères d'effectifs et de Chiffre d'Affaires (CA) du décret 2008-1354 du 18 décembre 2008 (Loi de Modernisation de l'Économie), définissant catégories de Petite et Moyenne Entreprise (PME), d'Entreprise de Taille Intermédiaire (ETI) et de Grandes Entreprises (GE)⁸, nous notons que plus de la moitié des multinationales françaises sont en réalité des PME (cf. table 4)⁹.

	Proportion (firmes)	Proportion (filiales)	moy. filiales/firme
PME	52.22%	23.20%	1.8
ETI	44.28%	64.29%	6.10
GE	3.50%	12.51%	15.0

Lecture : 52.22% des multinationales françaises sont des PME, mais elles ne détiennent que 23.20% des filiales françaises hors de France, et ont en moyenne 1,8 filiales à l'étranger.

Table 4 – Statut des multinationales françaises (2007)

Logiquement les plus grandes multinationales en France sont celles qui bénéficient aussi d'un plus large réseau d'implantation à l'étranger, avec en moyenne 15 filiales pour les Grandes Entreprises, contre moins de deux pour les PME, ce qui explique que la part des PME multinationales parmi les filiales françaises à l'étranger soit plus de deux fois moins importante que leur part parmi les maisons mères.

Les écarts entre les caractéristiques domestiques des multinationales selon leur catégorie de taille sont très marqués, avec une différence de presque 1 à 100 pour l'effectif moyen entre les PME et GE multinationales (tableau 5), et un écart encore plus marqué pour le CA moyen, puisque le rapport est de plus de 340. Nous constatons donc que le rapport CA/effectif est 3.7 fois plus grand pour les grandes entreprises que pour les PME, et déjà de l'ordre de 1.5 fois plus grand pour les ETI. Ces

8. PME : Moins de 250 salariés et moins de 50 millions de CA et moins de 43 millions de bilan. ETI : moins de 5000 salariés, et moins de 1 500 millions de CA et moins de 2 milliards d'euros de bilan. GE : Si un seuil est dépassé.

9. Les calculs ont été fait à partir des valeurs de la tête de groupe identifiée dans LiFi. Voir aussi Joyez (2015) in Rapport PME 2014.

2. HÉTÉROGÉNÉITÉ DES MULTINATIONALES ET DES IDE

	effectifs Fr. (moy.)	effectifs Fr. (med)	CA Fr. (moy. M€)	CA Fr. (med) M€
Ensemble	713	177	333.3	38.3
PME	97	82	18.8	15.8
ETI	778	494	223.3	123.0
GE	9 095	5 982	6 459.6	2 754.5

Lecture : La moitié des multinationales Françaises emploient moins de 177 salariés en France, et y réalisent moins de 38,3 millions d'euros de Chiffre d'Affaires. Ces valeurs sont respectivement de 82 salariés et 15.8 millions de CA pour les multinationales étant des PME.

Table 5 – Taille des multinationales françaises (2007)

indicateurs indiquent donc des différences de taille, mais également de productivité entre les différents types de multinationales.

Le tableau 6 souligne les différences de productivité totale des facteurs (PTF), qui suit comme attendu cette la taille des entreprises : les quelques multinationales les plus grandes et les plus internationalisées, sont également, et de loin, les plus productives.

Ce qui est d'autant plus marquant est que l'hétérogénéité domestique des multinationales semble se répercuter sur leurs choix d'internationalisation. Deux dimensions nous semblent particulièrement intéressantes. Tout d'abord, le choix de la structure organisationnelle – les PME ayant bien plus souvent recours aux Joint-Ventures –, mais également le choix de destination. Les multinationales les plus grandes et les plus productives sont celles qui s'implantent le plus dans les pays du Sud (tableau 6).

	moy. ln(PTF)	Proportion JV	Proportion OCDE
Ensemble	8.47	20.34%	71.86%
PME	7.71	30.78%	79.62%
ETI	9.13	16.47%	72.25%
GE	11.20	21.74%	55.24%

Lecture : Les multinationales qui sont des ETI ont en moyenne une ln(PTF) de 9.13. 16.47% de leurs filiales sont des JV, et 72.25% sont dans les pays de l'OCDE.

Table 6 – Caractéristiques des multinationales par groupes de taille.

La variabilité de l'internationalisation des multinationales, selon la taille du groupe, est confirmée pour l'ensemble des pays européens étudiés dans l'enquête Outward-FATS, utilisant des nomenclatures identiques pour tous les pays (calculées sur la taille du groupe international dans son ensemble, et non celle de la tête de groupe seulement). Là encore, la concentration du degré d'internationalisation rappelle celle des “happy few” exportateurs.

A vrai dire, le constat de cette variabilité dans l'internationalisation des multinationales, est assez ancien. Déjà Sullivan (1994) tentait de mesurer le degré d'internationalisation de 74 grands groupes américains, selon une moyenne pondérée de 5 indices (Vente à l'étranger / ventes totales ; actifs à l'étranger / total actif ; filiales à l'étranger / nombre de filiales ; Expérience internationale des top managers ; Dispersion internationale des opérations). Compte tenu de la petite taille de son échantillon et de sa composition (de grandes entreprises cotées américaines), il trouve une distribution normale de son indicateur, alors qu'une distribution plus concentrée en début de distribution aurait

été attendue pour être en phase avec les “happy few” révélés plus haut. En revanche, son indicateur permet de s’apercevoir qu’au sein d’une même industrie, plusieurs multinationales concurrentes peuvent malgré tout avoir des scores très différents, variant du simple au double. C’est notamment le cas dans l’industrie automobile, avec Chrysler obtenant un score de 0.94 (72^{ème} / 74), contre 1.88 (51^{ème}) pour General Motors, contre 2.14 (34^{ème}) pour Ford. Ainsi, les caractéristiques sectorielles ne suffisent pas pour prédire le degré d’internationalisation d’un groupe, ce qui justifie le recours aux modèles de firmes hétérogènes à la Melitz (2003) pour étudier ce phénomène, puisque la productivité totale des facteurs semble également être un élément déterminant de ce niveau d’internationalisation.

3 Contributions de la thèse

3.1 Objectifs

Cette thèse a explicitement pour objectif principal de décrire la multiplicité des stratégies d’implantation à l’international, souvent ignorée, et tâche d’en expliquer les origines en se focalisant sur les déterminants endogènes de ces choix, qui se révèlent cruciaux. A travers le terme stratégie, nous renvoyons au moins à trois dimensions des investissements directs à l’étranger que nous étudierons : (i) le mode d’entrée, (ii) le motif et (iii) l’interconnexion des filiales à l’étranger. Les résultats de ces trois analyses permettent de mettre en valeur le rôle joué par deux types de déterminants endogènes aux firmes multinationales : leur productivité et leur expérience à l’étranger. Bien que corrélées ces deux dimensions n’apportent pas les mêmes compétences aux entreprises. En cela cette thèse vise à rapprocher les littératures économiques et managériales, qui traitent toutes deux de ces questions, mais souvent sans prendre en compte les apports de l’autre.

Avant de restituer plus en détail les contributions de cette thèse sur chacun de ces trois thèmes, soulignons les enseignements généraux que nous pouvons tirer d’une meilleure compréhension des choix d’implantation à l’étranger. Tout d’abord, les multinationales sont en réalité un groupe très varié, et cette grande hétérogénéité se répercute sur tous les aspects des stratégies d’internationalisation. Ainsi il n’y a pas une seule façon de s’implanter à l’étranger, mais celle-ci dépend des caractéristiques de l’entreprise. Cette connaissance est particulièrement utile pour mieux structurer tous les dispositifs d’accompagnements à l’international, privés comme publics, quand cet objectif est récurrent dans le débat public¹⁰. Ensuite, bien que cela ne soit pas l’objectif premier de cette thèse, des considérations d’ordre politiques peuvent en être tirées. En effet, si la productivité est propre aux entreprises et que les leviers d’actions publics dessus sont pour le moins indirects, notons que l’expérience elle, peut se transmettre de façon non rivale entre les entreprises pour favoriser l’implantation internationale des groupes françaises, notamment hors de l’Union Européenne. En cela les initiatives de BPIFrance de s’adresser directement aux chefs d’entreprises en leur prodiguant des conseils et des

10. Cette thèse a été financée en partie à travers un contrat CIFRE par Pramex International, cabinet de conseil en implantation à l’étranger, intéressé au premier chef par ces questions. Plusieurs collaborations avec BPIFrance témoignent également de l’intérêt pour ces questions de leur part.

retours d'expérience sur l'internationalisation vont dans le bon sens¹¹.

Notons également, que ce travail vise également à enrichir les pratiques académiques, en utilisant de nouveaux outils d'analyses. Tout d'abord, en s'inspirant de ce que la littérature managériale peut apporter pour la compréhension des choix de structure organisationnelle. Ensuite, en considérant une double hétérogénéité des entreprises (chapitre 2), quand les modèles dominants en économie internationale n'en considèrent qu'une seule (en termes de productivité); et en traitant cette double hétérogénéité par une analyse de la supermodularité de la fonction de profit comme suggéré par Mrázová and Neary (2012). Enfin, le dernier chapitre montre l'apport que peut représenter l'analyse de réseaux dans l'étude des firmes multinationales.

Après ces considérations d'ordre général, détaillons les contributions de la thèse sur quelques questions plus précises.

3.2 Mode d'implantation et structure organisationnelle.

Le mode d'implantation des filiales étrangères, c'est-à-dire la structure capitalistique, et plus précisément leur taux de détention par la multinationale, est une question de première importance pour les entreprises qui souhaitent investir à l'étranger. L'entreprise doit-elle s'allier avec un partenaire local ? Le racheter entièrement ? Lui laisser une part au capital ? De combien ? Ces questions peuvent paraître au premier abord comme de simples modalités relevant de la gestion d'entreprise, et non d'économie. Cependant, ce serait sous-estimer les conséquences de ces choix. Loin d'être une simple différence statutaire, ce choix de la présence ou non d'une autre entité au capital est décisive, notamment pour les transferts de technologie et l'utilisation des procédés innovants de la maison-mère sans crainte de fuite de technologie ou d'appropriation par un partenaire étranger (Desai et al., 2008; Javorcik and Spatareanu, 2008). Le mode d'entrée a donc des conséquences importantes sur les bénéfices que l'on peut tirer d'un investissement à l'étranger, tout comme sur ses effets d'entraînement sur l'économie locale, qui seraient favorisés par l'association à une entreprise locale (Iršová and Havránek, 2011, 2013)¹²

Si la multinationale est la seule propriétaire de la nouvelle structure, on parlera de filiale contrôlée entièrement (wholly owned subsidiary, WOS), l'inverse étant une co-entreprise (joint-venture, JV). Cette dernière est un cas particulièrement intéressant de remise en question des frontières traditionnelles des firmes et du dilemme intégration/sous-traitance. Elle fait surgir de nombreuses questions sur la nature de la propriété des firmes et du contrôle de la production, et révèle la présence d'inefficacités contractuelles que l'intégration totale ne saurait résoudre. Elle questionne alors la théorie des droits de propriété de la firme (*property right theory, PRT*) de Grossman, Hart et Moore (Grossman and Hart, 1986; Hart and Moore, 1990), et ses développements récents dans le cadre du commerce international (Antràs and Helpman, 2004; Antràs, 2014). En effet, les premiers classent les joint-ventures

11. Voir notamment, *L'international, le salaire de la peur*. Sept. 2017, BPIFrance - LeLab.

12. Du moins à court terme. A long terme cet effet pourrait être contrebalancé par le moindre niveau technologique utilisé dans les Joint-Ventures (Merlevede et al., 2014).

comme des solutions sous-optimales pour les pertes d'incitations qu'elles engendrent, et les seconds ne les considèrent même pas.

Trop souvent perçu comme marginal, le recours aux joint-ventures¹³ de la part des entreprises françaises est pourtant fréquent lors d'investissements à l'étranger si l'on se fie aux statistiques de l'enquête liaisons financières (LiFi, INSEE). En effet, après une baisse du recours aux joint-ventures parmi les filiales nouvellement créées jusqu'en 2004, leur part s'est stabilisée à environ 25% des ouvertures de filiales, ce qui implique un nombre absolu forte en croissance (+92% entre 2000 et 2011). Plus important encore, parmi les 7 260 groupes Français ayant déclaré de nouvelles filiales à l'étranger entre 1997 et 2011, plus de la moitié d'entre eux (58.6%) ont ouvert au moins une joint-venture (pour 24.87% des filiales ouvertes). Contrairement à une idée reçue, aucune différence marquante n'est visible entre les secteurs commerciaux (57.2% de groupes concernés sur 1997-2011 pour 27.0% des nouvelles filiales), industriels (respectivement 59.9% et 23.9%) et les services (56.8% et 25.0%). Ainsi, le rôle du secteur d'activité, parfois mis en avant pour expliquer les différences de modes d'implantation, n'explique visiblement pas tout dans ce choix. Quand aux limites imposées par certains pays à la propriété étrangère d'entreprises sur leur sol, elles ont été largement assouplies dans de nombreux pays en développement au cours des années 1990. Et elles ne permettent pas non plus d'expliquer pourquoi la part des joint-ventures atteint les 23.90% pour les investissements français dans le reste de l'Union Européenne (UE) en 2011, soit sensiblement la même que dans le reste du monde (25%), malgré une totale liberté circulation des capitaux.

En revanche, pour éclairer ce choix, la littérature managériale a révélé notamment que les investisseurs internationaux optent davantage pour des joint-ventures quand la "distance culturelle" (langue, culture juridique, normes explicites et implicites, etc.) s'accroît entre le pays d'origine et le pays d'implantation, insistant alors sur l'importance des actifs intangibles que pourrait amener un partenaire local (Beamish, 2012). D'autres travaux ont par ailleurs montré que les plus petites entreprises avaient également davantage recours aux joint-ventures, pointant dès lors le possible rôle de facteurs endogènes dans ce choix, ainsi qu'une éventuelle dynamique à considérer (Mutinelli and Piscitello, 1998; Hollenstein, 2005). Les deux premiers chapitres de cette thèse se penchent sur la question du mode d'implantation, et révèlent le rôle de l'hétérogénéité des firmes dans celui-ci.

Chapitre 1

Le premier chapitre retrace l'évolution de la littérature théorique sur les questions d'intégration internationale en l'élargissant à la possibilité d'intégration partielle, brisant la dichotomie intégration (totale) / outsourcing. Deux branches distinctes de la littérature sont revues et approfondies. Il s'agit d'abord des modèles issus de la théorie de la propriété de la firme (PRT), à la suite des travaux de Grossman and Hart (1986); Hart and Moore (1990); Hart (1995), et plus particulièrement les travaux de Antràs and Helpman (2004, 2008) puis Antràs (2014) qui prolongent ce cadre d'analyse à un environnement international et aux firmes hétérogènes. Nous étendons ces modèles aux joint-

13. Définie ici par un taux de contrôle compris entre 10% et 95% pour un investisseur français.

ventures, qu'ils ignoraient jusqu'à présent (Gattai and Natale, 2015). En cela ce chapitre se rapproche des travaux théoriques et empiriques de Cui (2011), et de Eppinger and Kukharskyy (2017), puisque comme eux nous insistons sur l'hypothèse centrale d'incomplétude partielle des contrats (Antràs and Helpman, 2008). Cette imperfection variant selon la qualité des institutions juridiques des pays d'implantation, les choix d'intégration ne sont pas identiques selon les destinations, ni selon les firmes qui investissent. A l'inverse du cadre traditionnel de GHM qui considère les joint-ventures sous-optimales, nous montrons qu'elles peuvent être la solution optimale pour les multinationales les moins productives ou lors d'investissements dans des pays à plus faible qualité institutionnelle.

La seconde littérature que nous retraçons détaille davantage les jeux non-coopératifs auxquels peuvent se livrer les deux parties à cause des imperfections des contrats dans des coopérations internationales, que l'intégration ne saurait résoudre. La propriété (*ownership*) est dès lors distincte du contrôle effectif, quand ces deux aspects étaient sciemment confondus chez GHM. A la suite de Holmstrom (1999) cette littérature s'intéresse davantage aux aléas moraux dans les processus en équipe (*team production*). L'idée principale est celle selon laquelle chaque partie peut profiter des brèches contractuelles pour favoriser son revenu privé plutôt que le revenu commun (Bai et al., 2004; Wang and Zhu, 2005). Les deux parties peuvent alors avoir intérêt à laisser la seconde accéder à un certain pouvoir de veto, pour s'assurer de sa collaboration. Cependant ces analyses ne prennent pas en compte l'hétérogénéité des investisseurs à l'étranger. Nous développons alors un modèle inspiré de Bai et al. (2004), avec des firmes hétérogènes et plusieurs pays d'implantation.

Les deux modèles théoriques développés dans ce chapitre illustrent donc la grande diversité avec laquelle le sujet de l'intégration internationale des firmes est actuellement discuté dans la littérature, chaque approche ayant ses avantages et ses lacunes. Ce travail de comparaison permet également de clarifier les définitions des notions de propriété, contrat et même de joint-venture, que chaque branche induit implicitement. Cependant, les conclusions tirées de chaque modèle sont sensiblement similaires, détaillant les éléments endogènes et exogènes qui déterminent les choix d'intégration internationale des entreprises. Le second modèle ouvre toutefois la porte à des implications plus fines et plus complexes sur la répartition du surplus total, et le gain pour l'économie locale. De plus ce modèle de coopération entre deux entités peut s'interpréter aussi bien dans le cas d'un IDE horizontal que vertical.

Chapitre 2

Le second chapitre s'inscrit dans la continuité du premier. Notre point de départ est la remarque de Mrázová and Neary (2012), selon laquelle la majorité des modèles micro-fondés avec auto-sélection de firmes hétérogènes reposent en réalité sur une caractéristique commune de la fonction de profit qu'ils nomment "supermodularité", et qui implique une complémentarité des arguments "productivité" et "degré d'internationalisation" dans la fonction de profit. Nous montrons que c'est également le cas (sous certaines conditions) dans les deux modèles développés dans le chapitre 1, et qu'ils peuvent être donc tous deux synthétisés en une seule et même forme réduite, libérée de formes fonctionnelles

précises. La souplesse de ce modèle permet d’y incorporer d’autres déterminants dans le choix du mode d’entrée des multinationales, et de rechercher d’autres dimensions de l’hétérogénéité des firmes, importantes dans ce choix de la structure organisationnelle. En particulier, nous insérons des facteurs endogènes alternatifs à la simple productivité totale des facteurs de la multinationale (dans son pays d’origine), en endogénéisant notamment le degré d’incertitude contractuelle à laquelle elle fait face, et que sa propre expérience internationale peut réduire. Ainsi, nous ajoutons une perspective dynamique de l’internationalisation des entreprises comme un phénomène graduel, au sein même des stratégies des multinationales, et dissociions la productivité domestique du groupe de sa productivité effective à l’étranger. Le cadre d’analyse ainsi développé permet donc de réunir les différentes branches de la littérature sur les questions d’intégration internationale qui étaient jusqu’à présent éloignées.

Les prédictions du modèle dépassent donc celles du chapitre 1, en spécifiant notamment l’influence relative de deux facteurs endogènes (PTF, expérience internationale globale) sur les choix d’intégration, selon la “qualité” de l’environnement contractuel du pays hôte¹⁴. Ces prédictions sont ensuite testées empiriquement grâce à la combinaison des données individuelles de firmes françaises, de l’information sur les filiales lors de leurs ouvertures et des caractéristiques du pays d’accueil. Plus précisément, nos données se composent de plus de 6 000 filiales de groupes français à l’étranger observées entre 2001 et 2007, dans 87 pays hôtes. L’échantillon ainsi construit garantit une grande hétérogénéité à la fois des investisseurs (endogène), mais aussi des environnements d’implantation (exogène). Ce dernier point est un apport majeur par rapport aux études empiriques similaires, mais limitées à un pays, ou au mieux à quelques pays de l’OCDE bénéficiant tous d’un environnement contractuel relativement favorable.

Les statistiques descriptives sont cohérentes avec la littérature existante sur le sujet, montrant une corrélation générale positive de la productivité et de l’expérience internationale du groupe (nombre de précédentes filiales à l’étranger, taux d’exportation, etc.) sur le niveau d’intégration des filiales à l’étranger. Les modèles économétriques linéaires (OLS) et non linéaires (Logit, Tobit, Logit ordonné) livrent des résultats originaux confirmant nos prédictions théoriques. Nous montrons en effet que le phénomène d’auto-sélection des entreprises les plus productives vers davantage d’intégration n’est en réalité observé que pour les investissements vers des destinations à forte qualité institutionnelle. Au contraire, plus l’environnement contractuel est de mauvaise qualité, moins la productivité initiale joue un rôle par rapport à l’expérience internationale de la multinationale, perçue ici comme une plus grande capacité à faire respecter ses contrats internationaux. Des résultats concordants sont trouvés par les deux méthodes employées : en divisant l’échantillon en sous-échantillon selon la qualité institutionnelle des pays hôtes, mesurée par l’indicateur du “*rule of law*” de la Banque Mondiale ; ou bien par l’introduction de termes d’interaction entre le *rule of law* (exogène) et les facteurs endogènes (Productivité, expérience). Plus intéressant encore, plus les proxies utilisés pour mesurer

14. Cette vision unidimensionnelle de la qualité des institutions est directement reprise du cadre développé par Antràs (2003); Antràs and Helpman (2008); Antràs (2014) où il parle à plusieurs reprises de “*quality of institutions*” et plus particulièrement de la “*quality of a country’s contractual institution*”. Pour ne pas conforter une vision réductrice des institutions, nous entendons par ceci la qualité des institutions du point de vue des investisseurs étrangers, et non pas une qualité institutionnelle objective.

l'expérience internationale du groupe sont exigeants (du montant des exportations au nombre de pays avec implantations en propre), plus leur importance s'accroît dans les destinations à faible qualité institutionnelle.

3.3 Motifs d'implantation et choix du pays hôte.

Comme nous l'avons déjà souligné, il existe une pluralité de motifs d'implantation, et différentes nomenclatures ont déjà été dressées pour distinguer des flux d'IDE qui ne se ressemblaient pas. Sous l'appellation "IDE horizontaux" (Markusen, 1984) ont été regroupés les investissements qui visent à reproduire l'activité domestique à l'étranger. Ces investissements apparaissent alors comme une alternative à l'exportation pour les entreprises confrontées à un dilemme de concentration-proximité. Ainsi au fil du temps le terme d'IDE horizontal a pris un sens plus large, englobant les IDE qui recouvrent un motif de marché, se situant de fait dans des pays développés où la demande est forte.

Dans cette dichotomie, l'investissement direct à l'étranger "vertical" serait celui qui consisterait en l'intégration d'une étape de production, précédemment réalisée hors de l'entreprise (et à l'étranger). Cette intégration internationale du processus de production a rapidement été associée aux investissements à l'étranger pour des raisons de coûts de production, et analysée principalement par des modèles dits de proportion des facteurs, expliquant pourquoi des pays à dotations différentes peuvent avoir intérêt à réaliser des IDE.

Malgré la remise en cause incessante de cette dichotomie, jugée à juste titre trop restrictive, et l'essor d'une troisième catégorie d'IDE "complexes"¹⁵, cette distinction peut s'avérer utile. C'est notamment le cas pour étudier les conséquences domestiques d'un IDE (Hijzen et al., 2011; Barba Navaretti et al., 2006). En effet, on imagine aisément qu'un investissement à objectif de marché dans le même secteur dans un pays développé n'a pas les mêmes conséquences domestiques qu'un investissement pour produire un bien intermédiaire dans un pays en développement, en particulier sur l'emploi ou le gain de productivité suite à un IDE. A l'inverse, tout fondre dans un seul cadre "complexe", gomme artificiellement les différences qui subsistent entre les types d'IDE, et ne représente donc pas une solution satisfaisante.

Chapitre 3

Notre troisième chapitre se penche sur le lien entre caractéristiques de l'entreprise et motifs d'investissements à l'étranger. Plus particulièrement, nous regardons comment les facteurs qui attirent les entreprises françaises dans un pays varient avec la productivité ou l'expérience des entreprises en question. La combinaison des données microéconomiques et macroéconomiques nous amène à examiner le choix d'implantation de 1 644 filiales françaises à l'étranger, dans 57 pays.

L'étude des facteurs entraînant les IDE dans tel ou tel pays confirme la prévalence des motifs de marché (IDE horizontaux), en accord avec la majorité de la littérature récente ; la majorité de

15. A l'origine, le terme a été proposé par la UNCTAD (1998) pour définir les IDE dans les pays en développement, où les deux motifs initiaux - recherche de débouchés et moindre coûts de production - peuvent être combinés. Yeaple (2003) reprend ce terme et l'associe à une entreprise détenant simultanément des filiales verticales et horizontales.

ces filiales étant située dans des pays développés au large marché intérieur (pays voisins de l'Union Européenne et Etats-Unis en tête). En revanche, les entreprises les plus grandes et les plus productives se distinguent par un affaiblissement des motifs horizontaux dans leurs IDE, et un accroissement des motifs productifs, en recherchant notamment des destinations avec des avantages comparatifs dans les premières étapes de production, et qui s'inscrivent en amont des chaînes de valeur mondiales. Davantage qu'un changement radical de stratégie selon l'hétérogénéité des firmes, nous assistons plutôt au développement de stratégies complexes avec la productivité des firmes.

Un schéma similaire est observable selon le nombre de filiales précédemment ouvertes par l'entreprise. Si les premières filiales semblent uniquement entraînées par la recherche de débouchés, une plus grande variété de motifs est observée par la suite.

Ce changement progressif de motif d'internationalisation avec la productivité de l'investisseur ressort davantage pour les joint-ventures que pour les filiales contrôlées entièrement. Le mode d'entrée (examiné dans les deux premiers chapitres) et le motif suivi sont donc bien inter-dépendants pour les multinationales françaises.

3.4 Réseaux internationaux d'implantation

Les IDE s'inscrivent dans une logique globale d'extension des firmes multinationales, qui développent des réseaux internationaux de production et de distribution où transitent des biens intermédiaires, des services et des connaissances. Les IDE ne devraient donc pas être étudiés de manière indépendante les uns des autres, puisque les choix d'ouverture d'une filiale relèvent à l'évidence d'une stratégie mondiale sur l'ensemble d'une chaîne de valeur mondiale. L'investissement d'une entreprise pour intégrer une nouvelle étape sur ce réseau de production est vraisemblablement influencé par sa ou ses précédentes positions.

Cette ambition de ne plus étudier les IDE comme des flux de capitaux indépendants de la stratégie des multinationales trouve certains échos dans la littérature existante : Yeaple (2003) distinguait déjà les IDE dans une même destination selon le fait que la maison mère ait déjà (ou non) précédemment investi dans un pays différent. L'étude des IDE peut alors s'enrichir de l'étude de l'ensemble de la chaîne de valeur et des étapes contrôlées par la multinationale. Si l'image traditionnelle de la chaîne renvoie à une production séquentielle uni-directionnelle, la production internationale peut prendre d'autres formes à l'image de la distinction entre les chaînes de production "serpents" et "araignées" réalisée par Baldwin and Venables (2013).

De plus, les entreprises multi-produits développent des fourches, des doublons, des croisements ou des fusions entre différentes chaînes de valeurs. Pour aborder ces schémas organisationnels plus complexes que la simple chaîne, la notion de réseau de production doit être abordée. La chaîne "serpent" n'est qu'une forme extrême d'un réseau où chaque noeud n'est relié qu'à deux voisins, excepté les deux extrémités qui n'en ont qu'un ; de même la forme "araignée" est un autre extrême où un noeud central est relié à tous les autres, qui n'ont aucune autre liaisons bilatérales. Les firmes multinationales coordonnent des réseaux qui se superposent partiellement ou totalement sur une ou

plusieurs chaînes de valeur, en adoptant des stratégies complexes, qui ne correspondent pas à ces idéaux-types.

L'analyse des réseaux, issue de la théorie des graphes, semble alors adaptée pour étudier le développement des firmes multinationales, et particulièrement le développement de leurs réseaux internationaux de production. Cette méthode trouve de vastes champs d'applications dans de nombreux domaines comme le relate Hidalgo (2016), et notamment en microéconomie, en finance, et même en économie internationale. Quelques travaux ont déjà retracé les réseaux de firmes multinationales (Masi et al., 2013; Rozenblat, 2015), et le terme de réseau (*network*) est en réalité déjà très courant dans l'étude des chaînes de valeur mondiales, avec l'idée sous-jacente de complexité. Amador and Cabral (2016) affirment notamment dans leur très complète revue de littérature sur l'étude des chaînes de valeur que "*les réseaux qui contrôlent les chaînes de valeurs sont hautement complexes*". Pòl Antràs lui-même reprend actuellement des outils de cette théories des réseaux pour analyser la géographie mondiale des chaînes de valeurs (Antràs and de Gortari, In Preparation).

Contrairement à l'analyse traditionnelle en économétrie qui cherche à déterminer l'influence d'une ou plusieurs variables sur une autre, observées sur un ensemble d'individus, l'analyse de réseaux va détailler la position des individus les uns par rapports aux autres. En cela elle permet de mieux étudier la variabilité des comportements entre individus, et si celle-ci est liée à leur position dans la structure en réseau sous-jacente. Ainsi, cette approche est particulièrement utile pour étudier l'hétérogénéité des firmes multinationales et des choix d'implantation à l'étranger. Bien que son apport soit essentiellement descriptif, et qu'elle manque d'évidence causale, c'est une ouverture assez riche en enseignements qui conclura cette thèse.

Chapitre 4

Le dernier chapitre donc, détaillera cette approche en réseau des firmes multinationales françaises, afin d'insister sur l'interdépendance des implantations au sein des groupes¹⁶. Plus précisément nous utilisons les données micro-économiques par filiales, pour retracer les réseaux existants d'implantation des firmes multinationales. Après un bref rappel des notions de l'analyse de réseau, nous décrivons la structure de ce réseau et son évolution entre 1996 et 2011 grâce aux outils de la théorie des graphes. Ce réseau des pays d'implantation des multinationales françaises est donc constitué de noeuds (les pays), reliés par des liens, pondérés du nombre de firmes associant ce couple de pays durant leur internationalisation. Cette analyse de réseaux (*networks*) des firmes multinationales est très novatrice. Bien que déjà utilisée pour le commerce international (Serrano et al., 2007; Fagiolo et al., 2010) ou les flux d'IDE (Sgrignoli, 2014), à notre connaissance, seuls Masi et al. (2013) l'a adaptée aux firmes multinationales avant nous, mais avec un objectif différent du nôtre, en se focalisant sur les différences inter-industrielles, quand nous regardons davantage l'impact de la productivité sur la structure topologique du réseau, et son évolution.

Pourtant cette approche fournit de nombreux et précieux indicateurs quantifiables pour mesurer

16. Une version plus courte de ce chapitre a déjà été publiée (Joyez, 2017).

et qualifier la structure des réseaux. Ainsi, les mesures de densité et d'étendue du réseau tissé par l'ensemble des implantations des multinationales nous renseignent précisément sur son rythme d'expansion aussi bien quant à ses marges externes (nombre de pays impliqués) qu'internes (nombre de firmes multinationales françaises et nombre de filiales par firme). Outre sa simple expansion depuis la fin des années 1990 – attendue, car portée par la croissance des IDE vue précédemment – ce réseau d'implantations des multinationales françaises est caractérisé par une forte déconcentration. Les destinations centrales dans le réseau perdent de leur domination, et les destinations qui étaient marginales sont reliées à un nombre croissant de pays et davantage utilisées par les firmes françaises dans leurs IDE. Les associations de pays réalisées par les multinationales sont de plus en plus nombreuses et variées. Différents indicateurs comme les coefficients d'agglomération (*clustering*), l'indice de centralisation, ou encore l'indicateur de disparité, confirment cette tendance à la déconcentration dans le réseau des multinationales. Cette nette évolution du réseau des firmes multinationales illustre avec force l'émergence des chaînes de valeur mondiales, et le placement des multinationales françaises sur ces dernières. D'autant plus que cette tendance est constante sur les seize années consécutives étudiées, quand une analyse similaire du réseau constitué des flux d'exportation bilatéraux ne montre que peu de changement dans la structure des flux commerciaux (Fagiolo et al., 2010). Cette différence tend alors à conforter l'analyse que les mutations de la mondialisation sont bien tirées par les multinationales et les IDE et non pas les flux commerciaux. Ce chapitre reporte donc en premier lieu une série d'indicateurs quantifiant les mutations de stratégies opérées par les firmes multinationales sur la période récente.

Dans une deuxième partie de ce chapitre nous distinguons ce réseau selon les firmes qui le composent pour faire ressortir l'effet de l'hétérogénéité des entreprises qui investissent sur la formation et l'évolution de ce réseau. Les firmes les plus productives constituent logiquement un réseau plus large et plus dense. La différence notable tient davantage de la structure hiérarchique du réseau, avec une centralisation plus importante pour les firmes les moins productives. La déconcentration du réseau d'implantation des firmes multinationales françaises a donc été portée par les firmes les plus productives. Ces entreprises constituent un réseau d'implantation de plus en plus décentralisé, en développant des associations de pays novatrices.

Enfin, dans une dernière partie, nous montrerons comment ces indicateurs issus de la théorie des graphes peuvent être utiles pour étudier les choix de localisation des multinationales, et apporterons des preuves plus précises du rôle de l'hétérogénéité des firmes dans la structure du réseau.

Chapter 1

Two conceptions of ownership and international joint-ventures optimality.¹

1 Introduction

International joint-ventures are a widespread practice among multinational enterprises (MNEs). For French firms, around 46% of them are engaged in such an arrangement in 2011 according to the LiFi survey. Yet, investigating international Joint Ventures (JVs) is a continuing concern within mainstream approaches to international trade, mainly based on the Property Right Theory (PRT) of the firm, which rule out shared ownership as a sub-optimal arrangement (see Holmstrom (1999); Gattai and Natale (2015)).

Assuming the foreign ownership share to be actually a crucial choice in expansion strategies of MNEs, with deep consequences, this chapter investigates the role of firm heterogeneity in foreign ownership. More specifically, we focus on its interaction with host countries' contractual institutions. This chapter also investigates whether various approaches to equity ownership could reach similar conclusions on the role of firm heterogeneity.

Actually previous works dealing with the integration could broadly be classified in two categories: within or outside the PRT line². Within the PRT, the major step toward a better understanding of the integration dilemma has been the inclusion of firm heterogeneity to investigate

1. This chapter includes a work in progress co-written with Ivan Ledezma (Univ. de Bourgogne). I am very grateful to him for his substantial contribution and advice.

2. This dichotomy is obviously a simplification made for explanatory purposes, and within each of the two categories, very diverse assumptions coexist. See Gattai and Natale (2015) for an exhaustive review of the differences in this literature. We classified within the property right approach all works that match the PRT conception of ownership (ownership as control).

differences in integration choices within-industry. This mostly relates to Antràs and Helpman (2004, 2008), Antràs (2014) works which became the main baseline to study international integration issues. Among subsequent work, Cui (2011) differs a little from traditional PRT assumptions on the investments characteristics to allow partial ownership and international joint-ventures, and found vertical integration -either through JV or full integration- to be associated with greater productivity of the parent firm. Still close to the PRT model Eppinger and Kukharsky (2017), find that host countries' contractual institutions interact with another determinant of the foreign ownership share -the intensity of input's relationship-specificity-, although they define it as an industry-level parameter.

On the other hand, early contributions have shifted from the PRT, notably by disentangling ownership from control (Holmstrom, 1999; Rajan and Zingales, 1998), and focus explicitly on shared ownership and team production. Following work improved the formalization of expropriation strategies within teams, either with a trade-off between general and specific investments, the latter increasing the hold-up problem allowing a higher disagreement payoff³ (Cai, 2003; Wang and Zhu, 2005); or with a tradeoff between a private revenue and the common profit (Bai et al., 2004). This strand of literature introduces other control mechanisms besides ownership, such as voting rules defined by shareholders agreements. However this strand lacks of consideration of firm heterogeneity.

Although gathering the two approaches into one single framework would be a major step toward a better understanding of the international integration choices, the gap on very crucial assumptions prevents us to do so⁴. Instead, this chapter insists on the common conclusions the two approaches could reach, by extending both lines of research to partial ownership, firm heterogeneity, and several host countries.

Not only we show that generally the most productive firms should reach higher foreign ownership shares, but also that this relationship's elasticity depends on host country contractual institutions. Specifically, the better the contractual enforcement, the more the firm productivity increases its foreign ownership share. As a corollary to this finding, this chapter shows Joint-Ventures to dominate full integration in some destinations, even for top productive firms. This is a major difference from the few other works that have linked firm heterogeneity and ownership which never showed JV to be the best integration solution for all firms engaged in FDI. Moreover, as far as we know this is

3. Throughout this chapter, *disagreement payoffs* refer to the revenue the party could obtain outside the relationship once its investments made (*ex-post*, in case of bargaining failure). *Outside option* refer to *ex-ante* revenue the party could chose instead of engaging into the relationship.

4. At least when detailing the micro-foundations of the mechanisms. Chapter 2 does gather these two approaches into a single framework, simplified to a reduced functional form.

the first work interacting firm-level with host country parameters to investigate ownership share.

This chapter is built as follows. In the second section we build an extension of PRT approach to international joint-ventures, mixing the features of Cui (2011) for the partial ownership and non human investments, and Antràs and Helpman (2008); Antràs (2014) for partial contractibility assumption. In the third section I extend Bai et al. (2004) model to firm heterogeneity. The fourth section compares the conclusions and extensions of the two frameworks.

2 Ownership as the property of inputs

2.1 Conceptual background

The standard Property Rights Theory (PRT) of the firm, also known as the GHM framework after the seminal contributions of Grossman and Hart (1986) Hart and Moore (1990) Hart (1995), has made significant progress in the understanding of Coase's 1937 interrogation about firm boundaries. Their central assumption is about contracts' incompleteness, which stresses what has been known as the hold-up problem⁵, and leads to under-investment. Because of incomplete contracts, ownership gives the owner access to residual rights over the use of the assets, i.e. she is free to use the assets at its own discretion when it comes to unforeseen contingencies. Hence, ownership is the only control arrangement that would affect ex-ante investments incentives. Ownership should thus be given to the partner whose input is more important in the final good production, to minimize the inefficiencies losses.

As noted by Antràs (2014), the incomplete contracts assumption fits particularly well with international contracts who carry greater uncertainty about their enforceability. This led the GHM approach to be adapted to an international background to focus on Foreign Direct Investments (FDI) versus outsourcing dilemma. This recent "global sourcing" line of research is led by Gene Grossman, Elhanan Helpman, and especially by Pol Antràs from Harvard university (Grossman and Helpman, 2002; Antràs, 2003, 2014; Antràs and Helpman, 2004, 2008).

5. The hold-up problem refers to *ex-ante* inefficiencies on the level of non-contractible and relationship-specific investments engaged by the two parties. This leads both parties to under-invest. Although the GHM approach faced severe critics on this points, notably by Maskin and Tirole (1999) who suggest that revelation mechanisms could be inserted in the initial contracts, to make information verifiable to third parties (and to courts). The range of this critic was such that Oliver Hart and John Moore developed a new approach of the theory of the firm based on contracts seen as "reference points" by the two parties. See Hart and Moore (2007, 2008) for the premises and Hart (2009) for a discussion over asset ownership in this new framework, which yet yields similar conclusion than original GHM framework. However, as underline Aghion and Holden (2011), these revelation mechanisms are seldomly used in practice, a statement that makes the critics lose most of its bite.

The “global sourcing” line shares the PRT’s conception of ownership as control⁶. Actually it opts for an even more restricted conception of ownership where “*ownership of physical assets (buildings, machines) is associated with ownership of the inputs that are produced with those assets*” as states Antràs (2014, p.126). Because of this narrow conception of ownership, joint-ventures fit awkwardly in those models and are rarely evoked. Actually in these frameworks shared ownership would correspond to shared residual rights, which is by definition impossible over the totality of the assets, since the two parties cannot both freely dispose of them all. In addition, since the inputs are valueless in the outside market in standard GHM, giving each party residual rights over only a fraction of the inputs is also suboptimal. Therefore, in traditional GHM and global sourcing, joint-ventures are merely evoked, and rapidly considered as suboptimal control arrangement in which neither party has the residual rights.

Hence, for joint-ventures to be an optimal control arrangement, one should step aside from standard PRT assumptions. To our knowledge, only two papers explicitly inscribe in the line of Antràs and Helpman (2004, 2008) works, and try to make room for JV in a model in which crucial assumptions are still based on the GHM game. The first is Cui (2011), as noted by Gattai and Natale (2015), and we would add the recent contribution of Eppinger and Kukharsky (2017) although the authors remove firm heterogeneity feature. Let’s detail their contributions:

The theoretical model developed by Cui (2011) shares most of the GHM assumption, notably on ownership, still perceived as an access to assets (and to intermediate inputs for the final-good producer). However by assuming the non-contractible ex-ante investments to be not (entirely) in human assets but highly relationship-specific, it allows a mechanism providing disagreement payoffs to both parties in case of a bargaining failure: the division of surplus in liquidation. Already reported by Cai (2003) to be a common practice in the real-world, it assumes that when a bargaining failure occurs, the two parties jointly sell their inputs and each recover a share of the revenue equal to their ownership share in the common entity⁷. Hence, the disagreement payoff, and therefore the equilibrium revenue share, increase with ownership share. However, Cui (2011) embraces both joint-ventures and full ownership into “vertical integration” and his model does not conclude to any impact of firm heterogeneity on the ownership structure chosen within vertical integration, but only in the outsourcing versus integration dilemma.

6. As explicitly said by Grossman and Hart (1986): “We define a firm to consist of those assets that it owns or over which it has control; we do not distinguish between ownership and control and virtually define ownership as the power to exercise control.”

7. This practice assumes that inputs are (more) valuable when jointly sold, while relationship-specificity make these inputs’ value close to zero when sold independently.

The model of Eppinger and Kukharsky (2017) is based on Antràs and Helpman (2008) contribution, with notably the use of the partial contractibility feature, which divides the initial contract between contractible tasks, and non contractible ones⁸. The lower the contractibility, the higher the hold-up problem, and the more incentives should be given to the intermediate supplier. As in GHM, ownership arrangements are the only tool to shift incentives, so that the degree of contractibility has a direct (positive) effect on the multinational ownership share. However, their model had to differ from Antràs and Helpman (2008) in the conception of inputs. Because in the baseline model, only full ownership or outsourcing were considered, the owner always recovered all intermediate inputs (but his efficiency in using them depends on the collaboration of the supplier). Yet, Eppinger and Kukharsky (2017) assume the inputs to be divisible to fit with partial ownership. The final-good producer receives thus the contractible share of inputs plus its equity share of non contractible inputs. The authors had then to assume some outside value of inputs even when they are not all recovered. So they remove the assumption of a null value of inputs in the outside market, and instead value the intermediate inputs with regard to their degree of relationship-specificity.

Another intuition of them, is to interpret the contractibility degree as a country-level indicator of contractual institution quality. The key feature of their model is therefore to look at the interaction between this host-country institutional index and the relationship specificity of investments over the ownership share held by the MNE. They find a positive interaction, supported by a large worldwide empirical analysis, between relationship-specificity and institutional quality on the ownership share held by the foreign investor. Highly relationship-specific final-good producers face higher hold-up problem, and try to overcome it by integrating (more) their intermediate good supplier.

As reveals this short review of closely related works inspired by the GHM original game framework, there is room for another model which would embody heterogeneous firms as in Cui (2011), but would investigate the impact of firm heterogeneity over the choice of joint ventures over wholly owned subsidiaries (WOS). Moreover, with a similar inspiration as Eppinger and Kukharsky (2017), but including firm heterogeneity, we aim at investigating whether contractual institutions influence this choice using partial contractibility from Antràs and Helpman (2008). Actually their findings comfort our investigation, since we could legitimately assume that more productive firms are engaged in more relationship-specific inputs, which would lead to a positive relationship between total factor productivity and higher foreign control.

8. The author therefore assume the inputs to be a continuum of inputs that can be divided at any points, whereas this assumption was absent from Antràs and Helpman (2008)

Assumption	A&H 2004	A&H 2008	Cui 2011	E&K 2017
Partial ownership	No	No	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
Outsourcing vs Integration	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	No
Partial incomplete contracts	No	<input type="checkbox"/> Yes	No	<input type="checkbox"/> Yes
↔ for both inputs	-	Yes	-	<input type="checkbox"/> No
Firm heterogeneity (in TFP)	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	No
Disag. payoffs from selling	outputs	outputs	<input type="checkbox"/> outputs(I); inputs jointly(JV)	inputs separately
Disag. payoffs vary w/ ownership	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
Disag. payoffs vary w/ contractib.	-	<input type="checkbox"/> No ^a	-	Yes
Up-front payment	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	No
owners. share = resid. rights share	-	-	<input type="checkbox"/> No	Yes
TFP fosters FDI vs outsourcing	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	-
own. factors interact w/ institutions	No	No	No	<input type="checkbox"/> Yes

A&H 2004 refers to Antràs and Helpman (2004); A&H 2008 to Antràs and Helpman (2008), and E&K 2017 to Eppinger and Kukharsky (2017)

Table 1.1 – Main models differences

^a. Apart from indirect effect through ownership. In Antràs and Helpman (2008, p.11), μ “increases the optimal revenue share β_h by shifting β_h^* upward. As a result, the critical intensity levels $\eta_h L$ and $\eta_h H$ decline” . But does not go through the disagreement payoff, equal to O in outsourcing or to $\delta^\alpha R$ under integration, for H . and equal to w_m for M . μ does not determine the share of inputs recovered by H (because full integration or outsourcing), contrary as in Eppinger and Kukharsky (2017).

Table 1.1 summarizes the differences between these four models’ assumptions. Frames indicate the assumption we kept in this model. Dashes correspond to assumptions that are irrelevant in the models’ premises.

In our model, we decided to merge the partially incomplete contract framework from Antràs and Helpman (2008), with a possible partial ownership, as done by Eppinger and Kukharsky (2017), but including firm heterogeneity, and comparing joint-ventures to outsourcing and full integration. Moreover, we reject their conception of shared ownership and its repercussion on the disagreement payoffs, opting for the mechanism described in Cui (2011). Our model could thus also be seen as an extension of the latter to partially incomplete contracts, to study the role of host-country in organizational choices, and still very close to Antràs and Helpman (2008) baseline.

2.2 Basic set up

Consider a three countries world, one is referred as domestic (D) and two as foreign (a Western one W and another Eastern E), populated by a unit measure of consumers with identical preferences represented by:

$$U = q_0 + \frac{1}{v} \sum_{g=1}^G Q_g^v, \quad 0 < v < 1 \quad (1.1)$$

q_0 is the consumption of a homogeneous good. There are another G industries and Q_g is an index of aggregate consumption in industry g , which is a CES function.

$$Q_g = \left[\int q_g(f)^\alpha df \right]^{1/\alpha}, \quad 0 < v < \alpha < 1 \quad (1.2)$$

The elasticity of substitution between any two varieties in a given industry is $\frac{1}{1-\alpha}$, greater than unity. v denotes inter-industry elasticity of substitution, and is supposed to be lower than α . Labour is the only production factor and is immobile between countries. International trade is free such that in equilibrium, the price of q_0 is the same in each country, and normalized to one. The productivity of producing q_0 is fixed in each country, and determines the wage level.

As labour allocation and wages are fixed, the labour income in each country is fixed as well. Utility maximization gives the inverse demand function as:

$$p_g(f) = Q_g^{\mu-\alpha} q_g(f)^{\alpha-1} \quad (1.3)$$

Where $p_g(f)$ is the market price of variety f . Henceforth, we drop industry and firm subscripts (g and f), for clarity purposes when detailing the production process under partial contractibility. Equation (1.3) could be rewritten:

$$q = Ap^{-1/(1-\alpha)} \quad (1.4)$$

With $A = Q^{\frac{\alpha-\mu}{1-\alpha}} > 0$, a demand shifter. This demand function yields the revenue

$$R = q^\alpha A^{(1-\alpha)} \quad (1.5)$$

The production of a final good q requires the cooperation of two types of producers: a final-good producer and a (manufacture) intermediate-good supplier. We assume that only domestic workers (from country D) have the know-how to produce final goods through their headquarter services h , but that intermediate goods m can only be produced by a manufacture supplier M , located in a foreign country (W or E) for natural endowment reasons. This assumption is a convenient tool to simultaneously explain why an agency problem between two producers rises, and to focus only on international transactions. Rather than focusing on the choice of country W over E , that the headquarters first face, we make trivial this decision, by assuming it exogenous and randomly

distributed such that a share $0 < w < 1$ of firms chose to source in country W , and $(1 - w)$ in E . This way we only focus on the integration strategy of the headquarters, as done by Cui (2011). This integration strategy consists in choosing the ownership structure of the foreign supplier, between outsourcing, full integration, or any intermediate ownership share by H , within a joint-venture.

The production function of the final good combines both inputs using a Cobb-Douglas function:

$$q = \theta \left(\frac{h}{\eta}\right)^\eta \left(\frac{m}{1-\eta}\right)^{(1-\eta)}, \quad 0 < \eta < 1 \quad (1.6)$$

Following the contribution of Acemoglu et al. (2007), each of the two inputs is produced with a set of activities indexed by points on the interval $[0, 1]$, according to the Cobb-Douglas production function

$$j = \exp\left[\int_0^1 \log x_j(i) di\right], \quad j = h, m$$

where $x_j(i)$ is the investment in activity i for inputs $j = h, m$. Investments in activities are input-specific and can only be used to produce the input for which they were designed.

As in all Melitz (2003) like models, the θ parameter in the production function (1.6) corresponds to the firm's total factor productivity. It is worth noting that this firm-specific level of productivity affects the final-good production function but doesn't play a role in the investments payoffs. As in Antràs and Helpman (2008), more productive firms do not benefit from neither lower variable costs of investment c_j per unit x_j , $j = h, m$; nor from increased inputs production⁹.

We further assume that an exogenous threshold $0 \leq \mu \leq 1$ exists for M 's input activity, such that activities in the range $[0; \mu]$ are contractible *ex-ante*. Conversely, the set of activities in $]\mu; 1]$ is not contractible, in the sense that they cannot be fully specified in an *ex-ante* contract, or at least cannot be verified by third parties (courts), which makes the contract not enforceable *ex-post*¹⁰. As Eppinger and Kukharsky (2017), we believe this degree of contractibility to reflect the legal system quality, and thus to vary across countries. Such that $\mu \equiv \mu_l$, with $l = W, E$, the location choice. Specifically, we assume $\mu_W > \mu_E$, corresponding to a higher legal enforcement of contracts in country W .

We summarize the timing of events in this game:

9. This assumption could be justified by assuming common investments of all firms in a given industry. However, it could be released without qualitative changes in the model predictions, as long as the productivity in intermediate inputs is positively correlated with H 's TFP.

10. For simplicity purposes we assume h to be fully non-contractible *ex-ante*, such that the partial (and varying) contractual incompleteness only affects m , as done by Eppinger and Kukharsky (2017).

- In $t = 1$, H enters the industry, she draws a productivity level θ , and her country preferences, and then decides whether to exit the market or not. If she stays, she decides of her organizational structure.
- In $t = 2$ H offers a contract to a foreign manufacture supplier (M), which stipulates: (i) the organizational structure for the venture decided in $t = 1$; (ii) the supplier's required investments in the contractible activities $m_c \equiv \exp\left[\int_0^{\mu} \log x_m(i) di\right]$, and (iii) an upfront payment of τ_m (positive or negative) from H to M . We assume M 's outside option to be null.
- In $t = 3$, both parties invest in non-contractible activities and provide their amount of inputs.
- In $t = 4$, the parties bargain over the surplus from the relationship (or the “quasi-rent”).
- In $t = 5$: If an agreement has been reached in $t = 4$ final goods are produced and sold, and the revenue is distributed across the parties. Otherwise, the two parties proceed to a division of surplus in liquidation as detailed above.

In the following section, we solve this game by backward induction.

2.3 Equilibrium within Joint-Ventures

In $t = 4$, the two parties find an agreement, because the result of this Nash-bargaining game gives each party its disagreement payoff plus a fraction of the quasi-rent $Q = (1 - \delta)R$. Where $0 < \delta < 1$ is the fraction of the final revenue recovered through selling jointly all inputs to another final-good producer during the liquidation instead of selling the final good. The fraction of this cooperation surplus the parties obtain corresponds to their bargaining power, assumed exogenous, such that H recovers a share βQ of this quasi rent, besides its disagreement payoffs, and M gets $(1 - \beta)Q$, with $0 < \beta < 1$ ¹¹

In $t = 3$, both parties simultaneously and non-cooperatively invest in their non-contractible activities. Each party anticipates the outcome of the forthcoming bargaining game, and chooses the amount of non-contractible activities that will maximize her payoff. Because we assumed all h to be

11. Cui (2011) and Eppinger and Kukharsky (2017) both considered cases where β is endogenous, without notable change in their conclusions. It would also be the case here if firm-level β_i is positively correlated with the firms' total factor productivity (TFP) θ_i .

non contractible, the final-good producer's problem is

$$\max_{\{x_h(i)\}_{i=0}^1} \pi_H = s\delta R + \beta Q - c_h \int_0^1 x_h(i) di - \tau_m$$

The first term $s\delta R$ corresponds to its disagreement payoff, i.e. its revenue in case of liquidation, because s stands for the ownership share held by H . The second term corresponds to H 's share of the quasi-rent.

Final-good producer program could be rewritten :

$$\max_{\{x_h(i)\}_{i=0}^1} \pi_H = (s\delta + \beta(1 - \delta))R - c_h \int_0^1 x_h(i) di - \tau_m \quad (1.7)$$

Following Antràs and Helpman (2004, 2008), we note β_h the final share of revenue that goes to the final-good producer, with here $\beta_h = (s\delta + \beta(1 - \delta))$, from the division of surplus in liquidation mechanism.

From eq. (1.5) and (1.6), we find the amount of non contractible activities $h_n = \exp[\int_0^1 \log x_h(i) di]$:

$$h_n = \frac{1}{c_h} \eta \alpha R \beta_h \quad (1.8)$$

Meanwhile, M sets the amount of non-contractible activities to invest in, to maximize its own profit.

$$\max_{\{x_m(i)\}_{i=\mu}^1} \pi_M = (1 - \beta_h)R - c_m \int_{\mu}^1 x_m(i) di + \tau_m$$

Whereby $(1 - \beta_h)$ is the share of the revenue recovered by M and is equal to $(1 - \beta_h) = (\delta(\beta - s) + (1 - \beta))$

The maximization program yields

$$m_n = \frac{1}{c_m} (1 - \eta) \alpha R (1 - \beta_h) \quad (1.9)$$

These two values are expressed as functions of revenue, which in turn could be rewritten using equations (1.6), (1.8) and (1.9) into equation (1.5)).

$$R = \left([exp \int_0^\mu \ln x_m(i) di]^\alpha (1-\eta) \left(\frac{\delta(\beta-s) + (1-\beta)}{(1-\mu)c_m} \right)^{\alpha(1-\mu)(1-\eta)} (1-\eta)^{-\alpha\mu(1-\eta)} \right. \\ \left. \left(\frac{\alpha(s\delta + \beta(1-\delta))}{c_h} \right)^{\eta\alpha} A^{1-\alpha} \right)^{\frac{1}{1-\alpha[1-\mu(1-\eta)]}} \quad (1.10)$$

From equations (1.8) and (1.9), we directly see that the ownership share determines the investments in the non-contractible activities. The higher its ownership share, the more the party will engage into non-contractible investments, because it limits the hold-up issue, by increasing the disagreement payoff.

Following Antràs and Helpman (2008), H specifies in the contract the investments in contractible activities that would maximize its own payoff $\beta_h R - c_h \int_0^1 x_h(i) di - \tau_m$. However, the final-good producer must consider the participation constraint of M . Since we assume no *ex-ante* outside options, this constraint is

$$(1 - \beta_h)R - c_m \int_0^1 x_m(i) di + \tau_m \geq 0$$

Therefore, H satisfies this participation constraint by setting

$$(1 - \beta_h)R - c_m \int_0^1 x_m(i) di = -\tau_m$$

We can substitute the result into the final-good producer's objective function. In $t = 2$ the final-good producer's choice of contractible investments is the solution to

$$\max_{\{x_m(i)\}_{i=0}^\mu} \pi_H = R - c_h \int_0^1 x_h(i) di - c_m \int_0^1 x_m(i) di - \tau_m \quad (1.11)$$

Using eq. (1.8), (1.9) and (1.10) into (1.11), we obtain:

$$m_c = \frac{\alpha \mu (1 - \eta)}{c_m [1 - \alpha (1 - \mu (1 - \eta))]} R \quad (1.12)$$

Now, combining eq. (1.9) and (1.12), we find the total investments done by M using $m \equiv (m_n)^{(1-\mu)}(m_c)^\mu$

$$m = \frac{(1 - \eta)}{c_m} \alpha R (1 - \beta_h)^{(1-\mu)} \left(\frac{\mu}{1 - \alpha(1 - \mu(1 - \eta))} \right)^\mu \quad (1.13)$$

Recall that all h 's investments are non-contractible, such that $h \equiv h_n$, given in eq. (1.8).

Plugging these values of h and m (from equations (1.13) and (1.8) into eq. (1.6) and then into (1.5), we obtain the final expression of the total revenue, expressed as a function of the demand level, the firm productivity, M 's and H 's revenue shares, and the other fixed parameters from the model.

$$R = A \left[\theta^\alpha \alpha^\alpha \left(\frac{\eta}{c_h} \right)^{\alpha\eta} \left(\frac{1-\eta}{c_m} \right)^{\alpha(1-\eta)} \beta_h^{\alpha\eta} (1-\beta_h)^{\alpha(1-\eta)(1-\mu)} \left(\frac{\mu}{1-\alpha(1-\mu(1-\eta))} \right)^{\mu\alpha(1-\eta)} \right]^{\frac{1}{1-\alpha}} \quad (1.14)$$

Eventually, in $t = 1$, H chooses the optimal ownership share. As reminds Antràs (2014), given the existence of ex ante transfers, firms will agree on the ownership structure that maximizes the joint payoff of H and M .

The formal problem is therefore

$$\max_s \Pi = R(s) - c_h \int_0^1 x_h(i) di - c_m \int_0^1 x_m(i) di - \tau_m$$

From the first-order condition, we have :

$$\frac{\partial \Pi}{\partial s} = 0 \Leftrightarrow \frac{\partial R(s)}{\partial s} = 0$$

which yields (calculus details are given in appendix 1.A.1)

$$s^* = \beta - \frac{\beta}{\delta} + \frac{\eta}{\delta(\omega + \eta)} \quad (1.15)$$

Where, as in Antràs and Helpman (2008), $\omega = (1 - \mu)(1 - \eta)$, reflecting the importance of non-contractible investments activities of M in the final good.

Note that the optimal ownership share s^* is not bounded in $[0;1]$, since $s^* < 0$ when $\frac{\eta}{\omega + \eta} < \beta(1 - \delta)$, which could happen if η is low (or ω high). Conversely $s^* > 1$ arrives when $\beta + \frac{\eta}{\delta(\omega + \eta)} > 1 + \frac{\beta}{\delta}$, hence when η is high or ω low. As the real values s could take are bounded in $[0; 1]$, we conclude this theoretical optimal ownership share isn't always reachable by foreign investors, and they would opt for the closest optimal ownership share to s^* .

Obvious partial derivations of (1.15) show the expected signs about s^* variation: it declines in ω , the importance of M 's non contractible inputs, but rises in η , the final good intensity in headquarter services.

Interestingly, the optimal ownership share within JV is independent from the firms' productivity

level, when no fixed costs are considered (or at least considered as independent from the ownership share), because there is no trade-off between fixed and variable costs. Therefore, the ownership allocation structure has no other role than maximizing the partners' incentives.

In the following subsection, we broaden the analysis to other organizational structures than JVs, namely outsourcing and full integration. Following Antràs and Helpman (2004, 2008), we assume each one to imply different levels of sunk costs. These fixed costs are non-continuous with the ownership share, although increasing in it, such that the fixed cost function isn't suited for differential calculus, as developed above¹². Instead we simply compare the profit offered by each case.

2.4 Joint-Venture, Outsourcing and Integration.

Until now our model doesn't explicitly distinguish outsourcing and full integration from joint-venture, as if they would be only extreme JV cases. We have at least two reasons to reject this implicit assumption. The first lies on the liquidation mechanism detailed above, which is adapted for JV but not for sole ownership of one or the other party. Actually why would they keep on selling inputs jointly if one could assemble them all and sell the output? This issue is not addressed in Eppinger and Kukharsky (2017). The second reason would be the fixed costs. As explained above, we assume different fixed costs for each ownership structure, such that a tradeoff may occur between increasing revenue share and fixed costs, whose solution is given by the firm's TFP.

Following Antràs and Helpman (2004, 2008), we first compare the revenue share that gives each integration solution, denoting it $\beta_{h,k}$, with $k = \{O, J, V\}$ (O , and V respectively indicate Outsourcing and (full) Vertical integration, J stands for Joint-Venture).

As detailed in the previous section, under joint-ventures, we assumed the two parties to proceed to division of surplus in liquidation if the bargaining in $t = 4$ fails¹³. The disagreement payoff of H being $s \delta R$, the solution of the Nash bargaining game for H 's payoffs is $\beta_{h,J}(s) = (s\delta + \beta(1 - \delta)) = \beta + \delta (s - \beta)$.

Under outsourcing, we follow the standard assumption that gives no disagreement payoff to both parties. Hence we find H 's payoff to be $0 + \beta(R - 0 - 0) = \beta R$, such that $\beta_0 = \beta$.

Consider (entire) vertical integration now. Standard GHM models assume that total integration will not remove agency issues and that M 's cooperation is still required, such that in case of bargaining

12. Actually, when assuming fixed costs to be differentiable in ownership share s , we fail to determine the optimal ownership share s^* . See appendix 1.A.1 for more details.

13. Unlike traditional GHM models, the two parties have then a disagreement payoff.

failure, even under integration, the final-good producer face an efficiency loss, and is only able to recover a fraction $0 < \delta_p < 1$ of the potential revenue from producing on its own with M 's input. Our producer has therefore a choice in case of bargaining failure under full integration. As explained it can produce and sell the outputs and receives $\delta_p R$. Also, the liquidation mechanism explained above still hold, though not to be divided. Since H has access to all the inputs, they can be all sold together to a third party, resulting in a revenue δR , as explained above. We have no valuable reason to think that $\delta_p = \delta$. To the contrary, we believe the (costless) assembly to be valued in the market. Basic economic statements confirm that transformed products are more valuable than raw materials. We therefore assume $\delta_p > \delta$, such that at the end of the day, the final-good producer doesn't face a real choice, since it would always choose – if bargaining fails under complete integration – to produce and sell on its own and would get $\delta_p R$.

The disagreement payoff of the final-good producer under full integration is therefore $\delta_p R$, while M has no disagreement payoffs. $\pi_{H,V} = \delta_p R + \beta(R - \delta_p R - 0) = (\beta + (1 - \beta)\delta_p) R$. So that $\beta_{h,V} = \beta + \delta_p (1 - \beta)$

Let's now compare the revenue share each integration solution offers. From $\delta_p > \delta$ and since in a JV s is such as $0 < s < 1$, we deduce $\beta_{h,V} > \beta_{h,J}(s)$, $\forall s \in]0; 1[$

Obviously, we also have the traditional result in Antràs and Helpman (2004) derived models that $\beta_{h,V} > \beta_{h,O}$ because $0 < j < 1$, $j = \beta, \delta$.

The sorting is less clear for the revenue share granted by joint-venture and outsourcing. Actually $\beta_{h,J}(s) > \beta_{h,O}$ iff $s > \beta$

This means that a JV would give H more than outsourcing revenue share, only if she owns a share higher than its relative bargaining weight. The reason for that is simple: under outsourcing, she will get her bargaining power times the final revenue (βR), but under JV, she gets β over a fraction of R (namely, the relationship-surplus $((1 - \delta)R)$), but s over the remaining part of R (the sum of disagreement payoffs (δR))¹⁴.

We therefore have

$$\beta_{h,O} < \beta_{h,J}(s) < \beta_{h,V} , \forall s \in]\beta; 1[$$

$$\beta_{h,J}(s) \leq \beta_{h,O} < \beta_{h,V} , \forall s \in]0; \beta]$$

14. Until now, we assumed the bargaining power β to be exogenous, as it is in GHM line models. However, it is interesting to think of a (partially) endogenous β as evoked at the end of the previous section. If this bargaining weight is increasing with the firm productivity, hence more productive firms would either set a higher s , or proceed to outsourcing, but not proceed to JV with a low ownership share s . It would be an interesting alternative explanation of higher control by more productive MNEs.

Yet, in our model, as in seminal Antràs and Helpman (2004) model, there are two types of frictions in determining the integration level. (i) The total revenue share that goes to H detailed above, and (ii) the fixed costs borne by H . Specifically, as in all global-sourcing like models, we assume full integration to allow an increasing revenue share, but entails a higher fixed costs than outsourcing¹⁵. Concerning the fixed costs of joint-ventures, not evoked in Antràs and Helpman (2004), we assume them to be superior to outsourcing fixed costs F_O (because a local plant needs to be settled), but inferior to full integration ones. This point deserves to be detailed. Indeed, Joint-Venture fixed costs are shared between the two owners. However, we know the participation constraint of M being satisfied with equality, through the ex-ante lump-sum transfer, such that the fixed costs borne by M (reducing M 's profit), ends up entirely in increasing the up-front payment from H to M . So that actually H bears entirely the fixed costs of a JV, because it compensates M for its part. Therefore if the total fixed costs of setting up a JV were the same as those of a wholly owned affiliate, H wouldn't see any difference between F_V and F_J . However, we make the reliable assumption that it is less costly for M to open an affiliate in his own country, than it would be for H to open it in a foreign country¹⁶. Such that the costs H should compensate M for, are lower than the costs it would have payed for by itself. Therefore we assume M to open the local affiliate at a costs F_J , with $F_O < F_J < F_V$, and H offsets this costs through the lump-sum payment. For ease of understanding though, we do not include these costs into τ_m the ex-ante transfer, but as a separated flow, to distinguish F_J in the profit function. Yet, we deduce from this assumption that the total fixed costs of a JV borne by H is common to all JVs, and do not depend on its ownership share.

Considering fixed costs F_k varying with the ownership structure k , after satisfying M 's participation constraint, H 's profits are:

$$\pi_H = R - c_h \int x_h(i) di - c_m \int x_m(i) di - F_k$$

Using the expressions (1.8) and (1.13), and (1.14), we can rewrite the profit function as:

$$\pi_H = \Theta Z_k - F_k \tag{1.16}$$

15. To our knowledge, only Defever and Toubal (2013) assumed a reverse order: $F_O > F_V$, based on Williamson (1979) Transaction Costs Theory argument. However, transaction costs are operating costs, and not the entry sunk costs we picture here in the line of Melitz (2003) and Antràs and Helpman (2004). The next chapter develops more the inefficiencies of JV compared to full integration, which could be interpreted as higher transaction costs, as does the business literature we would review.

16. This assumptions is grounded in Antràs and Helpman (2004, p.558) statement that “*the fixed costs of search, monitoring, and communication are significantly higher in the foreign country*”. Which means that for any producer, investing at home is cheaper than investing abroad.

Where $\Theta = \theta^{\alpha/(1-\alpha)}$ and

$$Z = \left(1 - \eta\alpha\beta_h - \frac{\alpha\mu(1-\eta)}{1-\alpha(1-\mu(1-\eta))}\right) A \left[\alpha^\alpha \left(\frac{\eta}{c_h}\right)^{\alpha\eta} \left(\frac{1-\eta}{c_m}\right)^{\alpha(1-\eta)} \beta_{h,k}^{\alpha\eta} (1-\beta_{h,k})^{\alpha\omega} \left(\frac{\mu}{1-\alpha(1-\mu(1-\eta))}\right)^{\mu\alpha(1-\eta)} \right]^{\frac{1}{1-\alpha}}$$

is a derived parameter which is proportional to the demand level; it depends on the costs of inputs, on the bargaining shares, and on the importance of contractual frictions for headquarter services and intermediate inputs. The fraction $\left(1 - \eta\alpha\beta_h - \frac{\alpha\mu(1-\eta)}{1-\alpha(1-\mu(1-\eta))}\right) \geq 0$ corresponds to the final share of revenue that goes to H , after paying his variable costs, and compensating M for its own costs. Therefore it cannot be negative, H refusing to produce if it were the case. As one could expect, H 's profits are increasing in the demand level A , and in the fraction of M 's contractible inputs μ , as in the importance of headquarter services in the final good η .

Note that the profits are not monotonic in β_h , because increasing β_h could result in receiving an increasing share of a decreasing revenue, due to M 's lower willingness to cooperate.

Let β_h^* be the value of β_h that maximizes H 's revenue ΘZ_k , this reduces to find β_h^* that maximizes $(\beta_h^{\alpha\eta+1-\alpha}(1-\beta_h)^{\alpha\omega})$, which yields

$$\beta_h^* = \frac{\alpha\eta + 1 - \alpha}{(\alpha\eta + 1 - \alpha) + \omega\alpha} = \frac{1 + \alpha(\eta - 1)}{1 - \alpha\mu(1 - \eta)} \quad \text{See Appendix 1.A.2 for details}$$

This optimal revenue share has the expected characteristics, being positive, but inferior to one as the denominator is always greater or equal to the numerator (obvious from the first expression as $\omega\alpha \geq 0$). We see this optimal revenue share to increase in η and in μ , and decrease in $\omega = (1-\mu)(1-\eta)$ ¹⁷

Because of the slight modifications we made, we find the β^* curve drawn in figure 1.1 to be different from the one in Antràs and Helpman (2004), but still increasing in η . The shape of the curve depends on the value of μ . We considered two illustrative values of μ (i.e. μ_{Low} and μ_{High})¹⁸

On this figure, the bold curve represents the optimal revenue share β_h^* . The dashed part corresponds to values of β^* that cannot be reached by adjusting s within a Joint-Venture. Conversely, each point on the plain part of the curve could be reached by choosing the corresponding level of s in a JV.

The following table 1.2 summarizes the ownership structure and the ownership share chosen by

17. Actually due to our asymmetric game, where all H 's inputs are non-contractible, contrary to M 's ones we find a lower bound of $\beta^* = 1 - \alpha$. Extending the game to H partially contractible inputs would make the lower bound of $\beta^* \rightarrow 0$ when both H 's importance in the final-good and non-contractible fraction of inputs are close to zero. However, this lower bound in our model doesn't modify our predictions, as soon as we picture this value to be low.

18. The curves in figure 1.1, are drawn with $\mu_{Low} = 0.25$ and $\mu_{High} = 0.75$, and $\alpha = 0.85$

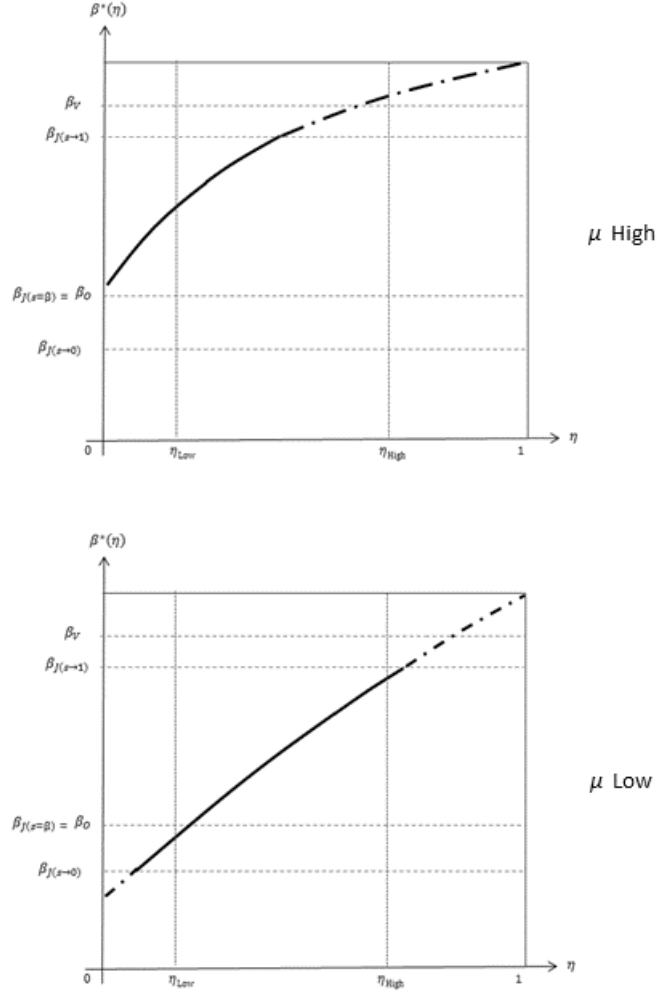


Figure 1.1 – Revenue share that maximizes joint revenue

H in each of the four combination possible between η and μ values.

μ	η	ω	$\beta_{h,k}$	s
μ_{High}	η_{High}	ω_{Low}	$\beta_{h,V}$	1
μ_{High}	η_{Low}	ω_{Med}	$\beta_{h,J}(s)$	$\beta < s < \beta_{h,V}$
μ_{Low}	η_{High}	ω_{Med}	$\beta_{h,J}(s)$	$\beta < s < \beta_{h,V}$
μ_{Low}	η_{Low}	ω_{High}	$\beta_{h,J}(s)$	$s < \beta$

Table 1.2 – Ownership structure chosen in each of the identified case.

In our example, the optimal level of β^* for $\omega = \omega_{Low}$ (i.e. η_{High} and μ_{High}) cannot be reached neither by JV, nor by full integration. Nevertheless the closest level of β_k from β^* is $\beta_{h,V}$, such that H will fully integrate the foreign supplier ($s = 1$). In the opposite case, when $\omega = \omega_{High}$ (i.e. η_{Low} and μ_{Low}), the optimal structure is JV with a low ownership share that allows H to give some of its

bargaining power to M , such that $\beta_h^* < \beta$ could be reached.

In the two other possibilities, when ω is intermediate, we see that JV is the best ownership structure, since it enables H to reach β_h^* , between $\beta_{h,O}$ and $\beta_{h,V}$.

However, reaching (or getting the closest possible to) β^* , only ensures the firm to be on the profit function with the higher slope $Z\Theta$. Yet it could not be the one maximizing the profit, due to fixed costs, since $F_O < F_J < F_V$.

Following Antràs and Helpman (2004, 2008), we simply compare a few number of environments, according to the cases distinguished above: those with highly important, medium-important and low-important non-contractible activities of M , measured by $\omega = (1 - \mu)(1 - \eta)$.

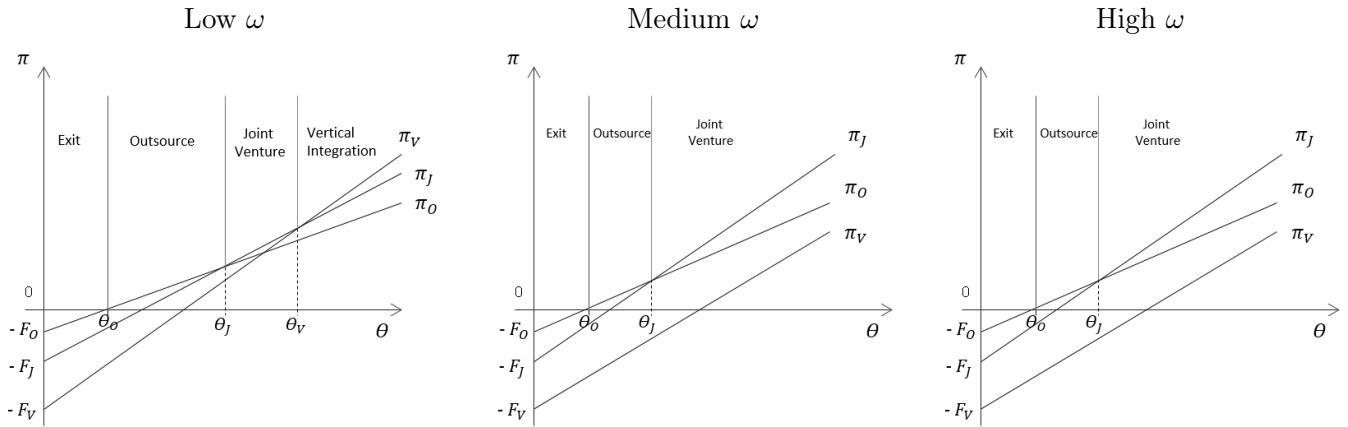


Figure 1.2 – Profit functions by importance of M 's non contractible activities.

When ω is low, we find an expected selection effect, similar to the one in Antràs and Helpman (2004, 2008) for headquarter intensive sectors, except that JVs appear to be an intermediate solution between Outsourcing and full vertical integration (see figure 1.2, left panel). In such environments, Joint-Ventures are then the optimal integration solution for firms with a productivity level $\theta_J \leq \theta \leq \theta_V <$. But complete vertical integration still dominates JV for most productive firms.

The major findings though arise in the two other environments, when ω is high or intermediate. In these two backgrounds, the profit curves have a similar aspect, with Joint Ventures being the sole optimal integration strategy, dominating full integration even for most productive firms, because as seen in figure 1.1, the optimal level of β is only reachable via a Joint-Venture, so that the curve of π_V is flatter than the one in π_J .

The only difference between these two last backgrounds is the ownership share held by the MNE in the JV. When the importance of M 's non contractible activities in the final good is intermediate, more productive firms would opt for JV over outsourcing because in spite of a higher fixed costs, it

allows them to recover a greater share of the joint revenue by setting $s > \beta$.

To the contrary, when ω is high, the MNE would set-up a JV with a low ownership share ($s < \beta$), to foster M 's non contractible investments, by giving up some of its initial bargaining power. In this case, the final-good producer aims at reducing its share of the joint revenue compared to what it would obtain under outsourcing, to maximize its final revenue through a higher production. However, only productive enough multinationals could do so, for the gain on the extensive margins of production to overcome lower per-unit profits. Anyway in both cases, higher TFP encourages integration – even in less favorable destinations for H , but does not lead to full vertical integration. Therefore, JVs are no longer an intermediate solution between outsourcing and integration, but a third organizational structure that can be optimal, and preferred to both standard solutions.

2.5 The role of host countries

As evoked in introduction μ is country-specific, reflecting the host-country contract enforceability. Assume $\mu_W = \mu_{High}$ while $\mu_E = \mu_{Low}$, because we assume the contractible environment to be more secured in country W , and weak in E .

The optimal organizational structure in each country is detailed in table 1.3, derived from table 1.2, and figure 1.2.

Host-Country	Sector	Low TFP ($\theta_O < \theta_i < \theta_J$)	Med. TFP ($\theta_J < \theta_i < \theta_V$)	High TFP ($\theta_i > \theta_V$)
W	η_{High}	Outsourcing	Joint-Venture	Full integration
W	η_{Low}	Outsourcing	Joint-Venture	Joint-Venture
E	η_{High}	Outsourcing	Joint-Venture	Joint-Venture
E	η_{Low}	Outsourcing	Outsourcing	Joint-Venture

Table 1.3 – Organizational structure chosen by H , by firm, sectoral and host-country characteristics

Only the most productive firms would opt for full integration, and only when they invest in a country-sector association where the non contractible activities of their partner are low enough. At the opposite, only low productive firms would choose to outsource in all cases, since they prefer the solution that limits fixed costs. Multinational firms are firms that have done at least one FDI, either in JV or full integration, such that they necessarily have a productivity of at least θ_J . Our model concludes therefore to a higher productivity of MNEs as standard models do.

We also show that the TFP might allow to undertake FDI in more uncertain countries, while low productive MNEs would outsource in such countries, when the final good isn't intensive in headquarters' services. The role of the foreign country is therefore as important as the one of sector affiliation

in standard GHM models, since it would shift the optimal integration strategy for two identical firms (in terms of TFP).

However, this model main contribution to the literature is to show that within multinationals, the TFP might allow the MNE to own more (entirely) its foreign affiliate compared to a least productive MNE, when investing in a country with good contractual institutions, and in a sector intensive in H 's inputs.

2.6 Discussion on the first model

In the previous section, we built a model of integration strategies in the line of the Grossman-Hart-Moore framework, using their conception of ownership as an access to assets (and more precisely, to inputs, as adopted since Antràs and Helpman (2004)); and of non-contractible ex-ante specific inputs that rises the hold-up problem as *ex-ante* inefficiencies at the core of GHM. Using Cai (2003) and Cui (2011) mechanism that gives both parties a disagreement payoff if the bargaining fails under a Joint-Venture, shared ownership is shown not to be always sub-optimal. To the contrary, we show it to be an optimal choice in two different cases: (i) For medium-productive firms where top productive firms would opt for full integration. (ii) As a dominant integration choice over full integration in country-sectors associations that make non-contractible M 's input important enough.

The second case is a major step this chapter does into the vast literature of rationale for (international) joint-ventures, highlighting the utility of considering JV as a possible organizational structure the mainstream models *à la* Antràs and Helpman (2004) do not account for, while staying close to their assumptions (only changing the disagreement payoffs in case of shared ownership).

This model also underlines the role of the host-country in the integration choice widening it to a firm - industry - host-country model, where the combination of all three parameters is important in defining the optimal ownership share.

Predictions on the aggregate behaviour of MNEs could easily be drawn from this extension of heterogeneity firms models. Our model concludes to a wider range of host-country more productive firms could invest in, and that most productive firms should own more their foreign affiliates, at least in favorable country-sector associations, opting for full integration when least productive MNE would opt for joint-ventures.

In the following section, we depart from the GHM ownership conception, to see how international joint-ventures could be explained when considering also ex-post inefficiencies, and whether the

conclusions are similar.

3 Ownership as decision-making power

3.1 Conceptual background

As indicated in introduction, the literature focusing on joint ventures, and more generally on team production optimal contracts, goes beyond the GHM notion of ownership and has many ramifications. The particular argument explored in this section relies heavily on Bai et al. (2004)'s model (henceforth BTW). This is one of the few models dealing with both *ex-ante* inefficiencies on investment incentives (i.e. GHM's main insight) and *ex-post* inefficiencies in decisions adopted once an initially uncertain state of the world is revealed, and where expropriation-like strategies are available to the controlling party. These inefficiencies can be addressed by combining revenue-sharing contracts and control arrangements of team production, as in Holmstrom (1982, 1999)¹⁹.

We adapt this rich framework to the context of FDI choices of heterogeneous multinational enterprises (MNEs), and emphasize from the outset that key underlying notions have some departures from those currently used in the nowadays standard treatment in international trade, mainly based on the GHM approach (see Antras (2015)). It is worth then proceeding to a brief preamble discussing the conceptual background of BTW.

Their model was indeed motivated by contemporaneous JV contracts in China. These are composed of two documents: (i) a contract, which specifies equity shares and the composition of main decision-making bodies; and (ii) articles of association specifying the governance structure of the JV, namely voting rules. These rules are important in allocating control rights. For instance, a partner holding a minor equity share and thus a small representation in the board of directors may still put a veto on a crucial decision if the voting rule on the issue at stake requires unanimous agreement.

BTW's view of control, as being defined by the interaction between equity shares and voting rules, is grounded on the evidence they provide. In their empirical analysis revenue-sharing arrangements are captured by the equity share of partners. Control arrangements are identified by combining the information on voting rules and partners' representation in the decision-making body. The authors make the distinction between two forms of governance: joint control, where no party can make a

19. Schmitz (2008) Also develops a model with both *ex-ante* and *ex-post* inefficiencies, where a JV arrangement can be optimal in the presence of asymmetric information about disagreement payoffs. We follow BTW's model as it completes GHM by highlighting moral hazard, an aspect well represented in multinational firms' context, the importance of which has received less attention in theoretical FDI literature.

decision without the other party's consent, and unilateral control arrangements, where the controlling partner unilaterally decides the course of the production plan with the aim of maximizing own profits only. The evidence collected convincingly shows that, although equity and voting shares are highly correlated, the presence of voting rules should be considered to understand specific control arrangements. Moreover, voting rules may vary from one type of decision to another within a given JV contract, and they may vary across JVs for a given decision (See Table 3, *ibid.*). This will be an important point that we will emphasise later in our modeling strategy.

In BTW's model, partners derive a joint verifiable revenue from the venture and also a non-contractible private revenue that depends on the specific adaptation of the production plan. The *ex ante* contracted revenue-sharing arrangement can act as an efficiency-improving device because it limits the incentives of the controlling partner to "*expropriate*" the other –i.e. to undertake a unilateral adaptation of the production plan that increases own private revenue at the expense of both joint revenue and private benefit of the other party. Not only the adaptation of the production plan can be sub-optimal in this case, the possibility of expropriation also negatively affects *ex ante* incentives to invest in the project. Hence, inefficiencies remain in spite of the contractibility of the joint revenue, and especially so as the revenue-sharing contract may not suffice to avoid expropriation. This leaves room for joint control to improve efficiency since no arbitrary adaptation of the production plan can be performed without common agreement in BTW's model²⁰.

Whereas revenue shares are captured by equity shares in BTW's empirical exercise, no explicit mention is made to the latter in their theoretical discussion. Such a specification is unnecessary for the authors purposes since what is important is the configuration of revenue shares and control rights. If one makes the assumption of perfect correlation between equity and revenue shares on verifiable joint revenue, as it is the practice in equity joint ventures, the notion of control in BTW appears to go beyond ownership of assets, since the equity share is generally interior in equilibrium, no matter what type of control arrangement is chosen. This remark should be kept in mind when relating the model to the property rights tradition since models based on GHM generally make no distinction between control and ownership²¹.

20. Conversely, as previously discussed, in GHM's approach no aspect of production decisions, and hence expected revenue, is contractible *ex ante*, but contractible *ex post*, which motivates the negotiation over the distribution of surplus. Ownership increases the incentives to invest, as it ensures control of assets, and so of residual rights. Joint ownership is in this context suboptimal as no party can unilaterally appropriate the marginal benefit of investment, which, via the anticipation of disagreement payoffs, results in both parties underinvesting.

21. "We define a firm to consist of those assets that it owns or over which it has control; we do not distinguish between ownership and control and virtually define ownership as the power to exercise control." (Grossman and Hart (1986, pp. 693-694))

3.2 Our modeling approach

In what follows we make two important departures from BTW. The first deals with the definition of joint-ventures, and their inner distribution of power. Secondly, we analyse how heterogeneity in the marginal productivity of multinationals' input shape the optimal control arrangement.

Conception of Joint-Ventures

As BTW, Joint-Ventures are here defined as production teams with partners playing complementary roles, although behaving in a non-cooperative way. Control is defined as the ability of one party to adapt the production plan that has been conceived in a world that is not fully contingent. This plan could be seen a set of decisions to be taken once the state of the world is revealed and becomes common knowledge.

We depart from BTW's model by going beyond the possibility of a binary choice between "unilateral" and "joint " control, which would apply to the full set of relevant decisions of the joint venture. In our model, when a multinational increases its equity share, besides absorbing a larger share of joint revenue, obtains also additional voting rights. This ultimately enables the investor to increase its decisional power to adapt the initially agreed production plan. We shall call "effective" control, the multinational's ability to effectively implement any arbitrary adaptation of the production plan. In our model a larger equity share is associated to a larger effective control, although not linearly since minority holders are often particularly protected in a subset of key decisions, some of them being crucial for the multinational to implement its privately optimal plan.

Our modeling strategy is consistent with antitrust law terminology, for which the notion of control in real-life joint ventures is a key building block. In Europe, for instance, it usually conceptualises control in joint ventures as a combination of *common* (i.e. joint) control and *exclusive* (i.e. unilateral) control allowed to the majority owner, with the distinction being applied at the decision level²². Typically, a key subset of decisions is under common control: both parties have veto power on these matters and a common agreement is then needed. Some decisions, on the other hand, can be taken by the majority owner alone, which exerts here its exclusive control. Usually the party benefiting exclusive control can adopt unilaterally a strategic decision. The form of exclusive control in this case is said "positive". In some cases, one party is able to unilaterally prevent the adoption of a given

22. These are also common notions in merger regulation and antitrust law in many countries. See *Official Journal of the European Union, 2009/C 43/09* (02.21.2009), p.17 or *Mergers Control Guidelines* issued by the French authority of competition.

strategic decision. There is also here a form of exclusive control, but is said “negative” since the party can only block but not impose a decision. Negative exclusive control is different than common control since the party having the unilateral right of blocking may or may not cooperate in finding an agreement.

The precise delimitation between decisions under common or exclusive control depends on three set of parameters. A first set is the host country legal protection of minority-shareholders, which gives them veto power on very crucial decisions. This is done, generally, through the requirement of high levels of qualified majority. For example, according French law, unanimous decisions are required for changing the firm’s nationality (i.e. transferring the headquarters abroad) or Increasing the venture’s capital²³. Some other decisions are set to a 95% threshold by the law, such as removing the firm from stock exchange²⁴.

A second set of parameters defining control is the shareholders’ agreement. This document defines the required level of approval for all key decisions that are not set by law or where the agreement completes the baseline provisions. For example, common draft models of shareholders’ agreements issued by legal counsel companies often list up decisions the shareholders should detail in the document. Among these one may find for instance “The lending of money by the corporation to any person other than as described in the approved business plan”, “The appointment or removal of directors”, or also “The creation, acquisition or disposition of any subsidiary of the corporation”²⁵.

Last but not least, control is of course also defined by the voting shares of partners. Voting shares of foreign investors is generally highly correlated with their equity share, as BTW’s evidence shows. Comparing actual voting shares of each party to the approval levels set by law and in the shareholder’s agreement gives the actual unilateral decisional power of the majority owner, the blocking power of the minority shareholder, and the extent of common decisional power in the joint-venture. For each decision, three cases of voting rules are worth to mention: (i) absolute majority rule, where (only) more than 50% of votes are required (so in a two-partners JV, the majority owner has exclusive control); (ii) unanimity, where 100% of votes are required, which implies common decisional power; and in between (iii) qualified majority, where a give, share of votes is required, usually (but not necessarily) larger than 50%. In this third case the two above-mentioned types of control can be present and the

23. Article L. 223-30 alinéa 1er and Article L. 223-30 alinéa 5, “Code de commerce”

24. The Radiall case is an interesting illustration. Despite holding 89% of equity shares after a take-over bid, the majority owner was unable to activate the squeeze out clause, set to 95%. Minority shareholders forced the majority to stay in the stock exchange list. The company was removed from Euronext by mid-2017, after a bargaining process with minority shareholders since 2010.

25. Examples are drawn from <http://www.thompsonlaw.ca/articles-and-resources.html>

larger the qualified majority required the larger the likelihood of adopting the decision under common control.

The empirical evidence provided by Bai et al. (2004) is indeed quite consistent with this conception of control as a combination of exclusive and common control. Over the 200 shareholders' agreements of Chinese JVs they review, more than 95% precises unanimity on 4 major decisions (within a list of 15 decisions examined): "Changing the corporate charter"; "Terminating or dissolving the joint venture"; "Increasing or transferring registered capital" ; "Merging with other organizations". Also, 70 JVs specified a two-third qualified majority for "approving the budget and profit/loss allocation", and 40 unanimity. On more trivial management decisions, such as "hiring consultants" or "Designing employments contracts", only a few JV specify voting rules and most JV are *de facto* classified as "unilateral control" by the authors (See Bai et al. (2004, table 3, p.282)).

In our view BTW's theoretical model does not fully exploit this possibility of different forms of decisional power within the same JV, which ultimately defines control. If the adaptation entails expropriation, joint control allows the expropriated party to reject the adaptation plan, so that the *statu quo* prevails in BTW. It all happens as if the full adaptation of the production plan was a *package deal*, over which no smoothing amendment is possible. In our model, conversely, we see the adaptation of the production plan as a set of decisions having different voting rules. More crucial ones will need unanimity or a high qualified majority, and so will be adopted under a form of common decisional power. But we allow also some internal decisions of the plan to be adopted by absolute majority or even some low level of qualified majority. Hence the ability of an investor to impose and implement its arbitrary adaptation, what we call "effective control", will increase with its voting share and hence with its equity share. Hence even in case of a low equity share, the foreign investor may, to some extent, *unilaterally* implement a small, but arbitrary, adaptation of the production plan. If the parties do not find an agreement on a decision yielding a larger surplus, effective control in our model will shape disagreement payoffs, and so the incentives to invest in the JV.

Firm heterogeneity

The second important departure from BTW consists in introducing firm heterogeneity into the model. For simplicity we focus only on one partner's decision, say that of firm *A*, the multinational enterprise that has the ability of increasing own benefits with the adaptation of the production plan. We allow for heterogeneous marginal contributions of the input provided by *A*-type firms.

Consider the ownership-location-internalisation (OLI) paradigm (Dunning, 1988). The assets that matter in the ownership dimension here are MNE's assets that can be profitably deployed in other markets. These assets are generally seen as immaterial corporate assets, having some degree of non-rivalry allowing them to be used simultaneously, with limited congestion, in domestic and foreign projects. The heterogeneity we have in mind is related to these assets, and should be confined to the subset of multinationals firms. Thus, when we qualify a multinational as being more productive, we are saying that the inputs it exploits in international FDI has a higher contribution to the affiliate's output. On a formal perspective, we stay as close as possible to BTW's setting, in order to facilitate interpretations.

3.3 Main setting and timing

Consider a world with a continuum of MNE evaluating the decision of signing a joint-venture contract in a foreign market. For simplicity, suppose a form of differentiation allowing us to focus on the within-firm problem only, as would be the case with, for instance, monopolistic competition. Let us call firm A the MNE and firm B its foreign partner. Suppose these firms have a commonly agreed initial production plan. Market conditions are however uncertain, so writing a fully contingent contract over eventual modifications of the initial project is not possible. Once the market context is revealed, the *ex ante* agreed production plan may appear to be inefficient and firms may (re)negotiate.

Let t index the time sequence. The timing and structure of the model is as follows.

Initial contract

At $t = 0$ partners sign a contract establishing the production plan and a revenue-sharing rule over the common verifiable revenue R . The share each firm obtains is perfectly correlated with its equity share. The contract gives A a revenue $sR + F$ and B a revenue $(1 - s)R - F$, where s is A 's equity share and F a lump-sum transfer from B to A .

Investment

At $t = 1$ each partner chooses the effort (or investment outlay) to be deployed in the joint production plan, denoted for A and B , respectively, α and β . These outlays are non-contractible investments that determine in turn the verifiable revenue of the joint project, defined as

$$R(\delta, \alpha, \beta) \equiv r(\delta) y(\alpha, \beta) \tag{1.17}$$

with y increasing and concave in (α, β) , and δ a parameter vector that summarises the kind of actions that can be performed *ex post* in order to modify the *ex ante* production plan.

Partners' investments also affect non-contractible private benefits that each party is assumed to obtain. These are defined as

$$P_A(\delta, \alpha) \equiv a(\delta) y_A(\alpha) \qquad P_B(\delta, \beta) \equiv b(\delta) y_B(\beta) \qquad (1.18)$$

with y_A and y_B nondecreasing and concave in, resp. α and β . We adopt the following functional assumption for the joint product:

$$y(\alpha, \beta) \equiv \mu_A y_A(\alpha) + \mu_B y_B(\beta) \qquad (1.19)$$

The marginal productivity of A 's input, μ_A , will be considered heterogeneous across multinational firms.

Adaptation of the production plan

At $t = 2$, once market conditions are known, partners decide whether and how they modify the production plan. This decision is modeled as the pair $\delta = (d_A, d) \in [0, 1]^2$ where a positive level of d_A captures an "expropriation" strategy, i.e. the action increasing A 's pay off at the expense of both the joint revenue R and the private benefit of B . Action d is, on the other hand, a Pareto-improving action that positively shifts the joint revenue as well as both partners' private benefits. A simple linear parametrisation of this can be written

$$r(\delta) = r_1 - r_2 d_A + r_4 d \qquad (1.20)$$

$$a(\delta) = a_1 + a_2 d_A + a_4 d \qquad (1.21)$$

$$b(\delta) = b_1 - b_2 d_A + b_4 d \qquad (1.22)$$

In this representation $\delta_0 \equiv (0, 0)$ identifies the initial production plan, which could be modified as $\delta^* = (0, 1)$ under a Pareto-improving adaptation, or as $\delta_A \equiv (\eta(s), 1)$ under expropriation by A , where $\eta(s)$ reflects A 's "effective" control, defined as the possibility of effectively implement its arbitrary adaptation decision, as explained in detail above. Let \mathbb{S} the set of decisions allowing to implement an expropriation strategy, with S_i being its typical element (for $i = 1..N$). Let us order

these elements by the required level of votes stipulated by the corresponding voting rule. Hence, in obtaining the adoption of the most trivial decision, S_1 , to the most crucial one, S_N , the MNE will need to increasingly enhance its voting share. In other words, the count of elements of \mathbb{S} , that can be effectively adopted unilaterally (i.e. with positive exclusive control) by the MNE will present a concave schedule with respect to its equity share. This motivates our first crucial assumption:

Assumption 1. *For $0 < s < 1$, the effective control function verifies*

$$0 < \eta(s) < 1, \quad (1.23)$$

$$\lim_{s \rightarrow 1^-} \eta(s) \rightarrow 1, \text{ and } \lim_{s \rightarrow 0^+} \eta(s) \rightarrow 0 \quad (1.24)$$

$$\eta'(s) > 0 \quad (1.25)$$

$$\eta''(s) < 0 \quad (1.26)$$

Assumption 1 defines an increasing but concave schedule between equity share and effective control. Small increases of equity ownership above 0 allows for progressive extension of daily business control, which may generally require trivial delegation or simple majority. But deciding on more crucial aspects, with expropriation motives, would require larger representation, and eventually the adoption of unanimous decisions. The function $\eta(s)$ smooths this progression in a tractable though insightful manner. Conditions (1.23)-(1.26) are sufficient for the results presented below.

Assumption 2. *Consider joint revenue and private benefits parametrisation, eqs.(1.20)-(1.22), and global benefits, $\Pi(\delta, \alpha, \beta) \equiv P_A + P_B + R$. We assume that expropriation is never globally efficient, viz.*

$$\Pi(\delta_A, \alpha, \beta) - \Pi(\delta^*, \alpha, \beta) < 0 \iff a_2 < r_2 \left(\mu_A + \mu_B \frac{y_B(\beta)}{y_A(\alpha)} \right) + b_2 \frac{y_B(\beta)}{y_A(\alpha)} \quad \forall \alpha, \beta \quad (1.27)$$

although joint revenue and B's private benefits always remain positive

$$r_1 + r_4 > \eta(s) r_2 \quad (1.28)$$

$$b_1 + b_4 > \eta(s) b_2 \quad (1.29)$$

At $t = 2$, the decision δ becomes contractible and the ensuing benefits symmetrically known.

The negotiation is assumed to be costless so that partners reach without delay the Pareto-improving decision, under the assumption that expropriation is never efficient. A "renegotiation surplus" from adopting the efficient decision is then obtained, and given by

$$RS = \Pi(\delta^*, \alpha, \beta) - (V_A + V_B)$$

where V_j is party j 's disagreement payoff ($j = A, B$), composed of its private revenue and its part in the (sub-optimal) contractible joint-revenue. Noting δ_D the decision taken in case of bargaining failure, we have

$$V_A = \Pi_A(\delta_D, \alpha, \beta) \equiv P_A(\delta_D, \alpha) + sR(\delta_D, \alpha, \beta)$$

and similar for B . We can thus write $V_A + V_B = \Pi(\delta_D, \alpha, \beta)$.

The adaptation of the production plan in case of bargaining failure does not necessarily entail expropriation. Firm A may have an equity share high enough to align its incentives to maximize the joint revenue. Consider A 's benefits without restricting δ ,

$$\begin{aligned} \Pi_A(\delta, \alpha, \beta) &= P_A(\delta, \alpha) + sR(\delta, \alpha, \beta) \\ &= [a_1 + a_2d_A + a_4d]y_A(\alpha) + s[r_1 - r_2d_A + r_4d]y(\alpha, \beta) \end{aligned}$$

Clearly, in case of bargaining failure $\delta_D = (\tilde{d}_A, 1)$ where $\tilde{d}_A = \eta(s)$ if

$$a_2y_A(\alpha) > sr_2y(\alpha, \beta) \Leftrightarrow a_2 > sr_2 \left[\mu_A + \mu_B \frac{y_B(\beta)}{y_A(\alpha)} \right] \quad (1.30)$$

and $\tilde{d}_A = 0$ otherwise. From which we have:

$$\begin{aligned} V_A &= \Pi_A(\delta_D, \alpha, \beta) = [a_1 + a_2\tilde{d}_A + a_4]y_A + s[r_1 - r_2\tilde{d}_A + r_4]y \\ V_B &= \Pi_B(\delta_D, \alpha, \beta) = [b_1 - b_2\tilde{d}_A + b_4]y_B + (1-s)[r_1 - r_2\tilde{d}_A + r_4]y \end{aligned}$$

Generally speaking, If A 's share of joint revenue is small relative to the private revenue that its effective control allows it to get, A will have incentives to expropriate B in case of bargaining failure.

Let λ_j be the bargaining power of partner $j = A, B$ with $\lambda_A + \lambda_B = 1$. Its payoff stemming from the Nash bargaining solution is

$$W_j = V_j + \lambda_j RS \quad (1.31)$$

It follows from the previous analysis that the equity share is key in determining disagreement payoffs as it defines partners' revenue sharing and also what can be done with the production plan.

Note that, contrary to BTW, partners never maintain the *statu quo*. This is a consequence of the explicit consideration of effective control. In BTW, when expropriation cannot be avoided without renegotiation (i.e. when condition (1.30) is verified), joint control entails two-sided veto power on *any* deviation from the initial plan. It is then efficiency augmenting because it prevents expropriation. However, this situation is reached at the price of giving up the Pareto-improving action $d = 1$. It all happens as if B 's veto power applies only to the full package of adaptation decisions, and not to singular actions, which constraint B to keep the *status quo*. This is contrary to the view that control arrangements may apply at the decision level. In our model, conversely, neither A nor B has reasons to deviate from the Pareto-improving action. Thus, we implicitly allow B the possibility of not being opposed to $d = 1$, even if it has veto power on all actions, i.e. in the limit case when $\eta(s) \rightarrow 0$. The essence of rational disagreement relies then on d_A . This explains why the situation of bargaining failure in our model considers $d = 1$ in $\delta_D = (\tilde{d}_A, 1)$ only²⁶.

Production

Finally, at $t = 3$ the decision δ is implemented and the gains from trade are perceived. The model is then solved by backward induction. The equity share will influence the disagreement payoffs and hence the incentive to invest. Next section analyses the optimal level of equity share.

3.4 Optimal revenue sharing and control arrangement

Given the form of revenue-sharing arrangements and the lump sum transfer, we need to consider the total net surplus. Under efficient bargaining this can be written,

$$\begin{aligned} X(\alpha, \beta) & : = \Pi(\delta^*, \alpha, \beta) - \alpha - \beta & (1.32) \\ & = (a_1 + a_4 + \mu_A(r_1 + r_4))y_A(\alpha) + (b_1 + b_4 + \mu_B(r_1 + r_4))y_B(\beta) - (\alpha + \beta) \end{aligned}$$

In order to obtain more economic intuition on the model results, let us consider the following maximization problems.

26. This corresponds to the case of bargaining failure under unilateral control by A in BTW's setting. Here this is qualified further, namely to allow for different levels of effective control.

- First-best (*FB*) problem: The efficient decision is taken directly (exogenously, without renegotiation) and efforts α and β are chosen in order to maximize the global net surplus, eq. (1.32). As a corollary, the equity share does not play a role.
- Second-best (*SB*) problem: The efficient decision is also taken directly here, but the efforts α and β are the result of individual maximization, based on each party's payoff and investment costs, $\Pi_A(\delta^*, \alpha, \beta) - \alpha$, and $\Pi_B(\delta^*, \alpha, \beta) - \beta$.
- Renegotiation (*RN*) problem: The efficient decision δ^* is adopted after a costless renegotiation. The Nash-bargaining solution over the renegotiation surplus pertains. The efforts α and β are then chosen individually in order to maximize the Nash-bargaining payoffs, eq. (1.31).

Lemma 1 *In the FB, SB, and RN problems, first-order conditions of partners' investment are of the form*

$$c_1 y'_A(\alpha) = 1 \quad (1.33)$$

$$c_2 y'_B(\beta) = 1 \quad (1.34)$$

where c_1 and c_2 will be called the "incentive coefficients" of, respectively, A and B optimal investment. Let c_1^k and c_2^k denote the specific value of c_1 and c_2 in the k -problem, $k \in \{FB, SB, RN\}$. We obtain

$$c_1^{FB} = a_1 + a_4 + \mu_A (r_1 + r_4) \quad (1.35)$$

$$c_2^{FB} = b_1 + b_4 + \mu_B (r_1 + r_4) \quad (1.36)$$

$$c_1^{SB} = a_1 + a_4 + s (r_1 + r_4) \mu_A \quad (1.37)$$

$$c_2^{SB} = b_1 + b_4 + (1 - s) (r_1 + r_4) \mu_B \quad (1.38)$$

$$c_1^{RN} = a_1 + a_4 + s (r_1 + r_4) \mu_A + [a_2 (1 - \lambda_A) + r_2 \mu_A (\lambda_A - s)] \tilde{d}_A \quad (1.39)$$

$$c_2^{RN} = b_1 + b_4 + (1 - s) [r_1 + r_4] \mu_B + [r_2 \mu_B [\lambda_B - (1 - s)] - b_2 (1 - \lambda_B)] \tilde{d}_A \quad (1.40)$$

Proof 1 *FB optimal efforts are given by the following first-order conditions*

$$\begin{aligned} \frac{\partial X(\alpha, \beta)}{\partial \alpha} &= 0 \\ \underbrace{[a_1 + a_4 + (r_1 + r_4) \mu_A]}_{c_1^{FB}} y'_A(\alpha) &= 1 \end{aligned} \quad (1.41)$$

$$\begin{aligned}\frac{\partial X(\alpha, \beta)}{\partial \beta} &= 0 \\ \underbrace{[a_1 + a_4 + (r_1 + r_4) \mu_B]}_{c_2^{FB}} y'_B(\beta) &= 1\end{aligned}\quad (1.42)$$

In the case of SB problem, individual optimal investment under $\delta = \delta_0$ is given by

$$\begin{aligned}\Pi_A - \alpha &= (a_1 + a_4) y_A(\alpha) + s(r_1 + r_4) [\mu_A y_A(\alpha) + \mu_B y_B(\beta)] - \alpha \\ \underbrace{[a_1 + a_4 + s(r_1 + r_4) \mu_A]}_{=c_1^{SB}} y'_A(\alpha) &= 1\end{aligned}\quad (1.43)$$

$$\begin{aligned}\Pi_B - \beta &= (b_1 + b_4) y_B(\beta) + (1-s)(r_1 + r_4) [\mu_A y_A(\alpha) + \mu_B y_B(\beta)] - \beta \\ \underbrace{[b_1 + b_4 + (1-s)(r_1 + r_4) \mu_B]}_{=c_2^{SB}} y'_B(\beta) &= 1\end{aligned}\quad (1.44)$$

As for the RN problem, we have

$$\begin{aligned}W_A - \alpha &= V_A + \lambda_A R S - \alpha \\ &= \Pi_A(\delta_D, \alpha, \beta) + \lambda_A [\Pi(\delta^*, \alpha, \beta) - \Pi(\delta_D, \alpha, \beta)] - \alpha \\ &= P_A(\delta_D, \alpha, \beta) + sR(\delta_D, \alpha, \beta) + \lambda_A [\Pi(\delta^*, \alpha, \beta) - \Pi(\delta_D, \alpha, \beta)] - \alpha\end{aligned}$$

$$\begin{aligned}\frac{\partial W_A}{\partial \alpha} - 1 &= a(\delta_D) y'_A(\alpha) + sr(\delta_D) \mu_A y'_A(\alpha) \\ &\quad + \lambda_A [a(\delta^*) y'_A(\alpha) + r(\delta^*) \mu_A y'_A(\alpha) - a(\delta_D) y'_A(\alpha) - r(\delta_D) \mu_A y'_A(\alpha)] - 1 \\ &= 0\end{aligned}$$

$$\begin{aligned}[a(\delta_D) + sr(\delta_D) \mu_A + \lambda_A [a(\delta^*) + r(\delta^*) \mu_A - a(\delta_D) - r(\delta_D) \mu_A]] y'_A(\alpha) &= 1 \\ [a(\delta_D) + sr(\delta_D) \mu_A + \lambda_A \tilde{d}_A [-a_2 + r_2 \mu_A]] y'_A(\alpha) &= 1 \\ [a_1 + a_4 + [r_1 + r_4] s \mu_A + [1 - \lambda_A] a_2 \tilde{d}_A + [\lambda_A - s] r_2 \tilde{d}_A \mu_A] y'_A(\alpha) &= 1 \\ \underbrace{[a_1 + a_4 + [r_1 + r_4] s \mu_A + ([1 - \lambda_A] a_2 + [\lambda_A - s] r_2 \mu_A) \tilde{d}_A]}_{c_1^{RN}} y'_A(\alpha) &= 1\end{aligned}$$

Now for B

$$\begin{aligned}
 W_B - \beta &= V_B + \lambda_B RS \\
 &= \Pi_B(\delta_D, \alpha, \beta) + \lambda_B [\Pi(\delta^*, \alpha, \beta) - \Pi(\delta_D, \alpha, \beta)] - \beta \\
 &= P_B(\delta_D, \alpha, \beta) + (1-s)R(\delta_D, \alpha, \beta) + \lambda_B [\Pi(\delta^*, \alpha, \beta) - \Pi(\delta_D, \alpha, \beta)] - \beta
 \end{aligned}$$

$$\begin{aligned}
 \frac{\partial W_B}{\partial \beta} - 1 &= b(\delta_D) y'_B(\beta) + (1-s) \mu_B r (\delta_D) y'_B(\beta) + \\
 &\quad \lambda_B [b(\delta^*) y'_B(\beta) + \mu_B r (\delta^*) y'_B(\beta) - b(\delta_D) y'_B(\beta) - \mu_B r (\delta_D) y'_B(\beta)] - 1
 \end{aligned}$$

$$\frac{\partial W_B}{\partial \beta} - 1 = 0$$

$$\begin{aligned}
 b(\delta_D) y'_B(\beta) + [1-s] \mu_B r (\delta_D) y'_B(\beta) + \lambda_B \tilde{d}_A [b_2 + \mu_B r_2] y'_B(\beta) &= 1 \\
 [b(\delta_D) + [1-s] \mu_B r (\delta_D) + \lambda_B \tilde{d}_A [b_2 + \mu_B r_2]] y'_B(\beta) &= 1 \\
 [b_1 + b_4 + [r_1 + r_4] [1-s] \mu_B + [\lambda_B - 1] b_2 \tilde{d}_A + [\lambda_B - (1-s)] \mu_B r_2 \tilde{d}_A] y'_B(\beta) &= 1 \\
 \underbrace{[b_1 + b_4 + [r_1 + r_4] [1-s] \mu_B + [r_2 \mu_B [\lambda_B - (1-s)] - b_2 (1 - \lambda_B)] \tilde{d}_A]}_{c_2^{RN}} y'_B(\beta) &= 1
 \end{aligned}$$

Assumption 3. The inverse function of $y'_A(\alpha)$, evaluated at $\frac{1}{c_1}$, and the inverse function of $y'_B(\beta)$, evaluated at $\frac{1}{c_2}$, respectively noted $\alpha(c_1) \equiv y_A'^{-1}\left(\frac{1}{c_1}\right)$ and $\beta(c_2) \equiv y_B'^{-1}\left(\frac{1}{c_2}\right)$, exist. Moreover, $\alpha'(c_1) > 0$, $\alpha''(c_1) > 0$, $\frac{dy_A(\alpha(c_1))}{dc_1} > 0$, and $\frac{d^2 y_A(\alpha(c_1))}{dc_1^2} < 0$. Similarly, $\beta'(c_2) > 0$, $\beta''(c_2) > 0$, $\frac{dy_B(\beta(c_2))}{dc_2} > 0$, and $\frac{d^2 y_B(\beta(c_2))}{dc_2^2} < 0$.

We can then follow the graphical routine of analysis proposed by BTW. Under Assumption 3 and Lemma 1, the function

$$U(c_1, c_2) \equiv X(\alpha, \beta) \quad \text{s.t. (1.33) and (1.34)}$$

is concave on (c_1, c_2) , which implies that the above-exposed optimisation problems can be graphically analysed in the (c_1, c_2) space, where the level curves of $U(c_1, c_2)$ are elliptic. The incentive coefficients of the FB problem are here the maximum of U . In the case of the SB and RN problems the equity share allows for an implicit relationship between c_1 and c_2 . In the SB problem this relationship is linear, the SB "incentive line" in the words of BTW. Multiplying (1.37) by $\frac{\mu_B}{\mu_A}$ and adding (1.38)

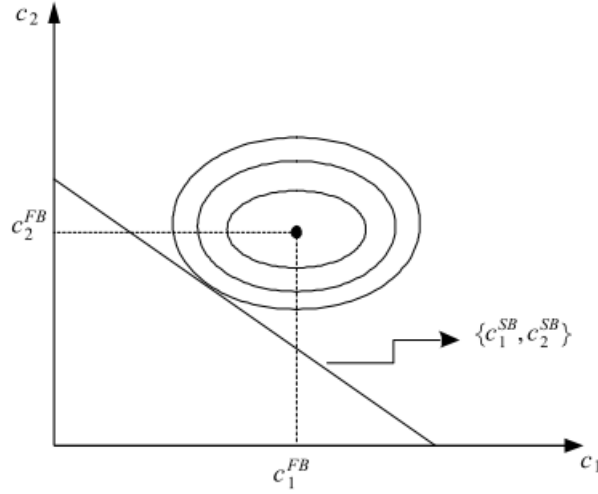


Figure 1.3 – Second-Best incentive line

gives

$$c_2^{SB} = (a_1 + a_4) \frac{\mu_B}{\mu_A} + b_1 + b_4 + (r_1 + r_4) \mu_B - \frac{\mu_B}{\mu_A} c_1^{SB} \quad (1.45)$$

Choosing the equity share, and so the share of the joint verifiable revenue, amounts to choose a point in the incentive line. Hence the solution to the *SB* maximization problem is given by the point reaching the highest indifference curve of $U(c_1, c_2)$. With the help of the bijection between s and the incentive coefficients one can obtain the optimal value of s .

Taking into account firm heterogeneity and effective control allows for additional insights. First note that a high-productivity MNE (featuring a high level of μ_A) has, relative to a low-productivity MNE, a flatter second-best incentive line in the (c_1, c_2) space, which also has a smaller vertical intercept (see eq.(1.45)). Note also that c_1^{FB} is larger for MNE featuring high productivity in the joint project, suggesting the allocation of a larger equity share for the MNE (i.e. the unconstrained optimum is horizontally further to the right in the (c_1, c_2) space).

For the *RN* problem the relationship between the incentive coefficient is obtained in an analogous way,

$$c_2^{RN} = (a_1 + a_4) \frac{\mu_B}{\mu_A} + b_1 + b_4 + (r_1 + r_4) \mu_B + \eta(s) \left[a_2(1 - \lambda_A) \frac{\mu_B}{\mu_A} - b_2 \lambda_A \right] - \frac{\mu_B}{\mu_A} c_1^{RN} \quad (1.46)$$

When (1.30) is not fulfilled, and so $\tilde{d}_A = 0$, eq. (1.46) collapses to the *SB* incentive line and both maximization problems are equivalent. Even if there is bargaining failure, A will rationally implement the Pareto-improving adaptation of the production plan in this case. Conversely, when

(1.30) pertains, and so $\tilde{d}_A = \eta(s)$, the relationship between c_1 and c_2 is no longer represented by a linear relationship, as it was the case in BTW. But the same reasoning can be applied since as s increases from 0 to 1, (1.46) can be represented by a continuum of parallel lines. We will call them the "expropriation" incentive lines. As in BTW we adopt the following assumption, which in our setting implies that all expropriation incentive lines are at or below the SB incentive line in the (c_1, c_2) space.

Assumption 4. *Parameters always verify*

$$a_2(1 - \lambda_A) \frac{\mu_B}{\mu_A} - b_2\lambda_A < 0 \Leftrightarrow a_2 < b_2 \frac{\mu_A}{\mu_B} \frac{\lambda_A}{(1 - \lambda_A)} \quad (1.47)$$

Choosing the equity share in the RN problem amounts then to select a specific expropriation incentive line and also a point within this line (since s is being held fixed). When $s \rightarrow 0$, and so $\eta(s) \rightarrow 0$, eq. (1.46) collapses to the SB incentive incentive, but with (1.30) being verified the solution is different. Indeed the incentive coefficients are here fixed at

$$c_2^{RN}|_{s=0} = b_1 + b_4 + [r_1 + r_4] \mu_B \quad (1.48)$$

$$c_1^{RN}|_{s=0} = a_1 + a_4 \quad (1.49)$$

Note that $c_2^{RN}|_{s \rightarrow 0} = c_2^{FB}$, but $c_1^{RN}|_{s \rightarrow 0} < c_1^{FB}$. In the (c_1, c_2) space, the point $(c_1^{RN}, c_2^{RN})|_{s \rightarrow 0}$ is horizontally at the left of the optimal point (c_1^{FB}, c_2^{FB}) . Clearly there is no reason to think that the highest indifference curve is reached at $s = 0$.

Now consider $s \rightarrow 1$, so that $\tilde{d}_A \rightarrow 1$. Eq. (1.46) collapses to the BTW incentive line in the case of expropriation, and the incentive coefficients are fixed at

$$c_2^{RN}|_{s=1} = b_1 + b_4 + \underbrace{r_2\mu_B(1 - \lambda_A) - b_2\lambda_A}_{<0} \quad (1.50)$$

$$c_1^{RN}|_{s=1} = a_1 + a_4 + (r_1 + r_4) \mu_A + \underbrace{(1 - \lambda_A)(a_2 - r_2\mu_A)}_{>0} \quad (1.51)$$

The signs stem from the following reasoning. When $s \rightarrow 1$ we can write condition (1.30) as $a_2 > r_2\mu_A + r_2\mu_B \frac{\mu_B}{\mu_A}$. Clearly, $(a_2 - r_2\mu_A) > 0$ and thus

$$c_1^{RN}|_{s \rightarrow 1} > c_1^{RN}|_{s \rightarrow 0}$$

Moreover, combining Assumption 4 and condition (1.30) we can obtain

$$sr_2 \left[\mu_A + \mu_B \frac{y_B}{y_A} \right] < b_2 \frac{\mu_A}{\mu_B} \frac{\lambda_A}{(1 - \lambda_A)} \quad (1.52)$$

Hence, with $s \rightarrow 1$ we can write $r_2(1 - \lambda_A)\mu_B \left[1 + \frac{\mu_B y_B}{\mu_A y_A} \right] < b_2 \lambda_A$, which is sufficient to express $r_2 \mu_B (1 - \lambda_A) < b_2 \lambda_A$. We have then

$$c_2^{RN} \Big|_{s \rightarrow 1} < c_2^{RN} \Big|_{s \rightarrow 0}$$

Switching from unilateral control of B to full control of A , implies the incentive coefficient of A increases and that of B decreases. Recall that y_A and y_B feature decreasing returns in, respectively, α and β , meaning that A substitutes B 's effort. This is also the case for interior values of A 's equity share, as the following lemma shows.

Lemma 2 *In the RN problem, as s goes from 0 to 1, (c_1^{RN}, c_2^{RN}) goes from $(c_1^{RN}, c_2^{RN}) \Big|_{s \rightarrow 0}$ to $(c_1^{RN}, c_2^{RN}) \Big|_{s \rightarrow 1}$ (defined in eq. (1.48)-(1.51)), depicting a concave relationship between c_1^{RN} and c_2^{RN} in the (c_1, c_2) space.*

Proof 2 *A first way to show the Lemma is to exploit the monotonic relationship between c_1^{RN}, c_2^{RN} and s . We have*

$$\frac{dc_1^{RN}}{ds} = (r_1 + r_4) \mu_A + \underbrace{[a_2(1 - \lambda_A) + r_2 \mu_A (\lambda_A - s)]}_{>0} \underbrace{\eta'(s)}_{>0} - r_2 \mu_A \eta(s) > 0$$

The term in squared brackets is positive. When $(\lambda_A - s) < 0$, the sole case that should be discussed, we always have $\frac{(s - \lambda_A)}{(1 - \lambda_A)} < s$, which enables us to invoke condition (1.30) as a sufficient condition for $a_2 > r_2 \mu_A \frac{(s - \lambda_A)}{(1 - \lambda_A)}$. Given this, we have $\frac{dc_1}{ds} > 0$ by (1.28) in Assumption 2 and (1.25) in Assumption 1. Moreover

$$\frac{dc_2^{RN}}{ds} = -[r_1 + r_4] \mu_B + \underbrace{[r_2 \mu_B [\lambda_B - (1 - s)] - b_2(1 - \lambda_B)]}_{<0} \underbrace{\eta'(s)}_{>0} + r_2 \mu_B \eta(s) < 0$$

Using $\lambda_A = 1 - \lambda_B$, condition (1.52) can be written $s \lambda_B r_2 \mu_B \left[1 + \frac{\mu_B y_B}{\mu_A y_A} \right] < b_2 (1 - \lambda_B)$. Noting that $s \lambda_B > [\lambda_B - (1 - s)]$ we know the term in square brackets is negative. Given this, condition (1.25) in Assumption 1, and condition (1.29) in Assumption 2, we conclude that $\frac{dc_2}{ds} < 0$. Finally, recalling

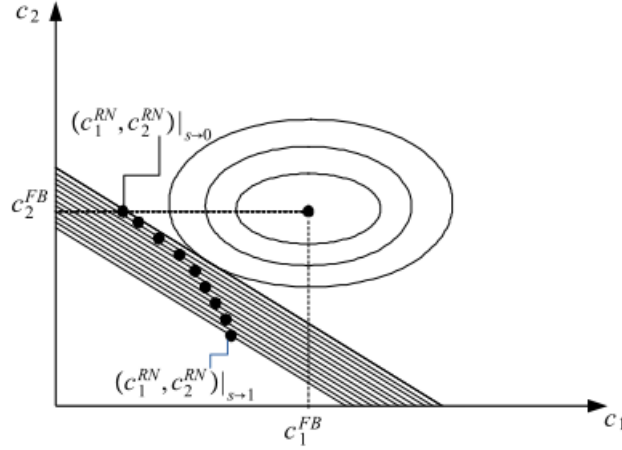


Figure 1.4 – Renegotiation incentive lines

condition (1.26) in Assumption 1, we obtain

$$\frac{d^2 c_1^{RN}}{ds^2} = \underbrace{[a_2(1 - \lambda_A) + r_2 \mu_A (\lambda_A - s)]}_{>0} \underbrace{\eta''(s)}_{<0} - \underbrace{2r_2 \mu_A \eta'(s)}_{>0} < 0$$

$$\frac{d^2 c_2^{RN}}{ds^2} = \underbrace{[r_2 \mu_B [\lambda_B - (1 - s)] - b_2(1 - \lambda_B)]}_{<0} \underbrace{\eta''(s)}_{<0} + \underbrace{2r_2 \mu_B \eta'(s)}_{>0} > 0$$

We can alternatively demonstrate the Lemma by totally differentiating (1.46), from which we get

$$\frac{dc_2^{RN}}{dc_1^{RN}} = \underbrace{\left[a_2(1 - \lambda_A) \frac{\mu_B}{\mu_A} - b_2 \lambda_A \right]}_{<0} \underbrace{\eta'(s)}_{>0} \underbrace{\frac{ds}{dc_1}}_{>0} \frac{\mu_B}{\mu_A} < 0$$

where the sign of the term in square brackets is defined by Assumption 4 and that of $\frac{ds}{dc_1}$ from the previous analysis. Moreover, the second derivative is

$$\frac{d^2 c_2^{RN}}{d(c_1^{RN})^2} = \underbrace{\left[a_2(1 - \lambda_A) \frac{\mu_B}{\mu_A} - b_2 \lambda_A \right]}_{<0} \underbrace{\eta''(s)}_{<0} \underbrace{\frac{d^2 s}{dc_1^2}}_{<0} < 0$$

Figure 1.4 presents this finding graphically, in the (c_1, c_2) space. Each dot belongs to the locus $\{c_1^{RN}, c_2^{RN}\}$, as defined by (1.46). The two parties must then agree on the ownership division that maximizes the joint surplus. Given the concavity of $U(c_1, c_2)$, this problem amounts to choose the point in the locus $\{c_1^{RN}, c_2^{RN}\}$ that minimizes the distance to the First-best solution. This calculation is not needed. Showing the uniqueness of s^* and how it varies with MNE productivity suffices for our

purposes²⁷.

Analytical solution of the renegotiation problem

Alternatively, s^* can be found as the value of A 's equity share that maximizes the total surplus, once we take into account the function compositions stemming from backward induction. As before, we only focus on the case where the disagreement payoffs are associated to eventual expropriation, i.e. when in case of bargaining failure $\tilde{d}_A = \eta(s)$. This pertains to condition 1.30. Otherwise, there is no renegotiation surplus, and the second-best solution is indeed reached. Thus, finding s^* amounts to solve:

$$\max_s U(c_1^{RN}(s), c_2^{RN}(s)) = X(\alpha(c_1^{RN}(s)), \beta(c_2^{RN}(s)))$$

We shall drop in what follows the RN index in order to simplify notations²⁸. The first-order condition gives:

$$\underbrace{\frac{\partial X}{\partial \alpha}}_{>0} \underbrace{\frac{d\alpha}{dc_1}}_{>0} \underbrace{\frac{dc_1}{ds}}_{>0} = - \underbrace{\frac{\partial X}{\partial \beta}}_{>0} \underbrace{\frac{d\beta}{dc_2}}_{>0} \underbrace{\frac{dc_2}{ds}}_{<0} \quad (1.53)$$

The left-hand side term corresponds to the net marginal surplus induced by increasing A 's ownership share, and will henceforth be noted MNS_A . Symmetrically, the right-hand side term is the marginal loss stemming from the ensuing disengagement of B , and will be noted as ML_B . Recall that $\alpha(c_1)$, $\beta(c_2)$ and $c_1(s)$ are concave, whereas $c_2(s)$ is convex. We can thus safely consider the fulfillment of the second-order condition. $U(\cdot)$ is concave in s . Formally:

Proposition 1 *There is a unique value of A 's equity share, s maximizing global net surplus in the renegotiation problem.*

Proof 3 *Signs of the first-order condition (1.53) follow from the previous analysis (excepting $\frac{\partial X}{\partial \alpha}$ and $\frac{\partial X}{\partial \beta}$, which are given by*

$$\begin{aligned} X(\alpha, \beta) &= \Pi(\delta^*, \alpha, \beta) - \alpha - \beta = P_A(\delta^*, \alpha) + P_B(\delta^*, \beta) + R(\delta^*, \alpha, \beta) - \alpha - \beta \\ &= a(\delta^*)y_A(\alpha) + b(\delta^*)y_B(\beta) + r(\delta^*)[\mu_A y_A(\alpha) + \mu_B y_B(\beta)] - \alpha - \beta \end{aligned}$$

²⁷. The minimization program of the distance to the first best, and precise identification of s^* can be found in appendix 1.B.1.

²⁸. indeed the same logic applies also to the SB problem.

$$\begin{aligned}
 \frac{\partial X}{\partial \alpha} &= a(\delta^*)y'_A(\alpha) + r(\delta^*)\mu_A y'_A(\alpha) - 1 \\
 &= \frac{c_1^{FB}}{c_1(s)} - 1 > 0
 \end{aligned} \tag{1.54}$$

Which must be positive if we want a first-order increasing effect of investments efforts on global surplus. $\frac{c_1^{FB}}{c_1(s)} > 1$. Similarly,

$$\begin{aligned}
 \frac{\partial X}{\partial \beta} &= b(\delta^*)y'_B(\beta) + r(\delta^*)\mu_B y'_B(\beta) - 1 \\
 &= \frac{c_2^{FB}}{c_2(s)} - 1 > 0
 \end{aligned} \tag{1.55}$$

The following properties apply to second-order derivatives. They help to examine the sign of $\frac{\partial MNS_A}{\partial s}$. For each left-hand side term in (1.53) we have:

$$\frac{\partial^2 X}{\partial s \partial \alpha} = -\frac{c_1^{FB}}{c_1(s)^2} \frac{dc_1}{ds} < 0.$$

Concerning the sign of $\frac{d^2 \alpha}{ds dc_1}$, we know from the first-order condition of optimal efforts (eq. 1.33) that $y'_A(\alpha) = \frac{1}{c_1}$. Hence $y''_A(\alpha) \frac{d\alpha}{dc_1} = -\frac{1}{[c_1]^2}$
 $\Rightarrow \frac{d\alpha}{dc_1} = -\frac{1}{y''_A(\alpha)[c_1]^2} > 0$

Now, take into account that c_1 itself depends on s :

$$\frac{d^2 \alpha}{ds dc_1} = \frac{2}{y''_A(\alpha)[c_1]^3} \frac{dc_1}{ds} < 0$$

Finally, from the proof of Lemma 2 we know $\frac{d^2 c_1}{ds^2} < 0$ in the case of renegotiation. Hence, all the elements of the marginal net surplus of A's equity ($MNS_A = \frac{\partial X}{\partial \alpha} \frac{d\alpha}{dc_1} \frac{dc_1}{ds}$), are decreasing in s . So we have formally:

$$\frac{\partial MNS_A}{\partial s} = \underbrace{\frac{\partial^2 X}{\partial s \partial \alpha}}_{<0} \underbrace{\frac{d\alpha}{dc_1}}_{>0} \underbrace{\frac{dc_1}{ds}}_{>0} + \underbrace{\frac{\partial X}{\partial \alpha}}_{>0} \left[\underbrace{\frac{d^2 \alpha}{ds dc_1}}_{<0} \underbrace{\frac{dc_1}{ds}}_{>0} + \underbrace{\frac{d\alpha}{dc_1}}_{<0} \underbrace{\frac{d^2 c_1}{ds^2}}_{<0} \right] < 0 \tag{1.56}$$

From the analogous functional assumption of B efforts and incentives, we have an increasing marginal loss of B contribution due to increasing A's equity share $\frac{\partial ML_B}{\partial s} > 0$.

Both sides of equation (1.53) cross each other once. This intersection gives the unique value of

s^* , as Figure 1.5 shows. We assume the concavity of $\eta(s)$, within the interval $]0, 1[$, strong enough to ensure an interior optimal equity share.

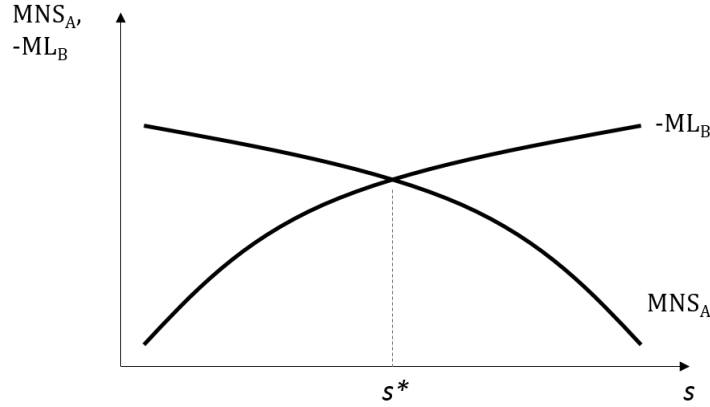


Figure 1.5 – Unique solution of s^*

Optimal equity share and firm heterogeneity

We study now how the optimal equity share s^* vary with the multinational's productivity. We ask whether increasing A 's productivity μ_A upwardly shifts the marginal net surplus of its ownership (i.e. the right-hand side of eq. (1.53)).

$$\frac{\partial MNS_A}{\partial \mu_A} = \frac{\partial^2 X}{\partial \mu_A \partial \alpha} \frac{d\alpha}{dc_1} \frac{\partial c_1}{\partial s} + \frac{\partial X}{\partial \alpha} \left[\frac{d^2 \alpha}{\partial \mu_A dc_1} \frac{\partial c_1}{\partial s} + \frac{d\alpha}{dc_1} \frac{\partial^2 c_1}{\partial \mu_A \partial s} \right] \quad (1.57)$$

All terms in eq.(1.57) are positive, excepting $\frac{d^2 \alpha}{\partial \mu_A dc_1} = \frac{2}{y''(\alpha)c_1^3} \frac{\partial c_1}{\partial \mu_A} < 0$ ²⁹. The sign of $\frac{\partial MNS_A}{\partial \mu_A}$ is then *a priori* ambiguous. The following proposition identifies the condition under which the positive correlation between MNEs' productivity and equity share pertains in the model.

Proposition 2 *In contractual environments where (i) a_2 and b_2 are sufficiently large, i.e. where the hold-up problem is particularly relevant, and (ii) the bargaining power of the MNE in the negotiation of the surplus is at least as large as its equity share, $\lambda_A > s$, the optimal equity share is positively correlated with the MNE's productivity.*

Proof 4 *Let $\epsilon(u, v)$ be the partial elasticity of u with respect to v , for any real variables (u, v) . After rearranging terms in eq.(1.57), we find $\frac{\partial MNS_A}{\partial \mu_A} > 0$ whenever:*

29. This comes from $\frac{\partial c_1}{\partial \mu_A} = s(r_1 + r_A) + r_2(\lambda_A - s)\eta(s) > 0$ according to eq. (1.28), and $\frac{2}{y''(\alpha)c_1^3} < 0$ as y_A is assumed concave (see appendix 1.B.2 for details).

$$\varepsilon\left(\frac{\partial X}{\partial \alpha}, \mu_A\right) + \varepsilon\left(\frac{\partial c_1}{\partial s}, \mu_A\right) > 2\varepsilon\left(\frac{\partial c_1}{\partial \mu_A}, \mu_A\right) \quad (1.58)$$

$\frac{d^2 c_1}{d\mu_A ds} = (r_1 + r_4) + r_2 [(\lambda_A - s)\eta'(s) - \eta(s)] > 0$ when $\lambda_A > s$ since Assumption 2 is being hold.

$$\frac{\partial c_1}{\partial \mu_A} \frac{\mu_A}{c_1} = \frac{1}{\underbrace{a_1 + a_4 + a_2(1 - \lambda_A)\eta(s)}_{D_1}} < 1$$

$$\frac{\frac{\partial^2 X}{\partial \mu_A \partial \alpha}}{\frac{\partial X}{\partial \alpha}} \mu_A = \frac{\frac{1}{c_1} \left[\frac{\partial c_1^{FB}}{\partial \mu_A} - \frac{c_1^{FB}}{c_1} \frac{\partial c_1}{\partial \mu_A} \right] \mu_A}{\frac{c_1^{FB}}{c_1} - 1} = \frac{\frac{c_1^{FB}}{c_1} \left[\frac{\partial c_1^{FB}}{\partial \mu_A} \frac{\mu_A}{c_1^{FB}} - \frac{\partial c_1}{\partial \mu_A} \frac{\mu_A}{c_1} \right]}{\frac{c_1^{FB}}{c_1} - 1} = \frac{c_1^{FB}}{c_1^{FB} - c_1} \left[\frac{\partial c_1^{FB}}{\partial \mu_A} \frac{\mu_A}{c_1^{FB}} - \frac{\partial c_1}{\partial \mu_A} \frac{\mu_A}{c_1} \right]$$

$$\frac{\partial c_1^{FB}}{\partial \mu_A} \frac{\mu_A}{c_1^{FB}} = \frac{1}{\underbrace{\frac{a_1 + a_4}{(r_1 + r_4)\mu_A} + 1}_{D_2}} < 1$$

Note $D_2 < D_1$, since $a_2(1 - \lambda_A)\eta(s) > 0$, and the inequality

$$\begin{aligned} [s(r_1 + r_4) + r_2(\lambda_A - s)\eta(s)]\mu_A &< (r_1 + r_4)\mu_A \\ r_2(\lambda_A - s)\eta(s) &< (1 - s)(r_1 + r_4) \end{aligned}$$

is true by ASS 2 since $(1 - s) > (\lambda_A - s)$ so that we can focus on the RHS inequality in the following array:

$$\begin{aligned} r_2(\lambda_A - s)\eta(s) &< r_2(1 - s)\eta(s) < (1 - s)(r_1 + r_4) \\ r_2\eta(s) &< (r_1 + r_4) \end{aligned}$$

We have then $\frac{\partial c_1^{FB}}{\partial \mu_A} \frac{\mu_A}{c_1^{FB}} > \frac{\partial c_1}{\partial \mu_A} \frac{\mu_A}{c_1} \Leftrightarrow \frac{\partial^2 X}{\partial \mu_A \partial \alpha} \mu_A > 0$.

Having shown partial derivatives signs, we can now establish a sufficient condition for $\frac{\partial MNS_A}{\partial \mu_A} > 0$ is then, viz.

$$\frac{c_1^{FB}}{c_1^{FB} - c_1} \left[\frac{\partial c_1^{FB}}{\partial \mu_A} \frac{\mu_A}{c_1^{FB}} - \frac{\partial c_1}{\partial \mu_A} \frac{\mu_A}{c_1} \right] > 2 \frac{\partial c_1}{\partial \mu_A} \frac{\mu_A}{c_1}$$

The parameter capturing the private gain of expropriation, a_2 , decreases the right-hand side and increases the left-hand side (recall c_1^{FB} is not affected by a_2 , and c_1 is increasing in it). In order to stay consistent with Assumptions 2 and 4 a_2 can be large when in turn b_2 is large too.

We interpret the parameter configurations allowing for a positive relationship between MNEs' productivity and their equity share as contractual environments where the relevance of the hold up problem in the JV is prominent. That is to say, when the private incentive for expropriation and the negative externality it causes are strong, but at the same time the high contribution of the MNEs to the global surplus compensates incentives.

These parameters are likely to be defined by country-level characteristics, notably for the contractual environment. In the following section we discuss the implication of host-countries characteristics. We particularly insist on the role of international contracts enforceability, in achieving or not a positive correlation between the foreign firm ownership share and its productivity level. Before that, it is worth to discuss the precise sense of the "expropriation strategy" and its link with contractual institutions.

Recall that the "expropriation" strategy is in our view a legal mechanism the MNE deploys by activating a set of decision in the joint-venture management that would actually be beneficial for her own private revenue, to the depends of both the common revenue and her partner's one. These decisions are submitted to the JV's board of directors, such that the higher the MNE control over the JV, the more the expropriation threat. The "expropriation" strategy is assumed to strictly follow the shareholder agreement the parties signed *ex-ante*, and do not refer to any illegal robbery or theft. Because such a contract is the law between the parties, a better contractual environment, means a stricter application of the shareholder agreement, and therefore of the expropriations strategies embodied in it. To the contrary, a weak contractual environment, means a loose application of the shareholder agreement. Specifically, the majority owner might experience difficulties in the shareholder agreement application, and could less rely on the juridical system to recover its theoretical power, if the decisions of the board are not fully applied. The MNE's incentive to increased ownership therefore positively depends on the quality contractual institutions, as they define the effective expropriation possibilities. In the next section we further examine possible extensions that can be drawn from this model, notably investigating the differences implied by a local welfare maximization instead of a global one, as done in the core of the model.

3.5 Further implications of the model

Host-country characteristics and the productivity-control correlation

We consider two possible host-countries for illustrative purposes. Let the country W benefit from high rule of law enforcement, while the other country E suffers from a weaker one. We then have $\frac{\partial c_1}{\partial s}|_{l=W} > \frac{\partial c_1}{\partial s}|_{l=E}$, where $l = W, E$ the host-country exogeneously attributed, such that the MNE has lower incentives to invest more when she increases her ownership share where she knows the shareholder agreement might not be entirely enforced, and therefore her total revenue (including private one) might not be as high as expected. From there, it is easy to deduce that the increase of this marginal incentive, with the firm productivity would be lower in country E , such that

$$\mathcal{E}\left(\frac{\partial c_1}{\partial s}, \mu_A\right)|_{l=W} > \mathcal{E}\left(\frac{\partial c_1}{\partial s}, \mu_A\right)|_{l=E}$$

We would therefore assume that

Assumption 5. Contractual institutions quality varies that much between the two host countries such that we have

$$\mathcal{E}\left(\frac{\partial c_1}{\partial s}, \mu_A\right)|_{l=W} > \mathcal{E}\left(\frac{\partial c_1}{\partial \mu_A}, \mu_A\right)|_{l=W} \quad \forall s \in [0; 1] \quad (1.59)$$

and

$$\exists s \in [0; 1] \text{ such that } \mathcal{E}\left(\frac{\partial c_1}{\partial s}, \mu_A\right)|_{l=E} < \mathcal{E}\left(\frac{\partial c_1}{\partial \mu_A}, \mu_A\right)|_{l=E} \quad (1.60)$$

Such that inequality (1.58) only holds in country W for any level of s , which implies that the selection effect of more productive MNEs opting for higher ownership share, only arises in countries with high contractibility, that ensures a strict application of the shareholder agreement and a possibility for expropriation strategies to be efficient. To the contrary, no selection effect toward higher (nor lower) ownership share from most productive MNEs could be observed in country E , with lower contractibility enforcement.

Local welfare policies implications

Until now, we found with this model similar conclusions to the ones from the GHM line model: most productive MNEs are more likely to integrate more their foreign affiliates, especially in countries

with higher legal enforcement.

Yet, this last model offers newer perspectives, notably for policy design, and suggests that host-countries could play non-cooperative game by maximizing their local welfare at the depends of the global revenue.

Specifically, we assume the private benefits of the MNE ($P_A(\delta^*, \alpha)$), to be located outside the host-country boundaries, in the MNE's headquarters (or any fiscally favorable destination). Such that the real revenue in the host-country the policy-makers aim at maximizing is no longer $X(\alpha, \beta)$, but

$$X(\alpha, \beta) - P_A(\delta^*, \alpha) = P_B(\delta^*, \beta) + R(\delta^*, \alpha, \beta) - \alpha - \beta.$$

Therefore a tradeoff arises, between retaining locally the higher possible share of the revenue, and provide enough incentives for A to invest. This tradeoff is often evoked in the literature about foreign ownership restriction. Actually, we can show that there is a unique equity share s_L^* that maximizes the local revenue, and which is always below the optimal ownership share s^* (see appendix 1.B.3). The rationale behind that is that the less the foreign MNE controls the affiliates, the less she is able to run expropriation strategies, but the less incentives she has to invest. However, the marginal local surplus for A increases less than decreases B 's marginal loss in s , since A 's private benefits are not embodied, while B 's ones are. Equalizing the two marginal variations therefore implies a lower level of s .

Hence, our model concludes that some ownership restriction would be profitable for the host-country, albeit inefficient for the global surplus the two partner consider. Such that without any exogenous intervention, this locally optimal ownership share would never be chosen. However, the maximal foreign ownership level to set from a host-country perspective is hardly identifiable because it depends on some firm-level parameters (bargaining power, productivity, etc.). This could explain why in practice, limitations on foreign equity policies had mixed results.

Similarly, an optimal productivity level of the MNE can be found, which maximizes the local surplus (see appendix 1.B.3). Actually two antagonist forces are in stake when the MNE productivity increases. This higher productivity increases the total revenue, but also allows the MNE to expropriate more, because it would fear less its' partner disengagement. Above a given threshold value of $\mu_A^* = \frac{\frac{\partial y_B}{\partial \mu_A}(r(\delta^*)+b(\delta^*)) + y_A r(\delta^*) - r_2 \mu_B y_B - \frac{\partial \alpha}{\partial \mu_A} - \frac{\partial \beta}{\partial \mu_A}}{|r_2 y_A - \frac{\partial y_A}{\partial \mu_A} r(\delta^*)|}$ the expropriation capacity is too strong, such that it reduces more the local revenue than the increased total production rises it.

A direct implication for economic policy makers from this suggestion would thus be to design policies that are made to attract middle to high productive firms, more than top productive MNEs, to foster local development. The local spillovers would be equivalent or even higher than for top productive MNEs, and this wouldn't harm the international reputation of the country and reduce inward FDI as a legal ownership limitation could do³⁰. The bargaining game with these lower productive firms would automatically lead to lower foreign control and expropriation possibilities. Dedicated further research should go further and try to determine more precisely this value of μ_A^* . However, we could already underline the possible drawbacks effects of attracting too much productive firms, due to their high expropriation capabilities.

The discussion on the role of host-countries is instructive also. The result could be seen as a second-best result, where two imperfections –the *ex-post* inefficiency, and the poor contract enforceability – they reach a higher welfare than with only one deviation from the first-best. Yet, the lower contractual institutions could in addition deter some firms to invest in the country, and decrease the host-country revenue from its extensive margin.

4 General discussion of the two models: when GHM meets BTW

From two distinct conceptions of ownership existing in the literature, we develop two frameworks of integration issues with sharable equity, heterogeneous firms and incomplete contracts. The first one stays as close as possible from the tracks of the GHM property theory of the firm, adopting its view of firm ownership as the ability to seize inputs. The second conception sees ownership as a (nonlinear) way to increase effective control over the firm's decisions. Control over such *ex-post* decisions are crucial since we assume the existence of a private benefit besides from the common one, creating adverse effect of ownership (expropriation). The two frameworks still have much in common though, notably concerning the hold-up problem, present in both models because of non-contractible (relatively) specific investments. In both models ownership is therefore seen as a way to secure disagreement payoffs, and to give investments incentives. Following the same idea as in standard GHM models, more ownership should thus be given to the most important partner, as defined as the one with higher investments' marginal return on the common revenue. From there, it is obvious that the two models conclude similarly that more ownership should be given to more productive foreign investors, who benefit from a higher investment return. This conclusion holds in both models until

³⁰. The negative influence of ownership restrictions on inward FDI flows is documented for long, as already report Gatignon and Anderson (1988).

the marginal losses of total revenue in increasing the MNE ownership share overcome the positive effect on production. We assume country-level characteristics to influence the level of this pivot point.

The two models though differ on how this ownership secures the MNE future revenue. On the one hand if ownership only gives access to assets (or inputs), it is the sale of those assets on the outside market that gives the owner a revenue. Hence it is crucial to assume either a non-zero value of independent assets on the outside market or a division of surplus in liquidation. Although in practice such revenues are never realized, they serve as disagreement payoffs in Nash Bargaining game. Nash solution giving each party its ex-post disagreement payoff plus an exogenous share of the surplus from the cooperation. On the other hand, the two partners do not bargain ex-post over the division of surplus, but rather on the ex-post decisions, i.e. the adaptation of the initial production plan. The higher the ownership, the more the ability to shift production plan to its own benefit. The parties no longer bargain over the share of the common revenue they would recover (contractible ex-ante), but over the value of this common revenue, compared to its baseline value (without adaptation of the plan) and to private ones (expropriation risks). The novelty is that there is room for a renegotiation surplus, with optimal decisions. The bargaining takes therefore place into a positive-sum game.

Besides the role of firm heterogeneity, our two models detail the role of some host-country characteristics, namely contracting institutions. Again, they conclude similarly in that sense that “better” contractual institutions lead to higher ownership levels for foreign investors. Yet, the two precise mechanisms differ one more time. In the GHM approach, following Antràs and Helpman (2008), we associate both host-country contractual incompleteness with the industry-specific parameter of headquarter’s input intensity into a single parameter. This parameter determines the optimal revenue share to be given to the MNE, which in turn sets the optimal ownership share to be specified in the initial contract. The higher the contractibility or headquarter’s input intensity, the higher the optimal ownership share. Here, the host-country characteristics have the exact same effect as industry-level parameters.

In our second model though, the headquarter’s intensity plays no explicit role³¹, and another vector for host-country characteristics must be found. Hence we associate the contractual environment to the effective “expropriation” capabilities through higher ownership, with the idea that better contractual institutions lead to stricter application of the shareholder agreement and therefore increase ownership incentives. Investing in a country with better law-enforcement has then the exact same

31. And this is actually a desired feature, to avoid the traditional shortcut often done in the application of Antràs’ models between each producer’s inputs intensity and the capital intensity in the industry.

effect as would have an increased efficiency of expropriation strategies.

Similar conclusions could thus be reached by models that do not share the same conception of ownership nor the same conception of contractual relationship and bargaining games between associate producers. Two important theoretical predictions could thus be drawn from each modeling approach, which gives increasing credits to them. (i) The most productive firms should in average (or for a given host country) own a higher ownership share in their foreign team production. (ii) Multinational's ownership shares should be in average lower in countries with weaker contractual institutions. A corollary of this second prediction would be that joint ventures are optimal integration strategies in such countries, a finding that has never been shown in GHM models, where either full ownership or outsourcing were seen as optimal solutions, but not JVs³².

The benefits from breaking with the GHM approach, and considering *ex-post* inefficiencies with the expropriation threat are mostly about implied policy implications. While in the GHM approach one can hardly distinguish global from local surplus, it is easy to do so in the second framework. This model allows us to show that from the host-country point of view, a tradeoff arises to limit expropriation losses, and could rationally lead them to proceed to foreign ownership restrictions or better identification of MNEs to attract locally.

The second chapter will go deeper on endogenous factors of ownership choices. Inspired by international business literature, it focuses on other endogenous determinants of foreign ownership besides TFP, and their complementarity. Empirical evidence would then be brought at the end of chapter 2.

32. this corollary actually only fits to our first model, since the second restricts to JVs and does not consider full ownership.

Appendix

1.A Ownership as the propriety of inputs (GHM)

1.A.1 Optimal ownership share

Without fixed costs First, we show the resolution of optimal ownership share without considering fixed costs (or at least that fixed costs are independent from the ownership share, and therefore included in τ_m), as in the first part of our GHM-like model. We know the optimal ownership share maximizes the net joint-profit, such that we aim at maximizing R .

From eq (1.14), we find our program to maximize

$$\max_s R = A \left[\theta^\alpha \alpha^\alpha \left(\frac{\eta}{c_h} \right)^{\alpha\eta} \left(\frac{1-\eta}{c_m} \right)^{\alpha(1-\eta)} \beta_h^{\alpha\eta} (1-\beta_h)^{\alpha\omega} \left(\frac{\mu}{1-\alpha(1-\mu(1-\eta))} \right)^{\mu\alpha(1-\eta)} \right]^{\frac{1}{1-\alpha}}$$

With $\beta_h = (s\delta + \beta(1-\delta))$, and $(1-\beta_h) = (\delta(\beta-s) + 1-\beta)$

First-order condition gives: $\frac{\partial R}{\partial s} = 0$

$$\begin{aligned} &\Leftrightarrow T \frac{\alpha\eta}{1-\alpha} \delta (s\delta + \beta(1-\delta))^{\frac{\eta\alpha}{1-\alpha}} (s\delta + \beta(1-\delta))^{-1} (\delta(\beta-s) + 1-\beta)^{\frac{\alpha\omega}{1-\alpha}} \\ &= T \frac{\omega\alpha}{1-\alpha} \delta (s\delta + \beta(1-\delta))^{\frac{\eta\alpha}{1-\alpha}} (\delta(\beta-s) + 1-\beta)^{\frac{\alpha\omega}{1-\alpha}} (\delta(\beta-s) + 1-\beta)^{-1} \end{aligned}$$

Where T is the component of R that is not directly affected by s

$$T = A \left[\theta^\alpha \alpha^\alpha \left(\frac{\eta}{c_h} \right)^{\alpha\eta} \left(\frac{1-\eta}{c_m} \right)^{\alpha(1-\eta)} \left(\frac{\mu}{1-\alpha(1-\mu(1-\eta))} \right)^{\mu\alpha(1-\eta)} \right]^{\frac{1}{1-\alpha}}$$

This FOC could be easily simplified by

$$\Rightarrow \eta(\delta(\beta-s) + 1-\beta) = \omega(s\delta + \beta(1-\delta))$$

$$\Rightarrow s = \frac{\beta(\omega + \eta)(\delta - 1) + \eta}{\delta(\omega + \eta)}$$

Which could rewrote as in eq. (1.15)

$$\Rightarrow s^* = \beta - \frac{\beta}{\delta} + \frac{\eta}{\delta(\omega + \eta)} \quad (1.61)$$

With fixed costs

Even if we had considered fixed costs as a continuous function of ownership $F(s)$, the calculus complications prevent the precise identification of the optimal ownership share. Indeed, the net joint profits are now:

$$\Pi = R(s) - c_h \int x_h(i)di - c_m \int x_m(i)di - F(s)$$

Our program would thus be now :

$$\max_s R(s) - F(s)$$

The first order condition is now $\frac{\partial R}{\partial s} = \frac{\partial F}{\partial s}$

which gives

$$\Leftrightarrow T \frac{\alpha\eta}{1-\alpha} \delta (s\delta + \beta(1-\delta))^{\frac{\eta\alpha}{1-\alpha}} (s\delta + \beta(1-\delta))^{-1} (\delta(\beta-s) + 1 - \beta)^{\frac{\alpha\omega}{1-\alpha}}$$

$$- T \frac{\omega\alpha}{1-\alpha} \delta (s\delta + \beta(1-\delta))^{\frac{\eta\alpha}{1-\alpha}} (\delta(\beta-s) + 1 - \beta)^{\frac{\alpha\omega}{1-\alpha}} (\delta(\beta-s) + 1 - \beta)^{-1} = F'(s)$$

$$\text{With } T = A \left[\theta^\alpha \alpha^\alpha \left(\frac{\eta}{c_h} \right)^{\alpha\eta} \left(\frac{1-\eta}{c_m} \right)^{\alpha(1-\eta)} \left(\frac{\mu}{1-\alpha(1-\mu(1-\eta))} \right)^{\mu\alpha(1-\eta)} \right]^{\frac{1}{1-\alpha}}$$

Which could be rewritten in a more elegant manner:

$$\eta(1 - \beta_h) = \omega(\beta_h) + \frac{F'(s)(1 - \alpha)}{T\alpha\delta\beta_h^{\frac{\eta\alpha}{1-\alpha}}(1 - \beta_h)^{\frac{\omega}{1-\alpha}}}$$

With $\beta_h = (s\delta + \beta(1 - \delta))$

Which gives:

$$s = \frac{\beta(\omega + \eta)(\delta - 1) + \eta}{\delta(\omega + \eta)} - F'(s) \frac{1 - \alpha}{T\alpha\delta} (s\delta + \beta(1 - \delta))^{1 - \frac{\eta\alpha}{1-\alpha}} (\delta(\beta - s) + 1 - \beta)^{1 - \frac{\omega}{1-\alpha}}$$

Therefore, even before considering in details $F'(s)$, we see that we cannot precisely identify s^* , because of the exponentiated sums that prevent us to develop more the equation; although we could show its solution to be unique.

Yet, we see that this optimal ownership share is lower than the one found previously (without fixed costs) $s^* = \beta - \frac{\beta}{\delta} + \frac{\eta}{\delta(\omega+\eta)}$, as soon as $F'(s) > 0$, which is assumed here. The increase in fixed costs that induces higher ownership share dissuades the firms to own as much as they would otherwise. Moreover, we see that firm-level characteristics such that TFP, embodied in the T parameter now play a role into this optimal ownership share, while they don't in the first case.

1.A.2 Optimal revenue share

Here, we identify the optimal revenue share that maximizes H 's revenue.

Without fixed costs We have $s^* = \beta - \frac{\beta}{\delta} + \frac{\eta}{\delta(\omega+\eta)}$ The subsequent optimal revenue share $\beta_h^* \equiv \beta_h(s^*)$ is obtain from plugging s^* into $\beta_h = (s\delta + \beta(1 - \delta))$

$$\Rightarrow \beta_h^* = \frac{\delta[\beta(\omega + \eta)(\delta - 1) + \eta] + \beta(1 - \delta)}{\delta(\omega + \eta)}$$

This gives $\beta_h^* = \frac{\eta}{\omega+\eta}$, again, independent from the firm-level characteristics such as the TFP.

When no fixed costs are considered, and if s^* is within the $[0; 1]$ all firms should opt for the same ownership share $s^* = \beta - \frac{\beta}{\delta} + \frac{\eta}{\delta(\omega+\eta)}$ (or to the closer extreme value), and would end up with a revenue of $\frac{\eta}{\omega+\eta}R$.

With fixed costs

From eq. (1.16), we know β_h^* to be the value that maximizes $(\beta_h^{\alpha\eta+1-\alpha}(1 - \beta_h)^{\alpha\omega})$, First-order condition gives

$$(\alpha\eta + 1 - \alpha)\beta_h^{(\alpha\eta+1-\alpha)}\beta_h^{-1}(1 - \beta_h)^{\alpha\omega} = \alpha\omega(1 - \beta_h)^{\alpha\omega}(1 - \beta_h)^{-1}\beta_h^{\alpha\eta+1-\alpha}$$

$$\Rightarrow (\alpha\eta + 1 - \alpha)(1 - \beta_h) = \alpha\omega\beta_h$$

which yields

$$\beta_h^* = \frac{\alpha\eta + 1 - \alpha}{(\alpha\eta + 1 - \alpha) + \omega\alpha} = \frac{1 + \alpha(\eta - 1)}{1 - \alpha\mu(1 - \eta)}$$

1.B Ownership as decisional power (BTW)

1.B.1 Distance to First-Best and optimal ownership share

In the second model developed (in the line of BTW), the distance to the first-best solution measures the loss of welfare (total surplus $U(\cdot)$) due to inefficiencies in the contracting game. In the figure 1.4, this distance is quantifiable in terms of incentives loss for each partners. Euclidean distance to the First Best from situation $k = SB, RN$ is given by the formula

$$dist^k = \sqrt{(c_1^{FB} - c_1^k)^2 + (c_2^{FB} - c_2^k)^2} \quad (1.62)$$

Using c_i^{FB} , c_i^k , $i = 1, 2$; $k = SB, RN$, given in equations (1.35) - (1.40).

Formally, the optimal ownership share s^* amounts from the program

$$\max_s dist^{RN}$$

In the SB case

$$dist^{SB} = \sqrt{((1-s)\mu_A(r_1+r_4))^2 + (s\mu_B(r_1+r_4))^2}$$

$$\Rightarrow dist^{SB} = (r_1+r_4)\sqrt{((1-s)\mu_A)^2 + (s\mu_B)^2}$$

First order condition gives

$$\frac{\partial dist^{SB}}{\partial s} = 0$$

$$\Rightarrow 2\mu_B^2 s - 2\mu_A^2 (1-s) = 0$$

The optimal ownership share is therefore $s^{*,SB} = \frac{\mu_A^2}{\mu_A^2 + \mu_B^2}$

This optimal ownership share is therefore always included in $[0; 1]$, and it is straightforward to see that s^* is always increasing in μ_A (and decreasing in μ_B) in the second best, such that in absence of any contractual frictions (i.e. if the efficient decision was taken directly), within an industry, the most productive MNEs would always own a higher equity share.

In the RN case

$$dist^{RN} = \sqrt{((1-s)\mu_A(r_1+r_4) + [a_2(1-\lambda_A) + r_2\mu_A(\lambda_A-s)]\tilde{d}_A)^2 + (s\mu_B(r_1+r_4) + [r_2\mu_B(\lambda_B - (1-s)) - b_2(1-\lambda_B)]\tilde{d}_A)^2} \quad (1.63)$$

To ease the computation, we develop separately the two terms under the root. The first one $(c_1^{FB} - c_1^{RN})^2$ gives:

$$\begin{aligned} & ((1-s)\mu_A(r_1+r_4) + [a_2(1-\lambda_A) + r_2\mu_A(\lambda_A-s)]\tilde{d}_A)^2 = \\ & (1+s^2-2s)\mu_A^2(r_1+r_4)^2 + \left[(a_2(1-\lambda_A))^2 + ((r_2\mu_A\lambda_A)^2 + (r_2\mu_A s)^2 - 2(r_2\mu_A\lambda_A)(r_2\mu_A s)) + 2(a_2(1-\lambda_A))(r_2\mu_A(\lambda_A - \right. \\ & \left. s)]\tilde{d}_A^2 + 2(1-s)\mu_A(r_1+r_4)[\tilde{d}_A(a_2(1-\lambda_A) + r_2\mu_A(\lambda_A-s))] \end{aligned}$$

While the second term $(c_2^{FB} - c_2^{RN})^2$ gives:

$$\begin{aligned} & (s\mu_B(r_1+r_4) + [r_2\mu_B(\lambda_B - (1-s)) - b_2(1-\lambda_B)]\tilde{d}_A)^2 = \\ & s^2\mu_B^2(r_1+r_4)^2 + \left[r_2^2\mu_B^2(\lambda_B-1)^2 + r_2^2\mu_B^2 s^2 + 2r_2\mu_B(\lambda_B-1)r_2\mu_B s + b_2^2(1-\lambda)^2 - 2r_2\mu_B(\lambda_B-1+s)b_2(1-\lambda_B) \right] \tilde{d}_A^2 + \\ & 2s\mu_B(1+r_4)[r_2\mu_B(\lambda_B-1+s) - b_2(1-\lambda_B)]\tilde{d}_A \end{aligned}$$

The first-order condition of the maximization program gives:

$$\frac{\partial dist^{RN}}{\partial s} = 0$$

$$\begin{aligned} \Rightarrow \frac{\partial [(c_1^{FB} - c_1^{RN})^2 + (c_2^{FB} - c_2^{RN})^2]}{\partial s} \cdot \frac{1}{\underbrace{2 * \sqrt{(c_1^{FB} - c_1^{RN})^2 + (c_2^{FB} - c_2^{RN})^2}}_{>0}} &= 0 \\ \Rightarrow \frac{\partial [(c_1^{FB} - c_1^{RN})^2 + (c_2^{FB} - c_2^{RN})^2]}{\partial s} &= 0 \end{aligned}$$

using the developed formulas above, we have:

$$\Rightarrow \frac{\partial (c_1^{FB} - c_1^{RN})^2}{\partial s} =$$

$$2s\mu_A^2 \left[(r_1 + r_4)^2 + r_2^2 \tilde{d}_A^2 + 2(r_1 + r_4) \tilde{d}_A r_2 \right] - 2\mu_A^2 \left[(r_1 + r_4)^2 + r_2^2 \lambda_A \tilde{d}_A^2 - (r_1 + r_4) \tilde{d}_A r_2 (\lambda_A + 1) \right] + 2\mu_A (1 - \lambda_A) a_2 \tilde{d}_A (r_1 + r_4 - r_2)$$

The first and last term are positive (since from condition (1.28) we know $(r_1 + r_4) > r_2$), but the middle term sign is not defined, and depends on the values of the parameters. Such that we directly deduce that $\frac{\partial^2 (c_1^{FB} - c_1^{RN})^2}{\partial s \partial \mu_A}$ sign might also vary, which is in line with our analysis in section 3.4.

The second part of the derivative is

$$\frac{\partial (c_2^{FB} - c_2^{RN})^2}{\partial s} =$$

$$2s\mu_B^2 \left[(r_1 + r_4)^2 + r_2^2 \tilde{d}_A^2 + 2(r_1 + r_4) r_2 \tilde{d}_A \right] + 2\mu_B^2 \left[\tilde{d}_A r_2 (\lambda_B - 1) (2 + b_2) \right] + 2\mu_B (r_1 + r_4) (b_2 (1 - \lambda_B)) \tilde{d}_A$$

Such that the first order condition is:

$$\frac{\partial dist^{RN}}{\partial s} = 0$$

$$\begin{aligned} \Rightarrow s\mu_A^2 \left[(r_1 + r_4)^2 + r_2^2 \tilde{d}_A^2 + 2(r_1 + r_4) \tilde{d}_A r_2 \right] - \mu_A^2 \left[(r_1 + r_4)^2 + r_2^2 \lambda_A \tilde{d}_A^2 - (r_1 + r_4) \tilde{d}_A r_2 (\lambda_A + 1) \right] + \mu_A (1 - \lambda_A) a_2 \tilde{d}_A (r_1 + r_4 - r_2) = \\ -s\mu_B^2 \left[(r_1 + r_4)^2 + r_2^2 \tilde{d}_A^2 + 2(r_1 + r_4) r_2 \tilde{d}_A \right] - \mu_B^2 \left[\tilde{d}_A r_2 (\lambda_B - 1) (2 + b_2) \right] - \mu_B (r_1 + r_4) (b_2 (1 - \lambda_B)) \tilde{d}_A \end{aligned}$$

From where we can isolate $s \equiv s^{*,RN}$, the optimal ownership share

$$s^{*,RN} = \frac{-\mu_B^2 \left[\tilde{d}_A r_2 (\lambda_B - 1) (2 + b_2) \right] - \mu_B (r_1 + r_4) (b_2 (1 - \lambda_B)) \tilde{d}_A + \mu_A^2 \left[(r_1 + r_4)^2 + r_2^2 \lambda_A \tilde{d}_A^2 - (r_1 + r_4) \tilde{d}_A r_2 (\lambda_A + 1) \right] - \mu_A (1 - \lambda_A) a_2 \tilde{d}_A (r_1 + r_4 - r_2)}{\mu_A^2 \left[(r_1 + r_4)^2 + r_2^2 \tilde{d}_A^2 + 2(r_1 + r_4) \tilde{d}_A r_2 \right] + \mu_B^2 \left[(r_1 + r_4)^2 + r_2^2 \tilde{d}_A^2 + 2(r_1 + r_4) r_2 \tilde{d}_A \right]} \quad (1.64)$$

Which is as you can see, not a convenient tool to use, but exists as a unique value that minimizes the distance to the First-Best.

1.B.2 Optimal ownership share and productivity level

using s^* We could simplify equation (1.64) to:

$$s^* = \frac{\mu_B^2 P_1 + \mu_B N_1 + \mu_A^2 I_1 + \mu_A N_2}{\mu_A^2 P_2 \mu_B^2 I_2}$$

Where P_1 and P_2 are positive combination of fixed parameters independent from s or μ_i $i = A, B$. N_1 and N_2 negative ones, while I_1 and I_2 are terms with undetermined signs.

Specifically

$$P_1 = [\tilde{d}_{Ar_2}(1 - \lambda_B)(2 + b_2)]$$

$$P_2 = [(r_1 + r_4)^2 + r_2^2 \tilde{d}_A^2 + 2(r_1 + r_4) \tilde{d}_{Ar_2}]$$

$$N_1 = -(r_1 + r_4)(b_2(1 - \lambda_B)) \tilde{d}_A$$

$$N_2 = -(1 - \lambda_A) a_2 \tilde{d}_A (r_1 + r_4 - r_2)$$

$$I_1 = [(r_1 + r_4)^2 + r_2^2 \lambda_A \tilde{d}_A^2 - (r_1 + r_4) \tilde{d}_{Ar_2} (\lambda_A + 1)]$$

$$I_2 = [(r_1 + r_4)^2 - r_2^2 \tilde{d}_A^2 + 2(r_1 + r_4) r_2 \tilde{d}_A]$$

Looking at how evolves s^* with μ_A becomes quite simple.

We have that $\frac{\partial s^*}{\partial \mu_A} > 0$ when

$$\mu_A > \frac{N_2 I_2 \mu_B}{(1 - N_2 P_2) [2\mu_B^2 (I_1 I_2 - P_1 P_2) - 2P_2 N_1 \mu_B]}$$

, which is always verified when $I_2 < 0$. However, this condition being not always certain, we find that more productive firms do not always fix higher optimal ownership shares, as found in the section (3.4).

Using the Marginal Net Surplus (MNS_A)

We look for the sign of $\frac{\partial MNS_A}{\partial \mu_A} = \frac{\partial^2 X}{\partial s \partial \mu_A}$ From (1.57), we have

$$\frac{\partial MNS_A}{\partial \mu_A} = \frac{\partial^2 X}{\partial \mu_A \partial \alpha} \frac{d\alpha}{dc_1} \frac{\partial c_1}{\partial s} + \frac{\partial X}{\partial \alpha} \left[\frac{d^2 \alpha}{\partial \mu_A dc_1} \frac{\partial c_1}{\partial s} + \frac{d\alpha}{dc_1} \frac{\partial^2}{\partial \mu_A \partial s} \right]$$

Let's review the sign of each term.

$$\frac{\partial^2 X}{\partial \mu_A \partial \alpha} = \frac{\partial c_1^{FB}}{\partial \mu_A} \frac{1}{c_1^{RN(s)}} - \frac{c_1^{FB}}{[c_1^{RN(s)}]^2} \frac{\partial c_1}{\partial \mu_A} \frac{1}{c_1^{RN(s)}} \left[\frac{\partial c_1^{FB}}{\partial \mu_A} - \frac{c_1^{FB}}{c_1^{RN(s)}} \frac{\partial c_1}{\partial \mu_A} \right]$$

We know, that $\frac{\partial c_1^{FB}}{\partial \mu_A} \frac{1}{c_1^{FB}} > \frac{1}{c_1^{RN}} \frac{\partial c_1^{RN}}{\partial \mu_A}$

$$\Rightarrow \frac{\partial c_1^{FB}}{\partial \mu_A} \frac{\mu_A}{c_1^{FB}} > \frac{\mu_A}{c_1^{RN}} \frac{\partial c_1^{RN}}{\partial \mu_A}$$

decomposing the terms gives:

$$\frac{\partial c_1^{RN}}{\partial \mu_A} = s(r_1 + r_4) + r_2(\lambda_A - s)\eta(s)$$

therefore $\frac{\partial c_1^{RN}}{\partial \mu_A} \frac{\mu_A}{c_1^{RN}} = \frac{1}{\underbrace{s(r_1 + r_4) + r_2(\lambda_A - s)\eta(s)}_{D_1} \mu_A} + 1$

Similarly, $\frac{\partial c_1^{FB}}{\partial \mu_A} = (r_1 + r_4)$

Hence,

$$\frac{\partial c_1^{FB}}{\partial \mu_A} \frac{\mu_A}{c_1^{FB}} = \frac{1}{\underbrace{\frac{a_1 + a_4}{(r_1 + r_4)\mu_A} + 1}_{D_2}}$$

Since $a_2(1 - \lambda_A)\eta(s) > 0$ and

$[s(r_1 + r_4) + r_2(\lambda_A - s)\eta(s)]\mu_A < (r_1 + r_4)\mu_A$ which is true from assumption (1.28) since $(1 - s) > (\lambda_A - s)$, we find $D_2 < D_1$.

We have then :

$$\frac{\partial c_1^{FB}}{\partial \mu_A} \frac{\mu_A}{c_1^{FB}} > \frac{\partial c_1^{RN}}{\partial \mu_A} \frac{\mu_A}{c_1^{RN}} \Rightarrow \frac{\partial^2 X}{\partial \mu_A \partial \alpha} > 0$$

By assumption we have $\frac{d\alpha}{dc_1} > 0$ because c_1 are A 's incentives to invest in α . Formally, from eq. (1.33) we have $\frac{d\alpha}{dc_1} = -\frac{1}{y''(\alpha)c_1^2} > 0$

We also find that $\frac{dc_1^{RN}}{ds} = (r_1 + r_4)\mu_A + [a_2(1 - \lambda_A)\eta'(s) - \eta(s)] > 0$

It is also obvious that $\frac{\partial X}{\partial \alpha} > 0$, such that the more A invests, the higher the total surplus. Formally, this comes from eq. (1.32).

We've shown on section 3.4, that $\frac{d^2\alpha}{\partial \mu_A \partial c_1} = \frac{2}{y''(\alpha)c_1^3} \frac{\partial c_1}{\partial \mu_A} < 0$. This results comes from $\frac{\partial c_1}{\partial \mu_A} = s(r_1 + r_4) + r_2(\lambda_A - s)\eta(s) > 0$ according to eq. (1.28), and $\frac{2}{y''(\alpha)c_1^3} < 0$ directly from $y''(\alpha) < 0$, because we posit y_A concave.

The last undefined term in $\frac{\partial MNS_A}{\partial \mu_A}$ is therefore the final term $\frac{\partial^2 c_1^{RN}}{\partial \mu_A \partial s}$. From the definition of c_1^{RN} in eq. (1.39), we find that $\frac{dc_1^{RN}}{ds} = (r_1 + r_4)\mu_A + [a_2(1 - \lambda_A) + r_2\mu_A(\lambda_A - s)]\eta'(s) - r_2\mu_A\eta(s) > 0$

such that

$\frac{\partial^2 c_1^{RN}}{\partial \mu_A \partial s} = (r_1 + r_4) + r_2[(\lambda - s)\eta'(s) - \eta(s)]$ which we would suppose positive (r_1 and r_4 are supposed large enough to ensure $\frac{\partial^2 c_1^{RN}}{\partial \mu_A \partial s} > 0$).

To sum up, we rewrite eq. (1.57)

$$\frac{\partial MNS_A}{\partial \mu_A} = \underbrace{\frac{\partial^2 X}{\partial \mu_A \partial \alpha}}_{>0} \underbrace{\frac{d\alpha}{dc_1}}_{>0} \underbrace{\frac{\partial c_1}{\partial s}}_{>0} + \underbrace{\frac{\partial X}{\partial \alpha}}_{>0} \left[\underbrace{\frac{d^2\alpha}{\partial \mu_A \partial c_1}}_{<0} \underbrace{\frac{\partial c_1}{\partial s}}_{>0} + \underbrace{\frac{d\alpha}{dc_1}}_{>0} \underbrace{\frac{\partial^2}{\partial \mu_A \partial s}}_{>0} \right]$$

Whose sign is ambiguous, and depends on the parameters of the model.

Let's find the condition for $\frac{\partial MNS_A}{\partial \mu_A}$ to be positive.

$$\frac{\partial^2 X}{\partial \mu_A \partial \alpha} \frac{d\alpha}{dc_1} \frac{\partial c_1}{\partial s} + \frac{\partial X}{\partial \alpha} \left[\frac{d^2\alpha}{\partial \mu_A \partial c_1} \frac{\partial c_1}{\partial s} + \frac{d\alpha}{dc_1} \frac{\partial^2}{\partial \mu_A \partial s} \right] > 0$$

$$\Leftrightarrow \frac{\partial^2 X}{\partial \mu_A \partial \alpha} \frac{d\alpha}{dc_1} \frac{\partial c_1}{\partial s} + \frac{\partial X}{\partial \alpha} \frac{d^2\alpha}{\partial \mu_A \partial c_1} \frac{\partial c_1}{\partial s} + \frac{\partial X}{\partial \alpha} \frac{d\alpha}{dc_1} \frac{\partial^2}{\partial \mu_A \partial s} > 0$$

$$\Leftrightarrow \frac{\partial^2 X}{\partial \mu_A \partial \alpha} \frac{d\alpha}{dc_1} \frac{\partial c_1}{\partial s} + \frac{\partial X}{\partial \alpha} \frac{d\alpha}{dc_1} \frac{\partial^2}{\partial \mu_A \partial s} > - \frac{\partial X}{\partial \alpha} \frac{d^2 \alpha}{\partial \mu_A dc_1} \frac{\partial c_1}{\partial s}$$

replacing $\frac{d\alpha}{dc_1} = -\frac{1}{y''(\alpha)c_1^2}$ and $\frac{d^2 \alpha}{\partial \mu_A dc_1} = \frac{2}{y''(\alpha)c_1^3} \frac{\partial c_1}{\partial \mu_A}$ gives:

$$\frac{\partial^2 X}{\partial \mu_A \partial \alpha} \left(-\frac{1}{y''(\alpha)c_1^2} \right) \frac{\partial c_1}{\partial s} + \frac{\partial X}{\partial \alpha} \left(-\frac{1}{y''(\alpha)c_1^2} \right) \frac{\partial^2}{\partial \mu_A \partial s} > - \frac{\partial X}{\partial \alpha} \left(\frac{2}{y''(\alpha)c_1^3} \frac{\partial c_1}{\partial \mu_A} \right) \frac{\partial c_1}{\partial s}$$

$$\Leftrightarrow \frac{\partial^2 X}{\partial \mu_A \partial \alpha} \frac{\partial c_1}{\partial s} + \frac{\partial X}{\partial \alpha} \frac{\partial^2}{\partial \mu_A \partial s} > - \frac{\partial X}{\partial \alpha} \left(\frac{2}{c_1} \frac{\partial c_1}{\partial \mu_A} \right) \frac{\partial c_1}{\partial s}$$

Which can be stated as a comparison of elasticities

$$\frac{\partial^2 X}{\partial \mu_A \partial \alpha} \frac{\mu_A}{\frac{\partial X}{\partial \alpha}} + \frac{\partial^2 c_1}{\partial \mu_A \partial s} \frac{\mu_A}{\frac{\partial c_1}{\partial s}} > 2 \frac{\partial c_1}{\mu_A} \frac{m\mu_A}{c_1} \quad (1.65)$$

Which gives (1.58):

$$\mathcal{E} \left(\frac{\partial X}{\partial \alpha}, \mu_A \right) + \mathcal{E} \left(\frac{\partial c_1}{\partial s}, \mu_A \right) > 2\mathcal{E} \left(\frac{\partial c_1}{\partial \mu_A}, \mu_A \right)$$

1.B.3 Local surplus maximization

The local surplus from the joint-venture, is defined as

$$X_{local}(\alpha, \beta) = X(\alpha, \beta) - P_A(\delta^*, \alpha) = P_B(\delta^*, \beta) + R(\delta^*, \alpha, \beta) - \alpha - \beta. \quad (1.66)$$

Optimal ownership share for local surplus

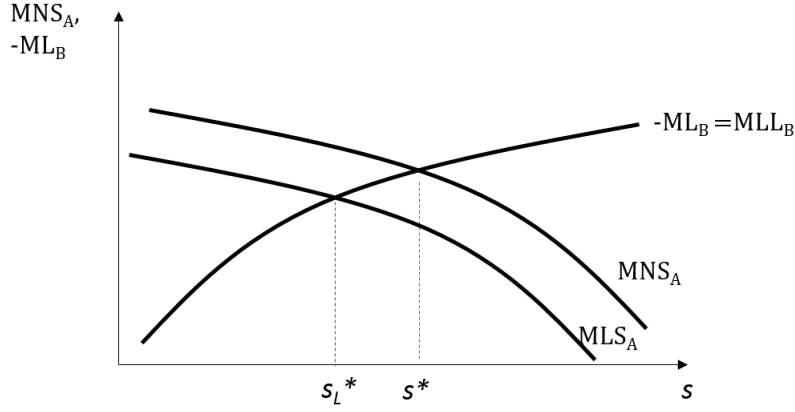
By similarity with s^* identification in section 3.4, we defined marginal local surplus for A (MLS_A) resulting from an increase ownership share, and marginal local loss for B (MLL_B). Since all B 's profits are located in the host country, we have $MLL_B = ML_B = \frac{\partial X}{\partial \beta} \frac{d\beta}{dc_2} \frac{dc_2}{ds}$.

To the contrary, the marginal local gains for A only pass through the increased common revenue, such that: $MLS_A = \frac{\partial X_{local}}{\partial \alpha} \frac{d\alpha}{dc_1} \frac{dc_1}{ds} < MNS_A$, from (1.66), and $\frac{\partial P_A}{\partial s} > 0$, due to increased expropriation possibilities.

The optimal ownership share (for local surplus) is obtained when $MLS_A = -MLL_B$, since $MLS_A < MNS_A$ and $MLL_B = ML_B$, we therefore have that $s_{local}^* < s^*$, with s^* the ownership share that satisfied $MNS_A = -ML_B$ in (1.53).

Graphically:

Such that, the solution of s_{local}^* is also unique and always lower than s^* . From a host-country point of view, it would always be beneficial to reduce foreign ownership, to benefit from a higher local surplus, although the total surplus would be lowered. However the precise identification of s_{local}^* would be difficult, since it depends on firm-level characteristics that might not be observed (such as the bargaining power).


 Figure 1.B.1 – s_{local}^* and s^*

Optimal productivity level for local surplus

The first-order condition that gives the optimal value of μ_A that maximizes the local surplus is

$$\frac{\partial X_{local}}{\partial \mu_A} = 0$$

We have from (1.66):

$$\frac{\partial X_{local}}{\partial \mu_A} = \frac{\partial P_B}{\partial \mu_A} + \frac{\partial R}{\partial \mu_A} - \frac{\partial(\alpha + \beta)}{\partial \mu_A}$$

From equations (1.18): $P_B = b(\delta)y_B$ we have

$$\frac{\partial P_B}{\partial \mu_A} = b(\delta^*) \frac{\partial y_B}{\partial \mu_A}$$

From eq. (1.17): $R = r(\delta)(\mu_A y_A(\alpha) + \mu_B y_B(\beta))$

$$\frac{\partial R}{\partial \mu_A} = \mu_A \left(\frac{\partial y_A}{\partial \mu_A} (r_1 + r_4 - r_2 \tilde{d}_A) - r_2 y_A \right) + \frac{\partial y_B}{\partial \mu_A} (r_1 + r_4 - r_2 \tilde{d}_A) + (r_1 + r_4 - r_2 \tilde{d}_A) y_A - r_2 \mu_B y_B$$

Such that the first order condition is

$$\frac{\partial y_B}{\partial \mu_A} (r(\delta^*) + b(\delta^*)) + y_A r(\delta^*) - r_2 \mu_B y_B - r_2 - \frac{\partial \alpha}{\partial \mu_A} - \frac{\partial \beta}{\partial \mu_A} + \mu_A \left(\frac{\partial y_A}{\partial \mu_A} r(\delta^*) - r_2 y_A \right) = 0$$

Which is satisfied for

$$\mu_A^* = \frac{\frac{\partial y_B}{\partial \mu_A} (r(\delta^*) + b(\delta^*)) + y_A r(\delta^*) - r_2 \mu_B y_B - r_2 - \frac{\partial \alpha}{\partial \mu_A} - \frac{\partial \beta}{\partial \mu_A}}{\frac{\partial y_A}{\partial \mu_A} r(\delta^*) - r_2 y_A}$$

The analysis of the second order condition gives that

$$\frac{\partial X_{local}}{\partial \mu_A} > 0 \Rightarrow \mu_A < \frac{\frac{\partial y_B}{\partial \mu_A} (r(\delta^*) + b(\delta^*)) + y_A r(\delta^*) - r_2 \mu_B y_B - r_2 - \frac{\partial \alpha}{\partial \mu_A} - \frac{\partial \beta}{\partial \mu_A}}{\left| \frac{\partial y_A}{\partial \mu_A} r(\delta^*) - r_2 y_A \right|}$$

Such that above this value of μ_A , the increasing expropriation losses overcome the production and revenue increase, and the local surplus diminishes.

Chapter 2

A Unitary Approach of Foreign Ownership Strategies.

1 Introduction

Why should economists study the rationale for international Joint-Ventures (JVs) when the management literature already covers this issue? Recent developments in economics give some support to the economic examinations of international JVs. Not only the 2016 “Nobel prize” in economics went to Oliver Hart and Bengt Holmström for their contribution to the understanding of contracts in economics, and notably in team production and joint ventures. But moreover, the choice of the organizational structure go beyond the firms’ individual performance that motivates management researchers, and has true economic externalities effects, such as local spillovers implications¹.

Yet, we certainly have a great deal to learn from international business literature since it has been the first one to open the black box that are the firms in the mainstream economic approach, and coined the “entry mode choice” expression, which broadly corresponds to the international integration dilemma of the Grossman-Hart-Moore framework, but includes JVs.

Although this literature recently started to spread into more traditional economics analyses, as reports Hayakawa et al. (2012)², we mostly stand with two closely related literatures concerning their

1. See Iršová and Havránek (2013, 2011) for surveys on spillover differences between joint ventures and wholly owned subsidiaries, and the discussion in section 3.5 of the previous chapter).

2. A working paper version of this review even considers the entry mode analysis as the third of the “eight literature lines” of firm level analysis of globalization (Hayakawa et al., 2010, section 2.3)

topic, but that diverge on their hypothesis, their analytic tools, and even their findings.

Traditional heterogeneous firms models *à la* Antràs and Helpman (2004) focusing on FDI and foreign ownership share only consider productivity-related firm heterogeneity, as if the total factor productivity (TFP) embodies all firm heterogeneity. To the contrary, international management literature ignores TFP, but mainly insists on learning-by-doing process and gradual internationalization (Johanson and Vahlne, 2009), and the role of cultural distance (Shenkar, 2001). The gradual pattern of internationalization starts to emerge in international economics with recent models of gradual strategies at early stages of firm internationalization. However they do not jointly consider heterogeneity in TFP and experience³.

This chapter investigates whether these two approaches are compatible within a single framework. Moreover, if both experience and productivity play a role in the foreign ownership choice, we wonder whether they are pure substitutes, or if they are rather complement factor, whose respective role depends on the host country characteristics, as one could assume.

This chapter's main contribution is to disentangle the role of various determinants of MNE's ownership choices in foreign direct investments, at the firm and host country level. Its novelty lies in the investigation of a two-dimensional heterogeneity of multinational firms -in productivity and international experience- and its impact on MNEs' behaviour. Specifically one or the other endogenous determinant turns dominant according to host-country characteristics, so that we provide a unified framework of both "entry mode choice" and "integration dilemma" literatures. In addition, we provide empirical evidence from a panel of 6,321 French foreign affiliates in 87 foreign countries.

The chapter is organized as follows : I review the "entry mode choice" and subsequent literature in the next section, because it is the one the less likely to be known by this thesis' readers. The third section details the theoretical framework and the resulting selection effects. Section 4 presents the data, the sample and the variables we use for empirical examination, and gives descriptive statistics. The 5th section presents the estimation strategies and their results. At last section 6 concludes.

2 Related literature : Entry mode choice, or "fifty shades of FDI"

The ownership structure of MNE's affiliates is at the source of a very abundant literature, despite the fact that it has been broadly ignored by GHM and mainstream "global sourcing" frameworks.

3. For progressive engagement in exports see Albornoz et al. (2012); and Conconi et al. (2016) for engagement from export to FDI. To our knowledge no progressive internationalization model detail several modes of FDIs

It has been the international business literature that coined the “entry mode choice” expression, referring to the organizational structure of an affiliate in a foreign market. Indeed a foreign investor faces multiple choices to engage physically in a new market, each corresponding to a given depth of commitment. The simplest, and most common way to represent this choice is the dichotomy between the choice to engage alone (Wholly Owned Subsidiaries, WOS) or setting up a joint venture (JV)⁴. For two decades now, this literature linked foreign direct investment and the boundaries of the firm issues as shows the survey done by Brouthers and Hennart (2007). Most of these contributions rely on the transaction cost framework (Williamson, 1979) to explain the different degrees of commitment in foreign markets⁵ (Hennart, 1988, 2010; Brouthers and Nakos, 2004; Maekelburger et al., 2012). The OLI approach, from the eclectic paradigm of Dunning (1988) is also used as an extension of the transaction costs theory (Nakos and Brouthers, 2002; Hollenstein, 2005). The general idea is that a formal alliance as an equity joint venture involves increased transaction costs. Thus, such an alliance is only worthy when the assets brought by the partner overcome the induced costs. These costs are often presented as effective losses, such as a profit sharing, but also cover a lot of potential costs and risks due to conflictual objectives or opportunistic behaviour of the partner. The principal-agent relationship is less straightforward since there are multiple parents. In addition, joint ventures involve opportunity costs since they are less adapted to set optimal intra-firm transfer prices and proceed to tax shifting, or to coordinate a geographically divided production process (Desai et al., 2004; Louri et al., 2002). The utility of a “parental advisory” of foreign affiliates could even increase with the development of global value chains and vertical integration, making WOS more adapted to current globalization as suggests Moran (2001).

2.1 Joint ventures and cultural distances

The international business literature deduces the advantages of international joint-venture by looking to where they are the most used. Indeed a significant proportion of the literature on organizational structures investigates why the entry mode varies across host countries, even in absence of any legal restriction. Some host countries characteristics seems to be associated with an increased use of IJV. One of the most discussed factor is the “cultural distance”, which measures cultural differences between home and host countries values that make domestic organization and process

4. The acronyms WOFE and WOFIE are also used for wholly-owned foreign (invested) enterprise instead of WOS. Another common dichotomy is between M&A and greenfield investment, but is rather used in financial topics.

5. The recurrent inscription in Williamson’s Transaction Costs framework shows the closeness with economics topics.

unadapted to new markets⁶. It has been repeatedly shown that this cultural distance increases the proportion of joint ventures among FDIs (Brouthers and Brouthers, 2001; Stopford and Haberich, 1978). As Shenkar (2001) puts it “the loosening of control in culturally distant locations was seen as a way of reducing uncertainty and information costs”. While control is less attractive, local cooperation gains in interest. Indeed firms in an unfamiliar environment would require a local partner’s experience, network and knowledge of the local market, its formal and especially informal institutions to reduce “cultural barriers” (Cheng, 2008). Investors would therefore increase the value of these immaterial assets brought by their partners, making joint ventures more attractive (Kogut, 1991; Gatignon and Anderson, 1988).

2.2 Integration and intellectual property rights protection

Close to the cultural distance faced by the MNE, its perception of the risk on the foreign country also determines the organizational structure. Economic -especially expropriation- and political risks are associated with a higher proportion of joint ventures among FDIs (Nunnenkamp and Andrés, 2014; Henisz, 2000). Beamish (2012) uses the same uncertainty argument to explain why U.S firms opt more for joint ventures in southern and developing countries. Henceforth, the better contracting institutions increase the incidence of full integration or shared-ownership. This fear of intellectual property (IPR) leakage also explains the technology intensity gap observed between joint ventures and WOS, the latter being more productive as show Nunnenkamp and Andrés (2014). They argue that multinational firms prefer to renounce to a higher performance, when they suffer an asymmetry on the partner quality. This statement also emerges in theoretical models derived from the property rights theory of the firm, with notably Atalay et al. (2014) and Bolatto et al. (2017) view of integration not only as a tool to secure input flows, but also as a strategy to secure efficient transmission of technology across the various production stages, to limit imitation risks. As a consequence, the most technology advanced MNEs should be the most deterred from using joint-ventures (Javorcik and Saggi, 2010). Similar conclusions on the role of the contracting institutions result from applications of the property right theory (PRT), either in the outsourcing versus integration dilemma (Corcos et al., 2013) or within JV toward higher ownership shares (Eppinger and Kukharsky, 2017).⁷

6. As reports Shenkar (2001), “*cultural distance is a widely used construct in international business (...) .Presumably measuring the extent to which different cultures are similar or different (...) It is in the area of Foreign Direct Investment(FDI), however that the construct has had its greatest impact*”. However he criticizes the multiple proxies that has been used to capture it, and calls for a more rigorous approach of this concept.

7. However, a very recent work by Bolatto et al. (2017) adds intangible assets feature on a PRT theoretical framework of integration versus outsourcing. Contrary to most works assuming material assets, they find the intellectual property rights protection to foster outsourcing in the case of complement assets (and insignificant effect for substitute assets).

2.3 Resource scarcity and joint venture benefits

Simultaneously an increasing strand of the entry mode literature focused on internationalized small and medium enterprises’ (SMEs) choice as noticed by Laufs and Schwens (2014). Evidences show that SMEs opt for “soft forms of internationalization” according to the word of Hollenstein (2005). More specifically, multinational firms that are SMEs are shown to opt more for joint ventures compared to full ownership of foreign affiliates. A first explanation lays on their lack of international experience. Because they are less experimented than large multinationals, they do not know the whole foreign market and institution specificities and prefer then to rely on some partners (Maekelburger et al., 2012; Cheng, 2008). More broadly, SMEs suffer from resource scarcity that goes beyond the only experience, and make partner’s assets more attractive. This is particularly true for human and financial resources constraints SMEs face to invest and manage alone a foreign affiliate (Nakos and Brouthers, 2002; Brouthers and Nakos, 2004; Calof, 1994). Although we found no study on French SMEs, empirical evidences are brought for neighbouring countries, as Belgian SMEs internationalization constraints, revealed by De Maeseneire and Claeys (2012, table 2 p.414). Italian SMEs are also shown to opt more for softer internationalization forms. Mutinelli and Piscitello (1998a) (1998b, table V) reveal that, on the 1986-1993 period, 75% of FDI from firms having less than 500 employees were joint ventures, while this share goes to 60% for firms having from 500 to 1,999 employees and 56% for firms from 2,000 to 9,999 employees. We provided similar evidences on French firms in introduction (section 2).

Given that the entry mode choice depends on endogenous characteristics of the investing firm, such as its size or its previous international experience, we are tempted to see another application of “new new trade theories” (NNTT), similar to those developed by Melitz (2003) and Helpman et al. (2004). However, to our knowledge only few contributions recently used the total factor productivity (TFP) to examine the entry mode of a MNE. Using Japanese data, Raff et al. (2009) (2012) show that the more the investor is productive, the more it opts for complete ownership of its foreign affiliates. Using the same sample of Japanese MNEs from Toyo Keizai publications, Cieřlik and Ryan (2009) show that even among joint ventures, TFP is associated with greater equity shares. In spite of their innovative aspect, these studies suffer from scare and imprecise data. Indeed, they study the capital structure of already established affiliates, which does not exactly correspond to the “entry mode”, and only have a mere idea of its age as the panel waves are not yearly defined⁸. Also, they only focus

8. They however include the estimated age of the affiliate in their estimations, and found it to be insignificant on the ownership share held by the Japanese investor.

on the FDI done by listed -and thus big- Japanese MNEs toward 22 OECD members host countries (20 for Cieřlik and Ryan (2009)). They might miss some specificities of smaller multinationals and of investments on southern countries, where uncertainty is higher than in OECD destinations. At last they do not include the investor's international experience in their analysis. Nevertheless, it is worth noting that their works represent the strongest link between the entry mode choice literature and traditional heterogeneous firms models. Their significant results legitimate our ambition to investigate the entry mode choice of new affiliates with NNTT tools such as a selection model of heterogeneous firms. This idea is also supported by Hayakawa et al. (2012) who include entry mode choice studies in their literature review of FDI and firm heterogeneity, assuming that the entry mode -as the host country- influences FDI sunk costs, and thus the productivity threshold in a Melitz (2003) approach.

2.4 Progressive internationalization process

A last strand of the literature deals with an endogenous determinant of the integration dilemma: the firm's experience, seeing the internationalization process as a progressive pattern. This very basic idea has been popularized by the "Uppsala" model of Johanson and Vahlne (1977), which specifies that a firm internationalization is a gradual process where international trade is the first step before engaging in FDI. In this framework, joint ventures appear as an intermediate step toward deeper commitment, which turns to be confirmed in a large number of empirical studies (Delios and Henisz, 2000; Kogut, 1991; Maekelburger et al., 2012; Anand and Khanna, 2000; Brouthers and Brouthers, 2001). Kuo et al. (2012) review the literature dealing with the progressive internationalization and entry mode choices. Some papers had shown that international experience can be decoupled from the firm self-commitment, as it could be brought by foreign shareholders (Filatotchev et al. (2007), 2009), or by poaching skilled employees that used to work for an internationalized group (Molina and Muendler, 2013). However, recent empirical findings show the firm-level experience to be highly correlated with the FDI decision. Gazaniol (2014) notably reveals that 95% of new industrial French outward FDIs are preceded by exports toward the host country and 73% by imports from this destination. In a renewed version of their model, Johanson and Vahlne (1990) insist on the progressive foreign commitment of the firms as the information asymmetry vanishes with previous experience. However their model lack precise formalization of heterogeneous firms in term of experience⁹. This

9. And conversely, most heterogeneous firms models assume firms to vary only in terms of productivity. More precisely they suppose that all heterogeneity could be captured through the Total Factor Productivity (TFP).

gap is bridged by Conconi et al. (2016) and their formalized gradual model of internationalization under uncertainty, although it only focus on horizontal FDI. Following Albornoz et al. (2012), they assume that uncertainty lowers a firm expected profitability abroad, as it blurs the actual foreign demand. Foreign investments would only be considered when the information asymmetry is reduced enough. Previous international experience reveals whether the foreign market worth a FDI. Contrary to the productivity in Helpman et al. (2004), but like the TFP in Antràs and Helpman (2004), previous experience is then a necessary condition for FDI, but not sufficient as the firm could be revealed to be unadapted to foreign demand. It is supposed that FDI require more information than exports, so exporting is the first opportunity given to the firm to reach foreign market. Admitting a sequential model, firms can gain experience from one period to the following by exporting. It will provide additional information about the firm profitability abroad, such as the actual demand faced by the firm. At the next period, the firm could thus consider more precisely the opportunity to engage in FDI. However, even if the formalization is close to previous models of heterogeneous firms, Conconi et al. (2016) don't mention the role of productivity, as if the firms where only heterogeneous in terms of experience.

The rehabilitation of the progressive internationalization patterns over the static “trade versus FDI” dilemma, is full of insights because it correspond more to the actual development of multinationals where exports and FDI are complementary through time, and not only substitute, but it should retain the contribution of traditional heterogeneous firms models (i.e. the endogenous capability to bear some exogenous sunk costs), that represent one of the last few major steps on international economics. This is why we aim in this chapter to evaluate the respective role of international experience and TFP in the foreign investment choices of multinational companies.

All the literature we reviewed contributes to a better understanding of the role of international experience and productivity to the FDI decision and depth. Both factors foster the worldwide expansion of firms. However what remains unknown is their respective contribution over the choice of the FDI structure, especially for southern-oriented FDI, which are less studied. We aim at bridging the remaining gap between “new new” trades theories and the “entry mode choice” of multinationals, and at providing intuitive explanation of self-selection of heterogeneous firms into internationalization's commitment degree.

3 Basic setup

Consider the same three countries world as in previous chapter (section 2), with one domestic country (D) and two foreign ones: W and E , where W benefits from a better legal contract enforcement than E . There is only one sector of differentiated goods and we further assume that the domestic market in this industry is only composed of heterogeneous MNEs engaged in a monopolistic competition. The final good to be produced requires one domestic input brought by the domestic firm, and a foreign input from W or E . As in chapter 1, the location choice of the MNEs is exogenous and fixed, such that some choose country W while other choose country E . The firms only choose their entry mode in the foreign market through a bargaining game: they can either fully integrate the foreign production plant or set up a joint-venture with a local producer¹⁰. As in the first model detailed in chapter 1, we use the framework of partial contract incompleteness from Antràs and Helpman (2008). Specifically, in country $l = W, E$, there is only a fraction μ_l of required tasks to produce the foreign input that are enforceable. Specifically we assume $\mu_W > \mu_E$, following the quality of legal institutions in each country. Simplifying Antràs and Helpman (2008), the contractual incompleteness in our model is simply given by $\omega_l = 1 - \mu_l$ ¹¹

The novelty of this chapter lies on the removal of two traditional assumptions of “global sourcing”-like models. First we assume the firm heterogeneity to impact the production of inputs, and no longer only their combination into outputs. However as we locate the production of manufactured inputs abroad, there are no valuable reasons to think the two entities (mother and daughter) share the same productivity, because we know firms to be reluctant to transfer some of their technologies abroad (see discussion in section 2). Instead we assume an incomplete productivity transmission from the parent to the affiliate, due to some frictions. We detail this foreign productivity in section 3.1

Second, we reject the restrictive assumption that the firms only differ in terms of domestic productivity, and broaden the firm heterogeneity to second dimension: the international experience (I_i), which impacts the ownership choice by two channels. (i): It improves the foreign productivity of the MNE (now different from the domestic productivity), by reducing the TFP transmission frictions. International experience helps the firm to transfer its productivity to its foreign affiliates, by allowing a better coordination between related entities notably. (ii): the international experience reduces the

10. Focusing only on multinationals firms, we assume they all have a sufficient enough productivity or rather that the selection effect already took place. Moreover, it allows us to ignore outsourcing strategy.

11. Because we only focus on within-industry choice, we don't consider the role of headquarter's and supplier's input intensity, relatively η and $(1 - \eta)$ in Antràs and Helpman (2008), as in Chapter 1, section 2

contract incompleteness $\omega_l \equiv \omega_l(I)$, with $\omega'_l(I) < 0$. This could be interpreted in several ways. A first explanation would be to consider that the previous internationalizations' experiences reduces the "cultural distance" to the foreign country, favoring full ownership as suggested in section 2.1. Staying closer to the Property Right Theory of the firm (PRT) framework, we would simply assume that the higher international experience of the firm, the higher its ability in writing internationally enforceable contracts and in suing a foreign partner, which reduces the liberty range of the intermediate good producer for non-cooperative behaviour. A last possibility, would be for experienced firms to identify and choose the most reliant partners, but the matching issue is only detailed in appendix 2.A.2, which shows that international experience increases both the matching quality and the integration incentives.

Our conception of internationalization experience in reducing the foreign contractual incompleteness actually finds some supports among theoreticians of the contracts theory. Notably, Tirole (1999) discusses the assumption according to which the two bargaining parties face symmetric information, and therefore suffer from the same unforeseen contingencies. He suggests that they might not face a symmetric information, because expectations about the future are generally made "*by analogies with better known, past situations and combine them with some specificities of the current situation to reach some assessment of the expected return and riskiness*" (Tirole, 1999, p. 764). He deduces from there that the two contracting parties might not share the same probability distributions over payoffs, since "*They might have different views on how far one can push this analogy and to transpose past experience*" (*ibid*). Using this postulate about unforeseen contingencies to depend on the firms' previous experience, we push the logic further and conclude that two different final-good producers will not share the same unforeseen contingencies, and therefore would not suffer the same level of contractual incompleteness $\omega_l \equiv \omega_{l;i}$, now depending on firm-country association.

3.1 The MNE problem

The profit function

Although the two partners play a non cooperative game, the ownership structure is chosen as to maximize joint-revenue by giving optimal incentives to each partner¹². Since we focus on the choice of this ownership structure, it implies to maximize the total profit function, we represent in a reduced form by

12. This happens through a lump-sum ex-ante transfer that binds the two parties' payoffs as explains Antràs (2014)

$$\pi = (1 - \psi_k)(p - c)q - F_k \quad (2.1)$$

Where $0 < \psi_k < 1$ represents the profit loss due to incomplete contracting. From chapter 1, we know these inefficiencies vary with k the ownership structure, such that one ownership share s^* minimizes these losses. Hence,

$$\psi'_k(s) > 0 \quad \text{iif } s > s^* \quad (2.2)$$

$$\psi'_k(s) < 0 \quad \text{iif } s < s^* \quad (2.3)$$

Such that if the solution of s^* is interior, $\psi_k(s)$ is first decreasing then increasing in s once s^* reached. Micro-foundations of these inefficiencies $\psi_k(s)$, can be found in either model of chapter 1. This term could embody both *ex-ante* and *ex-post* inefficiencies as suggests Bai et al. (2004), or only the *ex-ante* hold-up problem as in standard GHM line of models.

Now let us examine the rest of the profit function. The c parameter stands for average variable costs (fixed costs being of k -type, defined by F_k), such that $(p - c)$ represents the mean per unit profit. For ease of simplicity here, we suppose the headquarter services' (h) costs to be null, such that all variable costs are summarized by m 's costs. Due to the incomplete productivity's transmission (and because m is necessarily produced abroad by assumption), we find the variable cost c to be a reverse index of the affiliate's productivity¹³. We now detail the mechanism of the imperfect productivity's transmission.

Imperfect productivity transmission

Denoting θ_H the MNE (domestic) productivity, and θ_l the foreign plant productivity, we assume: $\theta_l = I \theta_H^e \theta_M^{1-e}$, whereby $0 \leq e \leq 1$ is the efficiency of the transmission from the multinational productivity. If this transmission is made impossible by some constraints ($e \rightarrow 0$), we assume the foreign plant productivity to be completely determined by the local manufacturer productivity θ_m and the foreign experience of the firm I ¹⁴. We set $I \geq 1$, the lower bound at one indicates a complete absence of international experience, and reduces the productivity function to a Cobb-Douglas, that is to a

13. One might wonder why the MNE draw a productivity θ_H , if it doesn't (directly) apply. First, as we'll later detail, θ_l is derived from η_H . Second, in real-world this concept is clearer since MNEs produce both domestically and abroad. This distinction is therefore important to match our empirical investigation to follow, because we only capture the domestic productivity θ_H , and not the foreign one θ_l . We could have assumed the MNE to produce another good domestically, such as an homogeneous good, and θ_H is their productivity in doing so.

14. Contrary to the TFP, we assumed the experience to be directly accessible from the affiliates. I could be interpreted as the general competences given to the MNE by previous international experiences. This point is further discussed on section (5.5)

weighted mean between parent firm and foreign partner. For simplicity we assume all possible foreign partners to share the same productivity level and normalize it to unity¹⁵. Such that the foreign plant productivity is actually $\theta_l = I\theta_H^e$ with $\theta_H > 1$ as we make the reliable assumption that the MNE productivity is higher than the foreign manufacturer own productivity. The effective foreign productivity crucially depends then on the efficiency of the transmission e . Efficiency of transmission depends on the uncertainty faced by the firm, since we know from literature on technology transfer toward foreign affiliates that parent firms are reluctant to transfer highly sophisticated technologies in unreliable environment, since they fear technological expropriation from an opportunistic partner (see Javorcik and Saggi (2010); Nunnenkamp and Andrés (2014), and discussion in 2). This uncertainty on the partner ability to appropriate protected technologies and production processes is here (inversely) proxied by $\mu(I)$, the level of contractual completeness, which itself depends on the previous international experience of the firm I , as earlier discussed from Tirole (1999) point. Unambiguously, we have $\frac{\partial e}{\partial \mu(I)} < 0$, such that lower contractibility in the foreign country reduces the productivity transmission from the MNE, notably by deterring technological transfers because of the fear of intellectual property rights leaks.

3.2 Supermodularity analysis and selection effects.

Mrázová and Neary (2012) show that most micro-funded models of heterogeneous firms related to selection issues can be written in a reduced form, releasing most of their restrictive hypothesis (specific restrictions on the functional forms of preferences, technology, the distribution of costs, the countries symmetry, etc.). The sorting pattern only comes from a property of the profit function called “supermodularity” following Milgrom and Roberts (1990) term^{16 17}.

We derive our reduced-form profit function (2.1) from Mrázová and Neary (2012)’s framework (see Mrázová and Neary (2012, table 2)). We therefore know the profit function in equation (2.1) to be supermodular in $\psi_k(s)$ and c arguments whatever the sign of price elasticity, and for any level of demand. The forthcoming analysis is therefore unrelated to the output quantity q , considered now as an exogenous variable. In what follows, initial subscripts are removed for clarity purposes. Remaining

15. Assuming heterogeneous partners is actually more relevant in a proper matching model, such the one detailed in appendix 2.A.2, but is not essential to capture MNE decision about ownership structure.

16. For a continuous function $f(x, y)$ defined on \mathbb{R}^2 and differentiable in x and y the supermodularity holds when $\frac{\partial^2 f}{\partial x \partial y} > 0$. In the case of a discontinuous function $g(x, y)$, the supermodularity prevails if $\Delta_x g(x, y_2) \geq \Delta_x g(x, y_1)$ where $y_2 \geq y_1$ and Δ_x is defined as the finite (positive) difference between the values of a function evaluated at two different values of x , x_1 and x_2 such that $x_2 \geq x_1$. Such a complementarity between two parameters of the profit function $\Pi(x, y)$ is a sufficient assumption to claim for a sorting pattern, because firms with higher level of x would gain more than others in increasing y .

17. We show in appendix 2.A.1 that both models developed in chapter 1 share this feature.

subscripts refer to partial derivatives.

The direction

Showing the function supermodularity is sufficient to give the *direction* of selections effects (Mrázová and Neary, 2012, p.12).

The supermodularity observed in $\psi_k(s)$ and c parameters involves two cases:

1. $\psi'_s > 0 \Leftrightarrow s > s^*$, such that π is supermodular in s and c
2. $\psi'_s < 0 \Leftrightarrow s < s^*$, such that π is submodular in s and c

In any case, the supermodularity pattern indicates that most productive firms have increased incentives to reach s^* than low productive ones.

The effect of host-country

We now consider the role of host-country in the integration choice. As indicated earlier, we assume $\mu^W > \mu^E$, such that for a given firm, we know $s^{*,W} > s^{*,E}$. For illustrative purposes we assume the two countries to be different enough such that $s^{*,W} > 1$ for all firms (even in absence of any international experience). Conversely, the initial level of $s^{*,E}$ for non-experimented firms is intermediate such that $0 < s^{*,E}|_{I=0} < 1$.

First focus on country W . By assumption, we have that $\frac{\partial \psi}{\partial s} < 0 \forall s \in]0; 1]$. We therefore have the second case evoked above where π is submodular in c and s , which implies $\frac{\partial^2 \pi}{\partial s \partial c} < 0$. In addition, we have $\frac{\partial c}{\partial \theta_L} \cdot \frac{\partial \theta_L}{\partial \theta_H} < 0 \Leftrightarrow \frac{\partial c}{\partial \theta_H} < 0$. Such that it is straightforward to deduce:

$$\frac{\partial^2 \pi}{\partial s \partial \theta_H} \geq 0$$

In country W , the affiliate's profit function is supermodular in the MNE ownership share s and its (domestic) productivity θ_H , such that a selection effect arise in foreign ownership.

We deduce the first proposition:

Proposition 1 *More productive firms select into higher ownership shares when the host-country contractual institutions are high enough.*

Now, consider country E , where initial s^* is interior, such that $\frac{\partial \psi}{\partial s}$ sign is ambiguous. All other relations evoked for country W hold, such that, the sign of $\frac{\partial^2 \pi}{\partial s \partial \theta_H}$ is also undefined.

A selection effect still exists in E , with higher productive firms self-selecting in ownership shares closer to s^* , but it is impossible to draw general conclusions on the respective level of ownership of

top productive firms as compared to least productive ones, since the latter could either be below or above the threshold.

Yet, remind that in our model s^* is not entirely country-specific, but also depends on the firm's own experience, which reduces unforeseen contingencies.

Formally $\frac{\partial s^*}{\partial \mu} \geq 0$ $\frac{\partial \mu}{\partial I} \geq 0 \Rightarrow \frac{\partial s^*}{\partial I} \geq 0$. Actually it is strictly positive before the corner solution $s^* = 1$, and becomes null afterward.

From first-order condition, we know s^* to be the solution of $\frac{\partial \pi}{\partial s} = 0$, such that $\frac{\partial s^*}{\partial I} \geq 0$ implies $\frac{\partial^2 \pi}{\partial s \partial I} \geq 0$

Following our assumptions on the two countries characteristics, we have $\frac{\partial s^*}{\partial I} = 0$ in W and therefore $\frac{\partial^2 \pi}{\partial s \partial I} = 0$, such that no experience-based selection effect should be observed in a country without any uncertainty on contract enforcement.

To the contrary, $\frac{\partial s^*}{\partial I} > 0$ and $\frac{\partial \mu}{\partial I} > 0$ in E , where initially firms face some uncertainty. Hence, in country E , a selection effect arises with more experienced firms opting for increased ownership.

We deduce our second proposition:

Proposition 2 *More internationally experienced firms select into higher ownership level of their foreign affiliates, especially in countries with low contract enforceability.*

Our model describes two extreme cases with two ideal type of countries, with either one or the other selection effect stressed. hence one could believe the reality to be in between these two cases, with the two selection effects co-existing. Yet, in real-world, host-country are not randomly chosen, such that the host country quality of contractible institutions is not randomly distributed, but biased toward higher values, as reveals our further empirical observations (see table 2.2). From this postulate we derive our third proposition:

Proposition 3 *On aggregate outward FDI flows, both selection effect might appear, but the productivity one should be stressed.*

In the two following sections we empirically investigate the model's propositions.

4 Empirical estimation : Data and variables

4.1 Sources and sample

The data on French foreign affiliates ownership come from merging LiFi survey (*INSEE*) with EAE-industry survey (*INSEE*). The first covers all firms possessing over 1.2 million euros of participation among other companies, firms above 500 employees or with a turnover superior to 60 million euros. LiFi details financial links between entities in the same group and informed us on the foreign affiliates of a French firm, and its ownership share. The EAE provided information on the parent firm. It covers each industrial french firms with at least 20 employees or turnover of 5 million euros. With those low thresholds, we certainly cover the majority of industrial firms engaged in significant FDIs. Merging the two dataset using firm-level unique identifier (*siren*), allowed us to compare characteristics of the parent-firm and foreign ownership choices.

Sample restrictions were necessary to avoid some biases. First, we drop french firms that belong to foreign groups. We only kept majority-owned affiliates. We also drop observations in countries where only joint ventures or wholly owned subsidiaries were observed, as we want to be sure that the ownership percentage could freely vary up to full ownership. At last we drop 55 observations with a ownership of 50.01 percent as they correspond to arbitrary values in the LiFi data, when the exact control share is ignored¹⁸. We finally end up with 6,321 new french affiliates, opened between 2001 and 2007, from 1,410 investing firms, over 87 foreign countries.

4.2 Sample overview and descriptive statistics

Our firm-level dataset reveals the remaining heterogeneity across the 1,410 MNEs considered, with a sharp concentration of firm TFP and experience features, and large standard deviations. As reveals table 2.1 all our international activity variables are positively correlated to each other, and to the firm total factor productivity, which supports an accumulative internationalization process through experience and productivity.

To further investigate the potential link between MNEs heterogeneity and foreign ownership, we detailed in table (2.2) the proportion of wholly owned affiliates according to the investor's type or host countries categories. The investor's productivity is associated with a more frequent use of wholly owned subsidiaries compared to average, while lower TFP also reflects lower use of WOS.

18. As it is explained in the dataset description provided by the INSEE :
http://www.webcommerce.insee.fr/FichesComm/PSMLIFI/P_TXCONTRA-LIFI.htm.

4. EMPIRICAL ESTIMATION : DATA AND VARIABLES

	Mean	Std. Dev.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Control share (%)	93.68	13.96	1						
(2) ln TFP,(t-1)	10.40	1.47	0.1228	1					
(3) exports, in thd. euros,(t-1)	90.00	555.1756	-0.0009	0.3868	1				
(4) Nb. of foreign affiliates,(t-1)	4.39	8.79	0.0823	0.4220	0.2588	1			
(5) Nb. of WOS,(t-1)	3.38	7.16	0.1142	0.4441	0.2351	0.8669	1		
(6) Nb. of FDI destinations,(t-1)	3.84	5.43	0.1147	0.4429	0.2395	0.0.9363		1	
(7) Destination Rule of Law index,(t-1)	1.05	0.74	0.1173	-0.1325	-0.0733	-0.0600	-0.0684		1

Source : LiFi, EAE, Authors' calculations

Table 2.1 – Descriptive statistics and correlation table

More precisely when considering the 95% of equity shares as the WOS threshold, the 10% most productive parent firms have the full ownership of 81.57% of their new foreign affiliates, whereas the least productive tenth of firms of them only entirely possesses 58.35% of them. This is in line with the proposition (1) of our model. The model prediction about experienced firms (proposition 2) is also supported by these descriptive statistics. A first-time foreign investor opts only in 72.28% of the cases for a WOS, while 76.88% of second or more foreign affiliates are fully owned. Besides investor type, the descriptive statistics reveal a 11 points drop in WOS share among FDI's between OECD and non-OECD destinations in favour of OECD host countries, in line with stylized facts depicted in the literature (Beamish, 2012).

	Nb. affiliates	WOS share (95%threshold)
All firms	6,321	75.83 %
1st foreign affiliate	1,450	72.28 %
2nd or more foreign affiliate	4,871	76.88 %
First FDI in the country	2,666	73.37 %
Previous presence in the country	3,655	77.62 %
10% least productive firms	365	58.35%
10% most productive firms	549	81.57%
In OECD countries	4,694	78.80%
In non-OECD countries	1,627	67.24%
In High Rule of Law destinations	4,913	78.42%
In Low Rule of Law destinations	1,408	66.76%

Source : LiFi, EAE, Authors' calculations

Table 2.2 – Wholly Owned Subsidiaries distribution across parent firm and destinations

A similar gap is observed between high and low rule of law countries¹⁹. Unsurprisingly, the number of observations per types of countries also shows a clear preference of French firms for developed and less risky destinations.

While WOS' investors display in average a higher TFP, this overall relationship is actually

¹⁹. Countries with a low Rule of Law index (World Bank, Worldwide Governance Indicators) are those with an Rule of Law index above the median of our sample's countries in a given year. Conversely, low Rule of Law countries are the countries with an index below the median. See appendix 2.B.2 for a list of countries in each category.

driven by the observation in high Rule of Law countries (the majority), but not from Law rule of law countries, as reports figure 2.1.

In this figure we see that the TFP distribution of WOS' and JV's parents (although some firms belong to both groups), is slightly higher for WOS parents overall (first row, left panel), and even more stressed in High rule of law countries (first row, right panel). However, in the lower half of institutional quality countries, the TFP distribution is frankly different. First it displays a lower kurtosis, with a wider range of frequent level of productivity, for both JV and WOS' parents. Although the TFP mode seems lower for JV parents, the low kurtosis implies that some productive firms also frequently opt for JV in those countries. No noticeable mean or median TFP differences between JV's and WOS's parents is therefore observable in poor institutional background.

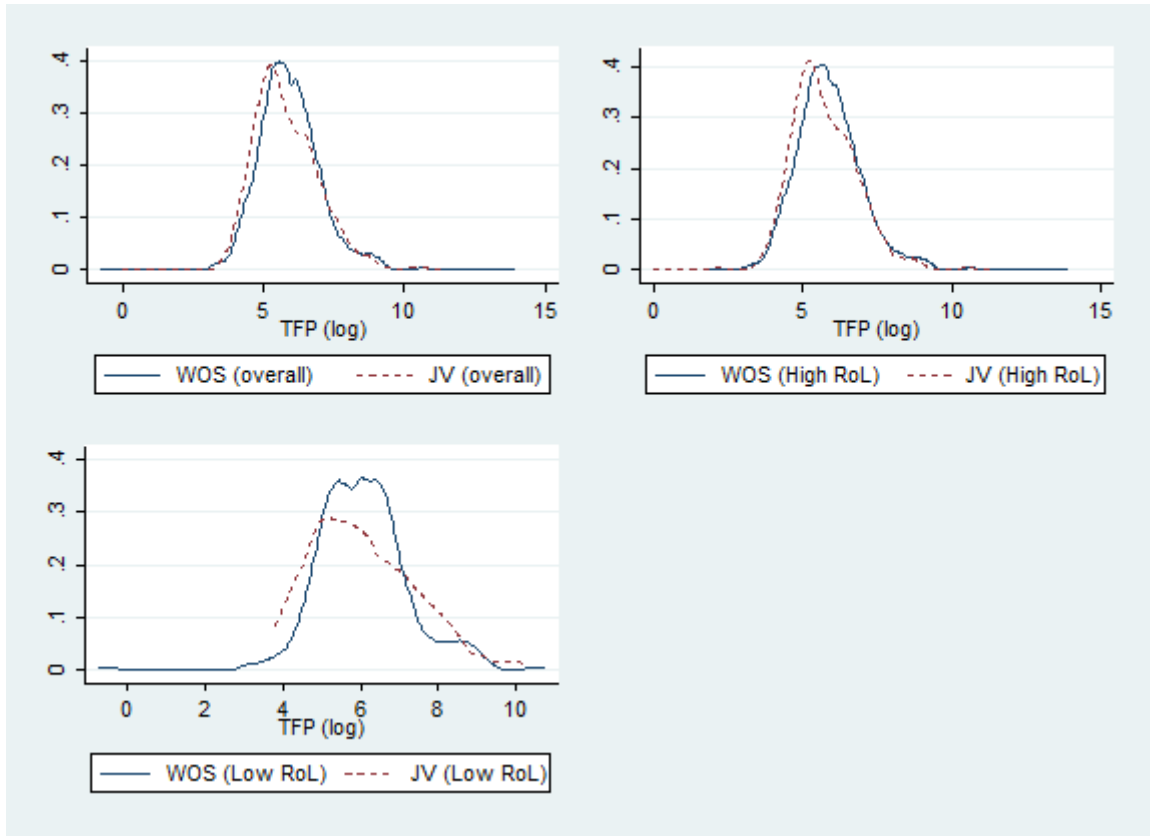


Figure 2.1 – TFP probability density function according to FDI structure and host countries

Kolmogorov - Smirnov (KS) tests of equality of distributions²⁰ confirm these differences (tab. 2.3).

Either when considering all countries or only High Rule of Law countries, we can reject at 1%

20. The two sided test examines the null hypothesis of equal distributions $H_0 : F(z) - S(z) = 0 \quad \forall z \in \mathbb{R}$ against $H_1 : \exists z$ such that $F(z) - S(z) \neq 0$. The one-sided Kolmogorov-Smirnov test examines the validity of the following null hypothesis : $H_0 : F(z) - S(z) \leq 0 \quad \forall z \in \mathbb{R}$ against $H_1 : \exists z$ such that $F(z) - S(z) > 0$

of statistical significance level the null hypothesis of equal distribution of JV's and WOS' parents productivity; and conclude that the TFP distribution of WOS' parents stochastically dominates JV's parents one, having then a higher mean and median, but also higher values all along the distribution²¹. To the contrary, we fail to reject the equality of distribution in Law rule of law countries, and simply reject at 5% the reverse hypothesis that JV's parent TFP distribution is stochastically dominant. The exact same conclusion is drawn when considering non OECD versus OECD countries instead of Rule of Law group of countries.

This gives support to our Proposition (1), assuming a positive relationship between foreign ownership and TFP, except in low rule of law destinations.

To confirm (or infirm) the first descriptive statistics, and test our three propositions simultaneously, we run preciser econometric models.

destination	$H_0 : JV \leq WOS$	$H_0 : WOS \leq JV$	$H_0 : JV = WOS$
world	0.1192** (0.000)	-0.0127 (0.713)	0.1192** (0.000)
OECD	0.1784** (0.000)	-0.0027 (0.990)	0.1784** (0.000)
non-OECD	0.0887* (0.005)	-0.0480 (0.218)	0.0887 (0.011)
High Rule of Law	0.1434** (0.000)	-0.0032 (0.990)	0.1434** (0.000)
Low Rule of Law	0.1390* (0.013)	-0.0104 (0.976)	0.1390 (0.027)

D-stats are reported as coefficients, P-values are in parenthesis
* and ** correspond to significance at 5% and 1%

Table 2.3 – Kolmogorov-Smirnov tests of TFP distribution

5 Estimation strategies and results

5.1 Probability of full ownership

As documented by Ai and Norton (2003), interactions terms in non-linear models such as Logits and Probits, are hardly interpretable²². Instead of adjusting the computed coefficient to report exact marginal effect (additive scale), we report the odds ratios (i.e. multiplicative scale) in our tables. Although they are equal to the exponent of coefficients, their interpretation on a multiplicative scale does not suffer any bias, because the bias lies on the coefficient not to be equal to the true marginal effects. See Buis (2010) for more details). Interpretation of odds ratio may be unusual since they are always positive, and must be compared to one. An odd-ratio above unity indicates a positive coefficient, whereas a value below unity implies a negative relationship. To ease the odds ratios

21. A cumulative distribution F first-order stochastically dominates another distribution G iff $F(x) \leq G(x) \forall x$ and $\exists x$ such as $F(x) < G(x)$

22. “The magnitude of the interaction effect in nonlinear models does not equal the marginal effect of the interaction term, can be of opposite sign, and its statistical significance is not calculated by standard softwares”, Ai and Norton (2003, p. 123)

interpretation, we change the logarithm base for non-linear models to base two. The odds ratio are therefore associated to the probability increase when independent variables are multiplied by two.

Since the JV versus WOS dichotomy is the most common way to look at the entry mode choice in international business literature we reviewed, we first start by evaluating the probability for the affiliate to be a WOS via a Logit estimation, using both firm-level and host-country determinants (table (2.4)). Column (1)-(4) reports the results of model (2.4):

$$Y = a_0 + \log(Exp.i)_{(t-1)} + a_2 * \log(TFP_i)_{(t-1)} + a_3 * RoL_{k(t-1)} + a_4 * Z + \epsilon \quad (2.4)$$

Where Y is here the probability of WOS, $Exp.i$ is the internationalization experience, here proxied by the number of foreign affiliates. The i subscripts indicates that this is a firm-level variable, while the k indicates a country-level variable. TFP stands for Total Factor Productivity, and is measure all along this article with the same method from Wooldridge (2009)²³. The Rule of Law index from the World Bank's Worldwide Governance Indicator is use to proxy the institutional quality in variable RoL . It is based on surveys of businessmen and citizen, and therefore directly related to the agents' perception of the enforceability of contracts. All variables are reported with a one-year lag, to be closer to their values at the time the decision has been taken, and (RoL) prevent any reverse causality, notably with the TFP. The parameter Z stands for a vector of dummy variables capturing host-country, and firm-level fixed effects when included in the model. In absence of any fixed effects, $Z = 0$ ²⁴.

What changes between columns (1)-(4) is the absence of any fixed effects in (1), while both host-country and firm-level fixed effects are jointly included in the remaining regressions. Moreover the scope of the regression is restricted to High rule of law countries in (3) and to Low Rule of Law ones in (4). Yet, these four estimations support our third hypothesis, with a positive and significant influence of previous international experience. When the number of affiliates doubles, it increases the probability for the firm to open a WOS by 8% in High rule of law countries but 13% in low ones, confirming also hypothesis (2). While this effect might seem low, two reasons could explain that. First, the probability of opening a WOS is already high in average, since this is the most frequent option for all types of firms, and in almost all countries, hence the probability to increase it will still be relatively low with such a high baseline. The second possibility is that more than half of the sample

23. Using PRODEST Stata module from Rovigatti and Mollisi (2016). This module also allows to compute Levinsohn and Petrin (2003) estimation, but choosing either one or the other had not significant impact on our results, since the correlation coefficient between the Wooldridge method and the Levinshon & Petrin one was about 0.967

24. A previous version of this paper estimated random-effects, using parent-firm clusters to limit heteroskedasticity bias, and led to sensibly similar results. However, following the suggestions of an anonymous referee from the IER, I opted for firm-level fixed effects.

has two or less previous foreign affiliates, such that doubling their number results in a low increase in absolute values. At last, the number of foreign affiliates could also capture only partially the firm's international experience. We would later on discuss on the experience captured by this proxy (see section (5.4)). Total factor productivity is also associated with increased probability of opening a WOS, except in low Rule of Law countries, where its effects turns non significant. Doubling the firm's TFP is associated with an increase of 28% of opening a WOS in High rule of Law countries. This also confirms hypothesis (1), while (3) is confirmed in columns (1) and (2).

The host country Rule of Law (RoL) plays a very important role in estimation (1), far beyond endogenous variables. Twice the rule of law is associated with an increase of 43% for the new affiliate to be a WOS, confirming what table (2.2), and international business literature on cultural distance first indicated. Yet, as one could expect this effect completely disappears as soon as we add host-country fixed effects, meaning that cross-countries differences in RoL have more impact than within countries variability, which seems logical since most of its variance is between countries. The RoL indicator shows very little variation within a seven-years period of time for a given country. We even observe a quite important negative effect of increasing RoL within high RoL countries. Although the significance of this effect remains low, its repetition is intriguing. It seems to show that when the contractibility within a country increases high enough, the MNE tends to opt more easily for JV. We presume it could be because when a certain level of RoL is reached, the MNE is able to engage in a JV without risking any expropriation or similar issues. However, since this question is not at the core of this chapter, contrary to endogenous determinants, we will not go any further discussing this effect.

The two last column are designed to test jointly hypotheses (1) and (2). Indeed, when preceding to sub-sample analysis as we did in columns (3) and (4), we let the fixed effects vary across the two estimations, for a given country (some are in both sub-sample, see appendix (2.B.2)), and moreover for a given parent-firm. To overcome this, we use interactions terms. Column (5) reports linear interaction between RoL and firm-level determinants, as details the model in eq. (2.5), whereas estimation in column (6) uses interaction of firm level variables over two dummy dichotomous variable indicating High or Low Rule of law countries, as shows the model in eq. (2.6)

$$\begin{aligned}
 Y = & a_0 + a_1 * \log(Exp.i)_{(t-1)} + a_2 * \log(TFP_i)_{(t-1)} + a_3 * RoL_{k(t-1)} \\
 & + a_4 * \log(Exp.i)_{(t-1)} * RoL_{k(t-1)} + a_5 * \log(TFP_i)_{(t-1)} * RoL_{k(t-1)} + a_6 * Z + \epsilon
 \end{aligned}
 \tag{2.5}$$

	World (1)	World (2)	High RoL (3)	Low RoL (4)	World (5)	World (6)
\log_2 Nb. for. aff. (t-1)	1.118 (10.20)***	1.074 (2.24)**	1.079 (1.96)*	1.130 (1.86)*	1.136 (3.63)***	
\log_2 TFP (t-1)	1.105 (10.87)***	1.232 (2.40)**	1.277 (2.30)**	0.997 (0.02)	1.186 (1.94)*	
\log_2 Rule of Law (t-1)	1.434 (26.91)***	1.063 (0.74)	0.691 (1.73)*	0.597 (1.57)	0.732 (1.72)*	0.905 (1.00)
\log_2 RoL*Nb. for. aff.					0.949 (4.07)***	
\log_2 RoL*TFP (t-1)					1.033 (3.27)***	
\log_2 TFP(t-1)*High RoL						1.232 (2.40)**
\log_2 TFP(t-1)*Low RoL						1.181 (1.90)*
\log_2 Nb. for. aff. (t-1)*High RoL						1.048 (1.39)
\log_2 Nb. for. aff. (t-1)*Low RoL						1.122 (2.89)***
R ²	0.05	0.24	0.21	0.26	0.24	0.24
Nb. Obs	22,934	22,932	18,108	4,809	22,932	22,932
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.4 – Logit (Probability of WOS)

$$\begin{aligned}
 Y = & a_0 + a_1 * \log(TFP_i)_{(t-1)} * HighRoL + a_2 * \log(TFP_i)_{(t-1)} * LowRoL \\
 & + a_3 * \log(Exp_i)_{(t-1)} * HighRoL + a_4 * \log(Exp_i)_{(t-1)} * LowRoL \\
 & + a_5 * RoL_{k(t-1)} + a_6 * Z + \epsilon
 \end{aligned} \tag{2.6}$$

Column (5) supports all of our hypotheses: Both international experience and TFP increase the probability of a WOS, as predicted in proposition 3. Moreover, the influence of TFP increases with host-countries' RoL, whereas the influence of foreign affiliates decreases. Similar conclusions are also driven from column (6): while interacted TFP odd ratio is above unity with both High and Low RoL dummy, the effect is substantially higher in countries with good contractual institutions, with a probability increased by 23% when the firms TFP doubles, against 18% in other countries, with also a lower significance. The reverse is observed concerning the number of previous affiliates, which odd ratio is only significant when interacted with law rule of law dummy, and highlights an increase of 12% of the WOS probability when doubling its number of foreign affiliates, in line with what found in (4).

This preliminary analysis confirms our intuitions and provides interesting supports for our propo-

sitions. Yet it ignores ownership variations within joint-ventures, whilst switching from JV to WOS is only an extreme realization of our predictions. We therefore proceed to preciser analysis on the exact ownership share, first via traditional OLS, then we run a Tobit model, better adapted to censored variable such as ownership share, bounded below 100 percent (Tobin, 1958).

5.2 Linear models

Before going any further in detailed analysis, we should discuss a potential bias stressed by multicollinearity, as the *TFP* and *Exp.* variables are likely to be correlated: TFP is known to foster exports and FDIs. From a theoretical perspective though, we believe that narrowing the scope of the analysis to multinational firms only reduces the correlation between internationalization experience and productivity, because all firms have some of the first, contrary to traditional analysis done in wider panel of firms. More important, even though they are correlated, their effect over foreign ownership is not exactly the same since it goes through different channel as explained above: TFP enables higher fixed-costs operations, while experience provides immaterial assets required to manage alone a foreign business. Such that, for instance, the remaining variability of internationalization experience for a given level of TFP would matter, and even more where those immaterial assets are required. If the two variables were not included, one of the two channels would be captured by the firm-level fixed effects and residual term. While the first is not much problematic, aside not being displayed as the fixed effects act as “black boxes”, the second would lead to endogeneity (omitted variable bias), which could bias the coefficients, while multicollinearity (if any) only affects their significance, through a higher variance. At last, and probably the most important point, is that if the two variables were actually capturing the same thing (i.e. that the firm is highly productive), we would not expect them to display systematic differences of level and significance according to the type of host country as our propositions predict²⁵.

From an empirical perspective now, we chose to add progressively each one of the endogenous regressors in the OLS model, to make sure they both capture a distinct effect on ownership share (especially noticeable in table 2.6). The joint inclusion of the two regressors only slightly lowers the coefficients’ magnitude and significance, which confirms the two variables being correlated, but not enough to lead to severe multicollinearity . Nevertheless, we note this potential multicollinearity could lead lower statistical significance of the coefficient, and hence report up to the 10% statistical

25. It even predicts opposite signs of this two variables, when interacted with the host country rule of law levels, which is already verified in table (2.4).

significance in our tables. The fear of severe multicollinearity is also rejected by the analysis of the mean variance inflation factor (VIF), only of 1.37 in the model from column (6) in table (2.5), far below values to be concerned of²⁶. Moreover, the correlation coefficient between the TFP and Experience are between 0.38 and 0.44 depending on the experience proxy retained (see table (2.1)), confirming a positive correlation, but not as high as one could expect.

This point being made, we can focus on the estimation results. Since interpretation of interactions' coefficients is not problematic in linear models, we kept traditional log-log estimations, with natural logarithm values of the variables, and reported the coefficients.

Table 2.5 reports result for a worldwide estimation of model (2.4), with $Y = \ln(s)$, where s is the ownership share expressed in basis points; and with stepwise inclusion of firm-level variables. Each firm-level variable shows positive and significant influence over ownership share when estimated together without any fixed effects. Including fixed effects (in column (2), (4) and (6)) surprisingly does not change any of the endogenous variables' coefficients, but increases their significance. Again, the host country rule of law seems to foster the MNE ownership over its subsidiaries in absence of host country fixed effects. Yet this influence vanishes when controlling the host country and the parent-firm unobserved characteristics.

	(1)	(2)	(3)	(4)	(5)	(6)
ln Nb. for. aff. (t-1)	0.006 (2.98)***	0.006 (3.16)***			0.005 (2.51)**	0.005 (2.66)***
ln TFP (t-1)			0.015 (2.58)***	0.015 (2.61)***	0.013 (2.25)**	0.013 (2.27)**
ln Rule of Law (t-1)	0.022 (6.15)***	0.011 (0.97)	0.022 (6.18)***	0.012 (1.00)	0.022 (6.17)***	0.012 (1.01)
R ² (overall)	0.03	0.04	0.03	0.05	0.04	0.05
Nb. Obs	22,934	22,934	22,934	22,934	22,934	22,934
Nb. aff.	6,318	6,318	6,318	6,318	6,318	6,318
Nb. sirtg	1,409	1,409	1,409	1,409	1,409	1,409
Firm-level Fixed Effects	No	Yes	No	Yes	No	Yes
Country Fixed Effects	No	Yes	No	Yes	No	Yes

Coefficients are reported in first row
t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.5 – Panel OLS estimations - Worldwide

The worldwide results support the propositions of our model : most productive and experienced firms tend to engage more deeply in new affiliate control through increased ownership. The third

26. $VIF = \frac{1}{1-R^2}$ where R^2 is the R-squared from linear regression of one predictor over all others. Like tolerance there is no formal cutoff value to use with Vif for determining the presence of multicollinearity. Values of Vif exceeding 10 are often regarded as indicating multicollinearity (Wooldridge, 2012, p.98), but in weaker models, which is often the case in logistic regression; values above 2.5 may be a cause for concern argues Paul Allison.

hypothesis is tested via host-countries sub-sample analysis and interaction terms in table (2.6). More precisely columns (1)-(6) show the result of the model in eq. (2.4), with stepwise inclusion, and over host-countries sub-samples by Rule of Law levels. This analysis gives more accurate results. In the sub-sample made of higher rule of law destinations, the ownership share of foreign affiliates is shown to be positively impacted by the investing firm's TFP, whose elasticity overwhelms the previous experience influence, which turns only significant at 10% when considered next to the TFP. In lower rule of law countries, only the experience proxy appears to be significant, either alone or with the TFP. The magnitude of the coefficient also increased, but remain low. We especially see that none of these variable suffers from the inclusion of the other, in neither sub samples. Therefore, the step-by-step inclusion of firm-level explanatory variables is not reproduced in further analysis.

While the continuous interaction estimation of model (2.5) (column (7)) only partially verifies our hypothesis (only the experience side is confirmed), we find more convincing support of our third hypothesis in column (8) of table (2.6), estimating model in eq. (2.6).

	(1) HighRoL	(2) HighRoL	(3) HighRoL	(4) LowRoL	(5) LowRoL	(6) LowRoL	(7) World	(8) World
ln Nb. for. aff. (t-1)	0.05 (2.27)**		0.04 (1.90)*	0.12 (3.88)***		0.011 (3.69)***	0.010 (3.63)***	
ln TFP (t-1)		0.012 (2.16)**	0.011 (1.91)*		0.017 (1.07)	0.011 (0.70)	0.011 (1.57)	
ln Rule of Law (t-1)	-0.028 (1.93)*	-0.027 (1.86)*	-0.027 (1.86)*	-0.031 (1.70)*	-0.033 (1.85)*	-0.030 (1.67)*	-0.003 (0.09)	0.005 (0.35)
ln RoL*Nb. for. aff.							-0.005 (2.36)**	
ln RoL*TFP (t-1)							0.002 (0.86)	
ln TFP(t-1)*High RoL								0.013 (2.26)**
ln TFP(t-1)*Low RoL								0.010 (1.67)*
ln Nb. for. aff. (t-1)*High RoL								0.03 (1.47)
ln Nb. for. aff. (t-1)*Low RoL								0.012 (3.84)***
R ² overall	0.02	0.04	0.04	0.07	0.07	0.07	0.05	0.05
Nb. Obs	18,110	18,110	18,110	4,824	4,824	4,824	22,934	22,934
Nb. Aff.	4,891	4,891	4,891	1,422	1,422	1,422	6,318	6,318
Firm-level Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Coefficients reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.6 – Panel OLS sub-samples and interacted estimations

The results of the Tobit model, ran to overcome the bias due to the bounded nature of ownership share are shown in table (2.7). As in all following tables, columns (1)-(4) are variations of the model in (2.4), column (5) displays the results of model (2.5), and the sixth column those of model (2.6). Most of the Tobit estimations yield very similar results, although the coefficients are slightly lower. Column

	(1)	(2)	(3)	(4)	(5)	(6)
	World	World	High RoL	Low RoL	World	World
ln Nb. for. aff. (t-1)	0.029 (10.86)***	0.026 (9.77)***	0.021 (6.32)***	0.038 (7.95)***	0.033 (9.12)***	
ln TFP (t-1)	0.027 (12.38)***	0.029 (12.97)***	0.040 (15.01)***	-0.000 (0.03)	0.011 (3.61)***	
ln Rule of Law (t-1)	0.096 (28.87)***	0.008 (0.48)	-0.131 (3.28)***	-0.071 (1.43)	-0.226 (7.24)***	-0.051 (2.60)***
ln RoL*Nb. for. aff.					-0.009 (2.89)***	
ln RoL*TFP (t-1)					0.021 (8.57)***	
ln TFP(t-1)*High RoL						0.032 (14.04)***
ln TFP(t-1)*Low RoL						0.020 (7.95)***
ln Nb. for. aff. (t-1)*High RoL						0.025 (8.60)***
ln Nb. for. aff. (t-1)*Low RoL						0.030 (5.97)***
Pseudo R ²	0.06	0.10	0.09	0.09	0.10	0.10
Nb. Obs	22,934	22,934	18,110	4,824	22,934	22,934
Nb. aff.	6,318	6,318	4,891	1,422	6,318	6,318
Nb. uncensored obs	8,775	8,775	6,312	2,463	8,775	8,775
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odds ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.7 – Tobit estimation

(5) shows more convincing results of linear interaction model, than the OLS did, with significant role of TFP. Column (8) shows that both factor still play a role on each countries sub-samples, but with a reverse importance, as predicted in our two first propositions.

5.3 Ordinal ownership classes

Although linear models such as the traditional OLS or Tobit regressions are often used to investigate ownership strategies -some papers even only display such estimations as Asiedu and Esfahani (2001) or Desai et al. (2004)- and give results in line with our model, we push the empirical analysis further and release the assumption of linear ownership control. Following Raff et al. (2009) we present non-linear models after traditional linear estimations. Actually, the ownership share of foreign affiliates is more likely to be non-linearly associated with the effective operational control over it. We already discussed in chapter 1 (section 3) this non linearity and the existence of thresholds values in equity shares (e.g. 50%, 67%; 75%, etc.). Hence, we reshape our dependent variable into a categorical variable. This assumes classes of ownership shares (between two thresholds) within which, varying ownership share has no effect. Only reaching another ownership threshold (upgrading to another

class), would give the MNE more decisional power and lead to substantial change into the partners' behaviour, such that we now only focus on this ownership classes change. Still from a theoretical perspective, adapting our simple model to discontinuous ownership categories is straightforward since the supermodular analysis was traditionally applied to non-linear functions (Milgrom and Roberts, 1990; Mrázová and Neary, 2012).

From an empirical point of view, the continuous dependent variable s must now be reshaped into an ordinal one. Rather than choosing arbitrary equity levels as ownership threshold, we deduced them from the actual distribution of ownership share of foreign affiliates (Appendix 2.B.1 details how ownership thresholds were empirically identified.). Alternative thresholds are further considered in appendix 2.B.4.

Ordered logit models are the more appropriated estimation strategy for discrete ranking with more than two choices (Chu and Anderson, 1992). The estimation strategy follows the one from linear models : first an overall analysis, then duplicated on sub-samples and at last two interacted regressions. Adopting non-linear model, we display odds-ratios and use \log_2 transformed variable as explained above.

	(1)	(2)	(3)	(4)	(5)	(6)
	World	World	High RoL	Low RoL	World	World
\log_2 Nb. for. aff. (t-1)	1.121 (3.70)***	1.066 (2.20)**	1.066 (1.73)*	1.140 (2.95)***	1.112 (3.30)***	
\log_2 TFP (t-1)	1.109 (2.97)***	1.219 (2.21)**	1.077 (0.70)	1.052 (0.32)	1.183 (1.81)*	
\log_2 Rule of Law (t-1)	1.416 (11.08)***	1.055 (0.33)	0.939 (0.29)	0.665 (1.69)*	0.769 (0.69)	0.903 (0.61)
\log_2 RoL*Nb. for. aff.					0.958 (2.02)**	
\log_2 RoL*TFP (t-1)					1.028 (1.35)	
\log_2 TFP(t-1)*High RoL						1.222 (2.30)**
\log_2 TFP(t-1)*Low RoL						1.177 (1.81)*
\log_2 Nb. for. aff. (t-1)*High RoL						1.046 (1.12)
\log_2 Nb. for. aff. (t-1)*Low RoL						1.097 (2.41)**
Pseudo R ²	0.03	0.24	0.28	0.32	0.25	0.26
Nb. Obs	22,934	22,934	18,110	4,824	22,934	22,934
Nb aff.	6,318	6,318	4,891	1,422	6,318	6,318
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.8 – Ordered Logit

Table 2.8 displays the results of the ordered logit. At the world scale, the two firm-level variables are shown to increase foreign ownership. When controlling for firm-level and host countries fixed-effects, Doubling the TFP is associated with an rise of 22% to reach the upper ownership class. However, surprisingly this coefficient is not significant when restricting only to high rule of law countries. However, assumption 3, finds some supports in column (8). Increasing TFP by 100% results in an increased probability to yield the upper ownership class by 22% in High rule of law destinations, versus 17% in low RoL countries, with a lower significance level. The reverse is observed for the role of previous foreign affiliates. While doubling their number helps by 9.7% to reach the upper class of ownership in Low RoL countries, its magnitude in High RoL countries is only its half, with 4.6%, and it lacks significance.

5.4 Robustness tests

The various econometric analysis deployed confirm the intuitions drawn in our theoretical model concerning the endogenous determination of ownership level in FDI, and its interaction with host country characteristics.

Yet, many features of these models can be legitimately questioned. First, the proxy for international experience. Besides wondering about its correlation with *TFP*, one might wonder whether the number of foreign affiliates is the appropriate proxy for the required experience to build WOS. Although the respective coefficient (or the odd-ratio) of several logit models cannot be directly compared, looking at their significance level might be meaningful, since when we use the value of previous exports as a proxy of international experience, it turns insignificant in low rule of law destinations, while all three other proxies for internationalization experience (number of foreign affiliates, foreign countries, and wholly owned subsidiaries) are positive and significant in such destinations. This indicates that only FDI experience is useful for further FDIs in uncertain destinations, and cannot be offset by “softer” international experience as exports. This is in line with our main hypothesis that TFP - which is not internationally related- is useless in such destinations, because only highly demanding experience seems to matter, although TFP is known to be correlated with internationalization degree (see Mayer and Ottaviano (2007) report on the “happy few”).

Another questionable feature would be the ownership categories drawn for the ordered logit analysis. In Appendix (2.B.4), we replace our ownership classes drawn from empirical observation by arbitrary classes by intervals of 10% equity share. Far from casting a doubt on our findings, it in-

creases the magnitude and the significance of the odds-ratios and turns to support better our initial predictions.

Another interrogation might lie on the measured of contractual completeness by the host-country rule of law. In Appendix 2.B.5, we replace it by the host-country uncertainty faced by French firms, captured by the mortality rate of French FDIs. The results are somehow disappointing, as they lack to find any significant interaction between TFP and host-country survival rate. As explained in details in the Appendix, we believe survival rate to be actually a poor proxy of uncertainty, as it computed over very different investing firms according to the host-country. However, the higher role of internationalization experience in Low survival rates countries is still verified.

Because the imperfect productivity transmission and the unforeseen contingencies are more likely to arise abroad, the mechanisms we detailed from endogenous factors should be more important in determining French MNEs' foreign ownership rather than domestic one (over their French affiliates.). We test this hypothesis in appendix (2.B.6), by changing our dependent variable from the simple foreign ownership share to the difference between foreign and domestic ownership difference. This empirical estimation also brings results in line with previous evidences, and supports our predictions. TFP (especially in countries with High RoL) and internationalization accumulated experience (especially for countries with Low RoL) help the MNE in reducing the ownership gap abroad.

A last recurrent interrogation in the literature is about adding a country-specific experience (or the affiliate's age) besides to, or instead of general internationalization experience proxy. Answering this question requires some prior discussion, and therefore is treated apart in the following sub-section.

5.5 General international experience versus country-specific experience

Until now, *internationalization experience* meant general international experience. Another kind of experience should though be discussed: the country-specific experience. As explained by Li and Meyer (2009), general international experience influences the firms' foreign ownership through only one channel, namely *competence building* to operate independently in a foreign environment, as we detailed in our theoretical model. Country-specific experience differs then, as it could affect ownership share in two opposite ways. Besides *competence building*, it also enhances *partner selection*, which is the probability to find a better partner²⁷, and therefore, avoiding to use WOS. This ambiguous effect of country-specific experience over the ownership choice – which led us to not considering it at

27. We didn't discussed it in the model for simplicity purposes assuming all local suppliers to be similar, and since we focused on general international experience, but the partner selection is detailed in appendix 2.A.2

first —, leads to different overall experience effect according to host-country context according to Li and Meyer (2009). Specifically, they assume the *partner selection* effects to dominate in developing countries, but not in developed economies. Their empirical estimations confirm this assumption, with a non-significant effect of country-specific experience over ownership share in developed countries, but a negative one in developing countries. However, this last result is only drawn by China, but not other developing countries. Although the authors explain this result by a particular business environment in China, they also wonder to which extent this finding is driven by looking only at Taiwanese electronic firms, which might find more easily a partner in mainland China than other firms would. Among studies that focused on the progressive entry mode choice within management literature, Mani et al. (2007) also find that previous experience with WOS (number of previous WOS) to be positively associated with the probability for the new affiliate to be wholly owned. Yet, host-nation experience, as they name it (measured by prior numbers of subsidiaries in the country), is negatively and significantly associated with the probability of forming a WOS, according to their estimations based on Japanese firms data.

As commonly done in this literature, we measured country-specific experience as the number of years operated in this country, corresponding to the age of the firms' eldest affiliate in each country. This measure is more precise than the affiliates' age sometimes used, for two reasons: First, it assumes country-specific ownership experience could be shared within the same group. Second, it might influence the initial ownership share of the affiliate, while the own affiliate's age would only capture the change in ownership share from its initial level²⁸. In our sample, only a minority of affiliates change of ownership share (19.4%). Although 65.4% of changes are upward changes (increase MNEs share), we note a majority (55.2%) of downward changes when it occurs the first year of the affiliate activity, such that changing ownership structures might also be a way to improve initial contract, and not only a resulting from a learning-by-doing process (or maybe learning to see the drawbacks of ownership).

We therefore add the country-specific experience in our main linear and non-linear specifications. The results displayed in table (2.9) are interesting. In the worldwide analysis, country-specific experience reveals to be highly significant and positively associated to foreign ownership, while general international experience turns insignificant, as we could expect it to be lowered down. The enhancement effect of total factor productivity remains positive and significant though.

28. In other words, for all first-year observations, age would be of zero, and cannot explain the ownership level, while experience as we measure it can already be higher if affiliates' elder sisters exist.

The same observation could be made for High RoL subset of countries, but the country-specific experience's coefficient turns low and insignificant in low RoL countries. Interaction terms also show that the country-specific experience is only (or at least more) valuable where the institutional quality is high enough. While the exact reverse is observed for general internationalization experience, in the line of Li and Meyer (2009) prediction (when partner-selection prevails for country-specific investments)²⁹ and Mani et al. (2007) findings. We assume the reason host-country experience helps partner selection (and decreased ownership) in countries with high rule of law index is because of the greater reproductibility these countries offer. To the contrary, where institutional quality is low, the reproductibility of previous lessons is not guaranteed. However, general international knowledge might help to foresee the boundaries of this uncertainty (what could be safely reproduced, what cannot), and provides lessons that could be applied even in changing environments.

Yet, even including country-specific experience into the model, our main conclusions remain unchanged : (general) internationalization experience and TFP continue to play the same role. Only, country-specific experience turns to be a better determinant of foreign ownership in countries with high contractibility enforcement, than is general internationalization experience. The reverse being observed in low rule of law countries.

6 concluding remarks

We described a model of ownership choices in foreign direct investments inspired from several literatures. The affiliate's ownership level results from a tradeoff between incentives to integrate (for intellectual property protection, and better coordination), ability to overcome investment sunk costs (depending on the firms' TFP), and the need of a local partner specific non-contractible assets (according to host countries' contract enforceability, and firms' own experience). Hence, heterogeneity between multinational firms greatly influences the ownership strategy, albeit with a noticeable variability across host countries. In line with our predictions and based on an extensive French dataset of over 6,300 foreign subsidiaries, we show that for an investment in a known and stable environment, the more productive firms would choose higher control of their foreign affiliates equity, whereas no similar sorting pattern is noticeable in destinations with fewer legal protection. However, this selection effect

29. Actually our results are in the line of Li and Meyer (2009) only in the sense that they anticipate that country-specific and general experience could have opposite effects on ownership choices, according to the host-country environment as we show it in column (7) of tables (2.9) and (2.10). However, they predict the partner selection model to prevail in developing countries, but failed to provide satisfying evidences. To the contrary, we show that this effects prevails in High rule of law countries.

A Unitary Approach of Foreign Ownership Strategies.

	(1)	(2)	(3)	(4)	(5)	(6)
	World	World	High RoL	Low Rol	World	World
ln Nb. for. aff. (t-1)	0.003 (1.37)	0.002 (1.06)	0.001 (0.24)	0.010 (1.98)**	0.009 (3.52)***	
ln TFP (t-1)	0.023 (7.79)***	0.011 (2.09)**	0.008 (1.43)	0.010 (0.73)	0.007 (1.46)	
Rule of Law (t-1)	0.021 (16.18)***	0.011 (1.81)*	-0.023 (1.77)*	-0.026 (1.14)	-0.013 (1.01)	0.005 (0.71)
ln years in country	0.011 (6.55)***	0.012 (6.46)***	0.015 (7.53)***	0.006 (1.42)	0.005 (2.06)**	
RoL*ln Nb. for. aff. (t-1)					-0.007 (5.52)***	
RoL*TFP (t-1)					0.002 (2.38)**	
RoL*years in country					0.008 (4.08)***	
ln TFP(t-1)*High RoL.						0.010 (1.91)*
ln TFP(t-1)*Low RoL.						0.008 (1.65)*
ln Nb. for. aff. (t-1)*High RoL.						0.000 (0.00)
ln Nb. for. aff. (t-1)*Low RoL.						0.011 (3.99)***
ln years in country*High RoL.						0.015 (7.41)***
ln years in country*Low RoL.						0.000 (0.05)
R ²	0.03	0.05	0.04	0.07	0.06	0.05
Nb. Obs	22,934	22,934	18,110	4,824	22,934	22,934
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.9 – Panel OLS (Country-Specific experience)

remain crucial as most of French FDIs, and especially first FDIs, are targeting developed countries with high institutional quality (UE, USA and other OECD members), where the productivity sorting pattern is verified. This productivity selection should therefore affect more the extensive margins of first-timer foreign investors rather than the expansion of already internationalized MNEs.

An international learning-by-doing process toward increased ownership is also observed, as already underlined by international business literature, except this is the first time -as far as we know- that it is revealed once controlled for the firms' TFP. This progressive internationalization is stressed for investing in uncertain destinations. The gradual pattern of internationalization strategies that recent studies highlighted from arm's length trade to FDI, where both experience and productivity play a role, is therefore continued by a second progressive commitment, among MNEs and within FDI strategies. The depth of international commitments differs from soft strategies of low productive

	(1)	(2)	(3)	(4)	(5)	(6)
	World	World	High RoL	Low RoL	World	World
log ₂ Nb. for. aff. (t-1)	1.151 (3.07)***	1.044 (0.98)	1.033 (0.58)	1.181 (2.53)**	1.138 (2.70)***	
log ₂ TFP (t-1)	1.161 (3.03)***	1.272 (1.91)*	1.079 (0.50)	1.059 (0.26)	1.200 (1.38)	
Rule of Law (t-1)	1.632 (10.60)***	1.075 (0.31)	0.919 (0.26)	0.602 (1.55)	0.539 (1.11)	0.958 (0.17)
log ₂ years in country	1.124 (2.32)**	1.237 (3.84)***	1.271 (3.76)***	1.117 (0.83)	1.089 (1.16)	
RoL* Nb. for. aff.					0.878 (2.77)***	
RoL*TFP (t-1)					1.061 (1.41)	
RoL*years in country					1.202 (2.86)***	
log ₂ TFP(t-1)*High RoL.						1.246 (1.76)*
log ₂ TFP(t-1)*Low RoL.						1.239 (1.69)*
log ₂ Nb. for. aff. (t-1)*High RoL.						1.004 (0.08)
log ₂ Nb. for. aff. (t-1)*Low RoL.						1.155 (2.57)**
log ₂ years in country*High RoL.						1.352 (4.81)***
log ₂ years in country*Low RoL.						0.989 (0.10)
Pseudo R ²	0.03	0.27	0.28	0.32	0.27	0.27
Nb. Obs	22,934	22,934	18,110	4,824	22,934	22,934
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.10 – Ordered logit (Country-Specific experience)

and inexperienced firms relying much on their partners, to bold and autonomous strategies of more productive and experienced MNEs. We also show the firm experience and its TFP not to be simple substitutes, but rather complementary features that do not provide the firm the same advantages.

One of the limit of our analysis would be not to consider previous internationalization steps than joint-ventures. In real-world, several intermediary solutions exist between direct exports and joint-ventures, such as formal alliances with local partner (without the equity component), or even representation and sales offices, that are local structures, but are hardly observable in statistics as they do not constitute a proper legal entity on their own (contrary to an affiliate). Actually the official form of joint venture (equity sharing) is only one particular and very restrictive type of contractual partnership (but the easier to detect). This certainly explains why a large proportion of inexperienced firms do opt “directly” for wholly owned subsidiaries. They probably have already concluded other

types of commercial partnership and agreements we cannot observe, that reduce or warranty the risks or the costs they face, prior to their first FDI. However having robust results when only considering official equity joint venture strengthens the assumption of an effective gradual pattern, as the other kinds of partnership should decrease the differences observed in experience and productivity across the equity commitment degrees.

Welfare implications could also be drawn from this chapter. While a consensus starts to emerge concerning a local spillover premium from joint-ventures compared to fully foreign owned affiliates because they favor local participation and sourcing, and use technologies easily adopted by local producers (see (Iršová and Havránek, 2013, 2011) surveys)³⁰, or limits the “expropriation” toward private benefits of the MNE outside the host country (see chapter 1, section 3.5); it would imply that developing countries would benefit more from foreign investments done by middle productive MNEs or first-time foreign investors than by major multinationals, because these firms are more likely to engage in JVs. In terms of policy implications to foster local development, developing countries should focus on attracting middle sized MNEs. This conclusion is yet to be taken cautiously, and calls for further research specifically dedicated, but are worth to be discussed.

Also, this chapter shows how the point made by Mrázová and Neary (2012) allows to investigate double-sided firm heterogeneity into selection models. Previous findings that only considered TFP enhancement effect over foreign ownership from Raff et al. (2012); Ciešlik and Ryan (2009) could be integrated as extreme cases of our framework results, because it only concerns affiliates in OECD host countries. The surrounding number of joint-ventures in southern countries detailed by Beamish (2012) also fits into our model.

To conclude, the interaction between firm-level and host-country factors could be more puzzling than one could think of, as shows our investigation over the various experience types, and calls for further research. We know some to be under progress, notably by Eppinger and Kukharsky (2017), who investigate the interaction between (industry-level) relationship-specificity of inputs and legal protection in host country to determine the ownership choice. This finding is in line with ours under the reliable assumption of a higher degree of relationship-specificity of inputs within industry, for higher productive firms. We hope these evidences to be striking enough in highlighting the complexity

30. Although this is a much debated topic. Recent evidences also show that majority-owned subsidiary provide higher spillover in the long run through the higher technological level they are using, while minority-held subsidiaries would have more immediate spillover but last less (Merlevede et al., 2014). But majority-owned could still be JVs, and their paper remain silent on fully foreign owned affiliates. Some also distinguish backward (vertical) spillovers from intra-sectoral (horizontal) ones (Merlevede et al., 2014; Javorcik and Spatareanu, 2008), which complicates the general statement above (although not in frontal contradiction with it). In the current state of research, JV are likely to favor immediate and backward oriented spillovers compared to WOS, if not overall spillovers.

of underlying international integration choices, such that further research would systematize these interactions and no longer investigate firm-level and host-country determinants separately.

Actually, the MNEs' choice could be even more complex, if we add a dimension not yet considered: the FDI motive, which could influence the ownership choice of the foreign affiliate, and also be related with the firm-level characteristics. The next chapter focuses on this motive-related aspect of FDI strategies and the role firm heterogeneity plays into it. A brief analysis does indicate that ownership might be slightly related to FDI motives.

Appendix

2.A Theoretical appendix

2.A.1 Chapter 1 models' supermodularity

The conclusions from the two models developed in chapter 1 can be drawn using this supermodularity analysis.

Ownership as the propriety of inputs (GHM)

Relation (1.16) in Chapter 1 gives the MNE's profit:

$$\pi_H = \Theta Z_k - F_k \quad (2.7)$$

Where F_k (fixed costs of investment) is independent from Θ , a parameter reflecting the MNE productivity.

It is trivial to deduce the first partial derivative: $\frac{\partial \pi}{\partial \Theta} = Z$

Then, studying the supermodularity results in studying $\frac{\partial Z}{\partial s}$. Where s is the ownership share of the multinational, and Z is a demand parameter defined such as:

$$Z = \left(1 - \eta\alpha\beta_h - \frac{\alpha\mu(1-\eta)}{1-\alpha(1-\mu(1-\eta))}\right) A \left[\alpha^\alpha \left(\frac{\eta}{c_h}\right)^{\alpha\eta} \left(\frac{1-\eta}{c_m}\right)^{\alpha(1-\eta)} \beta_{h,k}^{\alpha\eta} (1-\beta_{h,k})^{\alpha\omega} \left(\frac{\mu}{1-\alpha(1-\mu(1-\eta))}\right)^{\mu\alpha(1-\eta)} \right]^{\frac{1}{1-\alpha}}$$

Among all these parameters, only β_h depends on s the ownership share held by the MNE H ; with $\beta'_h(\gamma) \geq 0$. As already explained in Chapter 1, Z is not linear in β_h ; and therefore not in s , so that the supermodularity pattern in s and Θ isn't always verified.

Two cases are distinguished:

- When ω (importance of non-contractible activities of M) is low, such that $Z'(\gamma) > 0$, we find the traditional sorting pattern *à la* Antràs and Helpman (2004), the supermodularity being verified for all firms, such that most productive would opt for higher integration. Here the *direction* is unambiguous, and the *existence* is verified. This corresponds to the figure 1.2, left panel, in chapter 1.
- When ω_m is intermediate or low, $Z_J > Z_W$ and $Z_J > Z_O$. In other terms: $Z'(s) > 0$ for $0 < s < s^* < 1$ and $Z'(s) < 0$ for $0 < s^* < s < 1$. We thus observe a surpermodular pattern

between s and Θ for any ownership between between outsourcing and s^* , and a submodular pattern between from s^* to full ownership, such that, in fine, no clear-cut predictions could be drawn, except than most productive firms would choose for joint-venture over outsourcing or full integration (see figure 1.2, middle and right panel, in chapter 1).

Ownership as decisional power (BTW)

Actually, the section 3.4 in chapter 1 already lies on a supermodularity analysis when studying how the marginal net surplus increases with the MNEs' productivity (further detailed in appendix 1.B.2 of chapter 1). It consists on verifying the condition for which $\frac{\partial^2 X}{\partial s \partial \mu_A} > 0$, with X being the total net surplus. Therefore, it is equivalent to study when the supermodularity pattern holds between the ownership share s and μ_A the firm's productivity.

2.A.2 Model of matching quality following Rauch & Trindade (2003)

Rauch and Trindade (2003) address another issue of international joint-venture : the matching quality between partners³¹. We didn't implement this on our main model for clarity purposes. However we show here that it is perfectly adaptable in supermodularity analysis like ours. Indeed, Rauch and Trindade (2003) insist on the quality of information -as suggests their title- for the matching success. The better information I , enables the multinational firm i to chose an adequate partner j , such that the quality of match z_{ij} increases (up to 1/2 according to their unit length circle modeling of matches), increasing in turn the output quantity from the match y_{ij} (see equation (1) from Rauch and Trindade (2003)). From a formalized perspective, this parameter z impacts all operating profits (which are not further detailed). Let's reproduce their equation (2) :

$$\Pi_{ij} = z_{ij} * \pi$$

Where Π_{ij} the total profit from the match (before the profit-sharing). In their model, each producer is assumed to receive half of the profits Π_{ij} such that the MNE earns $\frac{1}{2} * z_{ij} * \pi$.

Adapting it to our model is straightforward. We simply detail the operating profits to our profit function (2.1): $\pi = (1 - \psi_k)(p - c)q - F_k$. Also, we replace the 50-50 sharing by a share β_h of final revenue that goes to H , which takes into account the bargaining game of the two parties, and is increasing in s , since s secures the disagreement payoffs (see chapter 1). We then add the z parameter of matching quality, that depends on the information held by the firm³². Noting Π_i the final profit for the firm i , we find:

$$\Pi_i = z_{ij}(\chi) * \beta_h(s) * ((1 - \psi_k)(p - c)q - F_k)$$

We can therefore directly conclude to similar sorting patterns than our initial model through the supermodular analysis. The submodularity between c and s is not perturbed by the addition of z , hence more productive firms always have higher incentives to integrate. The selection effect of experienced firms (benefiting from greater information) is strengthened by the addition of $z(I)$ in our profit function.

Experience plays thus an ambivalent role in this framework, favouring better matches while reducing the attraction of joint venture³³. However, this is not as contradictory as it appears to be. Actually Díez and Spearot (2014) argue that better matches increase the incentives to acquire the foreign partner, and could result in increased or full ownership.

31. The ownership share is not evoked, implicitly assuming a 50-50 equity ownership, as the equal profit sharing reveals.

32. Another possibility consists in embodying the z parameter into $\beta_h \equiv \alpha(S_i, I_i)$, with similar results.

33. Experience has both *competence building* and *partner selection* effect, as discussed in (Li and Meyer, 2009) and in section (5.5). Therefore experience is closer here to the country-specific experience, rather than the general internationalization experience, or could be seen a mix from both. Indeed, contrary to our baseline model, we assume here experience to give information about the partner selection.

2.B Empirical Analysis Appendix

2.B.1 Ownership thresholds and categories

The following histogram displays the concentration of joint-ventures over a few numbers of ownership shares. The horizontal dot line indicates the 5% of joint-venture cut-off. Such a concentration of ownership shares among indicates threshold effects when reaching a specific value.

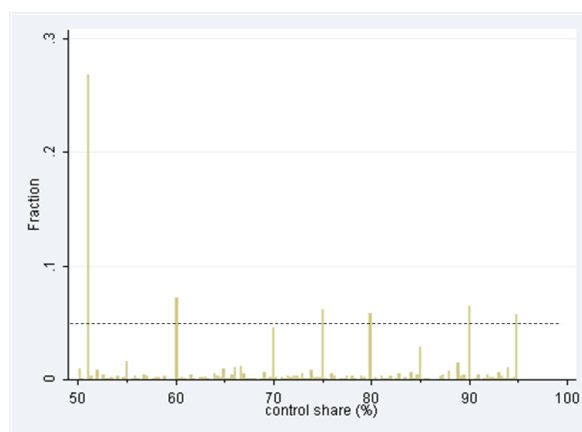


Figure 2.B.1 – Distribution of ownership shares

2.B.2 List of countries according to Rule of Law quality

For each year, we divided the sample of the 87 host countries into High Rule of Law (above median) and Low Rule of Law countries (below median). The two samples aren't of the same size because host countries with higher rule of law are more often chosen by French firms. Six countries appear in both groups because they switch from groups over the years, due to an index close to the sample median value : India, Slovakia, South Africa, Thailand, Tunisia and Turkey.

Lower Rule of Law index : Algeria; Angola; Argentina; Benin; Brazil; Bulgaria; Burkina Faso; Cambodia; Cameroon; Central African Republic; China; Colombia; Congo; Côte d'Ivoire; Croatia; Dominican Republic; Egypt; Gabon; Ghana; Guinea; Honduras; India; Indonesia; Iran; Kazakhstan; Kenya; Lebanon; Madagascar; Mexico; Mongolia; Morocco; Niger; Nigeria; Panama; Peru; Philippines; Romania; Russian Federation; Senegal; Serbia; Slovakia; South Africa; Tanzania United Rep. of; Thailand; Togo; Tunisia; Turkey; Ukraine; Venezuela; Viet Nam

Upper Rule of Law index : Australia; Austria; Belgium; Canada; Chile; Costa Rica; Cyprus; Czech Republic; Denmark; Finland; Germany; Greece; Hong Kong (SARC); Hungary; India; Ireland; Israel; Italy; Japan; Korea; Luxembourg; Malaysia; Mauritius; Netherlands; New Zealand; Norway; Poland; Portugal; Singapore; Slovakia; Slovenia; South Africa; Spain; Sweden; Switzerland; Taiwan; Thailand; Tunisia; Turkey; United Arab Emirates; United Kingdom; United States of America; Uruguay

2.B.3 Alternative proxies for internationalization experience

	(1)	(2)	(3)	(4)	(5)	(6)
	World	World	High RoL	Low RoL	World	World
log ₂ Nb. WOS (t-1)	1.330 (7.93)***	1.113 (2.99)***	1.121 (2.74)***	1.205 (3.30)***	1.193 (3.90)***	
log ₂ TFP (t-1)	1.062 (2.25)**	1.100 (1.94)*	1.099 (1.23)	1.039 (0.26)	1.052 (1.59)	
log ₂ Rule of Law (t-1)	1.386 (10.89)***	1.060 (0.37)	0.948 (0.24)	0.681 (1.62)	0.761 (0.67)	0.946 (0.33)
log ₂ RoL*Nb. WOS					0.940 (1.22)	
log ₂ RoL*TFP (t-1)					1.025 (1.09)	
log ₂ TFP(t-1)*High RoL						1.102 (2.00)**
log ₂ TFP(t-1)*Low RoL						1.059 (1.64)
log ₂ Nb. for. aff. (t-1)*High RoL						1.100 (2.24)**
log ₂ Nb. for. aff. (t-1)*Low RoL						1.183 (3.53)***
Pseudo R ²	0.04	0.29	0.31	0.32	0.29	0.29
Nb. Obs	22,934	22,934	18,110	4,824	22,934	22,934
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.B.1 – Ordered Logit (WOS)

A Unitary Approach of Foreign Ownership Strategies.

	(1)	(2)	(3)	(4)	(5)	(6)
	World	World	High RoL	Low Rol	World	World
log ₂ Exports (t-1)	1.035 (3.33)***	1.021 (2.03)**	1.026 (2.21)**	1.002 (0.10)	1.036 (1.54)	
log ₂ TFP (t-1)	1.125 (3.31)**	1.227 (2.29)**	1.076 (0.69)	1.134 (0.79)	1.203 (2.03)**	
log ₂ Rule of Law (t-1)	1.403 (10.89)***	1.055 (0.33)	0.936 (0.30)	0.646 (1.83)*	0.855 (0.41)	0.921 (0.48)
log ₂ RoL*Exports					0.992 (0.36)	
log ₂ RoL*TFP (t-1)					1.015 (0.74)	
log ₂ TFP(t-1)*High RoL						1.223 (2.30)**
log ₂ TFP(t-1)*Low RoL						1.189 (1.95)*
log ₂ Exports(t-1)*High RoL						1.027 (1.71)*
log ₂ Exports (t-1)*Low RoL						1.036 (1.50)
Pseudo R ²	0.03	0.26	0.26	0.32	0.26	0.26
Nb. Obs		22,934	18,110	4,824	22,934	22,934
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.B.2 – Ordered Logit (Exports)

	(1)	(2)	(3)	(4)	(5)	(6)
	World	World	High RoL	Low Rol	World	World
log ₂ Nb. countries (t-1)	1.301 (5.42)***	1.142 (2.68)***	1.121 (2.00)**	1.240 (2.64)***	1.235 (3.27)***	
log ₂ TFP (t-1)	1. (2.50)**	1.325 (2.15)**	1.110 (0.67)	1.104 (0.44)	1.228 (1.72)*	
log ₂ Rule of Law (t-1)	1.660 (11.22)**	1.082 (0.34)	0.913 (0.29)	0.549 (1.72)*	0.743 (0.58)	0.943 (0.24)
log ₂ RoL*Nb. countries.					0.908 (2.00)**	
log ₂ RoL*TFP (t-1)					1.052 (1.25)	
log ₂ TFP(t-1)*High RoL						1.313 (2.21)**
log ₂ TFP(t-1)*Low RoL						1.259 (1.83)**
log ₂ Nb. countries (t-1)*High RoL						1.106 (1.87)**
log ₂ Nb. countries (t-1)*Low RoL						1.229 (2.90)***
Pseudo R ²	0.03	0.26	0.28	0.32	0.22	0.26
Nb. Obs		22,934	18,110	4,824	22,934	22,934
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.B.3 – Ordered Logit (Nb. countries)

2.B.4 Alternative intervals for ordered logit

To make sure the results are not driven by the ownership threshold we drawn from actual ownership shares concentration, we replace them by the six following ordinal ownership classes: [50;60] [60;70] [70;80] [80;90] [90;100] [100]. This classification implies that ownership threshold correspond to round values around tenth of ownership. Although this is often true, this classification doesn't distinguishes for frequent ownership thresholds that are 2/3 and 3/4 of ownership share. However this classification doesn't suffer from the suspicion to be intentionally drawn for the results to emerge, yet the results are quite similar to table 2.8. Actually the sub-sample analysis with these categories supports our prediction better than the specification in table 2.8. Our three theoretical predictions are comforted, with both experience and productivity having a positive and significant effect on the ownership class reached, with a notable higher effect of experience in low rule of law countries, when the reverse is observed for total factor productivity.

	(1)	(2)	(3)	(4)	(5)	(6)
	World	World	High RoL	Low RoL	World	World
log ₂ Nb. for. aff. (t-1)	1.113 (3.14)***	1.086 (2.20)**	1.098 (1.88)*	1.130 (2.62)***	1.139 (2.63)***	
log ₂ TFP (t-1)	1.150 (3.86)***	1.503 (4.29)***	1.463 (3.67)***	1.530 (1.95)*	1.444 (3.48)***	
log ₂ Rule of Law (t-1)	1.655 (12.35)***	0.988 (0.07)	0.622 (2.05)**	0.591 (2.00)**	0.684 (0.76)	0.922 (0.41)
log ₂ RoL*Nb. for. aff.					0.938 (1.47)	
log ₂ RoL*TFP (t-1)					1.045 (1.05)	
log ₂ TFP(t-1)*High RoL.						1.499 (4.31)***
log ₂ TFP(t-1)*Low RoL.						1.460 (3.93)***
log ₂ Nb. for. aff. (t-1)*High RoL.						1.063 (1.50)
log ₂ Nb. for. aff. (t-1)*Low RoL.						1.147 (2.72)***
Pseudo R ²	0.03	0.24	0.26	0.28	0.24	0.24
Nb. Obs	22,934	22,934	18,110	4,824	22,934	22,934
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.B.4 – Ordered Logit (Alternative ownership thresholds)

2.B.5 Alternative proxy of contract incompleteness

Aside from using the Rule of Law index to measure the host country institutional quality and therefore the contractual incompleteness; we used an alternative proxy: the average survival rate of French affiliates. Similar index based on exporter's survival rate has already been used to capture the uncertainty domestic firms face abroad – the more uncertainty, the more the proportion of firm that wouldn't actually be adapted for that market, leading to higher exit rate – (Conconi et al.,

2016). However, contrary to Conconi et al. (2016), we do not assume this uncertainty to be in terms of actual demand, but rather of of actual formal and informal environment, which determines the completeness of contracts the MNE could offer to the foreign partner in the first period of our model. More specifically, if the MNE doesn't know all subtleties of local laws or habits, she would let room for the foreign partner to increase its range of non enforceable activities, which would virtually correspond to lower institutional quality. Including a foreign-demand uncertainty in the model would be a straightforward extension, following the baseline of Conconi et al. (2016).

The rest of the model suits also well with this interpretation, assuming notably that previous international experience reduces this type of uncertainty, and would therefore be particularly required to invest in countries with high uncertainty.

Yet, the econometric results displayed in table 2.B.5 are less conclusive than our main estimation model. While the overall test of propositions 1 and 2 still hold in columns (1) and (2), and the sub-sample analysis being as inconclusive on proposition 3 than the main analysis reported in table 2.8. However, we fail in verifying the third proposition in the last column (6). Specifically, while the higher importance of experience in low survival countries is verified in the interaction terms, the TFP seems to play a very similar role in both types of countries, contrary to our assumption.

	(1)	(2)	(3)	(4)	(5)	(6)
	World	World	High RoL	Low Rol	World	World
ln Nb. for. aff. (t-1)	0.005 (2.57)***	0.005 (2.12)*	0.003 (0.81)	0.007 (2.64)***	0.007 (1.03)	
ln TFP (t-1)	0.022 (7.56)***	0.012 (2.47)**	0.010 (1.06)	0.014 (2.55)**	0.021 (2.76)***	
Survival rate (t-1)	-0.184 (13.13)***	1.162 (6.32)***	1.087 (3.19)***	2.938 (4.40)***	1.379 (6.27)***	1.221 (6.20)***
Survival*Nb. for. aff.					-0.05 (0.41)	
Survival*TFP (t-1)					-0.016 (1.49)	
ln TFP(t-1)*High Surv.						0.012 (2.41)**
ln TFP(t-1)*Low Surv.						0.013 (2.51)**
ln Nb. for. aff. (t-1)*High Surv.						0.004 (1.39)
ln Nb. for. aff. (t-1)*Low Surv.						0.005 (2.33)**
R ² (overall)	0.03	0.05	0.04	0.06	0.05	0.05
Nb. Obs	22,568	22,568	8,651	13,917	22,568	22,568
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odd ratios reported in first row
t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.B.5 – OLS (Survival Rate)

This disappointing results on the role of TFP might have two sources, who could have undermined our estimation, which led us not to use this approach as the main estimation strategy, although only half of proposition 3 isn't verified. First, for this survival rate to be meaningful, it should have been

	(1)	(2)	(3)	(4)	(5)	(6)
	World	World	High RoL	Low RoL	World	World
ln Nb. for. aff. (t-1)	1.161 (3.12)***	1.079 (1.89)*	1.078 (1.49)	1.193 (2.89)***	1.226 (0.87)	
ln TFP (t-1)	1.125 (2.29)**	1.221 (1.61)	1.088 (0.55)	0.989 (0.05)	0.989 (0.06)	
Survival rate (t-1)	6.034 (4.66)***	0.296 (2.93)***	0.802 (0.42)	0.147 (2.60)***	0.004 (1.56)	0.313 (2.93)***
Survival*Nb. countries.					0.775 (0.55)	
Survival*TFP (t-1)					1.543 (1.27)	
ln TFP(t-1)*High Surv.						1.315 (2.09)**
ln TFP(t-1)*Low Surv.						1.314 (2.06)**
ln Nb. countries (t-1)*High Surv.						1.030 (0.45)
ln Nb. countries (t-1)*Low Surv.						1.151 (2.82)***
Pseudo R ²	0.01	0.26	0.28	0.32	0.26	0.27
Nb. Obs	22,568	22,568	8,651	13,917	22,953	22,568
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.B.6 – Ordered Logit (Survival Rate)

calculated over a significant number of firms. We therefore had to reduce our sample, to remove countries with less than 10 new French affiliates since 1996 (our first year of observation). Though, this is an arbitrary threshold, which remains quite low for our sample not to be too restricted. Yet, the new sample lies on 1,404 MNEs (-6 compared to the initial sample), 6,186 affiliates (-132); and 60 host countries (-27 (!))³⁴

The second limitation this approach suffers from would be that the exit rates (and survival rates), cannot be strictly compared across destinations. As the targeting MNEs vary across destinations we end up comparing exit rate of different populations. Notably, France's neighbouring countries display among the lower survival rate (0.45, against 0.55 in (unweighted) average for all countries). This is not because they are more uncertain destinations, but because they attracts smaller and "weaker" firms. Although exit rate might capture the ex-ante legal uncertainty faced by investing firms, it certainly also depends of other factors, notably endogenous ones. This leads to a negative correlation between Rule of Law index and Survival rate of -0.3181 -where one would expect it to be positive-. Another indicator that the exit rate is a poor index of uncertainty or institutional quality of host countries, would be that with this classification, we observe more affiliates in countries with low survival rates (3,797 affiliates and 1,121 parent firms); than in countries with high survival rate (2,444 affiliates for 831 parent firms). The logic (and previous research confirms it) would be that firms go more

34. Countries deleted from the sample were : Angola, Benin, Burkina Faso, Central African Republic, Congo, Costa Rica, Cyprus, Dominican Republic, Egypt, Ghana, Guinea, Honduras, Croatia, Iran, Israel, Kazakhstan, Kenya, Cambodia, Madagascar, Mongolia, Niger, Panama, Peru, Serbia, Togo, Tanzania and Ukraine.

in countries with less uncertainty and better contracting institutions. This is what we find in our main analysis, where the upper half of rule of law countries gathered 5,064 affiliates and 1,304 parent firms, versus respectively 1,423 and 497 for low rule of law countries. The two samples being more equitable in the survival analysis, with lower variability within the overall country sample, but with very dissimilar countries in sub-samples, it could explain the similar role of TFP across host-countries survival rates.

2.B.6 Alternative dependent variable

Because the mechanism we explain, and specially the gradual pattern, should only apply for foreign ownership, we decided to compare the domestic ownership of firms with their foreign ownership rate. To do so, we compute the annual mean ownership rate of domestic affiliates of French MNEs in our sample, and then for each foreign affiliate calculate the difference between foreign and domestic control. The difference is computed as *foreign – domestic* ownership share, for a higher result to indicate a higher foreign ownership share, to have results directly comparable with previous estimations.

A first result, coherent with our model is that domestic control is higher than foreign control overall. Yet the difference decreases with TFP as reports table 2.B.7, indicating a role of TFP in reaching foreign ownership levels close to domestic ones. Similar observation is done for experienced MNEs. Also, this difference increases in countries with low rule of law index.

sample	mean difference
overall	-2.74
1 st quintile TFP	-5.76
2 nd quintile TFP	-2.52
3 rd quintile TFP	-2.69
4 th quintile TFP	-2.74
5 th quintile TFP	-1.90
Low Rule of Law destination	-5.40
High Rule of Law destination	-1.93
1 st foreign affiliate	-4.16
2 nd or more	-2.71

Table 2.B.7 – Foreign - Domestic ownership difference

Table 2.B.7 shows globally the same overall characteristics as the analysis of absolute foreign ownership.

The econometric analysis (2.B.8) supports this view, even controlling form firm-level and host country fixed-effects.

	(1)	(2)	(3)	(4)	(5)	(6)
	World	World	High RoL	Low Rol	World	World
ln Nb. for. aff. (t-1)	0.005 (1.89)*	0.006 (2.02)**	0.006 (1.89)*	0.011 (1.80)*	0.012 (3.91)***	
ln TFP (t-1)	0.013 (3.06)***	0.014 (2.14)**	0.012 (1.81)*	0.011 (0.59)	0.010 (1.50)	
Rule of Law (t-1)	0.021 (14.25)***	0.009 (1.39)	-0.031 (2.02)**	-0.016 (0.60)	-0.015 (1.05)	0.003 (0.39)
RoL*Nb. for. aff.					-0.007 (4.71)***	
RoL*TFP (t-1)					0.004 (3.00)***	
ln TFP(t-1)*High RoL.						0.013 (2.05)**
ln TFP(t-1)*Low RoL.						0.010 (1.59)
ln Nb. countries (t-1)*High RoL.						0.04 (1.31)
ln Nb. countries (t-1)*Low RoL.						0.013 (3.67)***
R ² overall	0.01	0.05	0.03	0.08	0.05	0.05
Nb. Obs						
Firm-level Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 2.B.8 – Panel OLS - Foreign-Domestic ownership difference

Chapter 3

Location choices and internationalization motives of heterogeneous firms

1 Introduction

What drives Foreign Direct Investments (FDIs)? Answering this long-time debated question requires to mix both country-level and firm-level factors, and rarely gives satisfying answers relating both aspects.

Because FDIs flows are complex, as they gather various motives, it is illusory to pretend to find definitive FDIs drivers¹. This chapter investigates how FDIs determinants vary across firms. More precisely, we wonder whether firm heterogeneity influences their location choices, and thereby, the underlying FDI motive in a systematic manner, which would clarify our understanding of FDIs flows, dispelling the complexity haziness of the global picture.

Some valuable works already have investigated the links between firm productivity and FDIs location choices. The main contributions were probably brought by three papers successively published in the *Journal of International Economics* by Aw and Lee (2008), Yeaple (2009) and Chen and Moore (2010). They all conclude to a pecking order of FDIs, where multinational enterprises (MNEs) choose to invest at first in more attractive countries, while only most productive ones could in ad-

1. See notably the very recent survey of Alfaro and Chen (2017), on the overall determinant of FDIs flows, which concludes that gravity law applies, meaning that both horizontal (market-driven) and vertical motives (reduced transport costs) coexist in shaping FDIs flows.

dition invest into least attractive destinations. Each paper provides empirical evidence respectively from Taiwanese, U.S. and French data.

However, these three papers do not agree on what makes a country “more attractive”. Aw and Lee (2008) only focus on FDI entry costs, which are assumed lower in the South. The two other mainly insist on the higher demand the host country offers, such that northern countries are predicted to be more attractive than southern ones.

Actually one cannot dissociate the countries’ “attractiveness” from the FDI motivation. Using the traditional dichotomy between horizontal and vertical FDI, it is easy to see how a country could be attractive for one motive but not for the second one².

Unlike the works previously mentioned, this chapter doesn’t detail a theoretical model, but strictly focuses on empirical evidence. In contrast with previous findings, we show that the firms’ total factor productivity (TFP) changes the underlying internationalization motives and thereby the FDI location choice. Also, it broadens MNEs heterogeneity to the number of previous foreign affiliates, which seems better adapted to capture a pecking order of location choices, although the firms’ TFP remain the main motive-shifter identified. We show most productive or experienced firms to be less in search of foreign demand when investing abroad than are their least productive competitors. Highly productive MNEs are shown to prefer location offering production-oriented advantages and especially higher vertical integration into global value chains.

The rest of the chapter is organized as follows. Section 2 reviews the existing literature linking firm heterogeneity and FDI location choices. Then, section 3 presents the discrete location choice model we use to estimate FDI motives and the estimation strategy. Section 4 details our dataset, and shows some descriptive statistics. The fifth section presents the results of our estimations. At last section 6 concludes.

2 Literature review: heterogeneous firms and FDI location

Literature on FDI determinants is mainly divided in two approaches between *internal* (firm-level) factors and *external* (host country) drivers, as reminds Blonigen (2005) in his exhaustive survey on this topic³. We do not aim here at reviewing one more time each of these approaches (see the

2. Specifically, when examining separately the determinants of vertical and horizontal FDI Fukao and Wei (2008) logically find that “*market size and trade costs (...) have a strong positive impact on the location decision in the case of horizontal FDI, while labor costs and trade costs have a strong negative impact on the location choice in the case of vertical FDI*”

3. Actually Blonigen (2005) considers three approaches as he distinguished partial equilibrium from general equilibrium analysis of “external” factors. This distinction isn’t necessary for our purposes. In a more recent review surveying

first two chapters of this thesis for a review of firm-level determinants of the international integration dilemma and the recent survey by Alfaro and Chen (2017) for an up to date review of host countries drivers). Instead we would focus on the few contributions that linked these two sides, and the theoretical perspective they are inscribed in.

2.1 Diversity of FDI location choices

Yeaple (2003) first developed a theoretical model of FDI choices with three countries (two northern one and a southern one), letting the MNE a wider array of FDI choices than the traditional two countries models for the production plant. Then, Ekholm et al. (2007) introduce a two-stages production process that could be internationally divided broadening further the MNE organizational choices to serve each country. The solutions of these two models however only relied on transport costs and industry level parameters. Grossman et al. (2006) explicitly extend them to firm heterogeneity within an industry. The location choice results from a tradeoff between reducing the production costs of intermediate goods (cheaper in the South) and the implied trade costs to assemble them in the North. This framework concludes that some different location choices could happen according to the firm productivity (for some given values of fixed and transport costs). Namely, most productive firms would choose a combined FDI strategy in both northern and southern foreign countries, while least productive would produce at home and then export toward the second northern country. However, no clear-cut theoretical prediction is given concerning the differences between firms investing only in the North and only in the South. The firm productivity is hence shown to offer a wider spectrum of FDI possibilities, i.e. more FDI, in different types of countries.

2.2 Pecking order of FDI location choices

Further papers suggest that there is a pecking order of FDI destinations, along with firms' TFP, implying that the destination preferences vary with the firms' productivity. However, Nielsen et al. (2017), in a literature review that mixes international economics and international business studies on FDI drivers⁴, detail that two antagonist theoretical assumptions could be argued here.

Actually, a firm-level competitive advantage such as a proprietary intangible asset (a definition in which we could include the firm TFP in a Melitz (2003) view), could either enable the firm to

wider literature, Nielsen et al. (2017), also distinguish from parent-firm characteristics and destination location factors.

4. Grounded in a variety of economic theories, the authors classify existing research into three categories, close to Blonigen (2005) ones. The majority of the 153 papers reviewed deals with "pure economic factors" of FDI destinations. The second most studied factors are the links between host and home countries, such as the geographical or cultural distance. The least studied drivers though, remain the parent-firm characteristics.

invest where weaker MNEs couldn't go, i.e. in "unfavorable destinations", or attract them even more to "favorable destinations" to benefit more from the complementarity they offer. While the second assumption seems to be more verified in the few studies listed by Nielsen et al. (2017, figure 3 p.72), with 5 over 7 studies confirming it, some other papers specifically dealing with firm's TFP (not included in their survey) are rather in line with the first assumption.

Specifically, these papers find the TFP to allow FDIs in tougher countries as evoked in introduction (Chen and Moore, 2010; Aw and Lee, 2008; Yeaple, 2009; Hyun and Hur, 2013). However, the authors do not agree on what makes a country "tougher", although each of these papers only focus on horizontal FDIs, extending Helpman et al. (2004) model. For Chen and Moore (2010) and for Yeaple (2009), a tougher country is a country with fewer internal demand.

Aw and Lee (2008) adopt a singular comparison among host countries, focusing only on entry costs: the higher the sunk cost, the tougher the market. Starting by confirming Grossman et al. (2006) theoretical predictions on the more numerous and diverse FDIs done by the most productive firms, they detailed a similar model (simplified to one stage production process), where firms investing in the North are predicted to have a higher productivity than firms investing in the South, because of higher entry costs in northern countries. Their prediction turns to be empirically verified, but this ranking is very specific to the case they study, because they focus on Taiwanese firms investing either in the USA or in China. However, for most northern firms, to invest in China is probably more difficult and costly than investing in the U.S.⁵, and the expected sorting pattern could thus be reversed for other MNEs than Taiwanese firms. Therefore, as Nielsen et al. (2017) noted, this issue calls for further research, investigating the interactions between firm, industry, and host country characteristics.

2.3 Different FDIs strategies?

What if investing in tougher countries actually reflects the search of other FDIs motives? A few works tried to link the firm productivity level to different types of FDIs. Hyun and Hur (2013) distinguish between FDIs types according to the geographical breakdown of Korean foreign affiliates' sales, and find that more productive MNEs engage in combined FDIs (the same plant follows vertical and horizontal strategies). However, they were unable to detect any significant productivity difference between pure horizontal and pure vertical FDIs parent's firms. Their sample of vertical FDIs was

5. We have some valuable reasons to think so, notably because the World Bank's Doing Business ranking (2017) lists the USA at the 51st position for "Starting a business", while China is 127th.

restricted though, because of the strict definition they adopted (100% of affiliates' sales exported back to Korea).

Before that, Head and Ries (2003) complement the findings of Helpman et al. (2004) insisting in the interactions between heterogeneity in investing firms and in host countries. They go deeper considering two potential FDI strategies: either pure replication of the home countries activities abroad; or full production abroad and exports back to home country. Although they didn't use these terms, the first could be seen as an horizontal FDI similar to the one in Helpman et al. (2004). The second would be closer to a vertical FDI. While they find that under moderate fixed costs, most productive firms opt for (horizontal) replication FDIs, over foreign (vertical) production, Head and Ries (2003) suggest that the least productive firms could opt for foreign (vertical) production in low wages destinations. However, their empirical evidence is thin, especially when they use the firm TFP as a productivity index and not the firms' size (nb. of employees) in their sample of Japanese firms.

More recently, Kleinert and Toubal (2013) also link the TFP to the FDI type, stating that "*the more productive firms (...) are therefore more likely to engage in foreign production*" as opposed to distribution-oriented FDIs, the two types belonging to horizontal FDIs. Their result is supported by empirical data on German firms.

Considering vertical FDIs now, Hayakawa and Matsuura (2011) extend Antràs and Helpman (2004) model to link the investor's productivity to a reorganization of the MNE strategy, from pure vertical to the "complex-vertical" FDIs, with empirical support from Japanese data. However, they do not consider horizontal strategies.

Therefore, this short literature review could be summarized in three hypotheses:

Hypothesis 1 *MNEs shift from simple to more complex strategies along with their TFP level (Yeaple, 2009; Hayakawa and Matsuura, 2011).*

Hypothesis 2 a *A rise in the firm TFP induces a lower importance of market motives (Chen and Moore, 2010) and increasing production motives (Kleinert and Toubal, 2013) in FDI location choices.*

Hypothesis 2 b *Most productive firms invest more in higher income countries, for horizontal FDIs (Head and Ries, 2003; Aw and Lee, 2008).*

While hypothesis 1 yields a relative consensus, hypotheses 2a and 2b are opposed as they suggest opposite motive shifting with the firm's TFP. The current state of literature calls for new investigation

of this issue. In the next section, we detail how location choices could be used to proxy FDI motives, and then test the above hypotheses drawn from the literature.

3 Location choice and FDI motive

Two alternative methodologies could be used to identify ex-post the location choices determinants of multinationals as remind Herger and McCorriston (2013). The first relies on aggregated count of foreign affiliates by host countries. The discrete and non-negative nature of count data leads to the use of Poisson regressions. The second approach focuses on multiple individual location choices, using Conditional Logit (CL) classes of estimations and random utility models (RUMs). The conditional logit requires more demanding firm-level data, but this allows to account for firm heterogeneity using interaction terms between MNEs characteristics (such as the firm productivity) and the host country characteristics as in Chen and Moore (2010) or Hyun and Hur (2013). For this reason we use the conditional logit estimator⁶.

3.1 The conditional logit model.

The conditional logit is a random utility model developed by McFadden (1974)⁷. Not specifically designed for geographical issues, it has been progressively adopted for location choices analysis. First, Carlton (1983; 1979) uses a conditional logit model for national scale location decisions of domestic firms, across several U.S. metropolitan areas alternatives. Then, it has rapidly extended to inward FDI location choice among U.S. states (Luger and Shetty, 1985). It was later applied to outward FDI, considering the alternatives to be various possible host countries (Woodward and Rolfe, 1993). The conditional logit is now very common in current geography economics, to study location choices. Adapting McFadden (1984) model to a producer framework of foreign direct investment implies to replace the traditional utility function of RUMs by a profit function, which is impacted by

6. Despite its widespread use on location choices estimations (see an exhaustive list in Schmidheiny and Brühlhart (2011)), a continuous concern about the use of CL in such models is about the rivalry between alternatives. The CL model is actually a “null-sum” world, where an increase in the probability of choosing one alternative implies an equivalent decrease among others. Yet, considering the location choice of an affiliate, this is not a cumbersome assumption, since most firms only open one affiliate at once, and at this instant, must choose among all countries, even the ones they already established in, such that all countries became rival alternatives again for the new affiliate location choice. The way older destinations influence the choice of newer location choices is studied in the next chapter. In addition, Guimaraes et al. (2003) show that conditional logit model and Poisson count regression (modelling “positive-sum world”) result in identical coefficient estimates, meaning that this zero sum assumption doesn’t bias our coefficients.

7. Some people refer to conditional logistic regression as multinomial logit. However, a conditional logit model notably differs from a polytomous logistic regression extended to n possible outcomes, also called multinomial logit. To avoid confusion, we stay on the tracks of McFadden (1974) and use the “conditional logit” term. This “conditional logit” is nothing else than a case-specific fixed-effect logit, but we follow location choice and economic geography vocabulary.

the chosen destination characteristics. The firms are assumed to be able to rank unambiguously the alternatives according to their expected profit, and simply pick the destination that maximizes it. We detail below a model inspired from Disdier and Mayer (2004), deepened by a sectoral dimension.

Let $J = (1, \dots, j)$ the set of possible location countries⁸, and $K = (1, \dots, k)$ the set of sectors in the economy. Let t to be a yearly index. Each country-sector-time association offers a profit

$$\pi_{jkt} = U_{jkt} + \epsilon_{jkt} \quad (3.1)$$

Where

$$U_{jkt} = bX_{jkt}$$

With X a vector of all observable characteristics of the country-sector-year that may impact the profit, such as internal demand, labor costs, etc., and b the vector of coefficients to be estimated. ϵ_{jkt} represents all the unobservable characteristic of the country-sector-year association.

Specifically the conditional logit states that the probability for the firm to choose country J , given sector k and year t is :

$$P(j|k, t) \equiv Prob(\pi_j > \pi_m) = Prob(\epsilon_m < \epsilon_j + b(X_j - X_m)) \quad \forall m \neq j \quad (3.2)$$

Assuming error terms are independent and identically distributed, the equation (3.2) could be rewritten

$$P(j|k, t) = \frac{\exp(bX_j)}{\sum_{m=1}^n \exp(bX_m)} \quad (3.3)$$

The coefficients of vector b that indicates the characteristics of potential host countries are then estimated though maximum likelihood procedures.

As evoked, the CL could be interacted with firm-level variables, if one assumes that the abroad profit of each firm also depends on the adequation between its own characteristics (i.e. its TFP denoted θ_i) and the host country observable characteristics X_{jkt} . Therefore the profit in a country-sector-year association is still firm-specific, as indicates the firm-level index i . Specifically, equation (3.1) becomes:

8. We therefore ignore all countries where it is impossible for the firm to establish because of juridical barriers for instance.

$$\pi_{ijkt} = b_1 X_{jkt} + b_2 \theta_i X_{jkt} + \epsilon_{jkt} \quad (3.4)$$

This implies that we reject the above assumption of i.i.d. error terms in the non-interacted model, which should lead to flawed estimates of the initial model. This interacted model allows then to distinguish the main effect (coefficient of vector b_1) and interacted effect (vector b_2). The second reveals how determinants evolve with the firms' TFP.

3.2 Estimation Strategy

In order to identify FDI strategies, we need to proxy FDI motives via host country observable characteristics that would be included in the location choice model. All variables included in the model are considered with one year lag. Creating a foreign affiliate takes some times, and we can reasonably assume that the decision to open a foreign affiliate in a country is taken the year before the affiliate is opened, considering a previous state of the country's characteristics. We thus focus on countries' characteristics the year prior to the affiliates' opening. This lag may be seen as arbitrarily chosen. However, macroeconomic features such as internal consumption or labor costs vary much more between countries rather than within countries over a small period of time. These yearly fluctuations should have little impact on the location choice.

The traditional horizontal / vertical FDI dichotomy is easily proxied, following CL models of Protsenko (2004) and Fukao and Wei (2008). Horizontal FDI should follow a trade costs jumping strategy. Thus higher tariffs and distance are expected to favour horizontal FDI, as they make the export versus FDI trade-off more favorable to the latter. In a wider acceptance, FDI is said to be horizontal when market-oriented. Blonigen and Piger (2014) acknowledge that gravity variables (i.e. GDP and distance) may adequately capture "horizontal" motivations, with GDP as a proxy for host country interior demand, and distance for trade costs. We add per capita GDP, which measures the average income, as a proxy of market-seeking FDI. Similar statement is found on the recent paper of Alfaro and Chen (2017), although they try to determine the overall influence of transport costs on FDI choices. However, the result of this approach are quite frustrating, since they only confirm that FDI flows are complex. Specifically, according to Alfaro and Chen (2017) empirical finding and their exhaustive literature review, the law of gravity holds. This implies that FDI is attracted by larger markets – as would be horizontal FDI – but that distance, and more generally transport and information costs between home and host countries as between host countries and the rest of

the world deter FDI. This is in line with a vertical integration of multinational corporations, and contrary to the trade-cost jumping hypothesis of horizontal FDI.

To further examine this issue, we add others proxies of the vertical motive. Actually, a vertical integration goes pairwise with a fragmentation of the production in tasks, located in various countries aiming at optimizing the production process. We first use the Revealed Comparative Advantage (RCA) to proxy the relative sectoral advantage of each country. Such a criterion should attract vertical oriented FDI (or at least “production” FDI following Kleinert and Toubal (2013) terminology). From a host country perspective, Waldkirch (2011) argues that local RCAs should be compared to home countries levels, to properly capture the FDI motive. This point could apply to all of our variables. However, as we only consider French firms, we are not concerned by this issue, since the base level is the same for all firms in our sample.

Yet, in a vertical fragmentation of the production process, the task offshored abroad could be from a previous production stage, so that the host countries’ RCA in the parent industry wouldn’t capture the productive advantage in this occupation. Unfortunately, data limitation on the main activity of foreign affiliates prevents us from adequately observing the RCA in their sector. To account for vertical specialization, we use the share of intermediate goods in bilateral trade with France. The most intensive trade in intermediate goods between the host country and France, the higher the probability the French firm would trade them with its foreign affiliate. The trade in intermediate goods is identified using Broad Economic Categories (BEC) nomenclature of the UN Comtrade data, which distinguish the goods according to their final utility: capital goods, consumption goods and intermediate goods⁹. For a more specific analysis, we further distinguish the share of intermediate goods in (French) imports from the host country, to identify downstream sourcing; and in (French) exports toward the host country, for foreign assembly of French parts.

Close to this two-sided vertical integration motive, the host country might also be chosen for its position into the global trade network. All other things being equal, a host country tightly tied into trade flows with numerous partners would be a better choice for export-platform type of vertical integration, referring to assembly-oriented FDI that aim to export the final (or processed) good made into the affiliate (Hanson et al., 2001)¹⁰. To capture this centrality into global trade network

9. More precisely, in the BEC, the “intermediate goods” category gathers the classes 111* Food and beverages, primary, mainly for industry ; 121* Food and beverages, processed, mainly for industry ; 21* Industrial supplies not elsewhere specified, primary ; 22* Industrial supplies not elsewhere specified, processed ; 31* Fuels and lubricants, primary ; 322* Fuels and lubricants, processed (other than motor spirit); 42* Parts and accessories of capital goods (except transport equipment); 53* Parts and accessories of transport equipment.

10. Export-platform type of FDI has been itself divided into “*home country export-platform*”, “*third country export-*

we chose the eigenvector centrality of host countries as computed by De Benedictis et al. (2014), on their network trade database available from the CEPII. The main advantage of this centrality index, compared to others (e.g nodes' *degree* or *strength*¹¹) is to avoid endogeneity due to own host country characteristics (we know trade performances to be related to own country GDP, which is already included in our model, such that the *strength* in the trade network, equivalent to total exports, would be endogenous). The idea under eigenvector centrality is that it is not the country's position on the network that determines the country's centrality but it is the position of the countries linked to him. De Benedictis et al. (2014) report both inward (imports flows) and outward (exports) eigenvector centrality. Since exports and imports are closely related, we rather compute the in/out eigenvector ratio, that compares the two dimensions. A high in/out eigenvector centrality indicates a central position in the world's imports compared to its exports. The higher the ratio, the more downstream is the country in the world trade network (where goods are imported and consumed). A lower ratio indicates a country that participates much more to the world's trade network by its exports than its imports. We qualify this position of "upstream" position in the world's trade network (from where raw material and intermediate goods start their journey), and the in/out eigenvector ratio indicates the country "downstreamness". Therefore, if FDI's were in majority horizontal-oriented as suggests Blonigen (2005) reporting the share of local sales of U.S. foreign affiliates, we commonly expect this in/out ratio to be positively related to the choice of host country.

Besides these strategies, we also wanted to control for fiscal motives, since recent empirical evidence has shown that French MNEs tend to shift their profit through their intra-firm trade pricing behaviour transfer (Vicard, 2015). Yet, fiscal motives are hard to capture, because the effective tax rate of multinationals is often different from the nominal rate, as revealed by the famous "LuxLeaks" for Luxembourg's case¹². Therefore we simply capture the most obvious fiscally oriented affiliates, located in tax havens¹³.

At last, we had to account for maybe one of the greatest FDI's driver that is agglomeration effect. Actually, while FDI is often pictured as the "proximity" solution of the proximity - concentration

platform" and "*global export-platform*" (Ekholm et al., 2007), then into "*pure platform FDI's*" and "*complex platform FDI's*" (Hayakawa and Tanaka, 2011).

11. See detailed information on those indexes on De Benedictis et al. (2014), or on the dedicated CEPII web page (http://www.cepii.fr/CEPII/fr/bdd_modele/presentation.asp?id=27). The following chapter of this thesis also details a network approach and defines these indexes.

12. "LuxLeaks", or "Luxembourg Leaks" refers to a financial scandal revealed in November 2014 by the International Consortium of Investigative Journalists. It revealed that Luxembourg authorities modified its tax rulings on a discretionary basis for over than three hundred multinational companies based in Luxembourg.

13. We use to Dharmapala and Hines (2009) list of tax havens, but find similar results using OECD list or IMF list of offshore financial centers.

tradeoff in international economics (Brainard, 1997; Helpman et al., 2004), the location choice is still driven by concentration forces. Several works underlined that foreign affiliates of a given industry agglomerate not only in the same countries, but in the same region or cities within countries. Head and Mayer (2004) provide evidence on Japanese investments in Europe, mainly located “where markets are”, i.e. around European big cities. However, not only market-motive could motivate agglomeration tendencies. Based on French inward FDI flows, Crozet et al. (2004) suggest that agglomeration in some French regions and *départements* (lower scale administrative units) also comes from positive externalities between firms and technological spillovers. That is, agglomeration of firms in the same industry would generate external economies of scale, and would benefit to the production. From an outward FDI flows perspective, Disdier and Mayer (2004) compare agglomeration forces between two European regions, and find them to vary between Western and Eastern Europe. Specifically, the agglomeration effect of French FDI turned to be higher in Western UE. It is worth noting that these three articles use conditional logit estimations, and capture the agglomeration effect through the number of firms already located in the geographical unit considered. Also, Alfaro and Chen (2017) suggest that the agglomeration pattern of MNEs should differ from the one of domestic firms, notably due to their greater productivity. In this chapter we go further and wonder whether the differences in productivity among MNEs would lead to different agglomeration forces.

Actually, two opposite assumptions could be drawn on the role of firm heterogeneity over the strength of agglomeration effects. On the one hand, the more the concentration, the more the competition, such that only most productive firms could resist, and therefore could be more attracted by this agglomeration effect. On the second hand, agglomeration effect could be seen as an imitation strategy, copying what leading firms first have done, to minimize their risks. From this point of view agglomeration effects in FDI location choices should mainly concern low productive firms (followers) and less highly productive firms (leaders). The latter is close to the product cycle theory’s prediction (Vernon, 1966), where innovating (more productive) firms are the first one to invest abroad to escape the replication strategy of imitating rivals.

However, since agglomeration effect is ineluctably endogenous with other factors (the one that drove the first FDI), we add it in our estimations in a second time, to show this doesn’t bias our main results.

Table 3.1 summarizes the variables used, their sources and the motive they should proxy.

Variable	Precision	Source	Motive proxied	Expected Sign
Distance	C	CEPII (Gravity)	Horizontal	+
Tax haven	C	Dharmapala and Hines (2009)	Fiscal	+
per capita GDP	CY	World Bank WDI	Horizontal	+
GDP	CY	World Bank (WDI)	Horizontal	+
Tariffs	CYS	TRAINS (WITS)	Horizontal	+
Wages (USD)	CY	ILO (KILM/GWD)	Export-Supporting / Networked	-
Share trade in intermediate (bil.)	CY	UN COMTRADE	Vertical	-
Share trade in intermediate (Exports)	CY	UN COMTRADE	Vertical	+
Share trade in intermediate (Imports)	CY	UN COMTRADE	Vertical	+
In/Out weighted Eigenvector	CY	CEPII (WTN)	Vertical	+
RCA	CYS	UN COMTRADE	export-platform, vertical	-
Number of previous French aff.	CYS	LiFi	Vertical	+
			Agglomeration	+

Precision: C=Country; Y=Year; S=sector(isic rev3)

Table 3.1 – Proxies for FDI motives and host country characteristics.

4 Data and descriptive statistics

4.1 Sample

Our empirical dataset is made of firm-level data on location choices of industrial French firms foreign affiliates. We merged information from *EAE-industrie* and *Liaisons Financières*. The first enables us to compute the firms' TFP, using Wooldridge (2009) estimation method¹⁴, when the second allows us to identify foreign affiliates of French firms. We link the foreign affiliate to its direct French parent, and not to the firm identified as “head of group”. Actually, large “head of group” firms aren't listed as industrial firms, but rather as holdings, which prevent us from computing their productivity (absent from EAE survey). However, the affiliation to a group is captured, precisely in the firm's TFP, being the residual of the production function. If belonging to a group improves the firm's productivity, there is no valuable reason to remove this effect from the residual we compute. We restrict our sample to foreign affiliates that are held at least at 50% by their French parents, to make sure they have a majority, and have potentially themselves decided of the destination. As we focus on the location choices, we only observe newly opened affiliates abroad in the 2001-2007 time span.

Also, we chose to keep only industry-countries couples with more than one French FDI during the period covered, to make sure the alternative was an effective choice for French firms. At last, macro-economic data availability led us to drop some marginal countries from our sample. Despite, these exclusions, our final sample covers over 89% of new foreign affiliates of industrial French firms since 2001, and 93% of investing parent-firms first identified in LiFi. The sample restriction made might thus not have large impacts on our results. Our final sample is made of 1644 observations

14. Estimated with Rovigatti and Mollisi (2016) PRODEST Stata package.

Group	freq	freq (%)	Mean ln TFP	Std. Dev. ln TFP	Mean ln TFP cutoff
UE	781	47.5 %	10.98	1.65	8.90
non-UE	863	52.5%	11.14	1.74	9.32
OECD	1,332	81.02%	10.97	1.66	8.90
non-OECD	312	19.98%	11.46	1.81	10.06
BRICS	162	9.85%	11.51	1.81	9.70
non-BRICS	1,482	90.15%	11.02	1.68	9.05
Tax haven	123	7.48%	11.43	1.52	10.07
All	1644	100%	11.06	1.70	9.12

Table 3.2 – Characteristics of investors by country groups

of new affiliates location choices, from 957 investing firms in 57 foreign countries, including 31 non OECD countries.

4.2 TFP and country group

The overall pattern of French FDIs location choices in our sample is in line with previous empirical studies, and not surprising for the readers familiar with this literature. French firms mostly target developed countries, with 81% of new affiliates opened in OECD countries. Almost half of FDIs are toward European Union (EU) countries, while the first host country remains the USA (16.97%) which benefits from a size effect compared to individual EU partners. Only around 10% of new FDIs target large developing economies (Brazil; Russian Federation; India; China and South Africa).

Beside this expected pattern of host countries of French FDIs, table 3.2 details the MNEs characteristics by destination. OECD and UE countries display the lower mean of log TFP, the lowest standard deviation and moreover the lowest average TFP cutoff. Firms entering in southern (BRICS and non OECD) countries are more productive, in average and in minimum, which indicates a higher entry cost in southern countries, contrary to Aw and Lee (2008) and assumption 2b.

After this first observation of firms characteristics by country groups, the symmetric perspective is also interesting: comparing the location decisions of firms according to their productivity level highlights some interesting patterns. For this analysis, we split our initial sample into quintiles of firms based on their TFP level. Table 3.3 shows that most productive firms invest twice as more often as their least productive counterparts into the BRICS developing countries, and more globally they target more frequently non-OECD countries. They also invest less in traditional destinations, which are the EU and especially the USA, mainly targeted by low productive firms. The share in OFC also increases substantially for the two last quintiles of TFP.

These two tables are in line with the hypothesis 2a, but seems to invalidate hypothesis 2b defended

	Nb of firms	Nb of affiliates	share in UE	share in neighbours	share in USA
Overall	957	1,644	47.5 %	43.37%	16.97%
1 st quintile of TFP	192	236	48.30 %	39.83 %	29.66 %
2 nd quintile of TFP	191	272	50.37%	47.06%	20.59%
3 rd quintile of TFP	192	344	49.71%	48.26%	15.41%
4 th quintile of TFP	191	374	49.73%	46.52%	11.76%
5 th quintile of TFP	191	418	41.38%	37.56%	13.39%
	Nb of firms	Nb of affiliates	share in OECD	share in BRICS	share in Tax havens
Overall	957	1,644	81.02%	9.85%	7.48%
1 st quintile of TFP	192	236	86.86%	6.78%	5.08%
2 nd quintile of TFP	191	272	87.87%	5.14%	4.77%
3 rd quintile of TFP	192	344	80.52%	10.17%	5.52%
4 th quintile of TFP	191	374	81.01%	10.43%	10.96%
5 th quintile of TFP	191	418	73.68%	13.88%	9.09%

Table 3.3 – Host-countries by quintiles of TFP of investing firms

by Aw and Lee (2008) and Head and Ries (2003), that argued that least productive MNEs would target more southern (low-cost) countries. To the contrary, lower productive firms invest the more in the USA and remaining EU countries. Although eastern EU countries might be considered as low-cost countries from a French perspective, low productive firms actually choose France’s neighbouring countries within UE (For the first quintile, 82.7% of UE affiliates are located in the 6 Frances’ neighbouring countries that are the UK, Belgium, Germany, Switzerland, Italy and Spain). This shows that the Head and Ries (2003) and Aw and Lee (2008) hypothesis indicating that low productive firms invest more or even only in low cost countries is counter-factual, at least for French firms.

4.3 TFP and country characteristics

Going a step further than the group of countries invested, we now investigate some specific host countries characteristics according to the productivity of the investing firms. Figure (3.1) shows the median and inter quartile range of the host country characteristics detailed in previous section, by quintiles (five equal groups) of investing firms’ TFP. It reveals that distance to home country increases with the productivity level of investing firm, as decreases host countries’ GDP. These two effects are mostly noticeable between the first and second quartile of firms’ TFP. We also notice a drop into lower bound of GDP per capita of host country with the parents’ productivity. Evidence about tariffs barriers is less clear, since they seem to decrease at first and then increase for the top 40% of productive firms.

Concerning bilateral trade in intermediate, no particular trend is noticed, except a narrowing of the inter-quartile range, especially driven by the share in intermediate goods of exports. This share

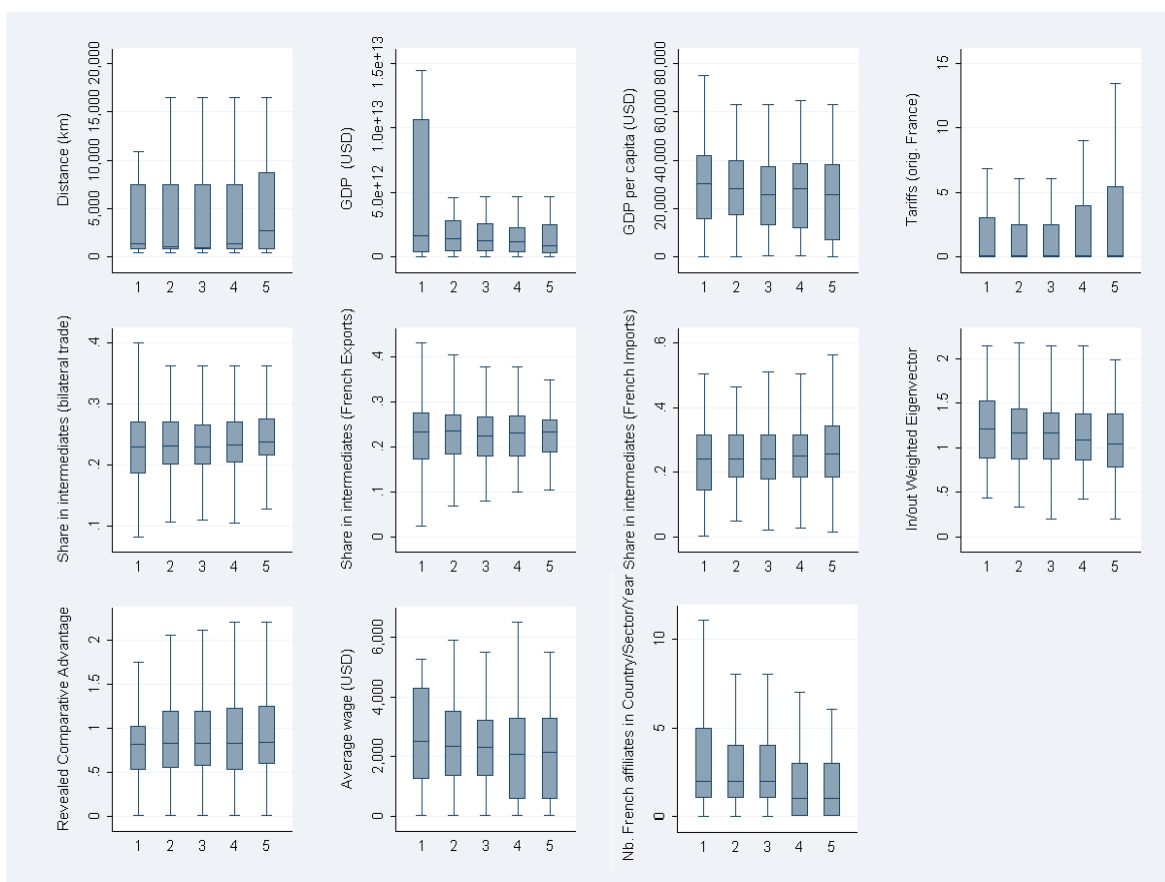


Figure 3.1 – Host country characteristics by quintiles of TFP

varies more between location choices of least productive firms, than for most productive ones. Yet, we notice an increase in the imports of intermediate goods, for most productive firms. This would suggest that the more productive the firms are, the most they choose to invest in countries from where France imports is intensive in component goods. This increase of production-related motives is also supported by the high increase of the upper bound of host country RCA along with parent-firms' TFP, and by reduced local wages. Also, we notice a decreasing trend in the in/out ratio of host countries' eigenvector centrality, which indicates that more productive firms chose host countries with a more “upstream” position in the global trade network.

At last, the number of previous French affiliates in the host country decreases with the average firms' TFP, indicating a higher average productivity where few French firms are, in line with Yeaple (2009) finding.

Most of these relationships suggest a decreasing influence of host country market-potential characteristics with investing firms' TFP, and higher vertical integration motives, as suggested in hypothesis 2a.

Table (3.4) displays the result of t-tests, revealing whether the mean differences in host countries

characteristics between high and low productive firms are significant. These tests conclude to significant differences in 10 out of 12 host countries characteristics. Some noticeable differences arise, compared to the figure (3.1), because of changing from quintile analysis to two TFP groups.

Country characteristic	average Low TFP firm	average High TFP firm	t-test
Distance (km)	3,852	4,230	-1.70*
Wage (USD)	2,596	2,147	5.25***
GDPpc	29,398	24,618	5.21***
GDP (in billion USD)	2,470	4,281	7.24***
RCA	1.07	1.06	0.10
Tax haven (%)	4.56	9.77	-3.43***
w. avg. Tariffs (%)	5.62%	7.49 %	-1.88*
share trade in intermediate (% bil.)	24.43	23.55	1.97**
share trade in intermediate (% Exp.)	22.77 %	23.33 %	-1.38
share trade in intermediate (% Imp.)	26.68 %	24.68 %	2.83***
in/out Eigenvector	1.21	1.13	2.14**
Nb French aff.	5.68	3.75	6.59***

Low TFP firm: 1st and 2nd quintile of firms sorted by TFP. High TFP firms 4th and 5th. H0 of the t-test: mean equality. In bold: significant higher values (at 10%)

Table 3.4 – Mean differences and t-test statistics

Conclusions on the relationship between firm-level TFP and host country distance and number of previous affiliates do not change. Those on the “horizontal” motive proxies that are GDP and per capita GDP do not change either. Neither change those on vertical integration proxies such as the share of imports in intermediate goods, or the in/out eigenvector centrality. However, no significant mean difference in RCA nor in tariffs are observed. Moreover, average wage tends to be higher in location choices of low productive MNEs. Most productive firms also show a significant preference for tax havens compared to low productive firms.

Except for the wage level, most of correlations underlined in these descriptive statistics are in line with hypotheses 1 and 2a drawn from the literature review. However, as all descriptive statistics, they suffer for not controlling for each other effects.

4.4 Productivity cutoff and host country characteristics

A traditional preliminary analysis in the role of TFP in location choices is to look at the productivity cutoff of host countries, i.e. the minimal productivity of firms investing in each country (Yeaple, 2009; Chen and Moore, 2010; Hyun and Hur, 2011). It consists in estimating the following model

$$\ln TFP_{cutoff\ j,k,t} = a_0 + a_1 * \ln dist_k + a_2 * \ln GDP_{k,t} + a_3 * V_{j,k,t} + a_4 * Z_{j,k,t} + \epsilon \quad (3.5)$$

Where j , k , and t indexes respectively refer to industry, host country and year of observation. $V_{j,k,t}$ stands for a vector of remaining host country variables detailed above expressed in log; while Z is a vector of dummy variables, capturing industry, host country and yearly fixed effects; or equal to zero when fixed effects are not included into the regression. ϵ corresponds to the error term.

The higher the productivity threshold, the harder the market entry. Table 3.5 shows the output of OLS estimates of model in equation (3.5), revealing the host countries' characteristics that ease the FDIs entry. We proceed to a two step analysis. At first we only include host country "gravity" variables, i.e. distance and GDP, that act as expected: the distance increases the required productivity to enter the country, while the GDP decreases it, probably due to higher expected returns. Then, we add the whole set of country characteristics to be evaluated. Each estimation is repeated with three level fixed effects (country-industry-year). As we could expect, controlling for those negates the influence of GDP over the TFP cut-off, as most host country characteristics.

5 Results

5.1 Conditional Logit estimation

In this section we report the results of the conditional logit model detailed in section (3.1).

The initial conditional logit estimation is reported in the first three columns of table 3.6, with progressive variable inclusions. The fourth column adds country-level fixed effects (firm-level fixed effects are *de facto* included in a conditional logit where groups are investing firms). Because of forthcoming use of interaction terms, we report odd ratios instead of traditional coefficients, whose interpretation as marginal effects could be biased (see discussion in chapter 2, section 5.1 and Buis (2010) for the rationale. See Raschute et al. (2014) for an illustration of use of odds-ratio on a dedicated location choice topic). To ease odd-ratio interpretation we used base 2 logarithm for continuous variables, such that the odds ratio give the probability increase (in multiplication terms) when the explicative variable doubles.

As suggested by descriptive statistics the higher distant is a country from France, the lower is the probability that a French firm would choose it as host country. Specifically, when the distance

	(1)	(2)	(3)	(4)
log distance	0.432 (11.89)***		0.368 (9.17)***	
log GDP	-0.422 (14.31)***	0.219 (0.50)	-0.401 (10.39)***	-3.267 (1.12)
log GDP _{pc}			-0.333 (3.45)***	2.685 (0.90)
log sh. Intermediate trade (bil.)			-0.043 (0.09)	0.330 (0.23)
log In/Out eigenvector			-0.090 (1.39)	0.689 (2.41)**
log Wage (USD)			0.416 (5.70)***	0.586 (1.82)*
Tax haven			-0.127 (0.73)	
log RCA			-0.073 (1.71)*	-0.064 (1.76)*
log Tariffs			0.085 (1.78)*	0.062 (1.42)
log Nb French affiliates			-0.429 (5.48)***	-0.072 (1.00)
Industry Fixed effects	No	Yes	No	Yes
Year Fixed effects	No	Yes	No	Yes
Country Fixed effects	No	Yes	No	Yes
R ²	0.29	0.66	0.35	0.66
Observations	807	807	807	807

First row displays OLS coefficient. Robust t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%

The cut-off productivity level is calculated in natural logarithm as the minimum parent-firm TFP for each country-sector-year association.

Table 3.5 – OLS Productivity cutoff

is multiplied by two, the probability to choose the country is reduced by almost 30%. Contrary to what some might have believed, the host country per capita GDP does not play a significant role when estimated with the GDP. Doubling the latter though, increases the probability of choosing the country by over 60%, confirming the great importance of the host country market size in overall French FDIs. No other explicative variable has the same shifting power in location choices decisions. We focus now on ours “vertical integration” proxies. The in/out eigenvector centrality index displays a highly positive effect, while a negative one is supposed to indicate vertical integration motives. French firms are shown to prefer to invest in host countries relatively downstream the global trade network, which strengthen the idea that horizontal motives dominate overall FDIs flows (see Blonigen (2005), Alfaro and Chen (2017)). Concerning the fiscal motive, being a tax havens increase by around

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log ₂ distance	0.710 (15.28)***	0.709 (14.79)***	0.736 (12.81)***		0.468 (6.01)***	0.459 (6.11)***	0.507 (5.18)***	
log ₂ GDP _{pc} (t-1)	0.953 (0.96)	0.950 (1.03)	0.978 (0.43)	0.844 (0.11)	1.579 (2.67)***	1.434 (2.06)**	1.158 (0.82)	0.897 (0.07)
log ₂ GDP (t-1)	1.698 (30.04)***	1.674 (30.46)***	1.593 (25.05)***	1.100 (0.07)	2.270 (13.38)***	2.240 (13.13)***	2.033 (11.10)***	1.187 (0.12)
Intermed. Bil. Trade (t-1)	1.009 (0.17)				1.055 (0.92)			
log ₂ In/Out Eigenvector	1.446 (5.98)***	1.467 (6.91)***	1.398 (5.10)***	0.961 (0.14)	3.217 (3.59)***	3.300 (3.61)***	2.652 (2.85)***	1.881 (0.97)
Mean wage (USD, t-1)	0.954 (1.08)	0.966 (0.80)	0.946 (1.30)	0.910 (0.41)	0.548 (3.77)***	0.566 (3.54)***	0.612 (2.97)***	0.752 (1.09)
Tax haven	1.316 (2.14)**	1.482 (3.01)***	1.483 (3.02)***		0.304 (1.87)*	0.466 (1.20)	0.906 (0.15)	
RCA (log ₂ , t-1)	1.009 (0.50)	1.001 (0.07)	1.002 (0.11)	0.980 (0.91)	1.375 (2.42)**	1.377 (2.40)**	1.363 (2.31)**	1.284 (1.71)*
Tariffs (log ₂)	0.961 (1.96)*	0.952 (2.38)**	0.952 (2.38)**	0.950 (2.14)**	0.904 (0.85)	0.887 (0.98)	0.848 (1.37)	0.803 (1.63)
log ₂ TFP (t-1)	1.086 (9.83)***	1.079 (9.09)***	1.194 (9.76)***	1.032 (1.41)	2.018 (3.43)***	1.774 (2.71)***	1.452 (1.73)**	1.154 (0.63)
Intermed. Exports (t-1)		1.259 (4.08)***	1.193 (3.13)**	0.639 (2.49)**		1.153 (2.20)**	1.083 (1.22)	0.586 (2.84)***
Intermed. Imports (t-1)		1.055 (1.42)	1.047 (1.18)	0.986 (0.11)		1.165 (3.05)***	1.158 (2.88)**	1.130 (0.92)
Nb. French affiliates (log ₂ , t-1)			1.220 (6.67)***	1.046 (1.45)			2.484 (4.93)***	2.484 (4.29)***
log ₂ TFP (t-1) x								
log ₂ distance					1.048 (3.29)***	1.050 (3.39)***	1.042 (2.78)***	1.035 (2.54)**
log ₂ GDP _{pc} (t-1)					0.956 (3.13)***	0.965 (2.47)**	0.985 (0.98)	0.990 (0.60)
log ₂ GDP (t-1)					0.968 (4.79)***	0.968 (4.80)***	0.973 (3.88)***	0.982 (2.91)***
Intermed. Bil. Trade (t-1)					1.065 (0.64)			
log ₂ In/Out Eigenvector					0.931 (3.27)***	0.930 (3.23)***	0.945 (2.49)**	0.945 (1.79)*
Mean wage (USD, t-1)					1.064 (3.62)***	1.062 (3.48)***	1.050 (2.79)***	1.039 (2.28)**
Tax haven (t-1)					1.139 (2.33)**	1.108 (1.81)*	1.045 (0.76)	1.079 (1.26)
RCA (log ₂ , t-1)					0.966 (2.40)**	0.965 (2.44)**	0.966 (2.34)**	0.970 (1.92)*
Tariffs (log ₂)					1.006 (0.54)	1.007 (0.60)	1.010 (0.96)	1.015 (1.24)
Intermed. Exports (t-1)						0.815 (1.96)**	0.789 (2.30)**	0.851 (1.33)
Intermed. Imports (t-1)						1.281 (2.62)***	1.288 (2.71)***	1.387 (2.87)**
Nb. French affiliates (log ₂ , t-1)							0.935 (3.90)***	0.929 (4.11)***
Firm-level FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-level FE	No	No	No	Yes	No	No	No	Yes
Observations	93,708	93,708	93,708	93,708	93,708	93,708	93,708	93,708
Pseudo R ²	0.19	0.19	0.19	0.22	0.19	0.19	0.20	0.23

Odd ratios reported in first row
t-stats are in parenthesis
***, ** and * respectively significant at 1%, 5% and 10%.

Table 3.6 – Conditional Logit

40% the probability to be chosen compared to other countries with similar characteristics. This is mainly driven by most productive firms as columns (5) and (6) in table 3.6 reveal.

When controlling for host countries invariant characteristics with destinations fixed effects, most variables turn insignificant, as in Chen and Moore (2010). This is certainly because the within countries variability of these variables is low, especially in a seven-year time period.

When disentangling the share of intermediate goods in imports and exports (col. (2)), we see that French firms show a clear preference for investing in countries toward which France exports more intermediate goods, but not toward countries from where French firms import intermediate products. This gives credit to export-platform FDI as described in Hanson et al. (2001) (assembly abroad), but not for domestic imports. Global export-platform or third-countries export-platform are thus more common than home countries one, referring to the typology of Ekholm et al. (2007). However, when considering the influence of in/out eigenvector, there is little chance that foreign assembled products are exported, but rather sold locally.

At last, adding the number of previous French firms in the host country in column (3), confirms the importance of agglomeration forces in FDI location choices.

It might seem odd for some attentive readers to add the firms' TFP as a regressor in our estimation, since this is not a country-level variable. Moreover we already account for firm-level fixed effects. Yet, since some firms are repeatedly observed over our seven-year sample, this firm-level fixed effect is not entirely collinear with the firm's TFP which varies over the years. The positive effect is common (Chen and Moore (2010) display a similar result), and highlights the positive relationship between a firm's TFP and its number of foreign affiliates.

Now, let's comment the results in columns (5)-(8), which display estimations including TFP interaction terms. Most of the initial effects of host country variables are deepened in these estimations, notably because the TFP interacted variables display essentially opposite signs than their level counterparts. Hence, before any further investigation, we see that TFP shifts internationalization strategies more than it would strengthen existing ones.

Therefore, there is not much more to say about non-interacted estimators. However, distance turns to a positive and significant predictor of location choice when interacted with TFP, indicating that the negative attraction effect of distance in location choice is reduced for top productive firms. Most productive firms are less repelled by the distance than their competitors. Similarly, more productive firms invest more where wages are higher, although this effect is low. These two results are in line

with the idea that more productive firms can invest in tougher countries, with higher entry or variable costs than least productive MNE could (Yeaple, 2009; Chen and Moore, 2010)

Both per-capita GDP and GDP turn negatively associated to location choice once interacted with the TFP. These results show that host country market-size characteristics attract French investors, but the most productive ones are less sensitive to this motive. This confirms a reduction of horizontal determinants of FDIs for most productive MNEs, as suggests hypothesis 2a from our literature review. This assumption finds even more support when looking at the vertical motives' proxies. The in/out eigenvector centrality effect turns negative, such that the most productive firms are more likely to choose more "upstream" positions in the global trade network. Moreover, they are found to invest more than other firms in countries from where France imports intensively intermediate goods, which probably indicate a vertical integration of sourcing activities. To the contrary, productivity is negatively correlated with the choice of countries toward which France's exports are intensive in intermediate goods. Most productive firms integrate more upstream strategies.

However, surprisingly, the most productive MNEs also seem to invest in countries with lower RCA. Actually in the interacted model, RCA is shown to foster FDIs location choice, with an increased probability of choice of around 37% when the index doubles. The effect even holds when the fixed effects of the host countries are included. This positive RCA effect shows the presence of vertical, or at least production-oriented motives in overall location choices, revealing the existence of mixed or complex FDI motives. The negative association with the firms' TFP could be interpreted in two different manners. First, one could assume that more productive firms are not looking for production-related advantages. However, this interpretation is not very convincing, because of the evidence mentioned above on the country's position on global trade network and intermediate exports toward France. The second interpretation we opt for is that most productive firms are able to invest in countries with lower RCA and suffer from higher production costs. Moreover, since vertical integration is probably done in sourcing industries, the host country RCA in domestic MNE's industry wouldn't affect much its effective productivity abroad.

At last, more productive firms are shown to prefer host countries with fewer previous French affiliates in their own sector, compared to the average French MNEs. This could be seen as a preference for competition avoidance, but we doubt so: most productive firms shouldn't fear more competition, especially with lower productive firms. This lower sensitivity to agglomeration forces is certainly a corollary of their capacity to invest in tougher markets. However, it might also reveal a will to be a pioneer firm in a new market, and benefit from a large market share.

To sum up, these first results show that TFP shifts MNEs' location choices, from mostly horizontal strategies to more vertically-oriented, in line with hypotheses 1 and 2a drawn in our literature review. Hypothesis 2b could hardly be supported. Although some vertical proxies do not act as expected, all demand-related variables are negatively associated with the firms' TFP. Actually, the results show two forces that developed with firm's TFP, and could explain some of the mitigated results: (i) TFP enables the firm to invest in tougher countries, with higher costs and lower advantages; (ii) TFP drives the firm to look for more production-related advantages and less market-oriented ones. The first phenomenon might lightly blur the second, resulting in positive effect of higher wages or lower RCA in location choices for most productive firms. However, the second phenomenon is characterized enough by several proxies to be reported, and further examined.

5.2 The IIA assumption and the Nested Logit Model

Conditional Logit models have a well known weakness: they rely on the assumption of Independence Irrelevant Alternatives (IIA), implying that choosing the alternative j over alternative i given by $\frac{P_j}{P_i}$ only depends on the characteristics of the two countries and not on any third alternative. Hence, the existence of any third alternatives on their total number should have no incidence on choosing j over i . As an example, the probability for a French firm to invest in Poland rather than in United States should be the same with or without including the choice of Germany in the model. The IIA assumption implies all alternatives to be comparable in terms of substitution patterns. Thus the error terms shouldn't be correlated across alternatives. Guimaraes et al. (2004) argued that the IIA is less likely to be verified when considering alternatives at a small geographical unit, because the smaller is the spatial unit considered, the greater the probability that unobserved characteristics extend their influence beyond geographical boundaries. Then, the error terms of two bordering alternatives are probably highly correlated.

Yet, although we use country-level spatial units, we use a nested structure to partially release the IIA assumption. The nested logit (NL) model configures a "tree" structure, splitting alternatives into groups. The error terms are thus allowed to be correlated within groups but not across them. In spite of a common hierarchical interpretation of nested logit, which presents it as a two-step decision, choosing at first the "nest", and then one alternative within this nest; the model should be rather seen as expressing a choice among all alternatives, as the conditional logit does, but correcting from non i.i.d. error terms across alternatives. The conditional logit can even be expressed as a specific case of

nested logic, where all error terms are independent. Thus, the choices are still among all alternatives and not only within the branch ones.

Denoting the group level by the subscript $g = 1, \dots, G$ and the alternative level by $j = 1, \dots, J$, the two level random utility is defined to be

$$U_{gj} + \epsilon_{gj} = z'_g \alpha + x'_{gj} \beta_g + \epsilon_{gj} \quad (3.6)$$

where z'_g varies only over the groups and x'_{gj} varies over both groups and alternatives. The probability to choose the alternative (g, j) equals

$$P_{gj} = p_g * p_{j|g} = \frac{\exp(z'_g \alpha + \tau_g I_g)}{\sum_{m=1}^G \exp(z'_m \alpha + \tau_m I_m)} * \frac{\exp(x_{gj} \beta_g / \tau_g)}{\sum_{l=1}^{K_g} \exp(x'_{gl} \beta_g / \tau_g)} \quad (3.7)$$

where $I_g = \ln \sum_{l=1}^{J_g} \exp(x'_{gl} \beta_g / \tau_g)$ is called the inclusive value or the log sum.

The partial release of the IIA assumption allowed by the nested structure led many scholars to adopt this specification, often in addition to a traditional conditional logit. Most of them opt for a geographical structure, with regional nests, whose size and borders depends on the total sample of countries considered (Disdier and Mayer, 2004; Procher, 2009; Bellak et al., 2008; Becker et al., 2005).

Using a nested structure into eight regions of the world (Western UE (base); Eastern Europe and Central Asia; East Asia and Pacific; Latin America and Caribbean; Middle-East and North Africa; North America; South Asia; Sub-Saharan Africa), we run a Nested Logit (NL) analysis, whose results are reported in Table (3.7).

The partial release of the IIA assumption leads only to small changes in the results. In the initial (non interacted) model of FDI's drivers, the average income (per capita GDP), appears as a positive factor, whilst not significant in the CL model. This strengthens the hypothesis of mostly horizontal FDI's. However, the same overall pattern displays, despite of a lower significance, and a decreased influence of demand-oriented factors (GDP and GDP_{pc}) along with the firms' TFP. Increased role of vertical integration proxies is also observed (intensity of French imports in intermediate goods, and upstream position in the global trade network, which highlights a significance level just above the 10% level). The NL also shows the same ability to invest in tougher countries (with higher wage, lower RCA, higher tariffs, and more distant destinations); and at last, the same lower sensitivity to

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	(1)	(2)
log ₂ distance	0.653 (4.41)***	0.500 (6.96)***
log ₂ GDP _{pc} (t-1)	1.125 (2.51)**	1.368 (2.75)***
log ₂ GDP (t-1)	1.277 (3.97)***	1.377 (3.76)***
log ₂ In/Out Eigenvector	1.192 (3.36)***	1.428 (1.96)**
Mean wage (USD, t-1)	0.810 (2.90)***	0.659 (3.49)***
Tax haven	1.063 (0.83)	0.960 (0.13)
RCA (log ₂ , t-1)	0.996 (0.53)	1.103 (2.09)**
Tariffs (log ₂)	0.994 (0.59)	0.899 (1.80)*
Intermed. Exports (t-1)	1.046 (1.61)	1.024 (0.67)
Intermed. Imports (t-1)	1.026 (1.01)	1.078 (2.31)**
Nb. French affiliates (log ₂ , t-1)	1.085 (3.07)***	1.449 (2.74)***
log ₂ TFP (t-1) x		
log ₂ distance		1.040 (3.92)***
log ₂ GDP _{pc} (t-1)		0.980 (2.23)**
log ₂ GDP (t-1)		0.987 (2.61)***
log ₂ In/Out Eigenvector		0.0976 (1.61)
Mean wage (USD, t-1)		1.028 (2.87)***
Tax haven		1.008 (0.27)
RCA (log ₂ , t-1)		0.989 (2.20)**
Tariffs (log ₂)		1.010 (1.83)*
Intermed. Exports (t-1)		0.976 (0.37)
Intermed. Imports (t-1)		1.146 (2.40)**
Nb. French affiliates (log ₂ , t-1)		0.971 (2.29)**
Firm-level FE	Yes	Yes
Country-level FE	No	No
Observations	93,708	93,708

Odd ratios reported in first row
t-stats are in parenthesis
***, ** and * respectively significant at 1%, 5% and 10%.

Table 3.7 – Nested Logit

agglomeration forces, as the CL.

The nested logit confirms the broad lines of the CL model, in line with hypothesis 1 (increasing complexity in FDI's choices with firms' TFP), and 2 (decrease of demand-oriented motive, and increase of vertical integration with TFP). Therefore, we kept with the conditional logit model for further analysis, to keep on the tracks of the majority of the literature.

5.3 Ownership structure and location choices determinants

To deeper examine whether firm heterogeneity by itself influences the location choices, and the underlying motive of FDI's, we should control more for FDI's' variability. We know FDI's are a complex matter with a high heterogeneity. One important difference in FDI's is about the ownership structure, as we revealed in the first two chapters of this thesis. Therefore we repeat our conditional logit model, controlling for the ownership structure. Specifically, we reproduce the same model over two sub-samples made of only joint-ventures affiliates for the first one (table (3.8)), and wholly owned subsidiaries for the second one (table (3.9)).

The comparison of the two tables confirms the inter-relation between ownership strategies, location choices and FDI's motives. In the non-interacted models, horizontal proxies tend to be higher location choice drivers for WOS rather than JV, as shown by the larger deviations from unity of GDP's, distance's and in/out eigenvector's odds ratios. In addition, in joint-ventures, lower wages increase the probability of choosing the country (with a significance level close to 10% in the first three regressions), while not observed in WOS sub-sample.

One might fear that the cross-sample differences would only come from the lower statistical significance reached in the JV sub-sample because of the fewer observations it is made of. To the contrary, we show that some variables reach higher significance level in the JV sub-sample (e.g. in/out eigenvector, intermediate imports).

The two TFP interacted models also highlight interesting differences, which tend to show a higher shift toward vertical motives with firms' productivity under joint-ventures. Actually, per capita GDP repel highly productive firms in JV while not in WOS, as higher in/out eigenvector ratio (downstream position in global trade network) does. JVs' location choices of the most productive firms do not highlight lower RCA, as WOS' did (and as observed in the overall analysis.). In addition, when investing in JVs, the most productive firms are highly attracted by countries who export intensively intermediate goods toward France, while this index of vertical integration of sourcing activities doesn't

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log ₂ distance	0.724 (7.52)***	0.726 (7.02)***	0.763 (5.63)***		0.595 (2.20)**	0.585 (2.27)**	0.662 (1.72)*	
log ₂ GDP _{pc} (t-1)	0.952 (0.62)	0.960 (0.50)	0.992 (0.10)	0.100 (0.81)	2.481 (3.17)***	2.199 (2.65)***	1.799 (1.93)*	0.158 (0.67)
log ₂ GDP (t-1)	1.665 (14.30)***	1.647 (14.53)***	1.543 (11.37)***	16.034 (1.03)	2.078 (5.93)***	2.047 (5.83)***	1.792 (4.45)***	21.911 (1.22)
Intermed. Bil. Trade (t-1)	1.003 (0.03)				1.194 (1.48)			
log ₂ In/Out Eigenvector	1.455 (4.84)***	1.469 (5.19)***	1.377 (4.13)***	2.442 (0.99)	6.030 (3.70)***	5.942 (3.61)***	4.815 (3.16)***	5.474 (2.35)**
Mean wage (USD, t-1)	0.890 (1.61)	0.898 (1.54)	0.878 (1.85)*	1.367 (0.78)	0.468 (2.59)***	0.479 (2.48)**	0.522 (2.19)**	0.867 (0.25)
Tax haven	1.486 (1.56)	1.573 (1.75)*	1.590 (1.79)*		0.371 (0.88)	0.546 (0.55)	1.185 (0.15)	
RCA (log ₂ , t-1)	0.971 (0.90)	0.963 (1.13)	0.964 (1.11)	0.997 (0.09)	1.295 (1.16)	1.311 (1.20)	1.317 (1.23)	1.255 (0.90)
Tariffs (log ₂)	0.986 (0.32)	0.979 (0.48)	0.983 (0.39)	0.953 (1.03)	0.728 (1.39)	0.719 (1.39)	0.718 (1.38)	0.644 (1.59)
log ₂ TFP (t-1)	1.067 (3.34)***	1.061 (3.05)***	1.205 (5.13)***	1.613 (5.61)***	2.933 (3.27)***	2.473 (2.58)***	2.104 (2.11)**	2.48 (2.26)**
Intermed. Exports (t-1)		1.265 (2.15)**	1.188 (1.59)	0.637 (1.72)*		1.184 (1.25)	1.088 (0.61)	1.204 (0.56)
Intermed. Imports (t-1)		1.002 (0.03)	0.994 (0.08)	0.532 (2.95)***		1.236 (1.95)*	1.221 (1.81)*	1.303 (1.39)
Nb. French affiliates (log ₂ , t-1)			1.322 (4.42)***	1.514 (5.76)***			3.232 (3.22)***	2.771 (2.51)**
log ₂ TFP (t-1) x								
log ₂ distance					1.023 (0.82)	1.025 (0.89)	1.014 (0.52)	1.011 (0.38)
log ₂ GDP _{pc} (t-1)					0.919 (3.54)***	0.930 (2.89)***	0.949 (2.03)**	0.944 (1.92)*
log ₂ GDP (t-1)					0.974 (1.91)*	0.975 (1.90)*	0.984 (1.17)	0.974 (1.99)**
Intermed. Bil. Trade (t-1)					1.624 (2.39)**			
log ₂ In/Out Eigenvector					0.879 (3.08)***	0.882 (2.91)***	0.894 (2.34)**	0.992 (0.19)
Mean wage (USD, t-1)					1.075 (2.22)**	1.074 (2.15)**	1.061 (1.81)*	1.056 (1.88)*
Tax haven					1.134 (1.23)	1.101 (0.96)	1.028 (0.27)	
RCA (log ₂ , t-1)					0.967 (1.36)	0.964 (1.44)	0.964 (1.46)	0.973 (1.00)
Tariffs (log ₂)					1.029 (1.39)	1.030 (1.34)	1.030 (1.34)	1.038 (1.45)
Intermed. Exports (t-1)						0.849 (0.64)	0.783 (0.96)	0.759 (0.93)
Intermed. Imports (t-1)						1.721 (2.99)***	1.716 (2.97)***	1.496 (2.05)**
Nb. French affiliates (log ₂ , t-1)							0.913 (2.53)**	0.912 (2.33)**
Firm-level FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-level FE	No	No	No	Yes	No	No	No	Yes
Observations	24,453	24,453	24,453	24,453	24,453	24,453	24,453	24,453
Pseudo R ²	0.17	0.17	0.17	0.18	0.18	0.18	0.19	0.22

Odd ratios reported in first row
t-stats are in parenthesis
***, ** and * respectively significant at 1%, 5% and 10%.

Table 3.8 – Conditional Logit (Joint-Ventures only)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log ₂ distance	0.708 (13.85)***	0.705 (13.51)***	0.728 (12.07)***		0.419 (6.04)***	0.411 (6.10)***	0.453 (5.30)***	
log ₂ GDP _{pc} (t-1)	0.962 (0.60)	0.955 (0.73)	0.981 (0.29)	0.906 (0.05)	1.184 (0.82)	1.086 (0.39)	0.865 (0.67)	0.947 (0.03)
log ₂ GDP (t-1)	1.703 (27.80)***	1.676 (28.05)***	1.604 (23.18)***	1.102 (0.06)	2.311 (12.17)***	2.273 (11.88)***	2.070 (10.07)***	1.149 (0.08)
Intermed. Bil. Trade (t-1)	1.016 (0.27)				1.016 (0.22)			
log ₂ In/Out Eigenvector	1.449 (8.50)***	1.474 (8.08)***	1.413 (7.29)***	0.796 (0.66)	2.293 (2.91)***	2.361 (2.96)***	1.865 (2.09)**	1.181 (0.27)
Mean wage (USD, t-1)	0.979 (0.38)	0.993 (0.12)	0.974 (0.49)	0.974 (0.10)	0.633 (2.48)***	0.656 (2.28)**	0.710 (1.78)*	0.978 (0.07)
Tax haven	1.251 (1.53)	1.445 (2.48)**	1.444 (2.48)**		0.255 (1.78)*	0.391 (1.22)	0.738 (0.38)	
RCA (log ₂ , t-1)	1.026 (1.14)	1.018 (0.77)	1.018 (0.80)	0.972 (1.05)	1.433 (2.45)**	1.437 (2.45)**	1.421 (2.36)**	1.221 (1.23)
Tariffs (log ₂)	0.950 (2.17)**	0.940 (2.59)***	0.939 (2.63)***	0.942 (2.02)**	0.970 (0.20)	0.954 (0.30)	0.896 (0.72)	0.895 (0.63)
log ₂ TFP (t-1)	1.087 (8.18)***	1.081 (7.49)***	1.184 (7.82)***	1.046 (1.74)*	1.477 (1.54)	1.325 (1.08)	1.060 (0.22)	1.083 (0.29)
Intermed. Exports (t-1)		1.253 (3.48)***	1.194 (2.72)***	0.512 (2.99)***		1.111 (2.02)**	1.099 (1.27)	0.489 (3.12)***
Intermed. Imports (t-1)		1.082 (1.90)*	1.074 (1.70)*	1.016 (0.09)		1.140 (2.38)	1.135 (2.28)	1.067 (0.36)
Nb. French affiliates (log ₂ , t-1)			1.187 (5.03)***	1.032 (0.87)			2.411 (4.00)***	1.574 (2.00)**
log ₂ TFP (t-1) x								
log ₂ distance					1.061 (3.64)***	1.062 (3.68)***	1.054 (3.15)***	1.022 (1.41)
log ₂ GDP _{pc} (t-1)					0.982 (1.07)	0.989 (0.64)	1.011 (0.59)	0.999 (0.07)
log ₂ GDP (t-1)					0.967 (4.46)***	0.967 (4.42)***	0.972 (3.57)***	0.991 (1.21)
Intermed. Bil. Trade (t-1)					0.999 (0.01)			
log ₂ In/Out Eigenvector					0.960 (1.67)*	0.959 (1.68)*	0.976 (0.97)	0.948 (1.32)
Mean wage (USD, t-1)					1.050 (2.52)**	1.048 (2.38)**	1.036 (1.76)*	1.007 (0.37)
Tax haven					1.150 (2.10)**	1.122 (1.71)*	1.061 (0.85)	
RCA (log ₂ , t-1)					0.964 (2.32)**	0.963 (2.38)**	0.964 (2.28)**	0.975 (1.44)
Tariffs (log ₂)					0.998 (0.14)	0.999 (0.10)	1.004 (0.28)	1.004 (0.29)
Intermed. Exports (t-1)						0.822 (1.67)*	0.816 (1.80)*	0.922 (0.57)
Intermed. Imports (t-1)						1.139 (1.34)	1.149 (1.45)	1.159 (1.18)
Nb. French affiliates (log ₂ , t-1)							0.936 (3.23)***	0.961 (1.90)*
Firm-level FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-level FE	No	No	No	Yes	No	No	No	Yes
Observations	69,255	69,255	69,255	69,255	69,255	69,255	69,255	69,255
Pseudo R ²	0.20	0.20	0.20	0.24	0.20	0.20	0.21	0.24

Odd ratios reported in first row
t-stats are in parenthesis
***, ** and * respectively significant at 1%, 5% and 10%.

Table 3.9 – Conditional Logit (Wholly Owned Subsidiaries only)

appear in the WOS' location choices. Actually, all happens as if under WOS, a higher productivity would only allow to invest in more distant countries, with lower RCA, higher wages and lower GDP. This is in line with the perspective of “tougher” countries, that TFP enables to invest in. To the contrary, it seems that under joint-ventures, a higher productivity makes the MNEs invest in upstream countries in the global value chains, and in countries that are specialized in intermediate goods. This is more in line with a vertical shift in underlying FDI motives.

Concerning fiscal motives, the initial model reveals that both JVs and WOSs subsets are attracted by tax havens. This is in line with the statistics that show a similar share of WOS in tax havens (74.8%) as in the rest of the world (73.8%). However, the increased attractiveness of tax havens for the most productive firms is only visible for the wholly owned subsidiaries.

5.4 Experience-related firm heterogeneity

In the previous chapter we insisted on the influence of international experience of MNEs over their FDI strategies. We therefore have to account for this aspect of MNEs heterogeneity in the location choices analysis. Moreover, the idea of a pecking order of host countries developed in the literature fits better with a gradual pattern of location choices rather than with productivity heterogeneity. As a consequence, we aim at estimating the role of international experience in the MNEs' sensitivity for FDI drivers, and possibly disentangling this role from TFPs' one. We therefore reproduce the model presented in section 3.1, except that the θ parameter in equation (3.4) is now the log previous number of foreign affiliates (table 3.10). Then, we would restrict the sample to first-time foreign investors to isolate the TFP effect (table 3.11). At last we would include both TFP and experience interacted terms (table 3.12).

In estimation reported in table 3.10, we add to the baseline model (columns (1)-(2)) the number of foreign affiliates of the group, as a predictor of the location choice, to then interact the host country characteristics with this value on columns (3)-(4). The negative signs imply that a MNE with twice the number of affiliates than another one is 4.5% less likely to proceed to new FDI during this period (while most productive firms have an increased probability to do so, this difference shows that TFP and experience could capture varied effects, despite their correlation). The analysis of host country drivers doesn't suffer any major change from this addition, compared to our initial CL model.

The second part of the analysis, when host countries characteristics are interacted with the number of previous foreign affiliates of investing firms also displays similar results as the TFP interacted one.

	(1)	(2)	(3)	(4)
log ₂ TFP (t-1)	1.188 (9.49)***	1.033 (1.45)	1.150 (7.39)***	1.005 (0.21)
log ₂ Nb. for. aff.	0.956 (5.28)***	1.005 (0.77)	3.019 (2.19)**	2.689 (1.72)*
log ₂ distance	0.736 (12.81)***		0.700 (10.40)***	
log ₂ GDP _{pc}	0.979 (0.42)	0.830 (0.12)	1.151 (1.30)	
log ₂ GDP	1.594 (25.05)***	1.088 (0.06)	1.687 (17.45)***	1.165 (0.11)
sh. Intermediate Exports	1.193 (3.13)***	0.643 (2.46)**	1.159 (1.71)*	0.628 (2.32)**
sh. Intermediate imports	1.046 (1.18)	0.982 (0.14)	1.077 (1.11)	1.002 (0.01)
log ₂ In/Out eigenvector	1.399 (8.03)***	0.959 (0.15)	1.694 (57.60)***	1.216 (0.67)
log ₂ Wage (USD)	0.945 (1.31)	0.919 (0.37)	0.826 (3.05)***	0.820 (0.89)
Tax haven	1.482 (3.02)***		1.520 (2.04)**	
log ₂ RCA	1.002 (0.11)	0.979 (0.92)	1.030 (0.96)**	1.042 (1.21)
log ₂ Tariffs	0.952 (2.39)**	0.927 (2.15)**	0.943 (1.85)*	0.942 (1.66)*
log ₂ Nb French affiliates	1.219 (6.66)***	1.046 (1.44)	1.350 (6.90)***	1.176 (3.69)***
log ₂ Nb. for. aff (t-1) x				
log ₂ distance			1.042 (1.66)*	1.033 (1.93)*
log ₂ GDP _{pc}			0.940 (1.60)	0.954 (1.21)
log ₂ GDP			0.967 (2.53)**	0.969 (2.34)**
sh. Intermediate Exports			1.011 (0.30)	1.012 (0.24)
sh. Intermediate imports			0.983 (0.57)	0.990 (0.27)
log ₂ In/Out eigenvector			0.890 (3.92)***	0.881 (3.21)**
log ₂ Wage (USD)			1.085 (2.59)***	1.074 (2.44)**
TAX haven			0.990 (0.10)	
log ₂ RCA			0.961 (2.97)***	0.965 (2.48)**
log ₂ Tariffs			1.006 (0.39)	1.003 (0.18)
log ₂ Nb French affiliates			0.936 (3.16)***	0.927 (3.65)***
Firm-level FE	Yes	Yes	Yes	Yes
Country-level FE	No	Yes	No	Yes
Observations	93,708	93,708	93,708	93,708
Pseudo R ²	0.19	0.22	0.20	0.23

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 3.10 – Conditional Logit (Experience)

One noticeable change is about host countries' trade intensity in intermediate goods with France, which do no longer matters (neither in France's imports or exports) when interacted with the firms' experience. Therefore, the conclusion on a "vertical" oriented shift in FDI's strategy is lightly weakened in this analysis (although the decreasing in/out eigenvector centrality influence is strengthened here), while the other conclusions on decreasing market motives, ability to invest tougher markets, and pioneer strategies are confirmed.

The experience interaction analysis gives then results very close to the TFP one, which stresses the correlation between these two firm-level aspects, that might blur the results. The following two estimations try to disentangle the TFP from the experience effects.

In table 3.11, we restrict our sample to first-time foreign direct investors, such that they have hypothetically the same (null) internationalization experience. Our sample consists in 519 new foreign affiliates from 504 parent-firms (some opened two affiliates in the same year) in 44 host countries. Although this control might seem imperfect, as other sources of international experience could exist (through employees, shareholders, etc.), the results it gives are instructive enough. Indeed, the "true" effect of TFP seems to be much reduced. It only fosters vertical motives, with a substantial increase of the attraction for countries from where France intensively imports intermediate goods; and of the attractiveness of upstream countries in the world trade network. The hypothesis according to which productivity allows firms to enter in more and tougher countries also find some supports with an increasing possibility for high-wage countries, and destinations with fewer French affiliates. However, the decrease in horizontal motive with firms' TFP isn't statistically significant for the firms' first FDI anymore.

These results tend to confirm the increasing vertical integration for more productive firms. However, they might not be very representative of the true effect of the TFP, since the results are obtained on a small fraction of our initial sample.

At last, we report in table 3.12, the model including both TFP and experience interactions terms, although we are aware of the multicollinearity issue that might bias the significance level of odds ratios.

It seems that total factor productivity plays a greater role in the changing FDI's motives of French MNEs, compared to what previous international experience does. The latter only seems to favor the choice of upstream positions in the global trade network. However, the reduction in other horizontal motives such as the market size, only passes through the firm's TFP. Similarly, only TFP leads to an increased preference for countries exporting intermediate goods toward France.

	(1)	(2)	(3)	(4)
log ₂ TFP (t-1)	1.318 (4.18)***	0.821 (1.21)	1.343 (0.67)	0.634 (0.80)
log ₂ distance	0.965 (0.90)		1.159 (0.56)	
log ₂ GDP _{pc}	0.939 (0.76)	0.002 (0.71)	0.987 (0.04)	0.006 (1.33)
log ₂ GDP	1.341 (8.42)***	11.160 (1.41)	1.543 (2.28)**	15.329 (0.99)
sh. Intermediate Exports	1.329 (2.37)**	0.260 (2.72)***	1.500 (2.67)***	0.294 (2.40)**
sh. Intermediate imports	0.916 (0.96)	0.770 (0.79)	1.072 (0.56)	0.807 (0.60)
log ₂ In/Out eigenvector	1.487 (5.63)***	0.502 (0.94)	3.677 (2.84)***	1.379 (0.30)
log ₂ Wage (USD)	0.961 (0.64)	1.519 (0.64)	0.578 (1.93)*	0.852 (0.23)
Tax haven	0.917 (0.35)		0.740 (0.23)	
log ₂ RCA	1.024 (0.60)	0.972 (0.56)	1.417 (1.27)	1.329 (1.03)
log ₂ Tariffs	0.838 (3.90)***	0.882 (2.24)**	0.555 (2.03)**	0.479 (2.37)**
log ₂ Nb French affiliates	1.245 (4.04)***	1.071 (1.20)	2.861 (2.68)***	2.451 (2.29)**
log ₂ TFP (t-1) x				
log ₂ distance			0.976 (0.77)	0.978 (0.73)
log ₂ GDP _{pc}			0.995 (0.17)	1.013 (0.35)
log ₂ GDP			0.983 (0.74)	0.986 (0.68)
sh. Intermediate Exports			1.524 (1.25)	1.769 (1.51)
sh. Intermediate imports			1.621 (2.03)**	1.558 (1.89)*
log ₂ In/Out eigenvector			0.918 (2.02)**	0.919 (1.22)
log ₂ Wage (USD)			1.065 (1.90)*	1.067 (2.07)**
log ₂ Tax haven			1.014 (0.11)	
log ₂ RCA			0.961 (1.29)	0.962 (1.24)
log ₂ Tariffs			1.041 (1.45)	1.061 (2.07)**
log ₂ Nb French affiliates			0.918 (2.16)**	0.918 (2.16)**
Firm-level FE	Yes	Yes	Yes	Yes
Country-level FE	No	Yes	No	Yes
Observations	11,250	11,250	11,250	11,250
Pseudo R ²	0.12	0.15	0.13	0.16

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 3.11 – Conditional Logit (First-time investors)

Location choices and internationalization motives of heterogeneous firms

	(1)	(2)
log ₂ TFP (t-1)	1.188 (9.49)***	1.263 (1.05)
log ₂ Nb. for. aff.	0.956 (5.28)***	2.645 (2.03)**
log ₂ distance	0.736 (12.81)***	0.416 (4.46)
log ₂ GDP _{pc}	0.979 (0.42)	1.306 (1.01)
log ₂ GDP	1.594 (25.05)***	2.748 (10.24)***
sh. Intermediate Exports	1.193 (3.13)***	1.153 (0.22)
sh. Intermediate imports	1.046 (1.18)	1.319 (0.95)
log ₂ In/Out eigenvector	1.399 (8.03)***	2.042 (2.50)**
log ₂ Wage (USD)	0.945 (1.31)	0.483 (2.96)***
Tax haven	1.482 (3.02)***	0.924 (0.11)
log ₂ RCA	1.002 (0.11)	1.372 (1.53)
log ₂ Tariffs	0.952 (2.39)**	0.758 (1.50)
log ₂ Nb French affiliates	1.219 (6.66)***	2.821 (3.56)***
log ₂ TFP (t-1) x		
log ₂ distance		1.033 (1.91)*
log ₂ GDP _{pc}		0.988 (0.55)
log ₂ GDP		0.970 (2.68)***
sh. Intermediate Exports		0.777 (2.36)**
sh. Intermediate imports		1.292 (2.61)***
log ₂ In/Out eigenvector		0.982 (0.65)
log ₂ Wage (USD)		1.040 (2.05)**
Tax haven		0.964 (0.35)
log ₂ RCA		0.974 (1.07)
log ₂ Tariffs		1.020 (1.10)
log ₂ Nb French affiliates		0.959 (2.03)**
log ₂ Nb. for. aff (t-1) x		
log ₂ distance		1.015 (0.55)
log ₂ GDP _{pc}		0.923 (1.49)
log ₂ GDP		0.968 (1.61)
sh. Intermediate Exports		1.163 (0.55)
sh. Intermediate imports		0.993 (0.05)
log ₂ In/Out eigenvector		0.902 (2.88)***
log ₂ Wage (USD)		1.091 (1.87)*
Tax haven		1.049 (0.70)
log ₂ RCA		0.981 (1.24)
log ₂ Tariffs		0.994 (0.24)
log ₂ Nb French affiliates		0.937 (1.70)*
Firm-level FE	Yes	Yes
Country-level FE	No	No
Observations	93,708	93,708
Pseudo R ²	0.19	0.20

Odd ratios reported in first row

t-stats are in parenthesis

***, ** and * respectively significant at 1%, 5% and 10%.

Table 3.12 – Conditional Logit (TFP and Experience)

6 Conclusion

In this chapter we went underneath the complexity of aggregated FDIs flows, by examining whether firm-level heterogeneity influences the motive of Foreign Direct Investments. Based on recent literature, we draw several assumptions that we test over a vast firm-level dataset of French new FDIs location choices. In line with previous research, we find that more productive firms benefit from a broader set of possibilities, and more complex strategies. We also reveal two channels through which investors' productivity influences location choices and might lead to some confusion about their internationalization motive. First, the more productive firms are able to invest in countries with higher entry or production costs, because their productivity will offset these increased costs. Second, more productive firms are more attracted by foreign production and internationally divided production chain.

The coexistence of these two effects had led to opposite predictions on previous literature. The use of several proxies for comparative advantage, fiscal motives, splitting production process and position into global supply chains; in addition to traditional "gravity" determinants (i.e. Demand and distance) in our location choice model led to clearer conclusions. Our empirical estimations in our two main models – the conditional and nested logits – lead to reject the assumption that the least productive firms go more in southern countries to produce and export back to France, as argued by Head and Ries (2003) and Aw and Lee (2008). This finding was over-estimated, with very few empirical evidence in Head and Ries (2003) (only inter-quartile descriptive statistics), and probably flawed in Aw and Lee (2008) by the restriction to the two host countries that are China and the US, in the specific case of Taiwanese firms, which reverse the respective entry costs in each country.

To the contrary, we find empirical evidence supporting the assumption of decreasing horizontal (demand-driven) motives for the most productive firms, as suggested in more recent papers (Chen and Moore, 2010; Hyun and Hur, 2013). Yet, we show such motives to be dominant in overall outward French FDIs flows. Therefore, we conclude to increasingly mixed and "complex" strategies with the MNE's TFP. This finding is close to Yeaple (2009) that reports an increasing diversity of host country with the firms' productivity (but didn't mention varying motives).

Moreover, the main finding of our paper is to report an increasing vertical integration motive with the firm's TFP, close to Kleinert and Toubal (2013) findings.

Distinguishing FDIs according to the ownership structure of the affiliates reveals that this shift toward production-oriented motives with the parent TFP is more stressed for international Joint-

Ventures.

This chapter also shows that a sequential pattern of FDI strategy probably exists, but the firm's TFP seems to be the major vertical motive shifter. The gradual pattern might concern more precisely the widening FDI possibilities, and access to tougher countries. However, disentangling between experience and TFP roles into the location choice is not easy and calls for dedicated further research, possibly using matching models, to better control for one of the two aspects of firm heterogeneity.

Actually, one of the advantages of this chapter lies on a weakness: we didn't build a theoretical model to explain why such a shift from horizontal to vertical motives arises, unlike the papers mentioned above, each mixing empirical and theoretical findings. However, most of them only extend either horizontal FDI models (Yeaple, 2009; Chen and Moore, 2010), or vertical ones Hayakawa and Matsuura (2011). Therefore, they lack the theoretical foundations to investigate changing FDI motives, as this question wouldn't fit in their model. While our chapter skips the theoretical part, we didn't have to restrict to either horizontal or vertical determinants, and could include proxies of both in our empirical estimations.

Yet, our chapter would benefit from a theoretical model that might explain both horizontal and vertical FDI, and show how firm heterogeneity might influence this choice. Such models exist, as the extension of Helpman et al. (2004) to "factor-seeking" FDI motives detailed in Head and Ries (2003), or the "capital-knowledge" of Carr et al. (2001). The most adequate model might be the Grossman et al. (2006) model, or its adaptation by Aw and Lee (2008), that allows a large variety of organizational forms for the international production. While these models could probably be extended to explain such a shifting from horizontal to complex-vertical FDI with firms' TFP, unfortunately, they are used in the papers that offer the fewest empirical analysis as discussed above. We believe these models to be adapted to explain our findings, because they notably state that "*Firms with low productivity choose an integration strategy that minimizes the fixed costs of operation, whereas firms with high productivity seek to minimize the variable costs of serving the various markets*" (Grossman et al., 2006, p.236). We might reasonably think that a replication (horizontal) FDI in a large host country involves lower fixed costs than a vertical integration FDI that would impact all existing operations of the firm, and therefore implies larger sunk costs of internal reallocation of resources and organizational costs. To the contrary, such a vertical investment (to secure international sourcing for example), offers the firm lower variable costs. Hence, a vertical FDI that would provide per-unit gains is only worth when the MNE produces enough – i.e. is productive enough and/or has already

expanded into several countries, such that the worldwide re-organization that follows a vertical FDI would benefit from several previous (horizontal) plants.

While we roughly draw the rationale for FDIs shifting motives with firms' TFP, dedicated further works on this topic would be welcome. This would be notably useful to confirm and better understand the role of ownership structure into it, and clarify the progressive internationalization pattern. The use of data on affiliates' sales, on parent-firms' TFP and on their existing affiliates could be greatly beneficial to the understanding of the FDIs drivers.

Appendix

3.A List of countries

The 57 countries in the sample are the following. The ^h superscript indicates countries classified as tax havens (from Dharmapala and Hines (2009)).

Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, China, Croatia, Cyprus^h, Czech Republic, Denmark, Egypt, Finland, Gabon, Germany, Hong-Kong^h, Hungary, India, Ireland^h, Italy, Japan, Korea, Latvia, Lebanon^h, Luxembourg^h, Madagascar, Malaysia, Malta^h, Mauritius^h, Mexico, Mongolia, Morocco, New Zealand, Norway, Pakistan, Panama^h, Peru, Philippines, Poland, Russia, Saudi Arabia, Senegal, Singapore^h, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland^h, Thailand, Turkey, Ukraine, United Kingdom, United States of America, Vietnam.

Chapter 4

On the Topological Structure of Multinationals Network.

1 Introduction

In 2010, one third of world trade was intra-firm according to the UNCTAD (2013). This is equivalent to the share we yield when adding all international trade done by China, the USA, Germany and Japan, the four biggest actors on world trade. Moreover, this share has probably increased since then, as multinational firms have benefited from the development of global value chains (UNCTAD, 2013; Amador and Cabral, 2016).

The networks of foreign affiliates coordinated by Multinational Enterprises (MNEs) are therefore of crucial matter in international economics as they shape the world trade flows, as probably many other ones (e.g. capital, technological flows).

Yet, the global expansion strategy of MNEs is still little documented, while most work focus either on FDI decision taken individually, or aggregated FDI flows by countries ignoring the MNE scope.

The network analysis seems adapted to capture the inter-dependencies between the affiliates location choices, but remaining within the scope of the MNEs, by identifying individual firms' foreign affiliates network.

The objectives of this research are to determine what can be learn from MNEs' affiliates' association choices. More specifically it reviews how the affiliates' network evolved, and the role of

firm heterogeneity into the topology of the subsidiaries worldwide positions. These are important questions to answer to better understand the global mapping of multinational firms, the rationale behind it, and its future progression.

To the best of our knowledge, no previous works used the network approach to map MNEs' affiliates, and describe the structure observed¹. Yet, a real starting point for our thinking was the paper of Masi et al. (2013), in which they build a network of Italian MNEs and host countries, and briefly show the projection on the "country space", consisting in a network of countries related according to the number of firms that are jointly present in both countries. We choose to replicate this representation and deepen the subsequent analysis.

Another inspiring paper, was the one of Fagiolo et al. (2010), detailing the evolution of the topological structure of the World Trade Web over time. Similarly we decided to review the evolution of the French MNEs' network we draw.

We map the global network of French multinationals, revealing the host-countries association that French MNEs develop. Apart from the first attempt of Masi et al. (2013), this is certainly the first paper doing so, and for sure concerning French firms. However, the main findings of the paper are even more original. First we show that the network evolution tends toward decreasing centrality and concentration, with further expansions being increasingly at the network periphery compared to its core. Moreover, we reveal that firm heterogeneity plays a role in the position of foreign affiliates, and the overall structure of the firms' network of foreign subsidiaries. At last we show the decentralization trend to be led by most productive firms, and conclude to distinct impacts of intensive and extensive FDI margins over the topological structure of the overall network.

Another input of this chapter would be on the methodological plan, revealing the utility of a relatively new quantitative approach in international economics, aside from traditional econometric methods, which is particularly well design to study the aggregate structure multinational activity.

This chapter is constructed as follows. In the second section, I review briefly how network approach began to spread in international economics literature. In section 3, I detail the network building methodology followed. Then section 4 details the topological structure of the network obtained. The fifth section presents a directed version of the network, to insist on firms' itinerary on this network. Section 6 describes the evolution of the network topology from 1996 to 2011. The following

1. Actually, closely related works have been done by geographers, who detailed the cities' central position on the global economy, studying MNEs urban network (Rozenblat, 2015, 2010). Their attention though focus on nodes (cities) and less on the whole network topology.

section details two sub-networks according to firm heterogeneity. At last section 8 concludes and discusses the possible utility for the metrics developed throughout the network analysis.

2 Network Analysis in International Economics

Since the early 2000s an increasing number of papers have focused on the empirical examination of economic networks structure. Among them international trade, through the World Trade Web (WTW) analysis, has been one of the first -and probably also one of the most- economic field studied through a network approach². Pioneer works analyzed topological properties of the WTW (Serrano and Boguñá, 2003; Garlaschelli and Loffredo, 2004, 2005; Serrano et al., 2006, 2007; Fagiolo et al., 2008, 2009). Then more precise issues were addressed through the network analysis, as the evolution of the WTW structure over time (Fagiolo et al., 2010), or the sectoral differences in the trade network (Baskaran et al., 2011; De Benedictis and Tajoli, 2011). The World Trade Web analysis is full of insights as it allows a proper description of the actual heterogeneity between world trade protagonists through their degree of connectivity and the structure of their connections, which reflects the pattern of their international economic integration³. However, the current globalization is rather driven by Multinational Enterprises (MNEs), Foreign Direct Investments (FDIs) and intra-firm trade than by arm's length trade (UNCTAD, 2013; Amador and Cabral, 2016). Surprisingly, only a few works explored the structure of FDI networks of multinational firms. Nonetheless, the high interdependences between related affiliates coordinated by common headquarters, which share capital, workers and technologies besides goods, call for a network approach to better understand the geographical breakdown of their global structure.

Sgrignoli (2014) compares the two network structures of countries bilateral trade flows (WTW) and bilateral Foreign Direct Investment (*FDIN*), and shows that both share a dissortative pattern and a similar (and very concentrated) strength distribution. However, the bilateral network structure blurs the individual MNEs boundaries. Conversely, focusing on Italian firm FDI network, Masi et al. (2013) build a bipartite network of investing firms and host countries, and alternatively use projection on the “firm space” (resulting in a network of firms, linked according to the common number of countries they have invested in), and more rarely develop the projection on the “country space”

2. See Hidalgo (2016), for a review of network analysis in several academic fields, and how well-known economic approaches could be seen as a network approach, such Leontieff input-outputs tables or even Walras equilibrium

3. I am also referring to Hausmann et al. (2014) “atlas of economic complexity”, and all the previous work that led to it, who derive new macroeconomic indexes of “export sophistication” (Hausmann et al., 2007) or product and country “complexity” (Hidalgo and Hausmann, 2009), which are based on a global trade network analysis, linking the product space (network) and the country one with their “method of reflections”.

(resulting in a network of countries, linked according to the number of firms that are jointly present in both countries), but do not give much information about the latter .

This chapter has two premises: first, the recent improvement in computability of network analysis through statistical softwares which allowed an easy use of this method⁴. Second, as noted above, the fact that the international trade networks are now commonly studied, whereas FDI and more especially multinational firms networks are still to explore. Using firm-level data on French multinationals, this chapter aims at revealing the topological structure of the underlying network of MNEs implantation countries, and properly quantify this properties through vertex-specific, dyad-specific and network-wide measures. Similarly to world trade network, the analysis shows a high centralization degree and a dissortative pattern of the network structure. However, while Fagiolo et al. (2010) note that the WTW structure didn't change much since the 1980s, this chapter shows that the MNEs network did evolve more recently toward a decentralized structure. At last, further results tend to indicate that firm heterogeneity plays a role in the FDI network building.

3 Network Building

Broadly speaking, networks are a collection of vertices linked by some edges. I first built individual network of foreign establishments for each firm, in which nodes are the world's countries. They are linked if the two countries host an affiliate of the same MNE (see figure 1). The links aren't associated to trade flows as standard World Trade Web analysis, but rather to the existence of MNE's intra-firm trade and immaterial information and decisional flows coordinated by multinationals. The aggregated network sums all firm-level graphs. Hence each edges' weight counts the number of French firms simultaneously established in both countries (see figure 2). The final network is therefore weighted by the frequency of each "pair" of countries, in order to highlight similar patterns of networks in firm's international expansion⁵. The data on foreign French affiliates comes from LiFi, a survey run by the French national statistic institute (*INSEE*). It lists the subsidiaries of French firms identified as "head of group". Hence, our network is not only made of directly controlled affiliates, but also of the entities they could themselves own, ensuring a proper vision of the actual network of French

4. I am especially grateful to Thomas Grund and its NWCOMMANDS package for Stata (<https://nwcommands.wordpress.com>). I also developed my own Stata packages to compute some additional network metrics (ANND, ANNS, strength centralization, disparity, reciprocity and weighted clustering coefficient), available on SSC archive of Boston College. Also a Stata module generalizes the set-up I used to transform a list of nodes by individuals into a proper network (nw_fromlist, SSC Boston College).

5. The objective to detect common FDI strategies is also what motivates Masi et al. (2013), who build a similar MNE network as this one with the projection of their bipartite graph in the subspace of countries (see figure 3, in ref. (Masi et al., 2013)).

multinationals. Only majority-held subsidiaries were considered. Although LiFi design involves threshold value⁶, these threshold values are quite low concerning multinational firms, hence the rejected firms -if any- may not lead networks large enough to significantly change the identified pattern of MNEs network. Self loops weren't considered, ignoring multiple-plants in a given country as the final objective is to study the pattern of country pairing. At last, France is not included in the network as it is the headquarters country of all firm considered. The set of countries is henceforth made of all countries, excluded France and countries without any French affiliate because they would have been isolated nodes, which would have complicated the computation, and wouldn't have brought anything to the analysis. For the year 2011, the French multinationals' affiliates network counts 167 countries, implying over 13,860 edges possibilities, with 2,996 firms and 19,872 subsidiaries composing it⁷. Figure (4.3) displays the main French FDI network.

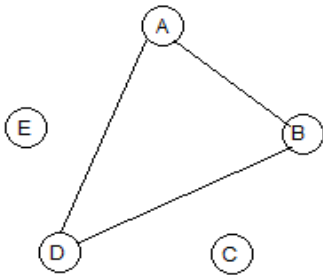


Figure 4.1: Firm i network

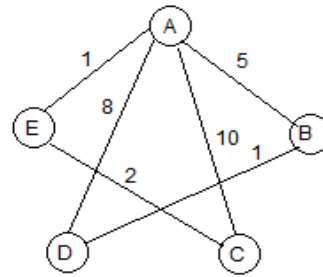


Figure 4.2: Aggregated network

Example: Firm i is settled in countries A, B and D, edges are unweighted at the firm-level (all equal to one). At the aggregated level, edges are weighted by the frequency of association. Firm i is the only one that associates countries B and D, but shares the A-B association with 4 other firms.

4 Topological structure of multinationals network

4.1 Overview

Before examining the connectivity pattern of the network, a network overview details the principal destinations of French FDIs, where unsurprisingly the USA stands first with over 12% of French affiliates. Below, the United Kingdom, Germany and Spain have a similar share of around

6. Only firms that fulfil one of the four following criteria are surveyed in LiFi: The participation into other firms outpaces 1.2 million euros ; the firms employs at least 500 employees; its turnover is superior to 60 million euros; the firm has been previously identified as "head of group".

7. As a consequence of the research question, French MNEs with only one foreign affiliates were not included in the designed network, because they don't associate any country pairs.

more central in the network. The topological structure of a network is first derived from the degree distribution $P(k)$, defined as the probability for a randomly chosen vertex to be connected to k other vertices. The figure (4.4) (left panel) presents the complementary cumulative distribution function of the node degrees, defined as $P_c(k) \equiv \sum_{k^* > k} P(k)$. The degree distribution, and all centrality measures, are first-order metrics that reflect the heterogeneity between nodes in the network structure.

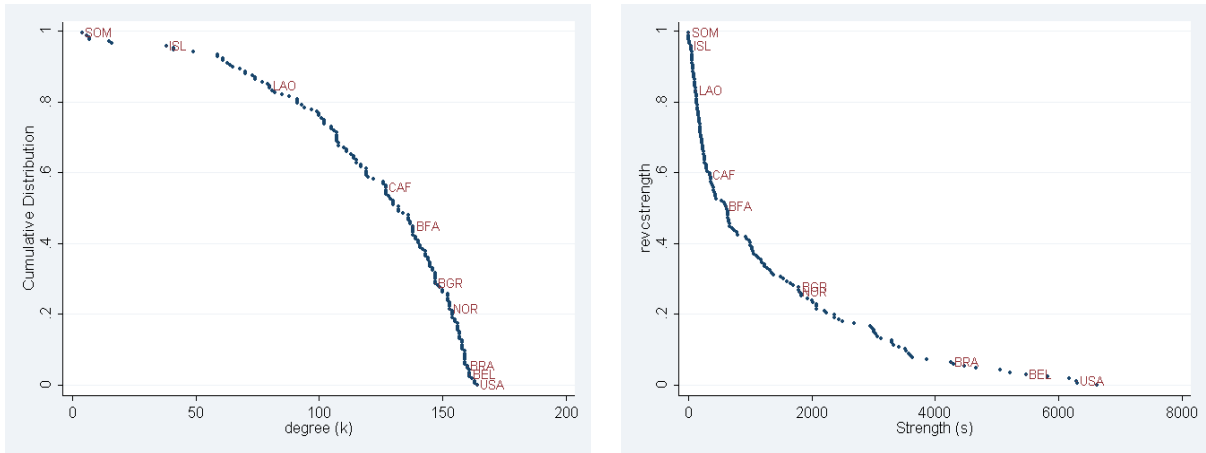


Figure 4.4 – Distribution of node's Degree and Strength

In this figure, the various flagged countries indicate that a node's degree is correlated to its size, the bigger economies having a more central position in the network. However, very few nodes have a low degree index, and few degree differences exist at the top of the distribution. Only 25% of countries are not related directly to 100 other countries or more. This is mainly due to the fact that the degree simply counts the number of neighbors, and consider equally all pairs of countries, whatever the number of firms using this association. To take frequency of use into account, the notion of *strength* must be introduced. The *strength* of a node is the total weight of its ties, computed as follows: $s_i = \sum_{j=1}^N w_{ij}$ (Barrat et al., 2004). Going back to the example of figure 2, countries E and C would have the same degree value of 2, but C displays a strength of 12 while only 3 for node E . In spite of the same number of countries they are associated with, the country C is more central in the network because used by more firms. This is what strength captures.

The strength distribution is much more concentrated than the one of degree index (figure 4.4, right panel). Few countries are thus central in the network, once considered their frequency of use, and many nodes are not much used by French multinationals. Though developed countries still appear as the more central nodes.

to a weighted adjacency matrix W of the same dimension, containing the weights associated to each link in every elements w_{ij} instead of a_{ij} .

The variability between nodes centrality can be measured by the centralization index⁹. The 2011 FDI network has a degree centralization of 0.263 and a strength centralization of 0.050. Although the latter clearly reveals a few centralized weighted network, as the Freeman index ranges from zero to one; the degree centralization index is hardly interpretable on its own, and will be later examined more examined (see section (6.1)).

Besides these intuitive indexes based on aggregated count flows, complementary measures of centrality were developed, based on walk structure, such as *farness* $f_i = \sum_{k=1}^N (dist_{ik}, \forall k \neq i)$ with $dist_{ik}$ being the length of the shortest path between nodes i and k . The reverse index is named *nearness*: $\eta_i = 1/f_i$, reflecting the centrality of the vertex i . A standardized nearness, called *closeness*: $\mu_i = \eta_i * (N - 1)$ ranges from zero to one, useful for cross-networks comparison.

rank	degree		strength		closeness	
	country	(score)	country	(score)	country	(score)
1	USA	(164)	ESP	(6624)	USA	(0.988)
2	ITA	(163)	DEU	(6306)	ITA	(0.982)
3	ESP	(163)	USA	(6291)	ESP	(0.982)
4	GBR	(162)	GBR	(6179)	GBR	(0.976)
5	BEL	(161)	ITA	(5823)	DEU	(0.971)
...
163	RWA	(15)	RWA	(15)	RWA	(0.522)
164	CUB	(7)	CUB	(7)	CUB	(0.511)
165	SDN	(7)	SDN	(7)	SDN	(0.508)
166	VCI	(6)	VCI	(6)	VCI	(0.506)
167	SOM	(4)	SOM	(4)	SOM	(0.505)
Set of countries	average degree		average strength		average closeness	
Overall	120.8		1282.7		0.808	
Bordering countries	161		5382		0.9708	
OECD countries	153		3440.6		0.9307	
BRICS countries	158.6		3863.8		0.9574	
Correlation	degree		strength		closeness	
degree	1					
strength	0.6632		1			
closeness	0.9832		0.7549		1	
log (dist)	-0.2644		-0.4712		-0.3165	
log (GDPpc)	0.3770		0.6194		0.4348	

Table 4.1 – Centrality measures

Table (4.1) displays the centrality scores of most and least central nodes. We observe a somehow similar ranking of most central countries whatever the centrality index used is. On the top of the ranking we observe the USA and France’s neighbouring European countries, although their respective rank vary a little depending on each index. The differences between these centrality measures does not lie much in the country rank, but rather in the respective centrality score. The strength ranking displays greater variability in scores rather than the two others. Comparing the average centrality of

9. Also known as Freeman (1979) centralization index. The degree centralization index is computed as: $C_D = \frac{\sum_{i=1}^N [k_{max} - k_i]}{(N-1)(N-2)}$. Similarly we built a strength centralization index, see Appendix 4.B for C_S details

some countries groups shows that OECD members, neighbouring countries, and the BRICS countries (Brazil, Russia, India, China and South Africa) display higher centrality than global average, with neighbouring countries being the most central according to each of the three indexes. It's worth noting that BRICS countries display a higher average centrality than OECD members, however when considering only the top five OECD countries, the reverse order is observed.

Two vertices correlation

First-order metrics are useful to describe the structure of the network, highlighting central versus peripheral nodes. However, they tell very little about network construction. Second order metrics give information on the interaction between nodes, and linkages preferences, describing therefore building network strategies. The first index computed is the average nearest neighbor degree (ANND), corresponding to the mean degree of direct neighbors. The correlation between a node's degree and the average degree of its neighbors reveals whether vertices of the network tend to link to similar nodes (*assortative* pattern), or to different nodes (*disassortative* pattern).

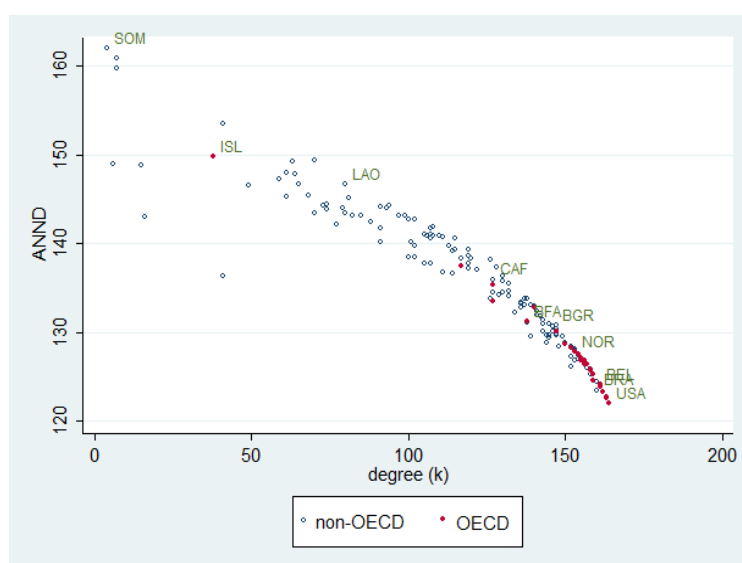


Figure 4.5 – Degree assortativity

In 2011, the international affiliates' network of French multinationals displays a highly negative assortativity coefficient of -0.9427 , defined as the Pearson correlation coefficient between each node's degree and its average direct neighbor degree. It implies that highly connected vertices tend to connect to poorly ones. More precisely, peripheral destinations are more frequently associated to hubs, rather than to other peripheral destinations. The network's degree disassortativity shows that the most central nodes are those that give access to the peripheral ones. Such disassortative pattern

also reveals integrated global value chains, with MNEs linking peripheral destinations to central economies. The degree disassortativity of the MNE network is therefore linked to the diversity of vertically integrated value chains.

In figure (4.5) we see that countries with higher degree are mainly OECD countries, as seen in table (4.1). However, the figure also reveals that those OECD countries are associated with less central countries, whereas the less central countries are in average associated with countries whose node degree is high. To account for the edges' weights, we compute the average strength of all neighbors of a node i , referred as $ANNS_i$ index. The strength-strength correlation also displays an disassortative trend, although with a coefficient of -0.5125 , the weighted disassortativity is lower than the unweighted one. This suggests that although they give more access to isolated countries, the most central nodes are more often associated to middle-central countries than to extreme peripheral countries. The scatter plot in figure (4.6) illustrates this disassortative weighted pattern of countries association, showing a lower limit of ANNS around 1.200 for the nodes with higher strength (only around 40% of the nodes have a strength above 1.200 (figure 4.4, right pannel)). By studying every linkages simultaneously, the network analysis goes beyond the traditional count flows analysis, and highlights a disassortative pattern of country linkage in FDI strategies, while focusing only on the principal associations first have tended to show that similar countries associations were preferred.



Figure 4.6 – Strength assortativity

Three vertices correlation

Correlation among three vertices can be measured by the clustering coefficient, referring to the tendency for three vertices to form a complete triangle sub-graph. The clustering coefficient of a vertex i is defined as $\gamma_i = \frac{2n_i}{k_i(k_i-1)}$ where n_i is the number of neighbor of i that are themselves connected to each other (Vázquez et al., 2002). The higher the clustering coefficient of vertex, the greater the probability that the node's neighbors are themselves directly connected. At the network level, the clustering coefficient is defined as the average of all individual γ_i 's: $\Gamma = \sum_i \gamma_i / N$. Its interpretation is not straightforward, but the coefficient can easily be compared to the clustering coefficient of a randomly drawn network of $\Gamma^{rand} = \langle k \rangle / N$. Doing so reveals that the French multinational network has a very clustered structure, with a coefficient of 0.89, versus 0.72 for a randomly drawn network of the same size and density¹⁰.

Several weighted extensions of clustering coefficient have been suggested as review Saramäki et al. (2007). We keep the Onnela et al. (2005) index of weighted clustering coefficient, defined as the geometric average of subgraph edges' weights: $\tilde{\gamma}_i = \frac{1}{k_i(k_i-1)} \sum_{j,k} (\hat{w}_{ij}\hat{w}_{jk}\hat{w}_{ik})^{1/3}$, where $\hat{w}_{ij} = w_{ij}/\max(w)$ is a normalized value of the edges' weights. This weighted clustering coefficient has some valuable features. It equals γ_i when the weights become binary and it is still bounded in $[0; 1]$. With an average of 0.0181 the weighted clustering coefficient displays much lower values than the unweighted one, because of the great variability of edges' weights within triangles. Only a very few proportion of triangles display balanced branches.

5 Directed network: Building FDI network strategies

In this section, an alternative version of the original network is built, indicating the direction in which FDIs expand. The element $a_{ij} = 1$ of the adjacency matrix indicates that the affiliate in the country j was settled after the FDI in i . The associated weight w_{ij} indicates the number of firms that went from i to j and w_{ji} the number of firms doing the reverse path. Therefore $w_{ij} \neq w_{ji} \forall \{i; j\}$, the new matrix is not symmetric, and the network is said to be directed¹¹.

10. Mean based on 10,000 random draws, computed with NWCLUSTER STATA PLUGIN (SSC)

11. Let X be the new weighted adjacency matrix, and W the initial one. We therefore have $X + X' = W$. The total link between the two countries i and j is the sum of links from i to j and from j to i . For countries that have been targeted by FDIs the same year by the same firm, I had to assume an alphabetical target order, not to drop observations from the dataset.

5.1 Reciprocity

Directed network are characterized by their degree of reciprocity, i.e. the likelihood of similar links in each direction between two nodes. A high reciprocity indicates close values between every symmetric elements w_{ij} and w_{ji} , here highlighting the absence of a preferred path between the two countries. Conversely, a low reciprocity could imply the existence of precise steps of internationalization. Specifically, the reciprocity index is computed following Squartini et al. (2013), as the ratio of the sum of reciprocated weights over total weights. The reciprocated weight noted w_{ij}^{\leftrightarrow} is simply defined as the minimum between the two weights of pair $\{ij\}$. $w_{ij}^{\leftrightarrow} = w_{ji}^{\leftrightarrow} \equiv \min\{w_{ij}; w_{ji}\}$. Let M be the total weight of the network. $M \equiv \sum_i \sum_{j \neq i} w_{ji}$, and $M^{\leftrightarrow} \equiv \sum_i \sum_{j \neq i} w_{ji}^{\leftrightarrow}$ the total reciprocated weight. The weighted reciprocity index r is defined as the share of reciprocated flows in total weights: $r \equiv \frac{M^{\leftrightarrow}}{M}$. This share equals 58.82% in the French multinationals' network in 2011. Following Squartini et al. (2013), we consider this ratio to be informative only after the comparison with a null model, i.e. a randomly drawn network of same dimension :

$$\rho \equiv \frac{r - \langle r \rangle_{NM}}{1 - \langle r \rangle_{NM}} \quad (4.1)$$

Where $\langle r \rangle_{NM}$ correspond to the average reciprocity of the null models¹². The interpretation is straightforward: when $\rho > 0$ the empirical network is more reciprocated than would be a randomly drawn network, and conversely when $\rho < 0$. The network of French MNE built displays a $\rho_{2011} = 0.3930$ (90% Confidence Interval (CI): [0.3864; 0.3994]). First of all, this result clearly rejects the hypothesis of randomly drawn networks of French MNEs, since the reciprocity coefficient displayed by the empirical network significantly differs from zero. Moreover, contrary to some intuitions that tend to see internationalization process of multinationals as a very directed path, the network analysis reveals that the ties between host countries tend to reciprocate. This highly symmetrical structure allows us to analyze the network as if it were undirected, as done in section 4 (Fagiolo, 2006)¹³. Although the undirected analysis is sufficient -and more convenient- to examine the topological structure of the network of multinationals, the directed network provides additional

12. Null models are defined as random weighted graphs with the same number of nodes, density and total weight than the observed one. In the following empirical estimation, the average is based on 10.000 randomly drawn graphs. I report a 90% confidence intervals between parenthesis corresponding to the null model reciprocity variability.

13. Fagiolo (2006) previously developed a different symmetry index to examine whether the empirical network is sufficiently symmetric to justify an undirected analysis, and found the WTW to be symmetric enough to do so (Fagiolo, 2006; Fagiolo et al., 2010). When computed, this index also supports the undirected analysis for our network, however the interpretation of the Squartini et al. (2013) index being more straightforward, I detailed only this one.

information on the steps of the network building.

5.2 Inward/outward connections and network building

Directed networks distinguish inward from outward connections. The inward degree (strength) of a node corresponds to the number of neighbors (sum of the weights of the edges) that lead to it, while the outward degree (strength) indicates the number of neighbors the node gives access to (sum of outgoing edges' weights). In our network, the inward degree gives the variety of countries that have preceded the expansion of MNEs in the observed destination. Conversely, the outward degree of the node indicates the number of countries where MNEs expand after an investment in the observed country. The ratio of inward over outward degree indicates thus whether the country has more destinations leading toward him than countries that it gives access to. Thus, the in/out ratio indicates whether the country appears upstream or downstream the internationalization strategy, the lower the ratio the earlier the stage. Unlike in/out degree ratio that indicates the relative set of opportunity given by each node, the in/out strength ratio indicates how many firms enter the country before expanding elsewhere compared to firm that did the reverse path, picturing the relative frequency of each path.

	Mean in/out degree	Mean in/out strength
Overall	1.64	2.28
Bordering countries	0.74	0.66
Non-bordering countries	1.67	2.34
OECD countries	0.82	1.00
Non-OECD countries	1.83	2.57
BRICS	0.80	1.03
Non-BRICS	1.66	2.31
UE countries	1.48	1.98
Non-UE countries	1.66	2.32

Table 4.2 – In/out degree in 2011

Table 4.2 reports the value of these ratios for various set of countries from our empirical network. The overall mean in/out degree ratio is above unity (1.64), indicating that there is more paths toward a country than from it, due to the higher number of inward flows than outward flows. At the opposite, we see that OECD countries have lower in/out degree ratio compared to non-OECD countries, and lower than one (0.82 versus 1.83 respectively). In line with this result, the in/out strength ratio is 2.6 times higher in the latter group. The pattern is even sharper for bordering countries of France. They display an in/out degree ratio of 0.74, and an even lower in/out strength ratio of 0.66, suggesting that such countries are often invested in the early stages of internationalization and then offer wide

diversification opportunities¹⁴.

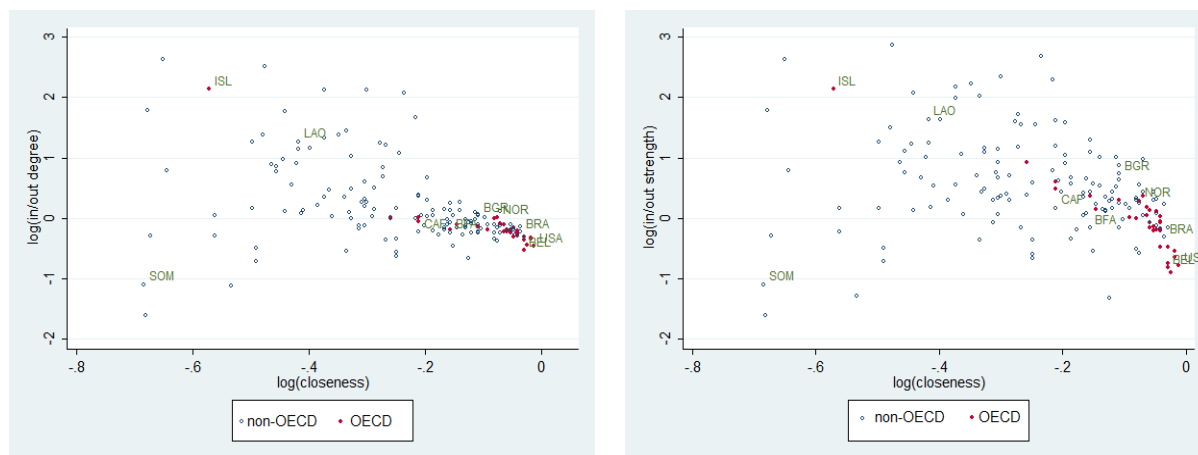


Figure 4.7 – Nodes centrality and in/out ratios

These findings are conventional enough with previous works on gradual expansion of MNEs. More surprising is the score displayed by the BRICS countries, the leading developing economies at the time. The mean in/out degree ratio of those five destinations is even slightly lower than for OECD countries, with a score of 0.80, and a weighted ratio also comparable to OECD destination (1.03 versus 1.00). However this is no longer surprising when thinking at these countries as regional hubs. Firms interested by those regions will target in priority these leading economies, and later consider further expansion in the region. They act as gateways to regional market, and therefore display high score of outward degree, which decreases their in/out ratio. Indeed, it doesn't mean that BRICS countries are targeted first, but they are followed by more further FDIs. They do not come at the end of an internationalization but rather as a prequel for deeper diversification. More generally, we observe a decreasing trend between a node's centrality index and the in/out ratios. The most central nodes appear then upstream the internationalization path, and diversification toward peripheral nodes comes afterwards (figure (4.7)¹⁵).

6 Evolution of FDI network

The global picture drawn by French multinational firms' affiliates over the world have substantially changed since 1996, with notably an increasing number of actors in this network (+167% of firms and

14. It is possible for a country to have an in/out strength ratio lower than one, meaning a lower number of firm coming in than coming out, because of the exclusions of the ties with France. The in-flows are only coming from third countries, and do not appear if the country is chosen first.

15. We use closeness as a centralization index, not to use degree or strength and generate endogeneity.

+165% of affiliates composing it). This increasing participation to MNEs network is lined up with the geographical expansion of French multinational location, with 38 newly considered host countries (+29%). This is in line with the upsurge of outward foreign direct investment evoked above, and calls for a precise analysis of the changed implied by this increasing international integration.

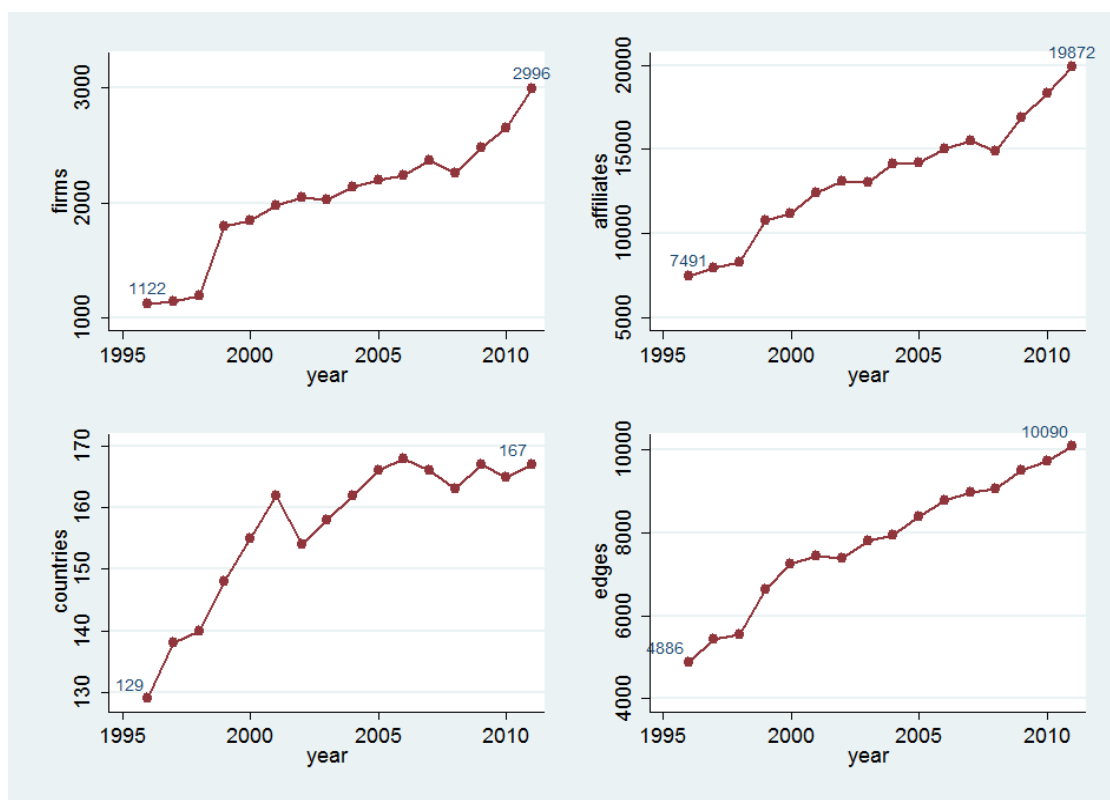


Figure 4.8 – Global properties of French MNEs network (1996-2011)

Far from reducing the network density, this increasing number of nodes has been followed by an even more important rise of edges in the network (+106%) resulting in an growing density, with almost 73% of possible countries association realized by French firms in 2011, against 59% in 1996.

6.1 First-order statistics : Connectivity

Nodes degree

The evolution of the degree and strength distribution is very instructive. The average degree has been steadily increasing since 1996 and especially since 2004 at a pace of around +3 degree a year (fig. 4.10). Moreover this increasing average is not driven by increased degree of most central nodes, but rather by a catch-up of less central ones, as indicates the difference in the distribution shape between 1996 and 2011, confirmed by the decreasing skewness and increasing kurtosis, as the distribution tend to be right-skewed. More and more affiliates countries are chosen by French firms, and these

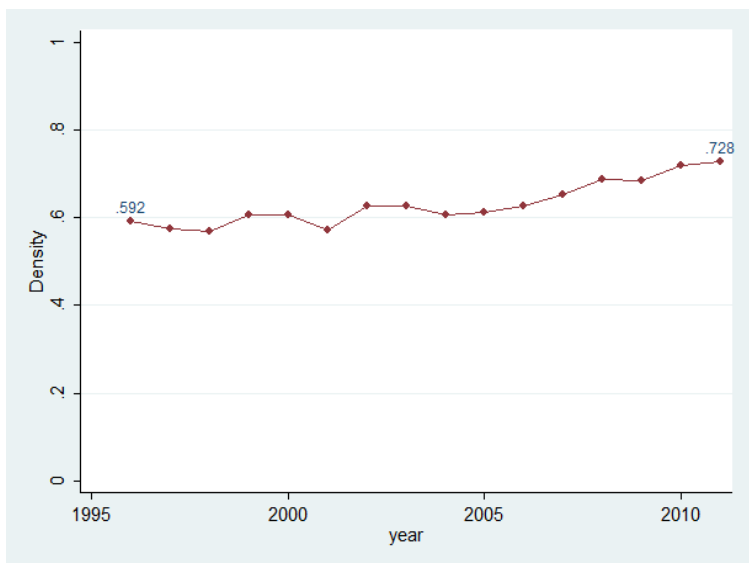


Figure 4.9 – Density evolution (1996-2011)

countries are increasingly inter-connected in the affiliates’ network, with fewer countries having few neighbours. As one could expect, the greater international integration made the countries association recently become wider than they used to be.

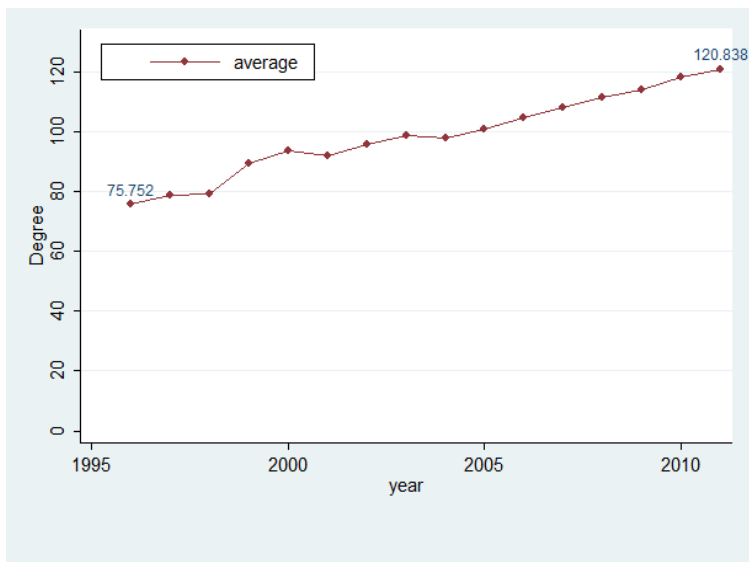


Figure 4.10 – Average node’s degree evolution (1996-2011)

Considering the *closeness* as an alternative measure of nodes centrality gives a clearer picture as this index is bounded between 0 and 1. The node’s closeness is therefore independent from the network size, contrary to the node degree. The evolution of the average closeness is somehow similar to the node’s degree one, deflated of the network size effect. The increasing average centrality of nodes is clearly supported by figure (4.12). The changing shape of the distribution of the nodes closeness

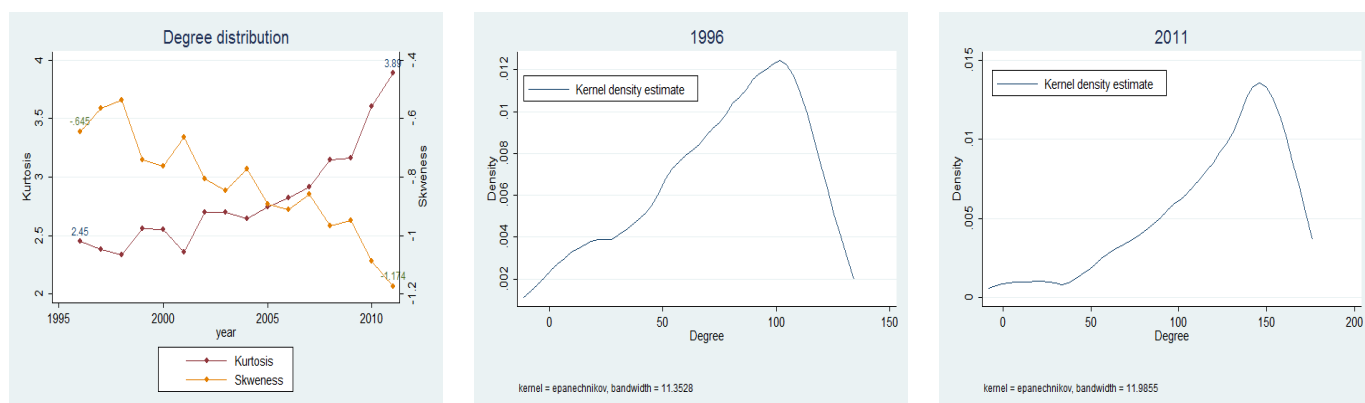


Figure 4.11 – Distribution of node's degree (1996-2011)

also confirms that the increasing average centrality of nodes is due to a catch-up of the peripheral ones, rather than an increased centrality of most central nodes (figure 4.13).

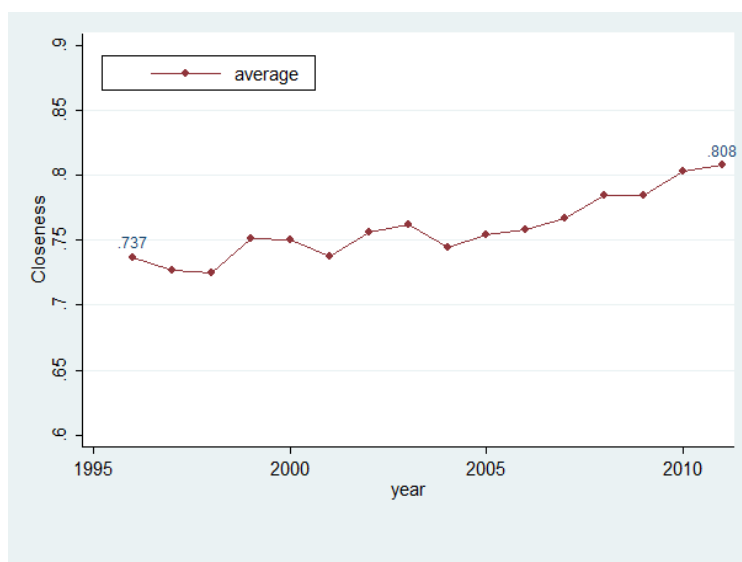


Figure 4.12 – Average node's closeness (1996-2011)

Nodes strength

The distribution of the nodes' strength however differs from the degree and closeness distributions, and appears much more unequally distributed (figures 4.14 and 4.15). Although each country offers increasing association opportunities, French FDI projects are still very concentrated in a few countries. We note also a decrease in the skewness since 2001 (remaining largely positive though, contrary to the degree distribution), implying that the distribution of nodes strength is slightly less concentrated than it used to be across countries, confirming an increasing diversification strategy in FDI projects in spite of the remaining prevalence of developed countries.

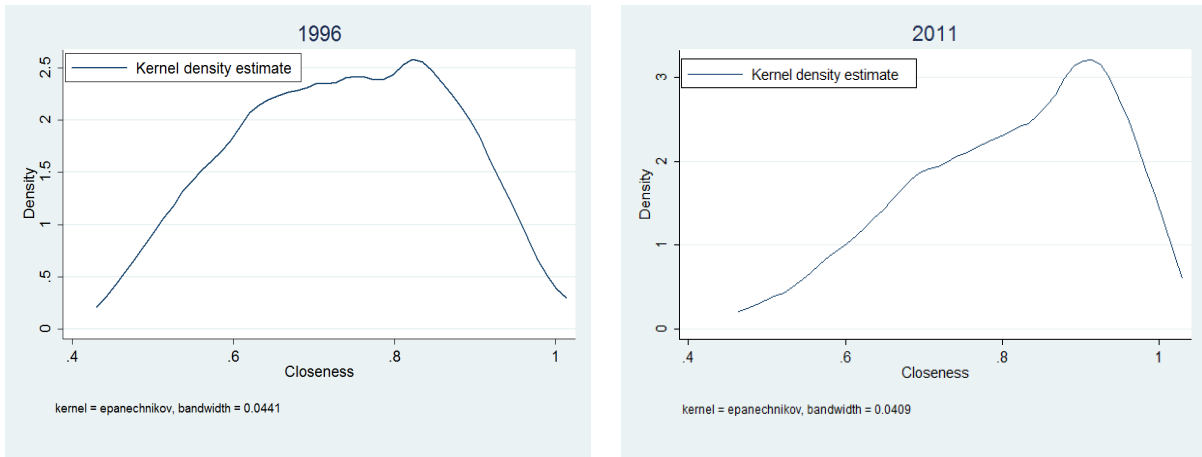


Figure 4.13 – Distribution of node’s closeness (1996-2011)

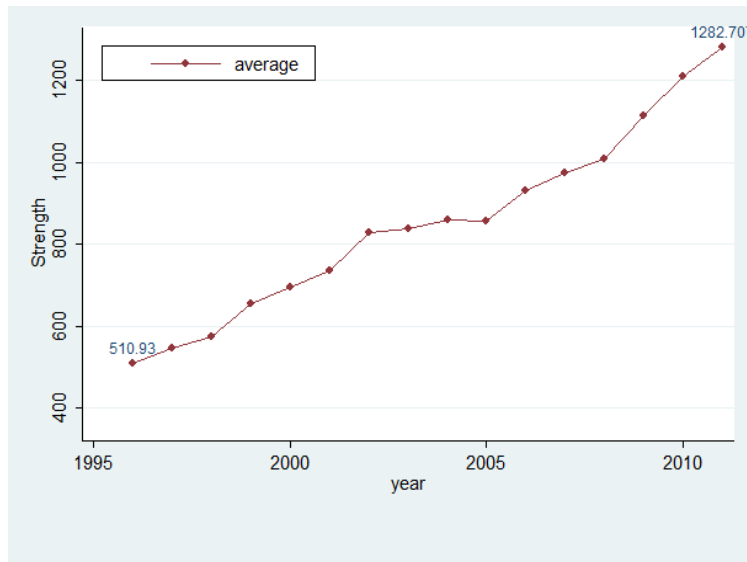


Figure 4.14 – Average Strength (1996-2011)

Other centrality measures

The repartition of a node’s strength over its various edges also matters in the network structure because it indicates among the neighbouring nodes, which ones are really important. This distribution is analyzed by an index called *disparity*, suggested by Barthelemy et al. (2003) and computed as follows : $Y_2(i) = \sum_j (w_{ij}/s_i)^2$. A higher disparity implies that the node’s strength is concentrated among few edges, whereas smaller values of Y_2 corresponds to a more fragmented flow. In figure (4.16) we notice a decreasing average Y_2 over the time span considered. However the average disparity of all nodes blurs the great dispersion of Y_2 among nodes. Focusing on the 10 more central nodes (according to strength centrality) is more meaningful. It seems logical that the more central countries display a higher Y_2 than the average, because they have more linkages on which the weight could vary.

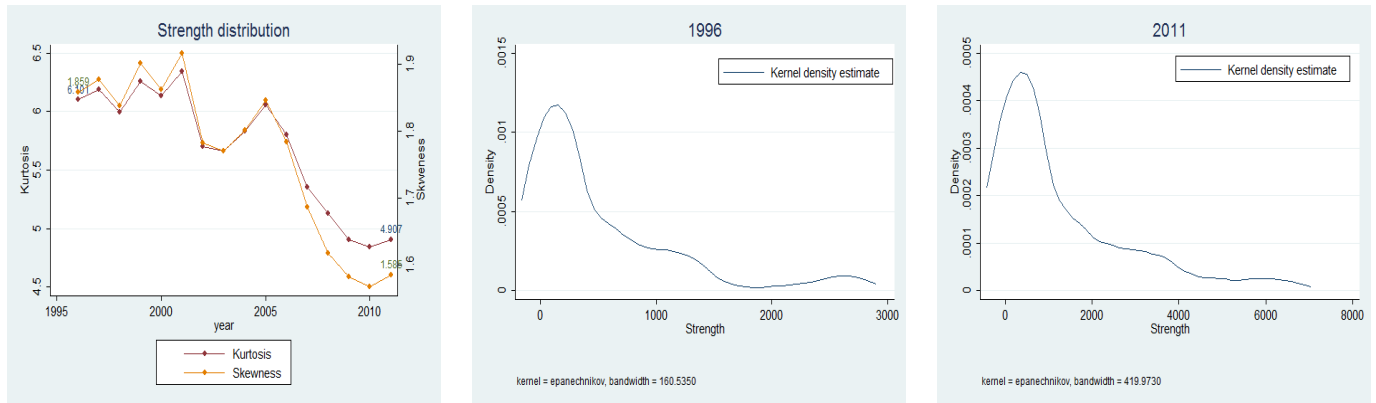
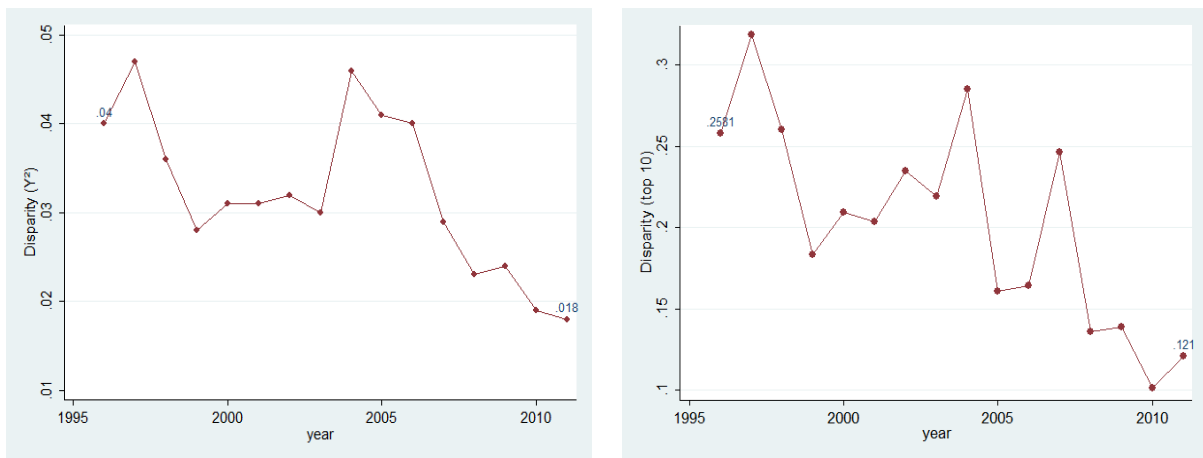


Figure 4.15 – Distribution of node’s strength (1996-2011)

However we note during that during the 1996-2011 period, even the 10 more central nodes decreased the disparity among their neighbours, suggesting that their strength is more equitably shared across their neighbors. As an illustration, Barthelemy et al. (2003) suggest that $1/Y_2$ could be used as a measure of the number of the node’s important linkages. In average, the nodes had 25 important neighbors in 1996 (or 33% of their 75 neighbors) against 55 in 2011 (or 46% of their 120 neighbors).



Left : Yearly overall average node disparity. Right : Yearly average of top ten node disparity.

Figure 4.16 – Evolution of disparity. Overall and top ten nodes (1996-2011)

6.2 Second Order : Assortativity

As a consequence of increasing average degree of nodes in the French multinationals network, the average *ANND* also increases, since it reflects the neighbor’s degree (figure 4.17). The network also highlights a high and persistent disortative pattern when looking at the unweighted structure. Indeed, *ANND* and *degree* are strongly negatively correlated (fig. 4.18). This highlights a “star” or “core-peripheral” structure in the newtork, where least connected nodes are not connected between

them, but rather connected to big hubs, lowering in turn the *ANND* of this central countries resulting in a negative correlation between the two dimensions.

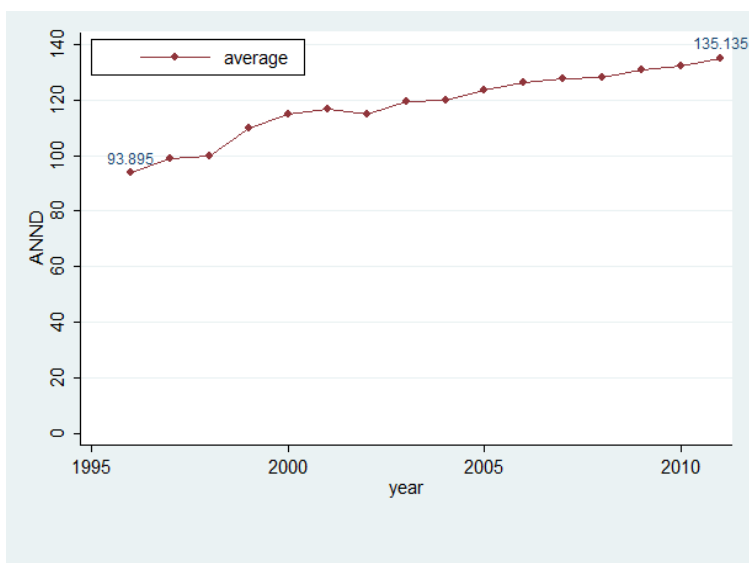


Figure 4.17 – ANND (1996-2011)

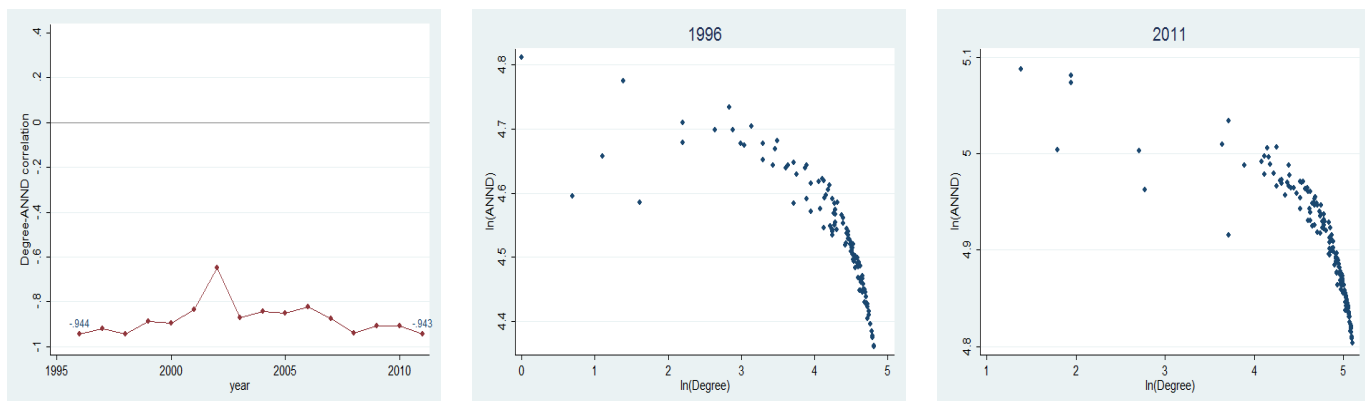


Figure 4.18 – ANND - Degree correlation (1996-2011)

The weighted average nearest neighbors degree (*WANND*) gives more importance to the node degree of neighbors with which the vertex is strongly related. At the opposite it minimizes the effect of neighbors the vertex is weakly linked with. When this weighting is done, we observe a higher increase of the average neighbors degrees than the unweighted one (figure 4.19), indicating that the node degree increased more for the most used vertices. The assortativity pattern also changes, with the U-shape characterizing the *WANND*-degree scatter plot (figure 4.20, mid and right panels). This persistent U-shape, although the increasingly dispersed cloud of points, seems to support the hypothesis that the least central nodes are highly connected with core vertexes, the latter are mostly associated with high similar high degree nodes. when weighting node degree by their frequency of

use. Moreover, the time evolution of this relationship reveals an increasingly assortative pattern with dots shifting toward the right branch of the U. This tends to show that some middle to high degree nodes, despite the overall disassortativity, are increasingly associated with central countries, themselves more and better connected.

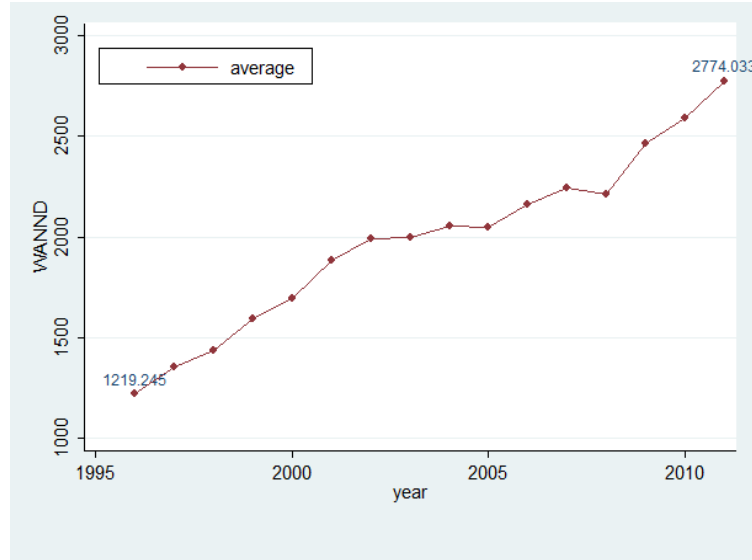


Figure 4.19 – WANNND (1996-2011)

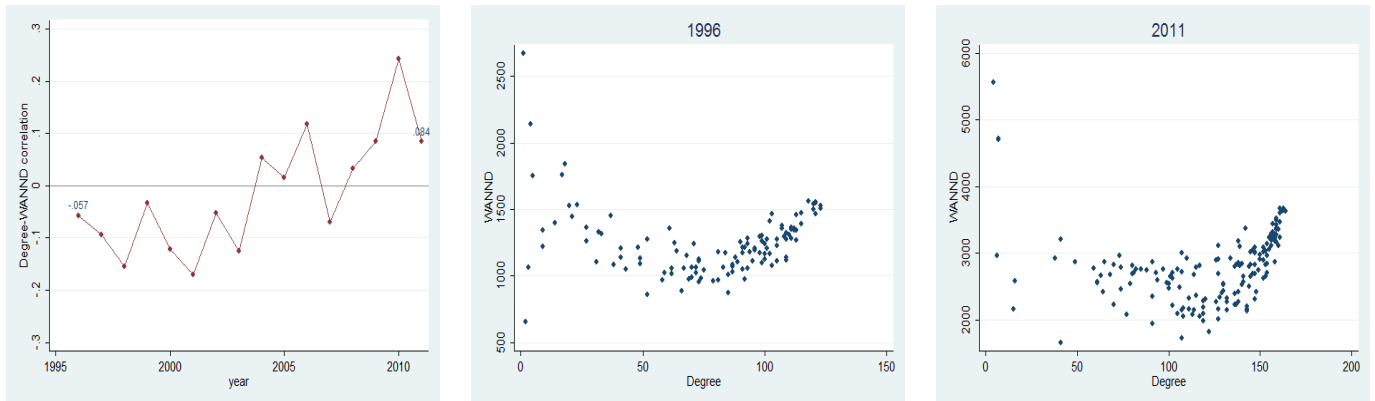


Figure 4.20 – WANNND - Degree correlation (1996-2011)

The second weighted measure of assortativity is the ANNS-strength correlation (figure 4.22). Here the disassortative pattern stands out, with scatter plot following the shape of an inverse function. Therefore, we observe that once again the disassortativity is particularly noticeable for the countries with the least strength, that are associated with high-strength countries. However when focusing only on mid and mid-to-high strength countries, the slope of the trend is very flat (fig. 4.21), and there is not much difference between the ANNS of a mid-strength country and the one of a high-strength country, particularly in 2011. This seems to support the idea that med-to-high strength countries are

associated to the same countries than are high-strength ones. However, low-strength countries are associated to central ones. This pattern doesn't change much between 1996 and 2005 (figure 4.22, left panel) in spite of the sensitive increase in average node strength and ANNS (figure 4.21).

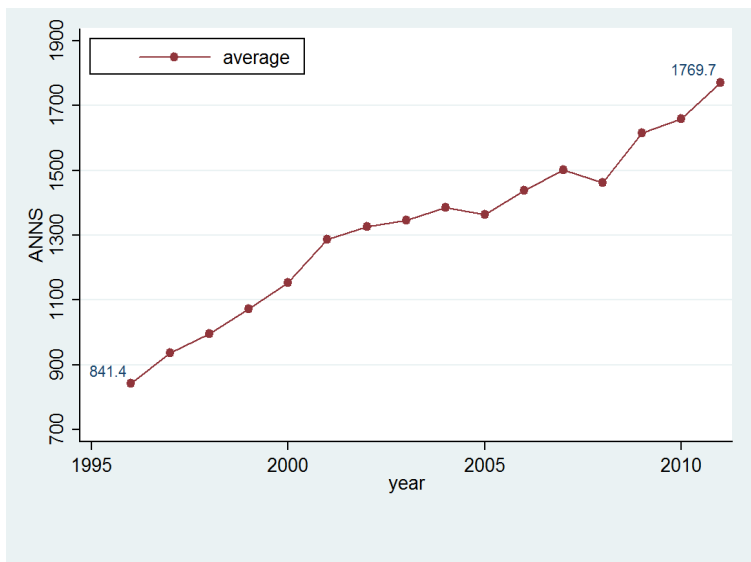


Figure 4.21 – ANNS (1996-2011)

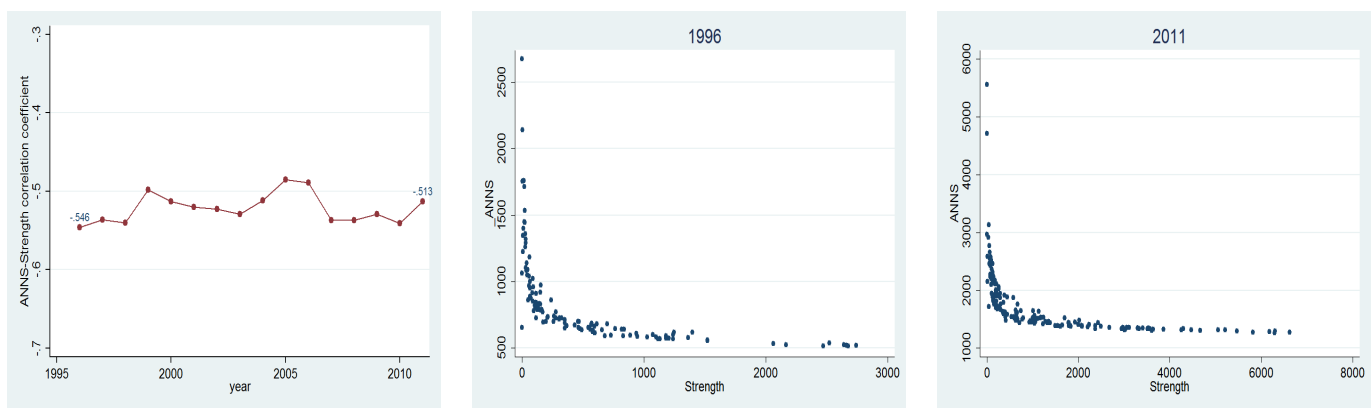


Figure 4.22 – ANNS - Strength correlation (1996-2011)

6.3 Third order : clustering

The triplets of countries that could be associated together in an internationalization strategy are forming close triangle sub-graphs; to the contrary, when two countries are never associated to a third one by any investing firms, the sub-graph remains open. The unweighted clustering coefficient reveals thus the share of closed sub-graphs among possible triplets starting from each nodes. The average clustering coefficient of the network's nodes increased slightly during the considered period, from 85.8% to 89.1% (figure 4.23, left panel), in spite of the increasing number of countries included in the

network, which has broadened exponentially the triplets possibilities.

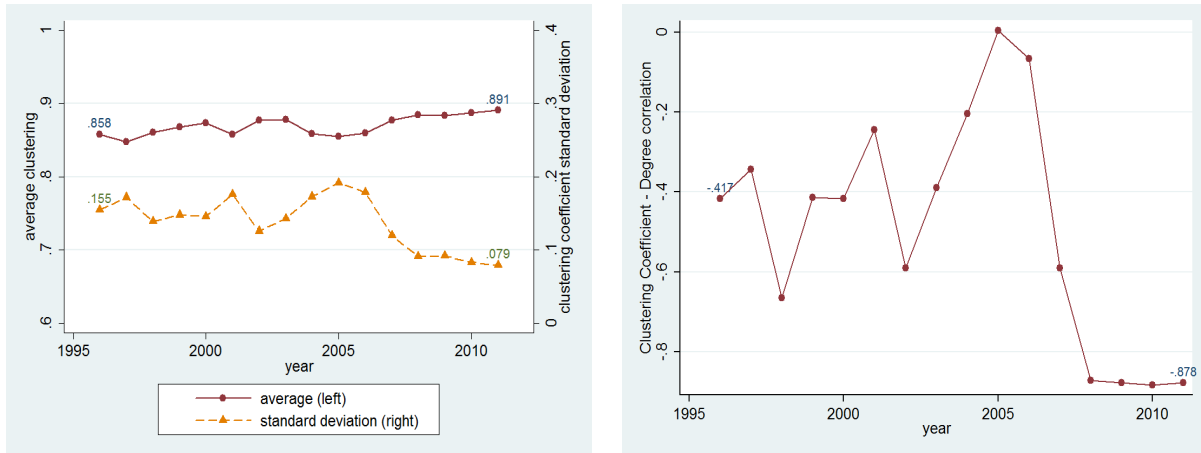


Figure 4.23 – Clustering coefficient (1996-2011)

The individual clustering coefficient is also more equally distributed among nodes since the late 2000's, with a lower the standard deviation. We note a great variability of the node degree - clustering coefficient correlation, until a large drop and a stabilization around -0.87 since 2008 (figure 4.23, right panel). The highly negative correlation coefficient indicates that the most central nodes are less clustered than the others. This also suggests that core countries in the network are associated with peripheral countries, which are not associated together by any firm. The same observation has been made for the world trade network: countries with more possible partners (high degree) are less clustered than those holding few partners (Serrano and Boguñá, 2003; Garlaschelli and Loffredo, 2005; Fagiolo et al., 2010). Nevertheless, the high increase of the correlation coefficient during the mid 2000s is surprising.

How evolved the Onnela et al. (2005) index of weighted clustering coefficient is reported in figure (4.24). Its average value is quite stable over time in our network with a low decrease, which should be attributed to the increasing number of peripheral nodes, poorly connected to other countries. The correlation between strength and the weighted clustering coefficient and strength is now highly positive, and increasing since the early 2000s. Therefore, countries with high inward FDI intensity are typically involved in highly interconnected triples. It also suggests that core countries are re-balancing their ties among their neighbors.

6.4 Directed network evolution : In/out ratios

The evolution of the yearly picture of the directed version of the network seen in section (5) indicates the French MNEs' geographical expansion. Although the internationalization process is



Figure 4.24 – Weighted clustering coefficient (1996-2011)

often seen as a very constrained path, the affiliates’ network highlights a high reciprocity, higher than a null model would do (see section 5.1). The share of reciprocated flows even increased from 57.4% in 1996 to 58.8% in 2011, which confirms the diversification of the network building strategy, especially when reminding that the number of edges increased by 20% in the meantime.

We now focus on the in/out degree and strength ratios, respectively indicating the relative further expansion opportunities given by a country, and its upstreamness in the MNE location choices (see section (5.2).

Figure 4.25 reports the values of in/out ratios for selected groups of countries from 1996 to 2011.

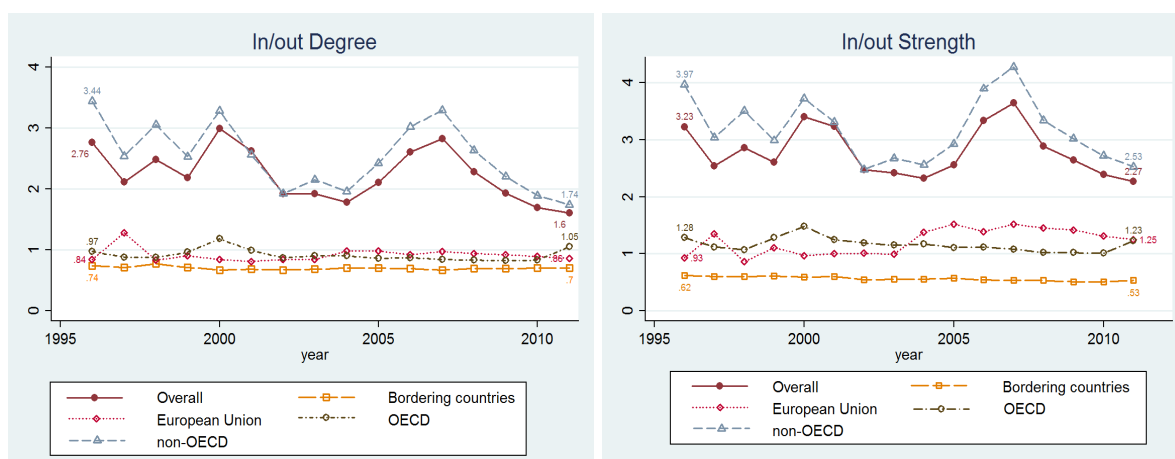


Figure 4.25 – Average in/out ratios (1996-2011)

We observe an overall decreasing trend in both average in/out ratios and in/out strength, in line with the deconcentration phenomenon analysed above, especially noticeable after 2008. This concomitance with the great trade collapse is striking enough and remains to explore. Moreover, the lower the variability of in/out ratios between countries highlights the greater international integration

of countries, which are more similarly treated by French Multinationals. Focusing on the score obtained by some subsets of countries, it is noticeable that France's bordering countries are those with the lower in/out ratios, as they often appear in upstream internationalization strategies and often represent the very first FDI. Neighboring countries are then followed by EU members or OECD members depending on the years, and the scope of each entity at that time. At last non-OECD countries display the greater in/out ratios, implying a more removed step of internationalization. Bordering countries, EU and OECD countries display ratios below the world average, while non-OECD countries average is above it. Although expected, these results give credit to the use of in/out ratio as an indication of the relative position in the internationalization path.

Almost every group has seen their in/out ratios decrease over the years. The increase for EU members ratios in 2005 could be explained by the 2004 expansion that broaden EU to ten central and eastern European countries that were quite peripheral in the MNE network, and did not account much first-time FDIs. However the increasing integration of those countries led to a decrease in the EU in/out ratios until 2011. Similarly, the arrival in 2010 of 5 new OECD member increased the in/out degree and strength ratios, that were before the expansion respectively of 0.83 and 1.01. The decreasing pace however differs greatly between the four groups of countries. With non-OECD and overall mean reducing much faster than the three other groups of core countries. Especially neighboring countries display a very flat diminution curve. This results in a reduction of the in/out ratios gap between countries, which is yet another signal of the increasing integration of the affiliates' network of French multinationals.

The individual examination of countries in/out ratios allows to see those that are increasingly integrated in the network and those that loose influence. Among the countries that gather at least 10 French FDIs, we note that the countries that have the most reduced their in/out strength ratio (i.e. slicing up the internationalization chain), are countries that have been characterized by a liberalisation of capital market and/or the integration to the European Union, with in the firsts position Bulgaria, Romania and China, closely followed by Czech Republic and Poland. This result suggests that when a country liberalizes its FDI market, not only it increases the inward FDIs but it also fosters the further linkages the MNEs will do worldwide. At the other end, countries that are decreasingly associated with further FDI are more varied, with sub-saharian African countries (Congo, Ivory Coast, Senegal), developing countries (Brazil, Thailand), and even developed countries (Germany, Korea). The reasons here are more diverse, as it could be because of an upsurge in inward FDIs in the recent years, before the outward flows to expand (e.g. Brazil), or because they do not stand as

regional gateways anymore (e.g. Germany for Eastern Europe; and Korea for Asia).

In/out Degree				In/out Strength			
Country	1996 (rank)	2011 (rank)	Delta rank	Country	1996 (rank)	2011 (rank)	Delta rank
China	1.30 (90)	0.75 (20)	70	China	2.649 (100)	0.845 (25)	+75
Tunisia	1.225 (86)	0.765 (23)	63	Hungary	2.468 (98)	0.841 (24)	+74
Czech Republic	1.092 (75)	0.771 (24)	51	Poland	1.902 (87)	0.812 (20)	+67
Poland	1.055 (71)	0.764 (22)	49	Romania	3.753 (108)	1.081 (46)	+62
Hungary	1.155 (82)	0.799 (35)	47	Czech Republic	2.247 (95)	0.939 (36)	+59
...
Canada	0.667 (13)	0.818 (43)	-30	Korea	1.08 (46)	1.358 (70)	-24
Panama	0.874 (47)	0.976 (79)	-32	Thailand	1.351 (65)	1.747 (91)	-26
Cayman Island	0.701 (18)	0.856 (53)	-35	Congo	0.355 (6)	0.975 (37)	-31
Congo	0.64 (11)	0.84 (50)	-39	Finland	1.017 (42)	1.447 (79)	-37
Norway	0.81 (34)	1.01 (83)	-49	Cayman Islands	0.691 (21)	1.42 (76)	-55

Table 4.3 – Individual countries in/out ratios

7 Firm heterogeneity and network building

One of the main advantage of relying on individual firm data is that it is very convenient to draw sub-sample networks, to illustrate how foreign affiliates location and connectivity pattern change according to the mother firms' characteristics. To illustrate this issue I divided the given network according to the firms' productivity.

7.1 Top productive and Least Productive firm networks

In this section I built two distinct networks, respectively made of the 50% top productive firm's network (TPN) and 50% least productive firm's network (LPN). Because of data availability, I had to restrict the analysis to industrial firms, the only ones I could estimate their domestic productivity via the Levinsohn and Petrin (2003) method based on EAE-industry survey data (*INSEE*). As a consequence, the sum of our LPN and TPN does not correspond to the previously studied network. Moreover, the EAE-industry dataset stopped after 2007, which will therefore be the reference year for this section. At the first glance the TPN and LPN networks cannot be compared, because they don't share the same dimension (number of countries), nor the same density (number of affiliates in it). Indeed, it is known for long that foreign investment is the prerogative of highly productive firms in the FDI versus arm's length trade trade-off (Helpman et al., 2004; Antràs and Helpman, 2004). Thus, we are not surprised to see that TPN is much denser than LPN, with a density almost twice as high in the first one (see table (4.4)). This density difference confirms the role played by the TFP in the FDI decision, just as the average length (number of countries by MNEs), four times higher in TPN than in

LPN. The TFP impact on location choice is also revealed when examining the nodes of each network. The set of countries present in both networks is mainly made of France's neighbouring countries (Germany, Great Britain, Spain, Italia, Switzerland, Belgium and Luxembourg), of other European countries (Netherland, Poland, Portugal, Austria, Hungary, Romania, Slovakia, Czech Republic), and of other leading economies (e.g. USA, China, Brazil). Top productive firms have a prerogative on 56 countries absent from LPN, whereas the reverse is true for only two countries. The countries only found in the top productive firms' network are in average more distant and less developed than the previous set, with especially all the Sub-Saharan African countries of our sample except Senegal which is included in both networks (Benin; Burkina Faso; Côte d'Ivoire; Cameroon; Congo; Gabon, Ghana; Mali, Nigeria, Togo, South Africa), some south-east Asian countries also (Philippines, Thailand, Indonesia, Cambodia, Macao, Malaysia, Singapore), and Latin America countries (Chile, Puerto Rico, Paraguay, Uruguay, Venezuela). The reverse case is almost exceptional with only two countries appearing only in LPN, but they are very marginal nodes: Malta and Costa Rica. Therefore, a brief analysis of these lists confirms the idea of a productivity-related location choice, with more productive firms having access to "tougher" markets (already discussed in chapter 3, in section 2.2).

7.2 Firm heterogeneity and network hierarchical structure

The network analysis brings original insights of the differences between the international behaviour of the two groups of multinationals. Especially, we note that both the degree and strength distributions are much more centralized in the lower productive firms network (table (4.4)). The LPN is very concentrated around its core nodes, with some peripheral nodes away from the core, and distant from each other, while in the TPN, more nodes are more equally targeted and closer to each other, illustrating the greater variety of internationalization paths deployed by the most productive firms. The top productive firms would therefore develop more original countries associations in their international networks than low productive firms will do. Looking at the node's strength disparity also supports this pattern. This strength disparity is higher for top productive firm's network. Taking the reverse of the disparity index as a proxy of the number of important neighbors each node has ((Barthelemy et al., 2003)), we note that the ten most central nodes in TPN have around eleven of important neighbours, against only two in LPN¹⁶. All this converging evidence conclude to a greater hierarchy of the LPN, and greater association liberty in the TPN.

16. This is not only due to the greater number of possible neighbours in the TPN. When reducing this analysis to the common sub-network of 29 countries shared by the TPN and the LPN, the same conclusion prevails.

	All	TPN	LPN	$\frac{TPN}{LPN}$
<i>1st order metrics</i>				
Nb. enterprises	233	116	117	0.99
Nb. affiliates	1241	1038	203	5.11
Average length	3.845	6.148	1.5812	3.89
Nodes (countries)	87	85	31	2.74
Edges	2784	2784	84	33.14
Density	0.7442	0.7798	0.1806	4.317
Average disparity \bar{Y}_2	0.024	0.025	0.203	0.123
Average disparity Top 10	0.087	0.085	0.485	0.175
Degree centralization	0.2380	0.2254	0.4126	0.546
Strength centralization	0.0531	0.0495	0.2094	0.236
Closeness centrality	0.799	0.839	0.331	2.53
<i>2nd order metrics</i>				
degree assortativity	-0.9616	-0.9617	-0.9447	1.02
strength assortativity	-0.6140	-0.6278	-0.2691	2.33
<i>3rd order metrics</i>				
average clustering	0.897	0.918	0.456	2.01
average weighted clustering	0.0570	0.0717	0.0946	0.758

Table 4.4 – Comparison of Top and Least Productive firms Networks

The degree-degree correlation is similar in TPN and LPN, both displaying a large disassortativity. In each networks, the more central nodes are connected to the poorly connected ones. However the pattern is different when considering the frequency of these connections. The strength correlation is highly disassortative in the TPN, and much less in the LPN. However, this could be due to a lower strength variability in the latter. At last, the overall clustering coefficient also shows a 34 percentage points drop in the probability that two neighbours of a node would be themselves directly linked between TPN and LPN, supporting the previous results on the pyramidal structure of LPN, and a more horizontal structure of TPN.

7.3 Firm heterogeneity and internationalization path

Similarly as in section 5, a directed version of the TPN and LPN is now studied. It shows a slightly higher reciprocity for the TPN. Squartini et al. (2013) reciprocity index evoked in section 5.1 gives $\rho_{TPN} = 0.1845$ (90%CI : [0.1673; 0.2014]) while $\rho_{LPN} = 0.1611$ (90%CI : [0.1019; 0.2058]). As the confidence intervals partially overlay, we cannot conclude on a significant difference in the weighted reciprocity of the networks.

Conversely, the in/out ratios highlight structural differences in the two networks building process. As noted above, in/out ratios determine the countries' position in the internationalization path. Reported values in table (4.5)) reveal that France's bordering countries display an in/out degree ratio below unity for LPN, whereas higher than one for TPN. The strength ratio is below unity for both networks, but still lower in LPN. Recall that the lower the strength ratio, the earlier the stage

in internationalization path. The conclusion is straightforward: lower productive firms use more bordering countries in earlier stages of internationalization than more productive firms do. The exact same observation is made with the whole European Union, which appears more in upstream stages of internationalization for lower productive firms.

Another interesting difference concerns the BRICS countries. For most productive firms, we see that they display a lower degree and strength in/out ratio than non-BRICS countries (and lower to the overall mean). The BRICS appear then in relative early stages of internationalization, although the ratios are above unity. When focusing on the LPN though, the BRICS in/out ratios both outpace two, and are much higher than the ratio displayed in average, and for the non-BRICS countries. These high ratios indicate that twice more countries are preceding an expansion in a BRICS country than preceded by a FDI in them, and there is less than one on two MNEs coming into BRICS countries that have not pushed its expansion further ever since. BRICS countries appear then downstream the internationalization path, at the very end of expansion strategies for lower productive firms, whereas upper in the path for more productive firms. Conversely, insisting on similarities between the two sets of MNEs, we note that developed countries (OECD) appear in both networks in earlier stages of internationalization than developing countries. This finding though is more conventional, and in line with the gradual internationalization pattern of MNEs.

	Top Productive firms Network		Least Productive firms Network	
	Mean in/out degree	Mean in/out strength	Mean in/out degree	Mean in/out strength
Overall	1.387	1.767	1.406	1.485
Bordering countries	1.029	0.914	0.744	0.782
Non-bordering countries	1.414	1.833	1.601	1.691
OECD countries	1.059	1.105	1.269	1.360
Non-OECD countries	1.568	2.136	1.701	1.752
BRICS	1.293	1.549	2.071	2.250
Non-BRICS	1.393	1.781	1.339	1.409
UE countries	1.013	0.982	0.696	0.761
Non-UE countries	1.482	1.967	1.737	1.823

Table 4.5 – In/out degree by productivity network

The comparison between the networks drawn by top productive firms and lower productive MNEs is instructive enough. First, it confirms previous results in the literature that insisted on the role played by TFP in the FDI decision and location choice. Then, the very network structure displays some differences, with a higher hierarchy for lower productive firms, whereas broader expansion opportunities for more productive MNEs, and less constrained path of development. Concerning this internationalization path, low productive firms appear to follow a more traditional pattern with neighbouring and European countries upstream and leading developing countries downstream. These

developing countries appear in earlier stages of internationalization of top productive MNEs as a premise of further expansion.

8 Discussion

8.1 Utility of network indexes

The various indexes we computed in this chapter are informative about the network structure.

However, they might also be further useful in more traditional econometric analysis, notably for a better understanding of location choices, as the one developed in Chapter 3.

Table 4.6 displays the result of a conditional logit model of French foreign affiliates location choices using the countries linkages profile resulting from the network analysis. The only indexes we cannot use are those based on the *strength* of the nodes, because they already the number of affiliate in the destination, and would lead to reverse causality. However, the *degree* based indexes only rely on the connectivity pattern of each country, and could be used in the CL model without any bias. We used a three order approach, with first the *degree* value of each node, corresponding to its number of “neighbours”, i.e. the countries that MNEs associate to it in their internationalization strategies. As a second order index, we used the average degree of the host countries’ nearest neighbours (*annd*). At last a third-order index is used, namely the clustering coefficient, reflecting the proportion of these neighbours to be themselves linked.

	(1)	(2)	(3)	(4)	(5)
degree	1.134 (21.88)***			1.067 (2.14)**	1.161 (10.09)***
annd		0.855 (30.99)***		0.913 (6.77)***	0.751 (2.91)***
clustering coefficient			2.345 (32.80)***	2.142 (13.20)***	1.411 (6.10)***
TFP					1.110 (3.22)***
log ₂ TFP (t-1) x					
degree					0.992 (4.65)***
annd					1.016 (1.71)*
clustering coefficient					0.843 (3.47)***
Firm-level FE	Yes	Yes	Yes	Yes	Yes
Country-level FE	No	No	No	No	No
Observations	92,626	92,626	92,626	92,626	92,626
Pseudo R ²	0.16	0.13	0.18	0.18	0.19

Odd ratios reported in first row
t-stats are in parenthesis
***, ** and * respectively significant at 1%, 5% and 10%.

Table 4.6 – Conditional Logit model

The results are instructive enough. First, they yield a similar goodness of fit than models in chapter 3, with fewer variables. Second they show that the more connect is a country, the more it attracts French foreign affiliates as shows the odd ratio above unity for the degree. Conversely, the average degree of neighbours is negatively associated with the probability to choose the host country. We explained it already: most central countries are associated with peripheral nodes, lowering their *annd*. Conversely, peripheral nodes are only linked to core countries, and therefore benefit from a high *annd*. Therefore this result confirms that multinationals prefer to invest in the central countries of the network. At last, the clustering coefficient increases the probability for the country to be chosen by French MNEs. Remind that this clustering coefficient captures the probability for the neighbours of a given node to be themselves associated. The lower it is, the more the firms investing in the country follow different internationalization path. This shows the tendency that have French firms, not only to invest in the same country (agglomeration forces), but also to replicate the countries linkages, leading to high clustering coefficient in the most frequent nodes.

The interacted estimation confirms our previous findings, with shifting preferences along with firm productivity. Most productive firms are less attracted by central nodes, as they tend to also invest in more peripheral countries, as revealed the analysis of top productive firms' network. As a consequence, they are more attracted by countries whose direct neighbours are more central than they are. Finally, They the more the firms' productivity, the less the similarity in neighbours association from one country, leading to a decrease of the clustering coefficient. This last point might seem contradictory with the separated analysis of TPN and LPN as shown in table 4.4, where TPN displayed a much higher average clustering than LPN. However, these two results are not that antagonist, because in the LPN, we only accounted for least productive firms' linkages. These firms had in average few foreign affiliates, which led to few clustering coefficient. To the contrary on the conditional logit run above, the node clustering coefficient is computed over all firms' linkages. Therefore, what we can deduce is that least productive firms invest in countries with high clustering coefficient, but these cluster are mainly made by more productive firms. This result confirm the replication strategy that follow the least productive firms.

We further detail in appendix 4.D the results of the CL model with weighted indexes of *annd* and *clustering*, and the addition of gravity variables, and country fixed effects. The main results of table 4.6 hold in all these configurations, notably when adding host-country fixed effects, while this used to turn insignificant most of traditional FDI drivers in conditional logit models as in chapter 3 and in Chen and Moore (2010). The location choice shift with TFP also seems to affect more the topological

indicators than traditional gravity variables.

8.2 Concluding remarks

Applying a network analysis to look at the web of French subsidiaries in foreign countries provides interesting insights of the building internationalization strategy of multinationals. The first-order centrality measures confirm the central role of nearby countries and leading economies in multinationals expansion. The decreasing centralization trend highlights although that French firms consider more and more peripheral countries as attractive destinations, and start building network aside from the traditional core countries. Second order metrics reveal that French firms tend to associate dissimilar countries in their FDIs, although the most frequent pairs of countries are quite similar. The principal host countries in the network are shown to offer a wider set of further expansion opportunities, and to be most associated to mid-high central nodes, while the few peripheral countries are almost systematically associated to one of the core countries in the network.

The directed network analysis shows that central countries in the network rather come in early stages of international expansion, with lower in/out degree and strength ratios, before a larger diversification. Interestingly enough some emerging economies are also shown to foster further internationalization. The empirical network of French affiliates also shows a higher reciprocity than a trivial network would do, with 58.8% of reciprocated flows among countries. The linkage preferences do not always impose a preferred path of internationalization from one country to another. The evolution of nodes' characteristics such as in/out ratios could also be used to study the changing position of countries in the global value chains.

At last this chapter provides some evidence that firm heterogeneity matters in multinationals' network building. Lower productive firms tend to follow more traditional internationalization path, resulting in a lower originality of their network pattern, and a very hierarchical network.

The network analysis suffers some limitations though. The main one could be the absence of any causality evidence, especially concerning the role of firm heterogeneity in network structure, despite many consistent results. We brought a few evidence on the role of the countries' position into the network into the location choice of heterogeneous firms, but a wider dedicated research would be welcome. Particularly, further research should disentangle the effect of firm productivity and network density in the degree distribution, through dedicated analysis using matching methods for instance. The influence of network structure on economic flows and especially foreign direct

investments location choice could also be precised, by including some network metrics into more traditional “gravity models” of location choice, as chapter three previously reveals the role of trade network indexes into FDI location choices.

Appendix

4.A Full table

	1996	1997	1998	1999	2000	2001	2002	2003	2004
<i>1st order metrics</i>									
Number of firms	1122	1145	1191	1795	1843	1975	2049	2023	2137
Number of affiliates	7491	7971	8297	10764	11175	12396	13073	13038	14136
Number of nodes	129	138	140	148	155	162	154	158	162
Number of edges	4886	5428	5534	6619	7242	7449	7373	7792	7935
Density	0.5918	0.5742	0.5688	0.6085	0.6068	0.5712	0.6258	0.6282	0.6084
Average disparity \bar{Y}_2	0.04019	0.04714	0.03616	0.02784	0.03056	0.030562	0.03173	0.03027	0.04618
\bar{Y}_2 Top 10 nodes	0.25810	0.31824	0.25989	0.18336	0.20914	0.20349	0.23464	0.21912	0.2852
Degree centralization	0.37493	0.39502	0.39370	0.3555	0.3588	0.37756	0.35922	0.35718	0.35241
Strength centralization	0.03404	0.03384	0.03302	0.03158	0.03032	0.03023	0.02964	0.02855	0.028212
closeness centrality									
<i>2nd order metrics</i>									
degree assortativity	-0.9437	-0.9217	-0.9458	-0.8878	-0.8966	-0.8352	-0.6495	-0.8704	-0.8447
strength assortativity	-0.546	-0.536	-0.540	-0.498	-0.513	-0.520	-0.523	-0.529	-0.512
<i>3rd order metrics</i>									
average clustering	0.8583	0.8485	0.8607	0.8683	0.8740	0.8579	0.8767	0.8779	0.8590

	2005	2006	2007	2008	2009	2010	2011	1996-2011 (% change)
<i>1st order metrics</i>								
Number of firms	2202	2236	2366	2264	2483	2649	2996	+36.0%
Number of affiliates	14202	15002	15516	14872	16904	18351	19872	+39.9%
Number of nodes	166	168	166	163	167	165	167	+0.60%
Number of edges	8380	8781	8963	9066	9514	9733	10090	+20.4%
Density	0.6119	0.6259	0.6545	0.6866	0.6864	0.7194	0.7279	+23.0%
Average disparity \bar{Y}_2	0.041	0.040	0.029	0.023	0.024	0.019	0.018	-56.1%
\bar{Y}_2 Top 10 nodes	0.161	0.164	0.246	0.136	0.139	0.101	0.121	-24.8%
Degree centralization	0.331	0.336	0.344	0.311	0.299	0.265	0.263	-20.5%
Strength centralization	0.0379	0.0336	0.0335	0.0334	0.0289	0.0272	0.0258	-31.9%
closeness centrality	0.7178	0.7330	0.767	0.7847	0.7845	0.8032	0.808	+12.6%
<i>2nd order metrics</i>								
degree assortativity	-0.8503	-0.8237	-0.8740	-0.9387	-0.9097	-0.9091	-0.9427	-10.9%
strength assortativity	-0.485	-0.489	-0.537	-0.537	-0.529	-0.541	-0.513	+6.4%
<i>3rd order metrics</i>								
average clustering	0.855	0.859	0.877	0.885	0.884	0.888	0.891	+4.2%

Table 4.A.1 – MNE network characteristics over the years

4.B Strength centralization index

Based on the Freeman (1979) definition of centralization, each centrality measure can have its own centralization index. Although the most commonly used is the degree centralization index, it is not properly adequate to study centralization of weighted network. I found no commonly accepted metrics for what I call “strength centralization”, I therefore constructed my own index following Freeman (1979) methodology :

Let C_i be a centrality measure of the node i (i.e. either degree, or in what follows, strength), and C_{i^*} the maximum value of C_i in the network. The Freeman centralization index corresponds to

$$F_C = \frac{\sum_i^N [C_{i^*} - C_i]}{\max \sum_i^N [C_{i^*} - C_i]} \quad (4.2)$$

In reference (Freeman, 1979), $\max \sum_i^N [C_{i^*} - C_i]$ corresponds to the maximum possible sum of differences in point centrality for a graph of n points. We broaden this definition assuming it to be the maximum possible sum of differences in point centrality for a network of same dimensions (number of nodes and total weights).

Noting s_i the strength of node i defined as the sum of the weights of its edges $s_i = \sum w_{ij}$, we have the strength centralization index by the formula :

$$F_s = \frac{\sum_i^N [s_{i^*} - s_i]}{\max \sum_i^N [s_{i^*} - s_i]} \quad (4.3)$$

We now try to determine the maximum sum of differences in the denominator. It is simple enough to see that the maximum possible value of s_{i^*} is the sum of the total weights $\sum_i \sum_j w_{ij} = W$ corresponding to a graph where all edges are linked to one central node (and only it, e.g. the “star graph”). In the extreme case all other nodes will have the lower strength possible $\min(s_i)$, such that the difference will be $W - \min(s_i)$ for each of the $n - 1$ comparisons, thus the difference sum will be

$$(W - \min(s_i))(n - 1)$$

As I said, the maximum possible sum of differences is reached for a star graph, where all weights are equal. In this case a node strength is only a proportional factor of its degree k , such that $s_i = \min(s_i) * k$, and both degree and strength centralization indexes are equal to one.

The opposite extreme case consists in a perfectly decentralized graph, such as a “circle graph” where all nodes are linked to two neighbours and each edges’ weight the same (normalized to one). In this case, $s_{i^*} = s_i \quad \forall i \Rightarrow \sum_i^N [s_{i^*} - s_i] = 0$, the centralization index is therefore null.

Therefore, we propose the following adaptation of Freeman index for the strength centralization:

$$F_s = \frac{\sum_i^N [s_{i^*} - s_i]}{(W - \min(s_i))(n - 1)} \quad (4.4)$$

F_s has two appreciable properties: first is bounded between zero and one, the higher implying the greater strength centralization. Also, this index equals the standard degree centralization index when the graph is unweighted.

4.C Productivity sub-sample appendix

4.C.1 List of countries in both TPN and LPN (29)

Argentina; Austria; Belgium; Brazil; Canada; Switzerland; China; Czech Republic; Germany; Spain; Great Britain; Hungary; India; Italia; Korea; Libanon; Luxembourg; Marocco; Mexico; Mauritius; Netherlands; Poland; Portugal; Romania; Senegal; Slovakia; Tunisia; United States of America; Vietnam.

4.C.2 List of countries only in TPN (56)

United Arab Emirates; Australia; Benin; Burkina Faso; Bulgaria; Bahrain; Chile; Cote d'Ivoire; Cameroon; Congo; Columbia; Cyprus; Danemark; Algeria; Egypt; Finland; Gabon; Ghana; Greece; Guatemala; Croatia; Indonesia; Ireland; Iceland; Japan; Cambodia; Latvia; Macao; Madagascar; Mali; Malaysia; Nigeria; Norway; New Zealand; Oman; Panama; Peru; Philippines; Puerto Rico; Paraguay; Rusia; Saudi Arabia; Singapore; Serbia; Slovenia; Sweden; Togo; Thailand; Trinidad and Tobago; Turkey; Taiwan; Ukraine; Uruguay; Venezuela; South Africa.

4.C.3 List of countries only in LPN (2)

Costa Rica; Malta.

4.D Network metrics and location choice model

	(1)	(2)	(3)	(4)
degree	1.067 (2.14)**	1.023 (3.16)***	1.161 (10.09)***	1.082 (5.99)***
annd	0.913 (6.77)***	0.973 (2.70)***	0.751 (2.91)***	0.849 (6.80)***
clustering coefficient	2.142 (13.20)***	3.055 (1.33)	1.411 (6.10)***	2.105 (2.60)***
log TFP			1.110 (3.22)***	1.234 (1.90)*
log TFP x				
degree			0.992 (4.65)***	0.996 (5.02)***
annd			1.016 (1.71)*	1.011 (6.55)***
clustering coefficient			0.843 (3.47)***	0.840 (2.89)***
Firm-level FE	Yes	Yes	Yes	Yes
Country-level FE	No	Yes	No	Yes
Observations	92,626	92,626	92,626	92,626
Pseudo R ²	0.18	0.22	0.18	0.22

Odd ratios reported in first row
t-stats are in parenthesis
***, ** and * respectively significant at 1%, 5% and 10%.

Table 4.D.1 – CL with TFP interacted network metrics

	(1)	(2)	(3)	(4)
distance	0.861 (8.10)***		0.763 (2.34)**	
GDP	1.301 (15.10)***	0.618 (2.67)***	1.324 (2.94)***	0.610 (2.38)**
degree	1.036 (11.06)***	1.039 (4.19)***	1.053 (12.87)***	1.043 (3.63)***
annd	0.942 (15.14)***	0.991 (0.79)	0.771 (7.82)***	0.813 (5.83)***
clustering coefficient	1.636 (7.07)***	4.152 (1.76)*	6.705 (7.47)***	4.426 (3.12)***
TFP			1.073 (2.08)**	1.261 (1.39)
log ₂ TFP (t-1) x				
distance			1.007 (0.70)	
GDP			0.993 (1.05)	0.988 (1.63)
degree			0.881 (6.20)***	1.022 (0.46)
annd			1.017 (6.20)***	1.016 (5.78)***
clustering coefficient			0.850 (5.45)***	0.902 (3.37)***
Firm-level FE	Yes	Yes	Yes	Yes
Country-level FE	No	No	Yes	Yes
Observations	92,626	92,626	92,626	92,626
Pseudo R ²	0.20	0.22	0.21	0.22

Odd ratios reported in first row
t-stats are in parenthesis
***, ** and * respectively significant at 1%, 5% and 10%.

Table 4.D.2 – CL with TFP interacted network and gravity metrics

Conclusion Générale

Partant du simple postulat que les entreprises multinationales constituent un groupe d'entreprises extrêmement divers, nous avons souligné à travers les quatre chapitres de cette thèse les mécanismes sous-jacents à cette complexité, en se focalisant sur les multiplicités de types d'investissements directs à l'étranger (IDE).

Loin d'être aléatoire ou chaotique, cette diversité de pratiques d'implantation à l'international répond en réalité à l'hétérogénéité des multinationales elles mêmes. Les grandes différences relevées entre entreprises multinationales, en termes de productivité totale des facteurs, mais aussi d'expérience à l'international, vont se répercuter sur tous les aspects de la stratégie d'investissement directs à l'étranger.

Ainsi cette thèse applique les enseignements des modèles de firmes hétérogènes pour étudier les différences dans les comportements des multinationales; une approche encore trop rare, mais dont les résultats sont convaincants, et fournissent une meilleure compréhension des choix internationaux des multinationales.

Une première partie de cette thèse se situe à la frontière entre l'économie internationale et la théorie des contrats pour mieux comprendre les choix d'intégration internationaux des multinationales françaises. En prolongeant les modèles d'intégration à la Grossman-Hart-Moore, nous avons montré dans le premier chapitre en quoi la productivité totale des facteurs (PTF) détermine le choix du mode d'implantation et du taux de contrôle des filiales étrangères, tout en soulignant le rôle de certaines caractéristiques du pays hôte. La principale nouveauté de notre modèle par rapport aux références de Antràs and Helpman (2004, 2008), est de souligner les différents cas où les Joint-Ventures s'avèrent des solutions optimales d'intégration pour la firme multinationale, à savoir pour les entreprises moyennement productives (pour des multinationales) dans des pays avec de bonnes institutions contractuelles; ou bien comme la meilleure forme d'intégration (devant l'intégration totale) dans des pays où le degré de contractibilité est limité, et ce pour toutes les entreprises. Cet apport

n'est pas négligeable, puisque ce choix organisationnel, choisi par plus de 40% des multinationales françaises était jusqu'alors considérée comme sous-optimal par les principaux modèles théoriques à la Grossman-Hart-Moore.

Des conclusions sensiblement similaires peuvent venir de l'élargissement des modèles de production en équipe (*team production*) à la suite de Holmstrom (1982) aux firmes hétérogènes. Bien chaque approche repose sur des inefficacités différentes (*ex-ante*, soit avant les investissements initiaux pour l'approche à la Grossman-Hart-Moore reprise par Antràs; *ex-ante* et *ex-post*, lors du suivi interne du contrat (*internal monitoring*) pour les modèles de production en équipe), les prédictions concordent en ce sens qu'il est optimal que les multinationales les plus productives aient un taux de contrôle (et de détention) de leurs filiales plus élevé que celui de leurs concurrentes moins productives. Ce taux de contrôle élevé garanti une plus grande coopération (*ex-ante* et *ex-post*) de l'entreprise la plus productive.

Cependant cette observation est à nuancer, bien qu'elle soit vérifiée au niveau mondial, et conforme avec de précédents résultats. En effet, nous mettons en évidence dans le second chapitre une limite théorique à cette prime de contrôle étranger pour les entreprises les plus productives lorsque l'environnement contractuel est dégradé au point de rendre au partenaire local des marges de manoeuvre et de négociations telles que la seule façon de l'inciter à coopérer pleinement est de lui octroyer une plus grande part au capital de l'entreprise. Ainsi dans certains environnements, la productivité de la maison mère ne joue plus qu'un rôle marginal dans le choix du mode d'entrée. En utilisant les contributions de la littérature managériale sur ces choix organisationnels, nous avançons une hypothèse complémentaire au rôle de la productivité : la capacité à se passer d'un partenaire local, acquise par l'expérience internationale s'avère cruciale dans les destinations plus incertaines. Aussi, nous dissociions la productivité domestique de l'entreprise, de la productivité des filiales à l'étranger, en supposant une transmission imparfaite de cette dernière, notamment dans le cas d'une Joint-Venture.

Basées sur un large échantillon de données de firmes, nos estimations empiriques confirment les rôles conjoints de la productivité et des expériences d'internationalisation des multinationales françaises sur le taux de contrôle de leurs filiales étrangères. Qui plus est, le rôle de la productivité se révèle essentiel dans les destinations les plus fréquentes où la qualité institutionnelle (du point de vue des investisseurs étrangers) est bonne. En revanche l'expérience est incontournable pour que les entreprises atteignent des hauts niveaux d'autonomie dans des destinations moins certaines.

Le troisième chapitre mobilise davantage des outils d'économie géographique pour étudier les choix des pays d'implantation, et à travers eux, les motifs d'internationalisation des multinationales françaises.

Contrairement à la majorité de la littérature existante sur le sujet, nous montrons que la productivité des entreprises ne leur permet pas seulement d'investir dans des pays à l'accès plus coûteux ou moins attrayant. Plus intéressant encore, les plus productives semblent en réalité développer de nouveaux motifs d'implantations, ou du moins renforcer les implantations à motif "vertical", et élaborer ainsi des stratégies plus complexes au sens de Yeaple (2003). En effet, dans l'ensemble, les choix de location traduisent une prépondérance des motifs "horizontaux", et en particulier la recherche de débouchés immédiats, bien que quelques motifs trahissent la recherche plus secondaire de gains productifs. Les choix de localisation des entreprises les plus productives sont plus diversifiés, et notamment plus orientés vers les pays du Sud. Surtout, l'analyse des données d'implantation des entreprises françaises révèle que ces entreprises les plus productives recherchent des pays situés plus en amont des chaînes de valeur internationales, et des pays dont les exportations vers la France sont essentiellement constitués de biens intermédiaires. L'émergence de ces critères de choix pour les plus productives s'accompagne d'un affaiblissement des motifs traditionnels de recherche de débouchés, approximés par le rôle du produit intérieur brut (PIB) du pays hôte dans le choix de localisation.

Nos résultats indiquent que les entreprises les plus productives réalisent plus souvent que les autres des IDE visant soit à fragmenter internationalement leur processus de production, soit à prendre le contrôle des étapes de production déjà à l'étranger et intégrer (verticalement) sa chaîne de production. En revanche, ce motif vertical ne doit pas être interprété comme la recherche du gain immédiat. Les entreprises les plus productives ne sont pas davantage attirés par de bas niveau de salaire, ou de taux d'imposition.

Parmi la littérature émergente (et restreinte) liant les déterminants des endogènes et exogènes des choix de localisation, nos résultats concordent avec le constat partagé d'une complexité croissante des IDE avec la productivité des multinationales. Comme d'autres, nous réfutons l'hypothèse que les moins productives investissent davantage les pays du Sud pour profiter de moindres coûts.

En outre, il est délicat d'isoler le rôle de la productivité totale des facteurs, notamment de celui des précédentes étapes d'internationalisation, notamment lorsqu'il est question d'ordonnement des préférences à l'étranger. Nos résultats sur cette question semblent indiquer que l'expérience se traduit davantage par une entrée plus fréquente dans des destinations plus "difficiles" (*tougher*). Quand la

productivité seule tendrait à favoriser l'intégration verticale et la fragmentation internationale de la production.

Enfin, soulignons la complexité des stratégies d'IDE, où tous les aspects sont liés, puisque l'augmentation de la "verticalité" des IDE avec la productivité est plus marquée parmi les joint-ventures, que parmi les filiales contrôlées entièrement par la multinationale.

Un objectif secondaire de cette thèse était de renouveler les approches théoriques et empiriques couramment utilisées en économie internationale. La principale nouveauté sur le plan théorique a été l'utilisation dans le chapitre 2, de modèles réduits à la Mrázová and Neary (2012), pour étudier les effets de sélection, et introduire ainsi plus facilement une seconde dimension à l'hétérogénéité des firmes, là où l'aspect mondial des firmes multinationales nous pousse à explorer d'autres différences que celles en productivité domestique.

Sur le plan empirique, la principale innovation porte sur l'utilisation, dans le chapitre 4, de l'analyse de réseaux pour décrire de manière plus précise l'implantation internationale des firmes françaises. Les multinationales se prête aisément à une analyse de réseaux de leurs filiales à l'étranger. Surtout cette approche apporte un grand nombre d'indicateurs précis qui permettent de mieux comprendre la structure de ce réseau, et d'analyser les choix de localisation de manière inter-dépendante, quand les approches plus traditionnelles comme dans le chapitre 3 se focalisent sur les choix pris individuellement.

Ces indicateurs se présentent à trois niveaux: (i) pour chaque pays hôte, révélant son importance pour les multinationales françaises et la manière dont il est associé aux autres pays. La façon dont les multinationales présentes dans un pays poursuivent leur implantation à l'international se répercute dans certains de ces indicateurs qui semblent être de bon prédicteurs des politiques d'ouverture des pays aux capitaux étrangers. (ii) au niveau des liens entre les pays d'implantations, caractérisant ainsi les principales associations entre pays. (iii) Au niveau du réseau dans son ensemble, informant sur la concentration ou la densité du réseau d'implantation pris dans sa globalité.

Un des résultats principaux de ce chapitre est la mise en évidence d'une forte déconcentration des implantations françaises à l'étranger depuis la fin des années 1990, avec l'émergence de nouvelles destinations et une moindre importance de l'Europe de l'Ouest et des États-Unis, en fréquence d'implantation, mais également dans la centralité de leurs implantation. Les entreprises françaises associent de plus en plus directement des pays "périphériques", sans passer par ces pays centraux.

Le second résultat principal de cette analyse novatrice, tient dans le lien que nous soulignons

entre cette décentralisation et l'hétérogénéité des firmes. Plus précisément, ce sont les multinationales parmi les plus productives qui ont initié cette tendance, tandis que les moins productives s'organisent toujours internationalement autour de réseaux très hiérarchisés, dans des destinations plus centrales et moins variées. Des conclusions évidentes peuvent alors être tirées sur les conséquences respectives des marges intensives et extensives de l'internationalisation des entreprises françaises sur la structuration de ce réseau, et par là, sur les flux attendus.

Une comparaison plus poussée de la structure du réseau d'implantation international avec celui des flux commerciaux internationaux, comme rapportés par De Benedictis et al. (2014) consisterait un développement intéressant de ce travail. La superposition des deux réseaux pouvant indiquer la propension des filiales à commercer entre elles.

Les travaux préalables aux nôtres soulignaient essentiellement que le nombre d'IDE (voire surtout la capacité à en entreprendre un) dépendaient de la productivité des entreprises. Cette thèse souligne que le rôle de l'hétérogénéité des firmes joue un rôle bien plus vaste sur les stratégies d'internationalisation des multinationales, à travers le choix de la structure organisationnelle des filiales ouvertes, le motif d'internationalisation et l'organisation internationale du réseau d'implantation.

De plus, chaque aspect semble lié aux autres, et tous indiquent une complexité croissante des stratégies d'intégration et d'implantation à l'international avec la productivité de la maison mère.

Un aspect complémentaire aux stratégies d'implantation à l'international étudiées porte sur le commerce intra-firme, qui relie ainsi les questions d'intégration verticale des multinationales et le cadre du commerce international dans lequel ces recherches s'inscrivent. Malheureusement, mis à part l'enquête du SESSI de 1999, qui distingue les modes de *sourcing* des (grandes) entreprises, aucune autre donnée de commerce intra-firme n'existe pour les entreprises. Or ces données ont déjà été utilisées par Defever and Toubal (2013) pour examiner le rôle de la PTF dans ces choix¹⁷. Il serait plus intéressant alors de regarder cette question en utilisant les données plus complètes (et plus récentes) du *Bureau of Economic Analysis* Américain, ou du *Survey on Overseas Business Activities*, du ministère Japonais de l'économie, du commerce, et de l'industrie (METI). A notre connaissance, seuls ces deux pays fournissent des données annuelles détaillant les ventes de filiales à l'étranger¹⁸.

17. Leurs résultats contredisent cependant en partie les prédictions de Antràs and Helpman (2004), puisqu'ils trouvent que les plus productives ont (relativement) moins recours au *sourcing* intra-firme (intégré verticalement) que les moins productives. Distinguer entre JV et WOS dans leur analyse permettrait peut-être de rapprocher leurs résultats de ceux de Antràs and Helpman (2004), car l'exclusion des JV, augmentera le niveau de productivité des multinationales sourceant leurs biens intermédiaires depuis leurs filiales étrangères.

18. Une enquête similaire existe pour Taïwan pour l'année 2007, notamment utilisée par Liu and Nunnenkamp (2011)

De telles données, gagneraient certainement être également étudié à travers une analyse de réseaux pour mieux comprendre la structuration des chaînes de valeurs mondiale et le positionnement des entreprises multinationales. Cette question représente certainement l'un prolongements les plus immédiats et les plus intéressants aux résultats que nous avons apportés, permettant une vision plus claire et une meilleure compréhension des mécanismes sous-jacents aux choix d'investissements directs à l'étranger des multinationales, ainsi qu'à la structure du commerce international, à laquelle nous souhaiterions encore contribuer.

Bibliography

- Acemoglu, D., Antràs, P., and Helpman, E. Contracts and technology adoption. *The American economic review*, 97(3):916–943, 2007.
- Aghion, P. and Holden, R. Incomplete contracts and the theory of the firm: What have we learned over the past 25 years? *Journal of Economic Perspectives*, 25(2):181–97, June 2011.
- Ai, C. and Norton, E. C. Interaction terms in logit and probit models. *Economics Letters*, 80(1):123–129, 2003.
- Akamatsu, K. A historical pattern of economic growth in developing countries. *The Developing Economies*, 1(s1):3–25, 1962.
- Albornoz, F., Calvo Pardo, H. F., Corcos, G., and Ornelas, E. Sequential exporting. *Journal of International Economics*, 88(1):17–31, 2012.
- Alfaro, L. and Chen, M. X. Transportation Cost and the Geography of Foreign Investment. Harvard Business School Working Papers 17-061, Harvard Business School, January 2017.
- Amador, J. and Cabral, S. Global value chains: A survey of drivers and measures. *Journal of Economic Surveys*, 30(2):278–301, 2016.
- Anand, B. N. and Khanna, T. Do firms learn to create value? the case of alliances. *Strategic management journal*, 21(3):295–315, 2000.
- Antràs, P. Firms, contracts, and trade structure. *The Quarterly Journal of Economics*, 118(4):1375–1418, 2003.
- Antràs, P. Grossman–hart (1986) goes global: Incomplete contracts, property rights, and the international organization of production. *Journal of Law, Economics, and Organization*, 30(suppl 1):i118–i175, 2014.
- Antras, P. *Global Production: Firms, Contracts, and Trade Structure*. Princeton University Press, 2015.
- Antràs, P. and de Gortari, A. On the geography of global value chains. Working paper, Harvard University and NBER, In Preparation.
- Antràs, P. and Helpman, E. Global sourcing. *Journal of Political Economy*, 112(3):552–580, 2004.
- Antràs, P. and Helpman, E. Contractual frictions and global sourcing. In Helpman, E., Verdier, T., and Marin, D., editors, *The Organization of Firms in a Global Economy*, pages 9–54. Harvard University Press, Cambridge, MA, 2008.
- Asiedu, E. and Esfahani, H. S. Ownership structure in foreign direct investment projects. *Review of Economics and Statistics*, 83(4):647–662, 2001.
- Atalay, E., Hortaçsu, A., and Syverson, C. Vertical integration and input flows. *American Economic Review*, 104(4):1120–48, April 2014.
- Aw, B. Y. and Lee, Y. Firm heterogeneity and location choice of taiwanese multinationals. *Journal of International Economics*, 75(1):167–179, May 2008.
- Bai, C.-E., Tao, Z., and Wu, C. Revenue sharing and control rights in team production: Theories and evidence from joint ventures. *RAND Journal of Economics*, pages 277–305, 2004.
- Baldwin, R. and Venables, A. J. Spiders and snakes: offshoring and agglomeration in the global economy. *Journal of International Economics*, 90(2):245–254, 2013.

BIBLIOGRAPHY

- Barba Navaretti, G., Castellani, D., Disdier, A.-C., et al. How does investing in cheap labour countries affect performance at home? france and italy. Working paper, CEPR Discussion Papers, 2006.
- Barrat, A., Barthelemy, M., Pastor-Satorras, R., and Vespignani, A. The architecture of complex weighted networks. *Proceedings of the National Academy of Sciences of the United States of America*, 101(11):3747–3752, 2004.
- Barthelemy, M., Gondran, B., and Guichard, E. Spatial structure of the internet traffic. *Physica A: statistical mechanics and its applications*, 319:633–642, 2003.
- Baskaran, T., Blöchl, F., Brück, T., and Theis, F. J. The heckscher–ohlin model and the network structure of international trade. *International Review of Economics & Finance*, 20(2):135–145, 2011.
- Beamish, P. *Multinational Joint Ventures in Developing Countries (RLE International Business)*. Routledge, November 2012.
- Becker, S. O., Ekholm, K., Jäckle, R., and Muendler, M.-A. Location choice and employment decisions: A comparison of german and swedish multinationals. *Review of World Economics*, 141(4): 693–731, December 2005.
- Bellak, C., Leibrecht, M., and Riedl, A. Labour costs and FDI flows into central and eastern european countries: A survey of the literature and empirical evidence. *Structural Change and Economic Dynamics*, 19(1):17–37, 2008.
- Berlingieri, G., Blanchenay, P., and Criscuolo, C. The great divergence(s). Working Paper 39, OECD, May 2017.
- Bernard, A. B., Eaton, J., Jensen, J. B., and Kortum, S. Plants and productivity in international trade. *The American Economic Review*, 93(4):1268–1290, 2003.
- Blonigen, B. A. A review of the empirical literature on FDI determinants. *Atlantic Economic Journal*, 33(4):383–403, 2005.
- Blonigen, B. A. and Piger, J. Determinants of foreign direct investment. *Canadian Journal of Economics/Revue canadienne d'économique*, 47(3):775–812, 2014.
- Bolatto, S., Naghavi, A., Ottaviano, G., and Kejzar, K. Z. Intangible Assets and the Organization of Global Supply Chains. Working Papers wp1105, Dipartimento Scienze Economiche, Università di Bologna, August 2017.
- Brainard, S. L. A simple theory of multinational corporations and trade with a trade-off between proximity and concentration. Working Paper 4269, National Bureau of Economic Research, 1993.
- Brainard, S. L. An empirical assessment of the proximity-concentration trade-off between multinational sales and trade. *American Economic Review*, 87(4):520–544, September 1997.
- Brouthers, K. D. and Brouthers, L. E. Explaining the national cultural distance paradox. *Journal of International Business Studies*, 32(1):177–189, 2001.
- Brouthers, K. D. and Hennart, J.-F. Boundaries of the firm: Insights from international entry mode research. *Journal of Management*, 33(3):395–425, 2007.
- Brouthers, K. D. and Nakos, G. Sme entry mode choice and performance: A transaction cost perspective. *Entrepreneurship Theory and Practice*, 28(3):229–247, 2004.
- Buis, M. L. Stata tip 87: Interpretation of interactions in non-linear models. *The Stata Journal*, 10(2):305–308, 2010.

- Cai, H. A theory of joint asset ownership. *Rand Journal of Economics*, 34(1):63–77, 2003.
- Calof, J. L. The relationship between firm size and export behavior revisited. *Journal of International Business Studies*, 25(2):367–387, 1994.
- Carlton, D. W. The location and employment choices of new firms: an econometric model with discrete and continuous endogenous variables. *The Review of Economics and Statistics*, 65(3): 440–449, 1983.
- Carlton, D. Why new firms locate where they do: An econometric model. In Wheaton, W., editor, *Interregional Movements and Regional Growth*, pages 13–30. The Urban Institute, Washington, DC, 1979.
- Carr, D. L., Markusen, J. R., and Maskus, K. E. Estimating the knowledge-capital model of the multinational enterprise. *The American Economic Review*, 91(3):693–708, 2001.
- Chandler, A. D. and Mazlish, B. *Leviathans: Multinational corporations and the new global history*. Cambridge University Press, 2005.
- Chen, M. X. and Moore, M. O. Location decision of heterogeneous multinational firms. *Journal of International Economics*, 80(2):188–199, 2010.
- Cheng, Y.-M. Asset specificity, experience, capability, host government intervention, and ownership-based entry mode strategy for smes in international markets. *International Journal of Commerce and Management*, 18(3):207–233, 2008.
- Chu, W. and Anderson, E. M. Capturing ordinal properties of categorical dependent variables: A review with application to modes of foreign entry. *International Journal of Research in Marketing*, 9(2):149–160, 1992.
- Cieřlik, A. and Ryan, M. Firm heterogeneity, foreign market entry mode and ownership choice. *Japan and the World Economy*, 21(3):213–218, 2009.
- Coase, R. H. The nature of the firm. *economica*, 4(16):386–405, 1937.
- Conconi, P., Sapir, A., and Zanardi, M. The internationalization process of firms: from exports to fdi. *Journal of International Economics*, 99:16–30, 2016.
- Corcos, G., Irac, D. M., Mion, G., and Verdier, T. The Determinants of Intrafirm Trade: Evidence from French Firms. *The Review of Economics and Statistics*, 95(3):825–838, July 2013.
- Crozet, M., Mayer, T., and Mucchielli, J.-L. How do firms agglomerate? a study of fdi in france. *Regional Science and Urban Economics*, 34(1):27–54, 2004.
- Cui, F. Incomplete contracts, joint ventures, and ownership restrictions. *Oxford Economic Papers*, 63(2):254–278, 2011.
- De Benedictis, L. and Tajoli, L. The world trade network. *The World Economy*, 34(8):1417–1454, 2011.
- De Benedictis, L., Nenci, S., Santoni, G., Tajoli, L., and Vicarelli, C. Network analysis of world trade using the baci-cepii dataset. *Global Economy Journal*, 14(3-4):287–343, 2014.
- De Maeseeneire, W. and Claey's, T. SMEs, foreign direct investment and financial constraints: The case of belgium. *International Business Review*, 21(3):408–424, June 2012.
- Defever, F. and Toubal, F. Productivity, relationship-specific inputs and the sourcing modes of multinationals. *Journal of Economic Behavior & Organization*, 94(C):345–357, 2013.

BIBLIOGRAPHY

- Delios, A. and Henisz, W. I. Japanese firms' investment strategies in emerging economies. *Academy of Management Journal*, 43(3):305–323, 2000.
- Desai, M. A., Foley, C., and Hines Jr., J. R. The costs of shared ownership: Evidence from international joint ventures. *Journal of Financial Economics*, 73(2):323–374, 2004.
- Desai, M. A., Fritz Foley, C., and Hines, J. R. Capital structure with risky foreign investment. *Journal of Financial Economics*, 88(3):534–553, June 2008.
- Dharmapala, D. and Hines, J. R. Which countries become tax havens? *Journal of Public Economics*, 93(9):1058–1068, 2009.
- Disdier, A.-C. and Mayer, T. How different is eastern europe? structure and determinants of location choices by french firms in eastern and western europe. *Journal of Comparative Economics*, 32(2):280–296, 2004.
- Dunning, J. H. Trade, location of economic activity and the mne: A search for an eclectic approach. In Ohlin, B., Hesselborn, P.-O., and Wijkman, P. M., editors, *The International Allocation of Economic Activity: Proceedings of a Nobel Symposium held at Stockholm*, pages 395–418. Palgrave Macmillan UK, London, 1977.
- Dunning, J. H. The theory of international production. *The International Trade Journal*, 3(1):21–66, 1988.
- Díez, F. J. and Spearot, A. C. Core competencies, matching and the structure of foreign direct investment. *Canadian Journal of Economics/Revue canadienne d'économique*, 47(3):813–855, 2014.
- Ekholm, K., Forslid, R., and Markusen, J. R. Export-platform foreign direct investment. *Journal of the European Economic Association*, 5(4):776–795, 2007.
- Engel, D. and Procher, V. Export, FDI and firm productivity. *Applied Economics*, 44(15):1931–1940, May 2012.
- Eppinger, P. and Kukharsky, B. Contracting institutions and firm boundaries. Working Paper 100, University of Tübingen, September 2017.
- Fagiolo, G. Directed or undirected? a new index to check for directionality of relations in socio-economic networks. *Economics Bulletin*, 3(34):1–12, 2006.
- Fagiolo, G., Reyes, J., and Schiavo, S. On the topological properties of the world trade web: A weighted network analysis. *Physica A: Statistical Mechanics and its Applications*, 387(15):3868–3873, 2008.
- Fagiolo, G., Reyes, J., and Schiavo, S. World-trade web: Topological properties, dynamics, and evolution. *Physical Review E*, 79(3):036115, 2009.
- Fagiolo, G., Reyes, J., and Schiavo, S. The evolution of the world trade web: a weighted-network analysis. *Journal of Evolutionary Economics*, 20(4):479–514, 2010.
- Filatotchev, I., Lien, Y.-C., Piesse, J., and Strange, R. FDI by firms from newly industrialised economies in emerging markets: corporate governance, entry mode and location. *Journal of International Business Studies*, 38(4):556–572, 2007.
- Filatotchev, I., Lien, Y.-c., Piesse, J., and Strange, R. Insider control and the FDI location decision: Evidence from firms investing in an emerging market. *Management International Review*, 49(4):433–454, October 2009.
- Freeman, L. C. Centrality in social networks conceptual clarification. *Social networks*, 1(3):215–239, 1979.

- Fukao, K. and Wei, Y. How do the Location Determinants of Vertical FDI and Horizontal FDI Differ? Hi-Stat Discussion Paper Series d07-233, Institute of Economic Research, Hitotsubashi University, January 2008.
- Garlaschelli, D. and Loffredo, M. I. Fitness-dependent topological properties of the world trade web. *Physical review letters*, 93(18):188701, 2004.
- Garlaschelli, D. and Loffredo, M. I. Structure and evolution of the world trade network. *Physica A: Statistical Mechanics and its Applications*, 355(1):138–144, 2005.
- Gatignon, H. and Anderson, E. Multinational corporation’s degree of control over foreign subsidiaries: An empirical test of a transaction cost explanation, the. *Journal of Law, Economics & Organization*, 4:305, 1988.
- Gattai, V. and Natale, P. A new cinderella story: Joint ventures and the property rights theory of the firm. *Journal of Economic Surveys*, 2015.
- Gazaniol, A. The location choices of multinational firms: The role of internationalisation experience and group affiliation. *The World Economy*, 2014.
- Girma, S., Görg, H., and Strobl, E. Exports, international investment, and plant performance: evidence from a non-parametric test. *Economics Letters*, 83(3):317–324, 2004.
- Greenaway, D. and Kneller, R. Firm heterogeneity, exporting and foreign direct investment. *The Economic Journal*, 117(517), 2007.
- Grossman, G. M. and Helpman, E. Integration versus outsourcing in industry equilibrium. *The Quarterly Journal of Economics*, 117(1):85–120, 2002.
- Grossman, G. M., Helpman, E., and Szeidl, A. Optimal integration strategies for the multinational firm. *Journal of International Economics*, 70(1):216–238, 2006.
- Grossman, S. J. and Hart, O. D. The costs and benefits of ownership: A theory of vertical and lateral integration. *The Journal of Political Economy*, pages 691–719, 1986.
- Guimaraes, P., Figueirido, O., and Woodward, D. A tractable approach to the firm location decision problem. *Review of Economics and Statistics*, 85(1):201–204, 2003.
- Guimaraes, P., Figueiredo, O., and Woodward, D. Industrial location modeling: Extending the random utility framework. *Journal of Regional Science*, 44(1):1–20, 2004.
- Hanson, G. H., Mataloni Jr, R. J., and Slaughter, M. J. Expansion strategies of US multinational firms. Working paper, National Bureau of Economic Research, 2001.
- Hart, O. *Firms, contracts, and financial structure*. Oxford university press, 1995.
- Hart, O. Hold-up, asset ownership, and reference points-super. *The Quarterly Journal of Economics*, 124(1):267–300, 2009.
- Hart, O. and Moore, J. Property rights and the nature of the firm. *Journal of political economy*, pages 1119–1158, 1990.
- Hart, O. and Moore, J. Incomplete contracts and ownership: Some new thoughts. *The American economic review*, 97(2):182–186, 2007.
- Hart, O. and Moore, J. Contracts as reference points. *The Quarterly journal of economics*, 123(1): 1–48, 2008.
- Hausmann, R., Hwang, J., and Rodrik, D. What you export matters. *Journal of economic growth*, 12(1):1–25, 2007.

BIBLIOGRAPHY

- Hausmann, R., Hidalgo, C. A., Bustos, S., Coscia, M., Simoes, A., and Yildirim, M. A. *The atlas of economic complexity: Mapping paths to prosperity*. Mit Press, 2014.
- Hayakawa, K. and Matsuura, T. Complex vertical FDI and firm heterogeneity: Evidence from east asia. *Journal of the Japanese and International Economies*, 25(3):273–289, September 2011.
- Hayakawa, K. and Tanaka, K. Export platform fdi and firm heterogeneity. *Journal of Monetary Economics*, 53(5):917–937, 2011.
- Hayakawa, K., Kimura, F., and Machikita, T. Firm-level analysis of globalization: A survey of the eight literatures. *ERIA-DP-2010-05*. Jakarta: ERIA, 2010.
- Hayakawa, K., Machikita, T., and Kimura, F. Globalization and productivity: A survey of firm-level analysis. *Journal of Economic Surveys*, 26(2):332–350, 2012.
- Head, K. and Mayer, T. Market Potential and the Location of Japanese Investment in the European Union. *The Review of Economics and Statistics*, 86(4):959–972, November 2004.
- Head, K. and Ries, J. Heterogeneity and the FDI versus export decision of japanese manufacturers. *Journal of the Japanese and international economies*, 17(4):448–467, 2003.
- Helpman, E. A simple theory of international trade with multinational corporations. *The journal of political economy*, pages 451–471, 1984.
- Helpman, E. Multinational corporations and trade structure. *The Review of Economic Studies*, 52(3):443–457, 1985.
- Helpman, E., Melitz, M. J., and Yeaple, S. R. Export versus FDI with heterogeneous firms. *American Economic Review*, 94(1):300–316, 2004.
- Henisz, W. J. The institutional environment for multinational investment. *Journal of Law, Economics, and Organization*, 16(2):334–364, 2000.
- Hennart, J.-F. A transaction costs theory of equity joint ventures. *Strategic management journal*, 9(4):361–374, 1988.
- Hennart, J.-F. Transaction cost theory and international business. *Journal of Retailing*, 86(3):257–269, 2010.
- Herger, N. and McCorriston, S. On discrete location choice models. *Economics Letters*, 120(2):288–291, 2013.
- Hidalgo, C. A. Disconnected, fragmented, or united? a trans-disciplinary review of network science. *Applied Network Science*, 1(1):1–19, 2016.
- Hidalgo, C. A. and Hausmann, R. The building blocks of economic complexity. *proceedings of the national academy of sciences*, 106(26):10570–10575, 2009.
- Hijzen, A., Jean, S., and Mayer, T. The effects at home of initiating production abroad: evidence from matched french firms. *Review of World Economics*, 147(3):457–483, September 2011.
- Hobbes, T. *Leviathan or The Matter, Forme and Power of a Common Wealth Ecclesiasticall and Civil*. 1651.
- Hollenstein, H. Determinants of international activities: Are SMEs different? *Small Business Economics*, 24(5):431–450, 2005.
- Holmstrom, B. Moral hazard in teams. *The Bell Journal of Economics*, pages 324–340, 1982.

- Holmstrom, B. The firm as a subeconomy. *Journal of Law, Economics, and organization*, 15(1): 74–102, 1999.
- Hyun, H.-J. and Hur, J. Who goes where and how? firme heterogeneity in the choice of FDI type and location. *Working Papers , Research Institute for Market Economy, Sogang University.*, 1105, 2011.
- Hyun, H.-J. and Hur, J. Who goes where and how? firm and country characteristics in the choice of fdi type and location. *Asian-Pacific Economic Literature*, 27(2):144–158, 2013.
- Iršová, Z. and Havránek, T. Estimating vertical spillovers from fdi: Why results vary and what the true effect is. *Journal of International Economics*, 85(2):234–244, 2011.
- Iršová, Z. and Havránek, T. Determinants of horizontal spillovers from fdi: Evidence from a large meta-analysis. *World Development*, 42:1–15, 2013.
- Javorcik, B. S. and Saggi, K. Technological Asymmetry Among Foreign Investors And Mode Of Entry. *Economic Inquiry*, 48(2):415–433, 04 2010.
- Javorcik, B. S. and Spatareanu, M. To share or not to share: Does local participation matter for spillovers from foreign direct investment? *Journal of Development Economics*, 85(1–2):194–217, 2008.
- Johanson, J. and Vahlne, J.-E. The internationalization process of the firm—a model of knowledge development and increasing foreign market commitments. *Journal of international business studies*, 8(1):23–32, 1977.
- Johanson, J. and Vahlne, J.-E. The mechanism of internationalisation. *International marketing review*, 7(4), 1990.
- Johanson, J. and Vahlne, J.-E. The uppsala internationalization process model revisited: From liability of foreignness to liability of outsidership. *Journal of International Business Studies*, 40(9): pp. 1411–1431, 2009.
- Joyez, C. Implantation internationale des PME et des ETI françaises. In *Rapport sur l'évolution des PME 2014*, pages 80–83. BPIfrance LeLab et Observatoire des PME, 2015.
- Joyez, C. On the topological structure of multinationals network. *Physica A: Statistical Mechanics and its Applications*, 473:578 – 588, 2017.
- Kleinert, J. *The role of multinational enterprises in globalization*, volume 326. Springer Science & Business Media, 2004.
- Kleinert, J. and Toubal, F. Production versus distribution-oriented fdi. *Review of World Economics*, 149(3):423–442, 2013.
- Kogut, B. Joint ventures and the option to expand and acquire. *Management science*, 37(1):19–33, 1991.
- Krugman, P. Scale economies, product differentiation, and the pattern of trade. *The American Economic Review*, 70(5):950–959, 1980.
- Krugman, P. Increasing returns, imperfect competition and the positive theory of international trade. In Grossman, G. M. and Rogoff, K., editors, *Handbook of International Economics*, volume 3, chapter 24, pages 1243–1277. Elsevier, 1 edition, 1995.
- Krugman, P. R. Increasing returns, monopolistic competition, and international trade. *Journal of international Economics*, 9(4):469–479, 1979.

BIBLIOGRAPHY

- Krugman, P. R. The new theories of international trade and the multinational enterprise. In Kindelberger, C. P., Audretsch, D., and Nelson, R. R., editors, *The Multinational Corporation in the 1980s*. MIT Press, Cambridge, MA, 1983.
- Kuo, A., Kao, M.-S., Chang, Y.-C., and Chiu, C.-F. The influence of international experience on entry mode choice: Difference between family and non-family firms. *European Management Journal*, 30(3):248–263, 2012.
- Laufs, K. and Schwens, C. Foreign market entry mode choice of small and medium-sized enterprises: A systematic review and future research agenda. *International Business Review*, 23(6):1109–1126, 2014.
- Levinsohn, J. and Petrin, A. Estimating production functions using inputs to control for unobservables. *The Review of Economic Studies*, 70(2):317–341, 2003.
- Li, P.-Y. and Meyer, K. E. Contextualizing experience effects in international business: A study of ownership strategies. *Journal of World Business*, 44(4):370–382, 2009.
- Liu, W.-H. and Nunnenkamp, P. Domestic repercussions of different types of FDI: firm-level evidence for taiwanese manufacturing. *World Development*, 39(5):808–823, May 2011.
- Louri, H., Loufir, R., and Papanastassiou, M. Foreign investment and ownership structure: an empirical analysis. *Empirica*, 29(1):31–45, 2002.
- Luger, M. I. and Shetty, S. Determinants of foreign plant start-ups in the united states: Lessons for policymakers in the southeast. *Vanderbilt Journal of Transnational Law.*, 18:223–245, 1985.
- Maekelburger, B., Schwens, C., and Kabst, R. Asset specificity and foreign market entry mode choice of small and medium-sized enterprises: The moderating influence of knowledge safeguards and institutional safeguards. *Journal of International Business Studies*, 43(5):458–476, 2012.
- Mani, S., Antia, K. D., and Rindfleisch, A. Entry mode and equity level: A multilevel examination of foreign direct investment ownership structure. *Strategic Management Journal*, 28(8):857–866, 2007.
- Markusen, J. R. Multinationals, multi-plant economies, and the gains from trade. *Journal of International Economics*, 16(3–4):205–226, 1984.
- Markusen, J. R. Trade versus investment liberalization. Working paper, National Bureau of Economic Research, 1997.
- Masi, G. D., Giovannetti, G., and Ricchiuti, G. Network analysis to detect common strategies in italian foreign direct investment. *Physica A: Statistical Mechanics and its Applications*, 392(5):1202 – 1214, 2013.
- Maskin, E. and Tirole, J. Unforeseen contingencies and incomplete contracts. *The Review of Economic Studies*, 66(1):83–114, 1999.
- Mayer, T. and Ottaviano, G. I. *The Happy Few: The internationalisation of European firms. New facts based on firm-level evidence*. Bruegel blueprint series, 3, 2007.
- McFadden, D. L. Conditional logit analysis of qualitative choice behavior. In Zarembka, P., editor, *Frontiers in econometrics*, pages 105–142. Academic Press, 1974.
- McFadden, D. L. Econometric analysis of qualitative response models. *Handbook of Econometrics*, 2:1395–1457, 1984.
- Melitz, M. J. The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6):1695–1725, 2003.

- Merlevede, B., Schoors, K., and Spatareanu, M. Fdi spillovers and time since foreign entry. *World Development*, 56:108–126, 2014.
- Milgrom, P. and Roberts, J. The economics of modern manufacturing: Technology, strategy, and organization. *The American Economic Review*, pages 511–528, 1990.
- Molina, D. and Muendler, M.-A. Preparing to export. Working paper, National Bureau of Economic Research, 2013.
- Moran, T. H. *Parental supervision: The new paradigm for foreign direct investment and development*. Peterson Institute for International Economics, 2001.
- Mrázová, M. and Neary, J. P. Selection effects with heterogeneous firms. Working paper, London School of Economics and Political Science, LSE Library, 2012.
- Mundell, R. A. International trade and factor mobility. *the american economic review*, 47(3):321–335, 1957.
- Mutinelli, M. and Piscitello, L. The entry mode choice of MNEs: an evolutionary approach. *Research Policy*, 27(5):491–506, September 1998a.
- Mutinelli, M. and Piscitello, L. The influence of firm’s size and international experience on the ownership structure of italian FDI in manufacturing. *Small Business Economics*, 11(1):43–56, 1998b.
- Nakos, G. and Brouthers, K. D. Entry mode choice of smes in central and eastern europe. *Entrepreneurship Theory and Practice*, 27(1):47–63, 2002.
- Nielsen, B. B., Asmussen, C. G., and Weatherall, C. D. The location choice of foreign direct investments: Empirical evidence and methodological challenges. *Journal of World Business*, 52(1):62–82, 2017.
- Nunnenkamp, P. and Andrés, M. S. Ownership choices of indian direct investors: Do fdi determinants differ between joint ventures and wholly owned subsidiaries? *South Asian Journal of Macroeconomics and Public Finance*, 3(1):39–78, 2014.
- Onnela, J.-P., Saramäki, J., Kertész, J., and Kaski, K. Intensity and coherence of motifs in weighted complex networks. *Physical Review E*, 71(6):065103, 2005.
- Procher, V. FDI location choices: Evidence from french first-time movers. *AStA Wirtschafts- und Sozialstatistisches Archiv*, 3(3):209–220, September 2009.
- Protsenko, A. Vertical and horizontal foreign direct investments in transition countries. Phd thesis, University of Munich, Department of Economics, 2004.
- Raff, H., Ryan, M., and Stähler, F. Asset ownership and foreign-market entry. SSRN Scholarly Paper ID 892737, Social Science Research Network, Rochester, NY, February 2006.
- Raff, H., Ryan, M., and Stähler, F. Whole vs. shared ownership of foreign affiliates. *International Journal of Industrial Organization*, 27(5):572–581, September 2009.
- Raff, H., Ryan, M., and Stähler, F. Firm productivity and the foreign-market entry decision. *Journal of Economics & Management Strategy*, 21(3):849–871, 2012.
- Rajan, R. G. and Zingales, L. Power in a theory of the firm. *The Quarterly Journal of Economics*, 113(2):387–432, 1998.
- Rasciute, S., Pentecost, E., and Ferrett, B. Firm heterogeneity in modelling foreign direct investment location decisions. *Applied Economics*, 46(12):1350–1360, 2014.

BIBLIOGRAPHY

- Rauch, J. E. and Trindade, V. Information, international substitutability, and globalization. *American Economic Review*, pages 775–791, 2003.
- Rovigatti, G. and Mollisi, V. PRODEST: Stata module for production function estimation based on the control function approach. Statistical Software Components, Boston College Department of Economics, September 2016.
- Rozenblat, C. Inter-cities’ multinational firm networks and gravitation model (international forum). *Annals of the Association of Economic Geographers*, 61(3):219–237, 2015.
- Rozenblat, C. Opening the black box of agglomeration economies for measuring cities’ competitiveness through international firm networks. *Urban Studies*, 47(13):2841–2865, 2010.
- Saramäki, J., Kivelä, M., Onnela, J.-P., Kaski, K., and Kertesz, J. Generalizations of the clustering coefficient to weighted complex networks. *Physical Review E*, 75(2):027105, 2007.
- Schmidheiny, K. and Brülhart, M. On the equivalence of location choice models: Conditional logit, nested logit and poisson. *Journal of Urban Economics*, 69(2):214–222, 2011.
- Schmitz, P. W. Joint ownership and the hold-up problem under asymmetric information. *Economics Letters*, 99(3):577 – 580, 2008.
- Serrano, M. Á., Boguñá, M., and Pastor-Satorras, R. Correlations in weighted networks. *Physical Review E*, 74(5):055101, 2006.
- Serrano, M. Á., Boguñá, M., and Vespignani, A. Patterns of dominant flows in the world trade web. *Journal of Economic Interaction and Coordination*, 2(2):111–124, 2007.
- Serrano, M. Á. and Boguñá, M. Topology of the world trade web. *Physical Review E*, 68(1):015101, 2003.
- Sgrignoli, P. *The World Trade Web: A Multiple-Network Perspective*. PhD thesis, IMT Institute for Advanced Studies, Lucca, 2014.
- Shenkar, O. Cultural distance revisited: Towards a more rigorous conceptualization and measurement of cultural differences. *Journal of international business studies*, 32(3):519–535, 2001.
- Squartini, T., Picciolo, F., Ruzzenenti, F., and Garlaschelli, D. Reciprocity of weighted networks. *Scientific reports*, 3:27–29, 2013.
- Stopford, J. and Haberich, K. Ownership and control of foreign operation. In *Ghertman, M., Leontides, J.*, pages 141–167. European Research in International Business, 1978.
- Sullivan, D. Measuring the degree of internationalization of a firm. *Journal of international business studies*, pages 325–342, 1994.
- Tirole, J. Incomplete contracts: Where do we stand? *Econometrica*, 67(4):741–781, 1999.
- Tobin, J. Estimation of relationships for limited dependent variables. *Econometrica: journal of the Econometric Society*, 26(1):24–36, 1958.
- Tomiura, E. Foreign outsourcing, exporting, and fdi: A productivity comparison at the firm level. *Journal of International Economics*, 72(1):113–127, 2007.
- UNCTAD. *World investment report 1998*. United Nations, 1998.
- UNCTAD. *World Investment Report: Transnational Corporations, Extractive Industries and development*. United Nations, 2007.

- UNCTAD. *World Investment Report: Global value chains: Investment and trade for development*. United Nations, 2013.
- UNCTAD. *World Investment Report: Investor Nationality: Policy Challenges*. United Nations, 2016.
- Vázquez, A., Pastor-Satorras, R., and Vespignani, A. Large-scale topological and dynamical properties of the internet. *Physical Review E*, 65(6):066130, 2002.
- Vernon, R. International investment and international trade in the product cycle. *The Quarterly Journal of Economics*, 80(2):190–207, 1966.
- Vicard, V. Profit shifting through transfer pricing: evidence from french firm level trade data. Working paper, Banque de France Working paper, 2015.
- Waldkirch, A. Comparative advantage FDI? a host country perspective. *Review of World Economics*, 147(3):485–505, April 2011.
- Wang, S. and Zhu, T. Control allocation, revenue sharing, and joint ownership. *International Economic Review*, 46(3):895–915, 2005.
- Williamson, O. E. Transaction-cost economics: the governance of contractual relations. *The journal of Law and Economics*, 22(2):233–261, 1979.
- Woodward, D. P. and Rolfe, R. J. The location of export-oriented foreign direct investment in the caribbean basin. *Journal of international business studies*, pages 121–144, 1993.
- Wooldridge, J. M. On estimating firm-level production functions using proxy variables to control for unobservables. *Economics Letters*, 104(3):112–114, 2009.
- Wooldridge, J. M. *Introductory Econometrics: A Modern Approach*. Cengage Learning, fifth edition, 2012.
- Yeaple, S. R. The complex integration strategies of multinationals and cross country dependencies in the structure of foreign direct investment. *Journal of International Economics*, 60(2):293–314, 2003.
- Yeaple, S. R. Firm heterogeneity and the structure of U.S. multinational activity. *Journal of International Economics*, 78(2):206–215, 2009.

Résumé

Cette thèse se propose d'étudier le rôle de l'hétérogénéité des entreprises multinationales dans leurs stratégies d'investissements directs à l'étranger (IDE). Si de précédents travaux soulignent l'importance de la productivité individuelle des entreprises dans le fait de devenir une multinationale, peu évoquent l'hétérogénéité restante entre ces entreprises pour expliquer les différences de choix de mode d'entrée ou de motif d'implantation à l'étranger. A travers des approches théoriques et empiriques innovantes, basées sur l'utilisation de données confidentielles d'entreprises françaises, nous montrons que l'hétérogénéité des entreprises détermine chacun des trois aspects stratégiques détaillés dans cette thèse : Le taux de contrôle à l'étranger, le motif d'implantation et la structure du réseau de filiales. Plus précisément, la productivité et l'expérience de la firme favorisent un contrôle accru des filiales étrangères, leur importance relative dépendant du pays hôte. Ces caractéristiques sont également associées à une intégration plus profonde dans les chaînes de valeur mondiales, ainsi qu'à la constitution d'un réseau d'implantations plus original. Ces résultats permettent une meilleure compréhension des choix des multinationales, au-delà de l'apparente complexité des flux d'IDE.

Mots Clés

Investissements Directs à l'Étranger; Firmes Multinationales; Firmes Hétérogènes; modes d'entrée; choix de localisation; analyse de réseau.

Abstract

This thesis examines the role of firms' heterogeneity in the Foreign Direct Investments (FDIs) strategies. We already know firms' heterogeneity to sharply distinguish between domestic firms, exporters and multinationals (MNEs). Yet, to what extent it impacts their foreign direct investments (FDIs) strategies among MNEs is rarely evoked, while several entry mode choices and FDI motives coexist. Mixing both theoretical and empirical innovating approaches using French firm-level data, the four chapters of this PhD dissertation reveal that the firm heterogeneity influences all of the three dimensions of strategies we review: foreign ownership mode, FDI motive and structure of the overall network of affiliates. Specifically, firm-level productivity and international experience foster deeper integration with a changing relative importance according to the host country. They are also associated with production motives and vertical integration into the global value chains. The more productive firms also display original affiliates' network structure. These findings allow a better understanding of multinationals' choices underneath the "complex" global picture of FDI flows.

Keywords

Foreign Direct Investments; Multinational firms; Heterogeneous firms; Entry Mode Choice; Location Choice; Network analysis.