

DOCUMENT DE TRAVAIL

DT/2012-03

# The impact of outward FDI on the domestic perimeter of manufacturing groups

*Alexandre GAZANIOL*

UMR DIAL 225

Place du Maréchal de Lattre de Tassigny 75775 • Paris Cedex 16 • Tél. (33) 01 44 05 45 42 • Fax (33) 01 44 05 45 45  
• 4, rue d'Enghien • 75010 Paris • Tél. (33) 01 53 24 14 50 • Fax (33) 01 53 24 14 51

E-mail : [dial@dial.prd.fr](mailto:dial@dial.prd.fr) • Site : [www.dial.prd.fr](http://www.dial.prd.fr)

# THE IMPACT OF OUTWARD FDI ON THE DOMESTIC PERIMETER OF MANUFACTURING GROUPS<sup>1</sup>

Alexandre Gazaniol  
Université Paris Dauphine, LEDa  
UMR 225 DIAL, IRD  
[a.gazaniol@hotmail.fr](mailto:a.gazaniol@hotmail.fr)

**Document de travail UMR DIAL**

Avril 2012

## Abstract

This article aims to analyze the structure and the performance of multinational firms at the group level, and to estimate the impact of outward FDI on the domestic perimeter of manufacturing groups. This empirical work anticipates a major reshape of business statistics, which does not consider Legal Entities (LEs) as the relevant unit for economic analysis. In order to construct new statistical units which enjoy some degrees of autonomy, we use a French dataset (“LiFi”) which allows gathering all French LEs which belong to the same group. We show that nearly all multinational firms in the French manufacturing sector are organized around several LEs and we describe the implications of this organizational choice in terms of market structure and performance. Following firms which invest abroad for the first time reveals that outward FDI has a positive effect on the whole domestic perimeter of groups, since value-added, employment and exports significantly increase *ex-post*. The growth of employment is especially high in companies dedicated to auxiliary functions so the share of employees in the manufacturing perimeter tends to decrease after the investment.

**Keywords:** Multinational firms, business groups, profiling, FDI, relocations, firms performance, deindustrialization, skill upgrading.

## Résumé

Cet article vise à analyser la structure et les performances des firmes multinationales au niveau des groupes de sociétés, et à estimer l’impact des IDE sortants sur le périmètre domestique des groupes industriels. Il s’inscrit dans une refonte des statistiques d’entreprises, qui vise à dépasser le niveau des entités juridiques pour adopter une définition économique de l’entreprise, tenant compte de son degré d’autonomie. Afin de construire de nouvelles unités statistiques jouissant d’une autonomie de décision, nous utilisons l’enquête LiFi, qui nous permet de rassembler les sociétés françaises appartenant à un même groupe. Nous montrons que presque toutes les firmes multinationales dans l’industrie manufacturière française s’organisent autour de plusieurs entités juridiques et nous décrivons les implications de ce choix organisationnel en termes de structure de marché et de performances. L’analyse en dynamique des firmes qui investissent à l’étranger pour la première fois révèle que les IDE sortants ont un impact positif sur l’ensemble du périmètre domestique des groupes, dont la valeur ajoutée, l’emploi et les exportations augmentent significativement *ex-post*. La croissance de l’emploi apparaît plus soutenue dans les sociétés dédiées aux fonctions en support de la production, ce qui suggère que les IDE sortants contribuent à la désindustrialisation des pays développés.

**Mots Clés :** Firmes multinationales, groupes de sociétés, profilage, délocalisations, désindustrialisation, performances.

**JEL Codes :** D22, F23, L22.

---

<sup>1</sup> Je remercie Jean-Marc Siroën, Frédéric Peltrault et Lionel Fontagné pour leurs encouragements et leurs remarques sur des versions préliminaires de ce travail. Cette recherche a été financée par le cabinet de conseil Prames International (groupe BPCE), dans le cadre d’un contrat CIFRE.

## INTRODUCTION

This paper aims to evaluate the impact of outward FDI on the domestic perimeter of manufacturing groups. We use a French dataset (the “LiFi” survey) which allows constructing the domestic perimeter of French business groups each year. In this paper, the term “firms” will refer to independent Legal Entities (LEs) or business groups, restricting to LEs which operate in France. Indeed, there are three reasons to discuss the relevance of empirical studies which analyze multinational firms at the LE level.

First, these studies are not able to identify all firms which are impacted by outward FDI. Indeed, if LEs which engage in FDI belong to a business group, their investments might affect – positively or negatively – the activity of other affiliated firms, given the potential synergies and interactions between them (see figure I for a typology of multinational groups). Besides, FDI flows do not always transit through LEs with a real economic activity, but also through LEs whose purpose is to centralize some financial operations for their group. This is why studies conducted at the LE level, which often focus on manufacturing LEs, cannot detect FDIs which originate from affiliated holding companies<sup>4</sup> (case n°4 in figure I). Taking into account the group dimension of firms might affect the census of FDIs and the identification of firms which are impacted by these investments.

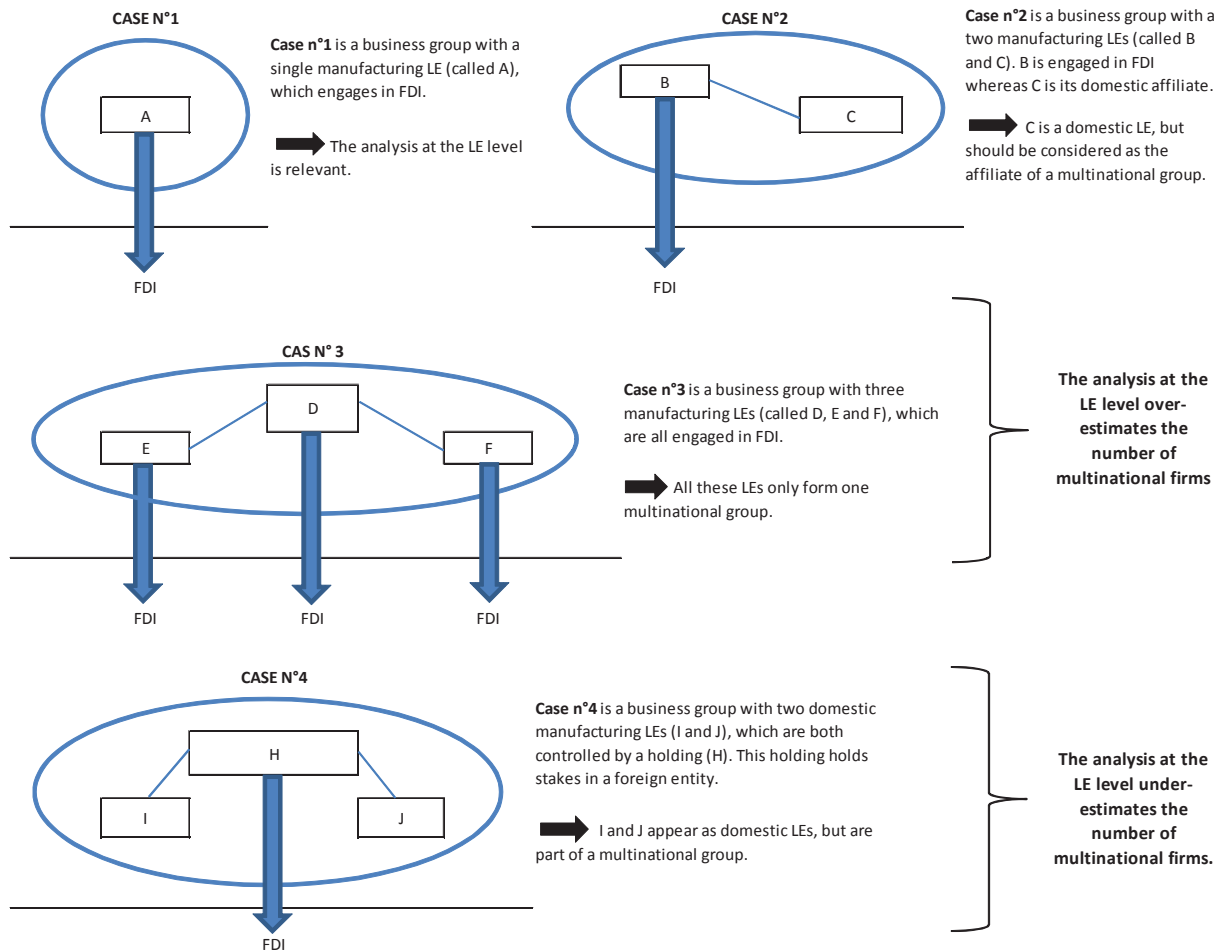
Therefore, analyzing multinational firms at the LE level goes with a second issue, which is the imprecise measure of the impact of outward FDI on home performance. Indeed, one needs to consolidate firms’ performance if these gather several LEs. Importantly, empirical studies which evaluate the impact of outward FDI on home activities are based on the assumption that only the LE which directly invests abroad (the parent company) is affected by the investment. This hypothesis is unlikely to be true if the firm is a business group with several entities at home: for example, if the investment consists in offshoring jobs and creating a new factory abroad, it might lead to group restructuring in the home country, impacting several affiliates at the same time. Reversely, if investing abroad leads to accessing new markets, all LEs within the group might increase their production in order to serve these markets. Reasoning at the group level allows controlling for this type of externalities.

Finally, neglecting that multinational firms articulate around several LEs might lead to under-estimate what is known as the “skill upgrading” phenomenon: firms which engage in outward FDI are expected to increase the share of skilled workers in their workforce, by offshoring their low-skilled activities and/or strengthening their auxiliary functions (R&D, logistics, IT, sales force). Empirical studies have found some evidence of this skill upgrading phenomenon (Head and Ries, 2002; Castellani *et al.*, 2008; Becker *et al.*, 2009), but they might suffer from a downward bias if auxiliary functions are concentrated into dedicated affiliates, which cannot be detected by an analysis at the LE level. By isolating employees in the non-manufacturing perimeter of groups, this article contributes to assess whether this skill upgrading phenomenon goes with the growth of affiliates dedicated to auxiliary functions.

---

<sup>4</sup> This is why a great share of FDIs which are realized by French manufacturing groups is attributed to the service industry, more precisely to the NACE code “7415”, which gathers headquarters and holding companies.

**Figure I: Typology of manufacturing multinational firms**



NB : In cases n°1 and n°2, the analysis at the LE level and the analysis at the group level count the same number of multinational firms.

**LEGEND:**  is a Legal Entity (LE).  is the domestic perimeter of the business group.  
➔ indicates that the firm is engaged in outward FDI.

Our main conclusions are the following.

First, this article gives a more accurate measure of FDI flows and the number of firms engaged in FDI. Looking at the French manufacturing sector in 2007, our sample counts 1,266 French LEs which own at least one FDI; however, these LEs only correspond to 622 different French groups and 386 foreign groups which have affiliates in France. In parallel, about 1,600 manufacturing LEs do not directly engage in FDI but belong to a business group which owns foreign affiliates. This way, by analyzing firms at the group level instead of the LE level, the number of French multinational firms we can count increases by 32%, while the number of foreign-owned firms engaging in FDI increases by 14%.

The literature on heterogeneous firms predicts a productivity premium for firms engaged in international activities: given the sunk costs of FDI, which exceed the sunk costs of exporting, multinational firms are expected to outperform exporters, which are larger and more productive than domestic firms (Helpman *et al.*, 2004). Taking into account the group dimension does not challenge this hierarchy: the domestic perimeter of French multinational groups is larger and more

efficient than the perimeter of French domestic groups. We show that these FDI premia also exists within business groups, suggesting that multinational groups are organized around one or two parent companies, which concentrate a great share of output and trade. Moreover, domestic LEs which are part of a multinational group are larger, more productive and more capitalistic than other domestic LEs: reasoning at the group-level increases the performance gap between multinational firms and domestic ones.

We use propensity score matching and a difference-in-difference estimator in order to estimate the impact of outward FDI on the domestic perimeter of groups. The analysis of firms which invest abroad for the first time, “switchers”, confirms the existence of a self-selection mechanism: firms have to reach a critical size before engaging in FDI. However, we also find that switchers increase their value-added, their workforce and their exports *ex-post*: the positive effect of outward FDI on home employment, which was already found by several empirical papers (Barba Navaretti and Castellani, 2008 ; Barba Navaretti *et al.*, 2010), is not compensated by the decline of employment in other affiliated LEs. Moreover, although investing abroad strengthens the manufacturing perimeter of groups, we observe that the share of employees in manufacturing LEs decreases after switching: this finding supports the idea that after investing abroad, the parent company of multinational firms mostly develops its auxiliary functions, contributing to the deindustrialization of the home economy.

This paper is organized as follows: first, we present the recent evolutions of business statistics, which precisely to describe the activity of business groups (section I). After detailing how we reconstruct business groups and follow their dynamics (section II), we present the data and the sample (section III) and describe the structure and the performance of domestic and multinational manufacturing groups (section IV). Finally, we focus our analysis on first-time investors, and evaluate their performance before (section V) and after switching (section VI).

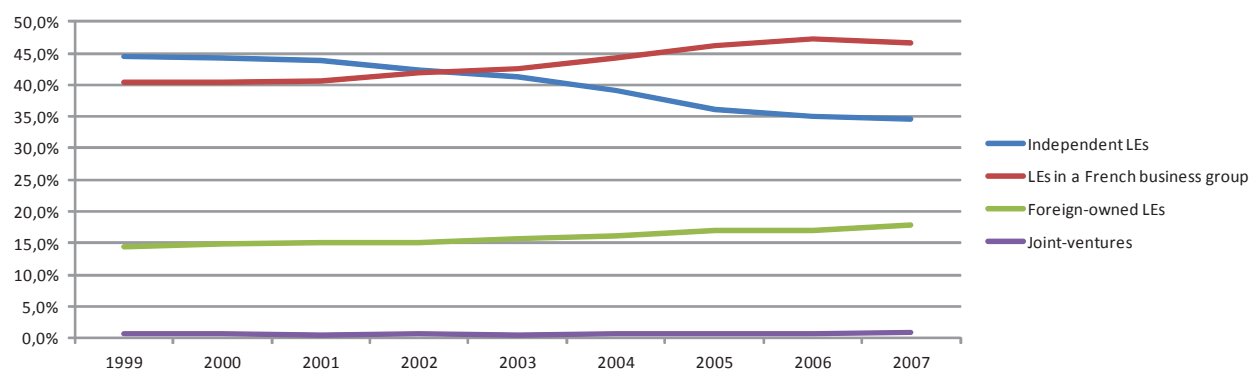
## **SECTION I: ONGOING EVOLUTIONS OF BUSINESS STATISTICS**

National Statistical Institutes (NSIs) historically rely on the notion of “Legal Entity” (LE) in order to collect information on businesses and to analyze their performance. The statistical unit which represents a business in the official data corresponds to a moral or a physical person which has an economic activity. However, the rise of Foreign Direct Investment (FDI) and Mergers and Acquisitions (M&A) over the last decades has challenged the operational definition of firms that prevails in most empirical papers, *i.e.* the definition of firms as LEs. For example, in France, the share of independent LEs in the manufacturing sector has decreased by ten percentage points between 1999 and 2007, falling to 35% (see the data in section II). This is why European NSIs are now evolving towards a new statistical definition of firms, which comes from the Statistical Units Regulation passed in March 1993: “*An enterprise is the smallest combination of legal units that is an organizational unit producing goods and services (for the market), with a certain degree of autonomy in decision making, especially for the allocation of its current resources*”. Firms might be independent LEs, operational divisions of groups, or even business groups as a whole.

This is a major development for the statistical analysis of firms: each firm must now correspond to an independent economic actor, and cannot simply exist because of an administrative registration. Especially, this definition is more suited for the analysis of affiliates: indeed, since these companies are often created for internal purposes (cash pooling, auxiliary functions, tax optimization), they might produce goods/services only for other affiliated entities, and their economic decisions might

not necessarily depend on market conditions. Therefore, integrating these affiliates in the activity of their parent company contributes to giving a more reliable picture of firms' activities.

**Figure II: Evolution of the share of independent entities in the French manufacturing sector between 1999 and 2007**



Reading : In the manufacturing sector, the share of foreign-owned LEs was of 14% in 1999, against 17% in 2007.

Sample : Manufacturing LEs with more than 20 employees between 1999 and 2007, excluding food and energy.

Sources : LiFi survey (LiFi), French annual census for manufacturing (EAE) - Author's calculation.

However, the implementation of this new definition is a complicated issue for NSIs. Indeed, it implies to identify the new statistical units, which can be complex business groups with several hundreds of LEs. This operation is known as “profiling”: according to the European Business Register manual (Eurostat, 2010a), it is a method to “analyze the legal, operational and accounting structure of an enterprise group, in order to establish the statistical units within that group and their links and the most efficient structures for the collection of statistical data”. Profiling has become a necessary step for NSIs because of the economic weight of some business groups: some changes in the legal structure of these groups might have great consequences of the computation of some economic aggregates (for France, Dervieux (2001, 2002) gave an example of these with the automobile manufacturer PSA).

The advancement of profiling varies across countries. United Kingdom and Netherlands have profiled their largest groups for twenty years (Eurostat, 2010b). The French Office of Statistics (INSEE) is now profiling firms which have activities in France, and is coordinating a working group which aims at defining and harmonizing practices for profiling<sup>5</sup>. The problem is that these new statistical units will only be available in several years: this is why we must elaborate an alternative method in order to construct the perimeter of business groups.

## SECTION II: HOW TO RECONSTRUCT THE PERIMETER OF BUSINESS GROUPS?

### Definitions

A business group is an economic entity composed of several LEs. This entity has two components:

- The parent company, which is a LE not controlled directly or indirectly by another entity, and which owns at least one affiliate;
- All LEs controlled by this parent company.

The parent company is either a LE with a real economic activity or a holding company created in order to centralize equity stakes in all affiliates of the group. This second type of organization is more

<sup>5</sup> This group gathers NSIs from Finland, France, Germany, Italy, Netherlands, Switzerland and United Kingdom.

likely to concern conglomerates which operate in many different industries and still want to centralize the supervision of their affiliates.

Our definition of business groups relies on the notion of control: it excludes inter-firm linkages which do not involve a majority stake, such as outsourcing, strategic partnership, portfolio investment etc. Besides, this definition also excludes joint ventures, which, by definition, do not belong to a single group. Opposing business groups, LEs which are not controlled by another one and do not own any affiliate are considered as independent LEs. They are isolated from a capitalistic point of view, but they might have informal or contractual relationships with other firms.

In this work, the term “firms” will refer to independent LEs or business groups as a whole, restricting to their French perimeter, meaning to LEs which operate on the French territory. Therefore, one should note that our definition of firms does not correspond to “profiling”, since we do not identify operational divisions of groups.

### **Construction of business groups and their domestic perimeter**

Following these definitions, we can construct the French perimeter of business groups using the LiFi survey (“Liaisons Financières”), which is conducted every year by the French office of statistics. Indeed, LiFi identifies the parent company of each French LE, each parent company having its own identification number. Although LiFi only allows reconstructing the French perimeter of business groups (since only LEs operating in France are surveyed), it is possible to determine if at least one LE within the group is located abroad. With this information, we are able to identify multinational groups: on the first hand, LiFi identifies all foreign affiliates of French firms; on the other hand, LiFi gives the location of each parent company, which enables us to determine the nationality of the group (French or foreign<sup>6</sup>). Thanks to this information, we distinguish three types of business groups: French domestic groups, French multinational groups, and the French part of foreign groups (which, sometimes, also invest abroad itself).

This paper is interested in multinational groups which mainly operate in manufacturing activities, and their manufacturing perimeter. LiFi provides the main activity of each business group, and allows us to restrict the sample to manufacturing groups, excluding energy and food industries<sup>7</sup>. However, defining the manufacturing perimeter of groups is more challenging. Ideally, we should know the share of sales, value added and workforce related to manufacturing activities but such information is not available in our data. Therefore, we have to make the following assumption: the manufacturing perimeter corresponds to LEs whose main activity is manufacturing (codes “C1” to “F6” in the Summary Economic Classification with 36 levels). Then we collect the income statements of these LEs (thanks to the Annual Census for Manufacturing (called “EAE” – see section II)) in order to describe their manufacturing activities in terms of sales, workforce, value-added, investment and capital stock. There are two major comments on this construction.

- First, the number of employees in the manufacturing perimeter does not correspond to the number of blue-collar jobs, since manufacturing LEs might also allocate some human resources to auxiliary functions (R&D, sales force, administrative functions). Let’s take the

---

<sup>6</sup> For simplification, we consider that the location of the parent company determines the nationality of the group.

<sup>7</sup> For LiFi, the main activity of the group is defined as the activity which gathers the greatest number of employees. The nomenclature we choose is the French Summary Economic Classification with 36 levels (see table 1).



example of a LE which has two activities: producing vehicles and repairing these vehicles. The first year, these activities respectively correspond to 60% and 40% of the total sales: INSEE will consider that the main activity of the firm is to produce vehicles. Therefore, this LE is considered as a manufacturer although 40% of its sales are related to consumer service. If the share of sales related to manufacturing vehicles falls to 40% the following year, the main activity of this LE slips to “wholesale and retail trade”. Therefore, the distinction between manufacturing and non-manufacturing workforce is not only approximate, but also sensitive to threshold effects: a change by only a few points of percentage in the ventilation of sales can change the main activity of the firm. However, Gonzalez and Picart (2007) have shown that in average, the main activity of French business groups gathers more than 75% of their employees, whatever industry level is considered.

- Second, the EAE is a threshold survey (only LEs with more than 20 employees are surveyed), so we do not get the information for all manufacturing LEs of some business groups. LiFi partly tackles this bias, since it provides the workforce for each LE within the group: we are able to estimate the gap between the total number of employees in France and the number of employees which are surveyed by the EAE. Then we can see how this gap evolves through time. This way, we will assess whether results suffer from this threshold bias.

Obviously, we cannot consolidate all variables of individual income statements. For example, we cannot sum the output of all LEs within the group, since some might produce the inputs of others: all these intra-group linkages might lead to overestimating the output of the whole group. Therefore, the only variables which we choose to consolidate (by summing them) are the following:

- Value added ;
- Workforce;
- Capital stock ;
- Wage bill ;
- Exports and imports (whose individual amounts are given by the French customs). These variables are consolidated at the group-level in order to include exports/imports that transit through commercial LEs<sup>8</sup>.

Besides, LiFi provides the workforce of every LE within the group, which allows us to distinguish the workforce in the manufacturing perimeter and the total workforce in France. As mentioned above, our definition of the manufacturing perimeter relies on the definition of the main activity of LEs, which depends on the ventilation of their sales or their workforce.

With these variables, we construct three additional indicators for the manufacturing perimeter of business groups: labor productivity (ratio value-added /workforce), capital intensity (capital stock / workforce) and mean wage (wage bill / workforce).

## **Following groups' dynamics**

Although LiFi allows reconstructing the domestic perimeter of business groups each year, following the dynamic of this perimeter is more complicated for several reasons.

First, the only way of constructing the groups' perimeter is to identify their parent company, which might change over the period. For example, if the group decides to create a new holding company

---

<sup>8</sup> About 13% of business groups export and import through this type of entities.



whose purpose is to centralize the stakes of every company within the group, this will change the ID number of the parent company and make it impossible for us to follow its dynamics. Of course, one could search for the new ID number of the parent company in the database and match it with the old number, but it is impossible to generalize this procedure for the thousands of business groups in the sample. We can solve this first problem by restricting the analysis to groups whose parent company does not change over the whole period. This allows us not only to use a panel of business groups, but also to limit the impact of Merger and Acquisitions (M&A) and restructuring on the results, since these operations often imply a change of the parent company.

Second, M&A might still affect the perimeter of groups and introduce some bias in the interpretation of our results. Indeed, changes in size might as well reflect the economic performance of the group or a simple change of its perimeter (if the groups acquires or sells a company). This change of perimeter does not necessarily imply job destructions and creations.

Finally, the appearance of a new LE in the group does not necessarily correspond to the launch of new activities or the acquisition of an existing company. Indeed, the group might just have split one of its LEs into two several entities, or changed its ID number in the “Sirène” database. One might detect this phenomenon if the disappearing of a LE goes with the appearance of a new one with the approximate same size.

Therefore, although following the dynamics of business groups is technically feasible, the interpretation of changes in size and performance is quite difficult.

## **First-time investors and matching procedure**

We are interested in the impact of outward FDI on manufacturing activities in France. In order to give evidence of causality, we focus our analysis on first-time investors (“switchers”). We exclude foreign-owned firms in this article since analyzing their performance at the group level has little sense without information about the foreign part of the group. We compare switchers to firms which do not engage in FDI over the whole period or firms which decide to invest abroad later.

Since the interesting question is “what would have happened if the firm had not invested abroad?”, we use matching techniques in order to build a counterfactual scenario. These techniques consist in matching switchers with very similar firms which did not choose to engage in FDI. Since this implies comparing switchers and domestic firms over a large number of criteria (size, productivity, exports, workforce, capital stock, industry), we follow Rosenbaum and Rubin (1983) and their recommendation to use “propensity scores”: here, these scores correspond to the probability of engaging in outward FDI, according to observable characteristics. We compute these scores with a probit model, using lagged regressors:

$$P(PRIMO_{it} = 1 | X_{i,t-1})$$

Then we compute each individual score and match switchers with domestic firms which have the closest score. This propensity-score matching procedure is robust only if scores control for all variables which determine outward FDI. If this condition is met, the performance gap between switchers and control firms will only come from different international strategies. Moreover, a large sample is needed in order to find a control firm for each switcher: this might get complicated in the case of very concentrated industries (like the automobile sector for example). Finally, we have to ensure that switchers and control firms exhibit the same observable characteristics after the

matching procedure, for each variable considered in the scores. If all these conditions hold, we can compute the impact of outward FDI all things being equal.

However, switchers might not only differ from domestic firms in terms of size, productivity or exports, but also in terms of unobservable characteristics, such as organization, technology or specific skills. If these characteristics are supposed time-invariant, one can control their influence by using a Difference-In-Difference (DID) estimator. This estimator measures the evolution of the gap between switchers and control firms, between the period preceding the investment and the period following it. Let  $Y$  be the performance indicator, we write the DID estimator as follows:

$$DID = (\bar{Y}_{i1} - \bar{Y}_{i0}) - (\bar{Y}_{j1} - \bar{Y}_{j0})$$

Where 0 corresponds to the *ex-ante* period (1 to the *ex-post* period), switchers are indexed  $i$  (domestic firms are indexed  $j$ ).  $\bar{Y}_{i1}$  represents the mean level of performance of switchers after switching. If the DID estimator is positive, this means that the performance premium of switchers increases *ex-post*. However, this estimator requires more data, as we need information about firms' performance *ex-ante* and *ex-post*. Besides, the results not only depend on the dynamics of switchers, but also on the dynamics of control firms: this is why we will also provide some descriptive statistics about the path of switchers, in order to precise how results should be interpreted.

Several studies have already evaluated the impact of outward FDI with a propensity-score matching combined with a DID estimator at the LE level (Barba Navaretti and Castellani, 2008 ; Barba Navaretti *et al.*, 2010 ; Hijzen *et al.*, 2009). Although we use the same technique, matching business groups and not LEs increases the difficulty of the exercise for two reasons. First, it is less obvious to find control units for business groups than for LEs, given the concentration of some industries. Therefore, we will drop switchers for which we do not have any valid candidate for matching. Second, M&A might greatly affect the results. This is why we check that series for workforce and value-added exhibit no major discontinuity, especially in the case of large business groups. These two additional precautions reduce the possibility of matching each switcher with several control firms. However, we will try to do so, since considering several controls decreases the influence of extreme values on the results.

### SECTION III: THE DATA

We merge three databases over the period 1999 – 2007.

The LiFi survey identifies and locates the parent company of each LE operating in France. LiFi also allows us to identify which firms engage in outward FDI, and where they locate their foreign activities. LEs which do not have any affiliate and are not controlled by another entity are considered as independent LEs (this also includes LEs which are not surveyed by LiFi).

The French manufacturing census (known as “Enquête Annuelle Entreprises” or EAE) provides income statements for all manufacturing LEs with more than 20 employees. This provides information about sales, employment, capital, value-added, and wages. It should be noted that we only have information about the French part of multinational groups, and that we cannot estimate the performance of the entire business group.

Finally, we get individual exports and imports from the French customs.

In 2007, LiFi counts 9,737 business groups in France whose main activity is manufacturing (excluding food industries and energy). We only keep business groups whose one or several LEs are identified by the EAE (therefore dropping about one third of all observations). Moreover, state-owned business

groups are also excluded from the sample since their activities and their internationalization strategy are more likely to depend on political factors.

As mentioned above, since the EAE is a threshold survey, we do not always have information about all manufacturing LEs within the group: this issue concerns about 31% of business groups in 2007. However, we choose to keep these groups in the sample since we can evaluate the impact of this bias on our results, thanks to LiFi. Indeed, LiFi provides the number of employees of every LE within each business group, even those which are not identified by the EAE. Therefore, we can compute the difference between the workforce of firms identified in the EAE, and the workforce of all manufacturing LEs within the group (this gap goes from 6% to 12%, according to the year of observation). This way, we are able to control for the evolution of this gap, and to ensure that this threshold in the EAE does not significantly affect the results.

In 2007, we finally keep 6,512 manufacturing business groups in the sample:

- 3,975 French domestic groups;
- 914 French multinational groups;
- 1,623 foreign groups which have manufacturing activities in France. 483 of these foreign groups own French affiliates which engage in outward FDI.

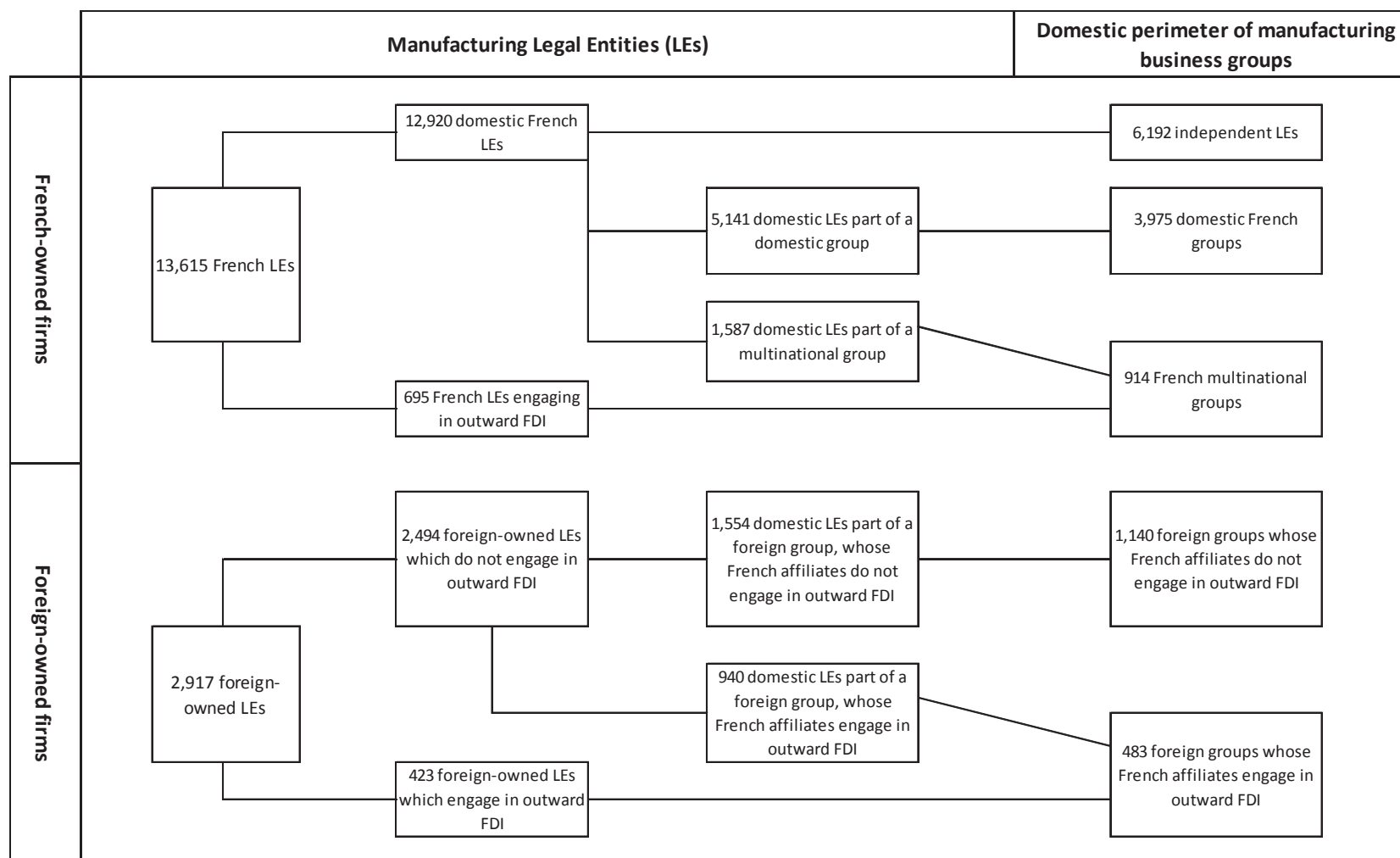
Besides, the EAE identifies 6,200 independent manufacturing LEs with more than 20 employees.

Let's precise that we drop 887 manufacturing LEs which belong to a French business group because their group's main activity is not manufacturing: 38% of these companies belong to a group in the construction industry, 28% to a group in wholesale and retail trade, 17% to a group in business services, 5% to a group in the transport industry, 5% to a group in financial services and 4% to a group in the energy sector.

Figure III details the transition from an analysis at the LE level to an analysis at the group level. Importantly, we find that there are more multinational firms than manufacturing LEs which directly engage in FDI: we count 914 French multinational groups in 2007, but only 695 French manufacturing LEs engaging in FDI. The same holds for foreign-owned firms: only 423 foreign-owned LEs are engaged in FDI, but we count 483 foreign groups which operate in France and whose French affiliates are investing abroad. This difference results from the fact that many FDIs transit through holdings and headquarters, so many manufacturing LEs might appear domestic although they belong to a multinational group. Therefore, analyzing the French manufacturing sector at the LE level leads to under-estimating the number of multinational firms: reasoning at the group-level increases the number of French firms engaged in outward FDI by 32%, and the number of foreign-owned firms investing abroad by 14%.

Table 1 shows the distribution of the sample in terms of size and industry. As expected, firms engaging in outward FDI are larger, even when considering only their domestic perimeter. However, one should note that 47% of firms which engage in outward FDI are Small and Medium Businesses (SMEs, *i.e.* firms with less than 250 employees). The share of SMEs among French multinational firms is even higher (58%), suggesting that foreign groups own very large units in France.

**Figure III: Transition from an analysis at the LE level to an analysis at the group-level (restricting to LEs operating in France), for the French manufacturing sector in 2007**



Sample : Manufacturing sector, excluding food and energy, restricting to LEs with more than 20 employees. Joint-ventures and state-owned firms are dropped from the sample. In order to simplify the figure, we drop eight independent LEs which are engaged in outward FDI (they are still considered as independent LEs because their controlling share is lower than 50%).

**Table 1: Characteristics of the sample in 2007**

CHARACTERISTICS IN 2007	All firms	French firms	Foreign groups operating in France	All firms engaging in Outward FDI	French multinational firms	Foreign groups whose French affiliates invest abroad
<b>Number of firms</b>	12,712	11,089	1,623	1,405	922	483
<b>Number of employees in France</b>						
Less than 50	55%	60%	20%	10%	13%	2%
50 - 99	21%	21%	17%	11%	14%	6%
100 - 249	14%	12%	24%	26%	30%	19%
250 - 499	5%	3%	14%	18%	16%	21%
500 - 999	3%	2%	11%	15%	12%	21%
1,000 and more	3%	1%	13%	19%	13%	31%
	100%	100%	100%	100%	100%	100%
<b>Industry (Summary Economic Classification with 36 levels)</b>						
Clothing and leather	5%	5%	2%	5%	6%	3%
Publishing, printing and reproduction	7%	8%	4%	4%	4%	3%
Pharmacy, perfumes, maintenance	2%	2%	6%	6%	5%	8%
Household equipment	7%	7%	4%	8%	10%	5%
Manufacture of motor vehicles	2%	2%	4%	2%	1%	4%
Shipbuilding, aeronautics and rail construction	1%	1%	1%	2%	3%	1%
Mechanical equipment	19%	20%	18%	16%	15%	19%
Electrical and electronic equipment	6%	5%	7%	7%	7%	7%
Mineral products	5%	5%	5%	3%	3%	5%
Textiles	4%	4%	4%	5%	6%	3%
Wood and paper	6%	6%	6%	4%	3%	6%
Chemicals, rubber and plastics	11%	10%	19%	17%	17%	19%
Metal and transformation of metal	20%	21%	14%	14%	15%	13%
Electrical and electronic components	4%	4%	6%	6%	6%	5%
	100%	100%	100%	100%	100%	100%

Reading: 19% of firms which engage in outward FDI have more than 1,000 employees in France.

Sample : Manufacturing firms with more than 20 employees in France in 2007.

Sources : LiFi survey, French annual census for manufacturing (EAE) - Author's calculation.

Firms appear more likely to engage in outward FDI in the “chemicals, rubber and plastics” industry: this sector only represents 11% of the sample but 17% of firms engaged in FDI. Reversely, the “metal and transformation of metal” industry gathers only 14% of firms engaged in FDI, although it represents 20% of the sample. Besides, foreign-owned firms are more specialized in “pharmacy, perfumes, maintenance”, “manufacture of motor vehicles”, “electrical and electronic equipments (and components)” and “chemical, rubber and plastics”. Reversely, French manufacturers are more present in “clothing and leather”, “household equipments”, “mechanical equipments” and “metal and transformation of metal”.

## SECTION IV: THE PROFILE OF FRENCH MULTINATIONAL GROUPS

We temporally exclude independent LEs for the sample and analyze manufacturing business groups under three dimensions:

- The activities of LEs within these groups;
- The structure of these groups;
- The performance of business groups according to international activities.

### More auxiliary functions in multinational groups

French manufacturing business groups generally count between two and four different LEs operating in France. Only 5% gather more than 10 LEs (the record being established at 252 different LEs). Nearly all these groups (96%) are composed of non-manufacturing LEs: these mainly include holding companies and headquarters (57% of business groups own at least one LE in this activity – see figure IV), LEs in wholesale and retail trade (21%), LEs in financial services (15%), LEs providing business services (13%) and LEs in real estate activities (11%).

The great share of holding companies, and to a lesser extent of LEs in real estate or financial activities, shows that this diversity of NACE codes within groups first reflects organizational or financial issues:

- The management activities of holdings (gathered in class “7415” in NACE revision 1.1) consist in holding the securities of (or other equity interests in) companies and enterprises for the purpose of owning a controlling interest or influencing the management decisions. This also includes the activities of head offices and centralized administrative offices.
- Here, real estate activities essentially consist in letting of own property: non-residential buildings, exhibition halls, lands (class “7020” in NACE revision 1.1).
- LEs in financial services mainly correspond to private equity funds (class “652E” in the French Nomenclature of Activities (NAF) revision 1.1, which is part of the “6523” class in NACE revision 1.1).

Besides, large manufacturing groups often concentrate their auxiliary functions into dedicated LEs, explaining the great number of LEs in business services. The four most recurrent auxiliary functions are:

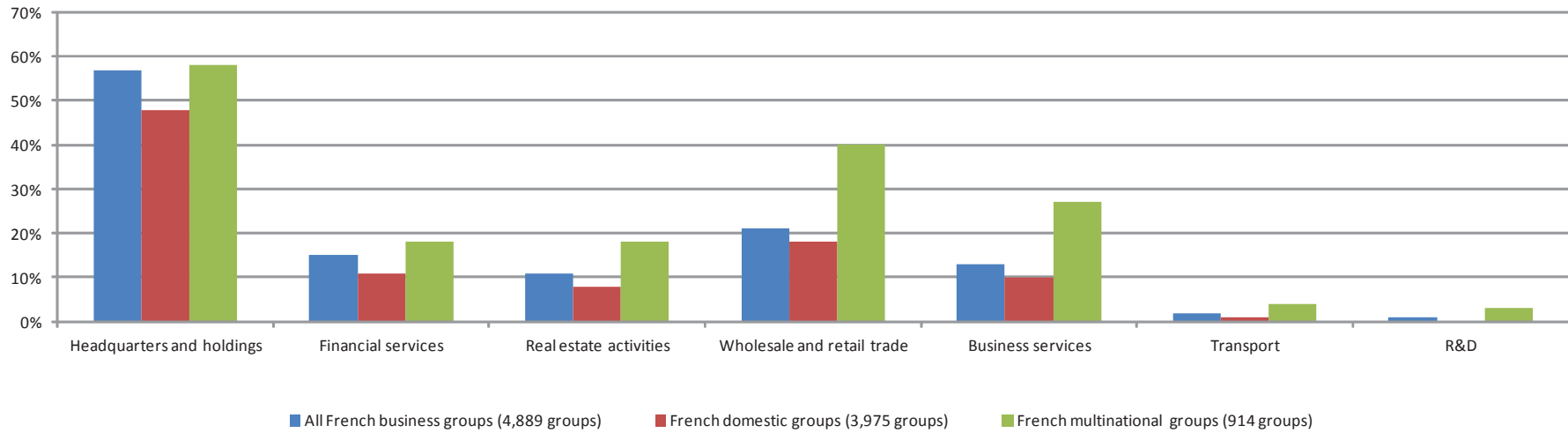
- Business and management consultancy activities (class “7414” in NACE) which cover several fields of expertise: public relations and communication, design of accounting systems, budgetary control procedures, organization etc.
- Engineering activities and related technical consultancy (class “742C” in NAF, part of the “7420” section in NACE), which include building design and drafting, projects elaboration and realization relative to electrical and electronic engineering, mining engineering or chemical engineering, or still geological and prospecting activities.
- Other business activities (class “748K” of NAF, part of the “7487” section in NACE), which cover both upstream (design) and downstream services (bill collecting, management of rights related to intellectual property).
- Advertising (“7440” section in NACE), which covers the creation and realization of advertising campaigns, media representation, the creating and placing of outdoor advertising (billboards, panels, bulletins and frames etc.), the provision of spaces for advertising or the distribution and delivery of advertising material or samples.

French multinational groups exhibit a more diverse range of NACE codes than domestic groups: these non-manufacturing LEs either pursue organizational or financial purposes or correspond to auxiliary functions (wholesale, business services, transport and storage, R&D). This finding is consistent with the intuition that multinational firms progressively transfer their manufacturing activities abroad, so parent companies become specialized in auxiliary functions and skilled-intensive activities.

We must analyze the case of foreign-owned firms separately, since these firms essentially aim at serving the French market, and more generally at exploiting their location advantages (Dunning, 1977). Therefore, they are not expected to house all the auxiliary functions of the parent company. The LiFi survey shows that 57% of foreign manufacturing groups operating in France only own manufacturing LEs: only 24% of these groups establish a holding company in France; only 23% set commercial affiliates, 10% have affiliates providing business services (excluding holdings) and only 1% have a R&D centre in France.

**Figure IV: Composition of manufacturing business groups in terms of NACE codes**

% of business group owning at least one LE in the considered industry



*Lecture : 48% of French domestic groups own at least one holding company in France. This share reaches 58% among French multinational firms.*

*Champ : French manufacturing groups with more than 20 employees in 2007.*

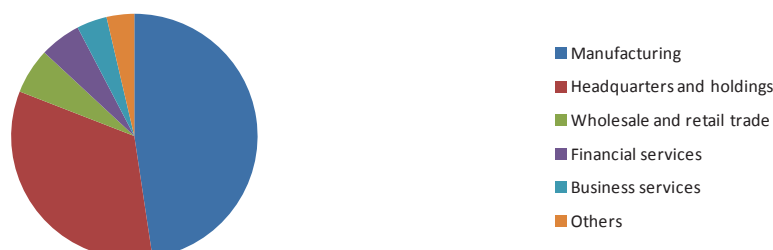
*Sources : LiFi survey, French annual census for manufacturing (EAE) - Author's calculation.*



## Holdings are a major vehicle for outward FDI

If we consider all foreign affiliates of French multinational groups, we find that one third of these affiliates are owned by a holding company (see figure V). Therefore, manufacturing LEs which do not directly invest abroad but transit through this type of entity cannot be detected by a classic analysis at the LE level: in 2007, this case concerns 475 manufacturing LEs (this was case n°4 in figure I).

**Figure V: Main activity of LEs which engage in FDI, within French manufacturing groups**



NB : The "Others" category mostly gathers LEs in R&D, real estate or computer activities.

Reading : 48% of FDI of French multinational groups transit through manufacturing LEs.

Sample : French manufacturing firms (independent LEs and business groups) with more than 20 employees in 2007.

Sources : LiFi survey, French annual census for manufacturing (EAE) - Author's calculation.

## The performance of multinational groups

The domestic perimeter of French multinational groups is larger than the perimeter of French domestic groups, both in terms of value-added and employment (see appendix I for the computation of performance premia and table 2 for results). This result holds regardless of industry and export/import activities. French multinational groups also exhibit a greater capital intensity, are more productive and more skilled-intensive if one looks at the mean value of wages. The performance premia which appear at the LE level (see Greenaway and Kneller (2007) for a review) are confirmed at the group-level. Besides, we find that the share of employees in the manufacturing perimeter is lower in multinational groups than in domestic ones.

**Table 2: Performance premia of manufacturing business groups according to their degree of internationalization, in 2007**

REGRESSORS	MANUFACTURING PERIMETER OF THE GROUP					Share of employees in the manufacturing perimeter
	Value added	Employment	Labour productivity	Mean wage	Capital intensity	
	(OLS)	(OLS)	(OLS)	(OLS)	(OLS)	(OLS)
<b>Foreign-owned firms (reference : French)</b>	0.759*** (0.032)	0.588*** (0.029)	0.171*** (0.015)	0.146*** (0.008)	0.491*** (0.027)	0.0328*** (0.0038)
<b>International activities (reference : groups without international activities)</b>						
Groups which only export (no FDI)	0.188*** (0.068)	0.0848 (0.062)	0.103*** (0.031)	0.0605*** (0.018)	0.279*** (0.057)	0.0002 (0.0081)
Groups which only import (no FDI)	0.293*** (0.068)	0.220*** (0.062)	0.0727** (0.031)	-0.0079 (0.018)	0.0598 (0.058)	-0.0214*** (0.0081)
Groups which both export and import (no FDI)	0.690*** (0.048)	0.571*** (0.044)	0.119*** (0.022)	0.0591*** (0.013)	0.468*** (0.041)	-0.0112** (0.0057)
Groups engaged in outward FDI	2.008*** (0.054)	1.766*** (0.049)	0.242*** (0.025)	0.118*** (0.014)	0.711*** (0.045)	-0.0428*** (0.0064)
Industry fixed effects	yes	yes	yes	yes	yes	yes
Number of observations	6512	6512	6512	6512	6512	6512
R <sup>2</sup>	0.4095	0.3420	0.3016	0.3315	0.2446	0.0287

NB : Standard errors are in parenthesis. \*\*\* indicates a significance at 1%, \*\* at 5%, \* at 10%. The regression is estimated by OLS and includes industry fixed effects (Summary Economic Classification with 36 levels). The table reports the value of coefficients. Consider  $\beta$  a given coefficient, we can compute the associated performance premium with the following expression :  $100 \times (\exp(\beta) - 1)$ .

Reading : All things being equal, labour productivity in the domestic manufacturing perimeter of multinational groups is 27,3% higher than labour productivity in the manufacturing perimeter of groups without international activities.

Sample : Manufacturing groups with more than 20 employees in France in 2007.

Sources : LiFi survey, French annual census for manufacturing (EAE), French customs - Author's calculation.

Let's mention that groups which both export and import also exhibit performance premia, but these are systematically lower than FDI premia. Groups which only import do not pay higher wages (when considering the mean wage) and do not appear more capitalistic than groups without international activities. Groups which only export do not exhibit a significant size advantage. Finally, in average, foreign groups which have manufacturing activities in France are larger and more productive than French groups.

### The manufacturing perimeter often articulates around several LEs

48% of French business groups in the sample gather several manufacturing LEs. This case is more frequent among French multinational groups (61%). For nearly two thirds of these groups, all manufacturing LEs belong to the same industry (French Nomenclature of Activities with 31 levels). Therefore, we can reasonably suppose that these firms are integrated in the same chain value, which justifies performing the analysis at the group level. Interestingly, when one business group gathers several manufacturing LEs, we are able to evaluate the performance of these LEs according to their international activities. We find that LEs which engage in FDI concentrate a greater share of output than affiliated LEs without international activities (see table 3 and appendix I for methodology). Besides, LEs which invest abroad are also more productive, more capitalistic and more skilled-intensive than domestic firms within the same business group.

**Table 3: Performance premia for multinational LEs within the same business group, in 2007**

REGRESSORS	PERFORMANCE OF THE LEGAL ENTITY (LE)				
	Value added	Workforce	Labour productivity	Mean wage	Capital intensity
	(OLS)	(OLS)	(OLS)	(OLS)	(OLS)
<b>International activities of the LE (reference : LEs without international activities)</b>					
LEs which only export (no FDI)	0.128 (0.174)	0.0188 (0.159)	0.109 (0.091)	0.0919** (0.044)	0.219 (0.169)
LEs which only import (no FDI)	0.459*** (0.151)	0.394*** (0.138)	0.065 (0.079)	0.01 (0.038)	0.314** (0.146)
LEs which both export and import (no FDI)	1.051*** (0.110)	0.826*** (0.100)	0.225*** (0.057)	0.103*** (0.028)	0.592*** (0.106)
LEs which are engaged in outward FDI	2.314*** (0.114)	1.862*** (0.104)	0.452*** (0.060)	0.235*** (0.029)	0.910*** (0.110)
Industry fixed effects	yes	yes	yes	yes	yes
Group fixed effects	yes	yes	yes	yes	yes
Number of observations	2022	2022	2022	2022	2022
R <sup>2</sup>	0.602	0.559	0.483	0.580	0.497

NB : Standard errors are in parenthesis. \*\*\* indicates a significance at 1%, \*\* at 5%, \* at 10%. The regression is estimated by OLS. The model includes industry fixed effects (Summary Economic Classification with 36 levels) and group fixed effects. The table reports the value of coefficients. Consider  $\theta$  a given coefficient, we can compute the associated performance premium with the following expression :  $100 \times (\exp(\theta) - 1)$ .

Reading : All things being equal, LEs which are engaged in outward FDI are 57,1% more productive than affiliated LEs without international activities.

Sample : 402 French manufacturing groups with more than 20 employees, gathering both domestic and multinational  
Sources : LiFi survey, French annual census for manufacturing (EAE), French customs - Author's calculation.

This finding brings two comments. First, as expected, the output of the manufacturing perimeter is rarely distributed equally among all LEs within the same group: the typical structure of multinational groups is composed of one or two parent companies, which concentrate a great share of output, trade and FDIs, and several smaller and less productive LEs without international activities. This finding might partly explain the productivity premium of multinational LEs: in fact, these units might have increased their specialization, and transferred the activities for which they had a comparative disadvantage to their domestic affiliates. Second, the existence of heterogeneity within business

groups might imply heterogeneous responses to outward FDI: since offshoring is more likely to impact negatively the least productive and skilled-intensive LEs, we might expect that the potential negative effect of outward FDI on home employment does not affect the parent company itself, but one of its domestic affiliates.

### Reallocation of the most productive domestic LEs inside multinational groups

At this point of the analysis, it is interesting to assess if our new definition of firms affects the performance gap between domestic firms and multinational firms. Table 4 shows that domestic LEs which belong to a multinational group are larger and more productive than other domestic LEs, regardless of industry and export/import activity (see appendix I for methodology). Therefore, multinational groups gather the two most efficient categories of LEs: multinational ones and their domestic affiliates: reasoning at the group-level amplifies the level of FDI premia which is observed at the LE level.

**Table 4: Performance premia of domestic LEs according to ownership in 2007**

REGRESSORS	CHARACTERISTICS OF DOMESTIC LEGAL ENTITIES (LEs)			
	Value added (OLS)	Workforce (OLS)	Labour productivity (OLS)	Capital intensity (OLS)
<b>Export and import activities (reference : firms without international activities)</b>				
LEs which only export	0.131*** (0.024)	0.0247 (0.021)	0.106*** (0.015)	0.322*** (0.032)
LEs which only import	0.268*** (0.024)	0.162*** (0.021)	0.106*** (0.015)	0.339*** (0.031)
LEs which both export and import	0.594*** (0.017)	0.403*** (0.015)	0.191*** (0.011)	0.618*** (0.022)
<b>Ownership (reference : independent LEs)</b>				
LEs part of a domestic group	0.254*** (0.014)	0.261*** (0.013)	-0.006 (0.009)	0.105*** (0.019)
LEs part of a multinational group	0.755*** (0.021)	0.725*** (0.019)	0.030** (0.014)	0.191*** (0.028)
Industry fixed effects	yes	yes	yes	yes
Number of observations	12,920	12,920	12,920	12,920
R <sup>2</sup>	0.307	0.204	0.275	0.184

*NB : Standard errors are in parenthesis. \*\*\* indicates a significance at 1%, \*\* at 5%, \* at 10%. The regression is estimated by OLS. The model includes industry fixed effects (Summary Economic Classification with 36 levels). The table reports the value of coefficients. Consider  $\beta$  a given coefficient, we can compute the associated performance premium with the following expression :  $100 \times (\exp(\beta) - 1)$ .*

*Reading : All things being equal, labour productivity of domestic LEs which are part of a multinational group is 3% higher than labour productivity of domestic independent LEs.*

*Sample : Domestic independent LEs with more than 20 employees in the manufacturing sector in 2007, excluding foreign-Sources : LiFi survey, French annual census for manufacturing (EAE), French customs - Author's calculation.*

## SECTION V: EX-ANTE PERFORMANCE OF SWITCHERS

In order to analyze the dynamics of firms before and after investing abroad, we organize the data around cohorts. We define cohorts as windows of five years centered on year T, where T is the year in which domestic firms (independent LEs or groups) may choose to invest abroad. We construct five cohorts, centered on years 2001 to 2005. Cohorts are balanced, so results cannot be affected by a change in the number of observations. Besides, as explained above, we only consider firms whose parent company does not change over the five years of the cohort. Then we distinguish two categories:

- A switcher is a French firm which remains domestic during the first two years of the cohort, becomes a multinational firm in T, and keeps affiliates abroad for at least two years<sup>9</sup>.
- A domestic firm is a French firm which has no FDI until year T included. This means we will not compare switchers with firms which stay domestic over the whole period, but with firms which might invest abroad later (in T+1 or T+2)<sup>10</sup>.

We will only keep these two types of firms in cohorts. Switchers which set commercial affiliates abroad or which invest through commercial LEs are dropped from the sample, since affiliates in wholesale and retail trade have few chances of destroying jobs at home. We also drop switchers which own more than five FDIs in year T. Finally, we exclude switchers which experience significant breaks in the dynamics of their workforce, as these breaks are essentially due to M&A and might false the results and their interpretation. This last precaution concerns 19 switchers and has two advantages: smoothing the distribution of size and improving the quality of the matching procedure.

We check that each switcher has a potential control firm with a similar size. This might not be the case in very concentrated industries, where there are few medium-sized firms. This is why we exclude all switchers in the « publishing, printing and reproduction » industry (code “C2” in the Summary Economic Classification with 36 levels).

**Table 5: Composition of the cohorts**

Composition of the cohort	Year of investment (T)					TOTAL
	2001	2002	2003	2004	2005	
<b>Domestic firms</b>	6,757	6,295	5,915	5,799	5,432	30,198
- Independent LEs	4,799	4,465	4,148	3,904	3,627	20,943
- Firms which invest abroad in T+1 or T+2	85	83	98	87	91	444
<b>Switchers (which remain engaged in outward FDI in T+1 and T+2)</b>	41	48	21	50	35	195
- Independent LEs	8	13	2	15	9	47
- Firms investing in developing countries	19	11	21	21	17	89
<b>Switchers which remain engaged in outward FDI only in T</b>	0	3	6	5	3	17
<b>Switchers which remain engaged in outward FDI only in T and T+1</b>	3	4	6	5	3	21

*Reading : 41 French firms decide to invest abroad in 2001 and remain engaged in FDI for at least two years.*

*Sample : French manufacturing firms (independent LEs and business groups) with more than 20 employees over the period 1999 - 2007.*

*Sources : LiFi survey, French annual census for manufacturing (EAE), French customs - Author's calculation.*

Finally, we do consider foreign groups whose French affiliates invest abroad as potential switchers, since these groups are already, by definition, multinationals. Moreover, evaluating their performance makes little sense without information about the other units of the group.

### Switchers' characteristics

Switchers gather 47 independent LEs, 92 business groups with a single manufacturing LE and 66 groups with several manufacturing LEs (in T-1). Nearly 80% of switching groups engage in FDI through their parent company. FDI often transits through a manufacturing LE (this is the case for 60% of groups) or a holding (31%). Less than 25% of investors realize several investments in T. 59% of foreign affiliates are located in high-income countries.

<sup>9</sup> We choose to follow the performance of switchers over two years for two reasons: first, few firms keep foreign affiliates less than two years (36 firms in all cohorts) ; second, considering more than two years might lead to keeping only firms which succeeded in investing abroad, introducing a new selection bias in the analysis.

<sup>10</sup> 16% of switchers will be matched with firms which engage in FDI one or two years later.

**Table 6: Performance premia of switchers in T-1**

DEPENDENT VARIABLE	MANUFACTURING PERIMETER OF THE FIRM					FIRM LEVEL		
	Value added	Workforce	Labour productivity	Mean wage	Capital intensity	Export status	Import status	Share of employees in the manufacturing perimeter
Coefficient	0.787***	0.631***	0.156***	0.057***	0.141**	0.188***	0.191***	-0.021**
Standard error	(0.061)	(0.063)	(0.028)	(0.017)	(0.057)	(0.015)	(0.015)	(0.009)
N	30,393	30,393	30,393	30,393	30,393	30,393	30,393	30,393
R <sup>2</sup>	0.206	0.171	0.167	0.173	0.173	0.078	0.100	0.174

NB : Standard errors are in parenthesis. \*\*\* indicates a significativity at 1%, \*\* at 5%, \* at 10%. The regression is estimated by OLS. The model includes industry fixed effects (Summary Economic Classification with 36 levels) and a dummy for business groups. The table reports the value of coefficients. Consider  $\theta$  a given coefficient, we can compute the associated performance premium with the following expression :  $100 \times (\exp(\theta) - 1)$ .

Reading : In T-1, the average value added of switchers is 120% higher than the average value added of domestic firms.

Sample : French manufacturing firms (independent LEs and business groups) with more than 20 employees over the period 1999 - 2007.

Sources : LiFi survey, French annual census for manufacturing (EAE), French customs - Author's calculation.

Nearly all switchers have an export and an import experience: in T-1, seven switchers only export, three only import and two have no international activities. As expected, switchers already exhibit performance premia one year before investing abroad (see table 6), for all considered indicators: value-added, workforce, labor productivity, capital intensity, mean wage and propensity to export/import. This finding confirms the self-selection hypothesis, and justifies the use of matching techniques.

### Propensity scores and matching procedure

We now estimate the probability of investing abroad in T, according to observable characteristics in T-1. The predicted scores will allow us to match each switcher with a comparable domestic firm. Scores are estimated with a probit model with lagged regressors. These regressors both describe the characteristics of the firm taken as a whole and the characteristics of its manufacturing perimeter.

Variables at the firm-level are:

- Main industry (Summary Economic Classification with 36 levels) ;
- Total workforce in France ;
- Share of employees in the manufacturing perimeter ;
- Exported and imported amounts<sup>11</sup>.

These variables are provided by LiFi and the French customs, and can be considered as exhaustive.

Variables which describe the manufacturing perimeter are:

- Value-added ;
- Labour productivity ;
- Capital intensity ;
- Mean wage.

These variables are given by the EAE and only cover manufacturing LEs with more than 20 employees or with sales exceeding 5 million euros. In T-1, LiFi allows us to estimate the gap between the number of employees in the EAE and the total number of employees of the manufacturing perimeter. This gap is rather small and reaches 6% in T-1. More importantly, the number of employees which are not covered by the EAE does not change between T-1 and T+2. Therefore, it does not seem that results are affected by threshold effects because of the use of the EAE.

<sup>11</sup> We prefer to account for exported/imported amounts rather the status of exporter/importer, since almost all switchers are both exporters and importers in T-1. This increases the accuracy of the matching procedure.

We also introduce a dummy in order to separate independent LEs from business groups, since the latter might enjoy unobservable advantages: more efficient organization and auxiliary functions, pooling of tangible and intangible assets (Chang and Hong, 2000). Finally, we introduce year fixed effects in order to account for different business cycles.

We separately estimate the regression on two samples: the first one includes all cohorts and the second one only keeps firms whose manufacturing perimeter does not change (*i.e.* LEs composing their manufacturing perimeter stay the same over the whole period). This subsample gathers 43% of switchers. The advantage of this sample censoring is that we can interpret results more easily, since changes in performance cannot result from M&A or changes of industry for this subsample.

Regardless of size or industry, the propensity of investing abroad next year increases with exports and imports, and decreases with capital intensity (see table 7). Moreover, business groups are more likely to engage in FDI than independent LEs, which justifies matching these two categories separately.

**Table 7: Propensity of engaging in outward FDI next year**

DETERMINANTS OF THE PROPENSITY TO ENGAGE IN OUTWARD FDI	ALL FIRMS			FIRMS WITHOUT CHANGE OF THEIR MANUFACTURING PERIMETER			
	(Probit)			(Probit)			
	Coefficient	Standard error	Significativity	Coefficient	Standard error	Significativity	
Business groups (reference : independent LEs)	0.0034	(0.0011)	***	0.0018	(0.0009)	***	
CHARACTERISTICS OF THE FIRM	log(workforce in France)	0.0046	(0.0020)	**	0.000007	(0.0036)	
	log(share of employees in the manufacturing perimeter)	-0.0018	(0.0034)		-0.0028	(0.0041)	
	log(exports)	0.0015	(0.0003)	***	0.0009	(0.0002)	***
	log(imports)	0.0005	(0.0003)	*	0.0006	(0.0002)	***
CHARACTERISTICS OF THE MANUFACTURING PERIMETER	log(value added)	-0.0013	(0.0019)		0.0012	(0.0036)	
	log(labour productivity)	0.0054	(0.0023)	**	0.00004	(0.0037)	
	log(capital intensity)	-0.0012	(0.0005)	***	-0.0007	(0.0003)	**
	log(mean wage)	0.0001	(0.0017)		0.0004	(0.0012)	
Reference probability (at mean values of regressors)		0.0039			0.0019		
Number of observations		17 030			13 418		
R <sup>2</sup>		0.1711			0.1663		

NB: \*\*\* indicates significativity at 1%, \*\* at 5%, \* at 10%. Standard errors are clustered around firms. We use a probit model which includes industry and year fixed effects. The table reports marginal effects at the mean.

Reading: Considering all firms in cohorts, the probability of engaging in outward FDI is 0.39% for the reference firm (*i.e.* independent LEs whose characteristics correspond to the average of the sample for continuous variables). For business groups, this probability increases by 0.34 percentage points, so it reaches 0.73%. At the sample mean, an increase of 10% of workforce in France increases the probability of switching of 4.6 percentage points.

Sample: Cohorts of domestic firms and switchers covering the period 1999 - 2007.

Sources: LiFi survey, French annual census for manufacturing (EAE), French customs - Author's calculation.

We now retrieve the propensity scores for each firm in order to match switchers with comparable domestic firms. We use the “nearest neighbor” matching technique and only keep one control firm per switcher (we will also test the results keeping two control firms). The switcher and its control firm must belong to the same industry and to the same cohort. Independent LEs and business group are matched separately. We end up with 186 pairs, each containing a switcher and a domestic firm. We are only left with 76 pairs when restricting to firms whose manufacturing perimeter remains unchanged over the whole period<sup>12</sup>.

<sup>12</sup> The sample initially has 80 switchers whose manufacturing perimeter does not change ex-post, but we have to eliminate four in order to improve the quality of the matching procedure.



Before comparing the dynamics of switchers and control firms, we assess whether these two groups have similar observable characteristics *ex-ante*, for each variable considered in the propensity scores. We perform Kolmogorov-Smirnov tests (see results in table 8) and confirm that the distribution of each variable is significantly close in the two subsamples. This confirms that we have correctly eliminated the selection bias, and that we can evaluate the impact of outward FDI all things being equal.

**Table 8: Characteristics of switchers and control firms in T-1**

VARIABLES INCLUDED IN THE PROPENSITY SCORES		ALL SWITCHERS (186 PAIRS)			SWITCHERS WITHOUT CHANGE OF THEIR MANUFACTURING PERIMETER (74 PAIRS)		
		Mean for switchers	Mean for control firms	P-value (KS test)	Mean for switchers	Mean for control firms	P-value (KS test)
CHARACTERISTICS OF THE FIRM	log(workforce in France)	4.88	4.80	0.71	4.51	4.43	0.74
	log(share of employees in the manufacturing)	-0.07	-0.08	0.88	-0.07	-0.06	0.74
	log(exports)	7.94	7.9	0.71	7.81	7.58	0.11
	log(imports)	7.39	7.34	0.88	7.29	7.35	0.96
CHARACTERISTICS OF THE MANUFACTURING PERIMETER	log(value added)	8.77	8.67	0.53	8.43	8.46	0.74
	log(labour productivity)	4.04	4.02	0.37	4.01	4.10	0.46
	log(capital intensity)	3.36	3.35	0.98	3.36	3.64	0.17
	log(mean wage)	3.21	3.23	0.71	3.21	3.24	0.46

*Sample : Firms switching between 2001 and 2005, matched with similar domestic firms.*

*Sources : LiFi survey, French annual census for manufacturing (EAE), French customs - Author's calculation.*

## SECTION VI: IMPACT OF OUTWARD FDI ON THE DOMESTIC PERIMETER OF GROUPS

We perform a two-step analysis of the impact of outward FDI on firms' performance: first, we begin by describing the dynamics of switchers and control firms, then we complete this description with the econometric model, using the DID estimator.

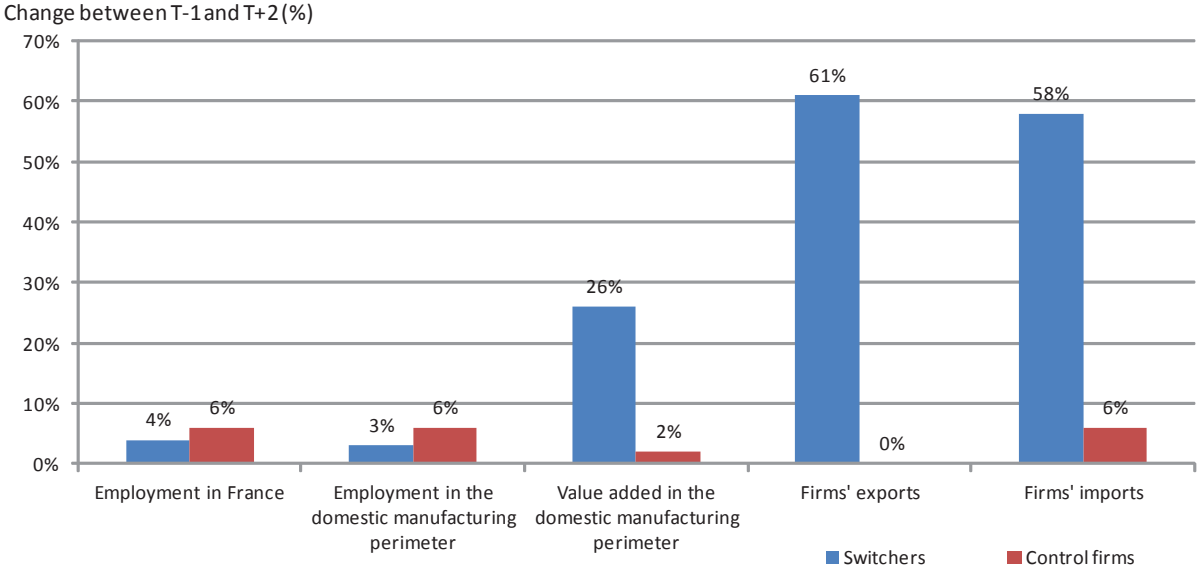
55% of switchers increase their number of employees in France between T-1 and T+2. 67% increase their value-added (in the manufacturing perimeter), 74% increase their exports and 72% their imports. Considering all switchers, total workforce in France increases by 4%, total value-added by 26% and net exports (exports minus imports) by 3% (see figure VI). Therefore, the outcome appears positive for the French economy, especially as control firms do not experience such an increase of their performance. The only noteworthy exception is that total employment in France, especially in the manufacturing perimeter, grows faster for control firms than for switchers, but this evolution seems driven by some outliers: only 45% of control firms increase their workforce in France between T-1 and T+2 (against 55% of switchers); the median number of employees remains stable for switchers (133 employees in T-1 and T+2) whereas it decreases slightly for control firms (falling from 120 to 117 employees).

It is important to precise that this increase of total workforce might result from the start of new activities but also from M&A. Considering the identification number of each LE in the manufacturing perimeter, we observe that the composition of these ID numbers changes for more than half firms between T-1 and T+2. As explained in section I, we cannot tell whether this change of the perimeter is related to M&A or administrative procedures (one LE simply changes its identification number) or changes of the legal structure of the group without any change of its activity. However, let's remind



that we have already removed all firms (domestic ones and switchers) which experience an unrealistic evolution of their workforce between T-1 and T+2. Therefore, our results are not affected by some big acquisitions.

**Figure VI: Evolution of value-added, workforce, exports and imports for switchers and control firms between T-1 and T+2**



*Reading : Switcher's total exports have increased by 61% between T-1 and T+2.  
 Sample : Firms switching between 2001 and 2005, matched with similar domestic firms.  
 Sources : LiFi survey, French annual census for manufacturing (EAE), French customs - Author's calculation.*

Now we measure the impact of outward FDI on firms' performance with the DID estimator. The regression is the following:

$$\ln X_t = C + \beta \times SWITCH + \sum_t \delta_t \times LAG_t + \sum_t \gamma_t \times SWITCH \times LAG_t + \varepsilon_t \quad (4)$$

First, we only keep firms whose manufacturing perimeter does not change. As explained above, any change of the size of these firms corresponds to the creation or the destruction of activities in France, since M&A cannot affect the results for this subsample. The DID estimator shows that the impact of outward FDI on total workforce and employment in the manufacturing perimeter is positive but not significant (see the first column of table 9). However, the share of employees in the manufacturing perimeter decreases significantly after the investment. At the same time, switchers significantly increase their value-added, their productivity and their mean wage in their manufacturing perimeter. One might interpret these results as the sign that these firms are offshoring their low-skilled activities, reducing the share of low-skilled workers in the home country and increasing labour productivity and value-added. However, employment in the manufacturing perimeter remains stable and the impact on exports and imports is non-significant (whereas vertical FDI should at least increase intra-group trade). Therefore, these productivity gains do not seem to come from relocations but might result from the creation of new auxiliary functions.

Now let's analyze the results for all switchers. The impact of outward FDI appears positive and very significant in terms of employment, value added and exports (see the second column of table 9). Considering two control firms for each switcher does not affect this positive trend. Therefore, it seems that switchers are able to conquer new markets, which improves the performance of the

parent company. There is no impact on imports, which suggests that the first motive for investing abroad is not to import cheaper products and materials from low-income countries.

**Table 9: The impact of outward FDI on the domestic perimeter of firms in T+2**

DEPENDENT VARIABLE	(1) Switchers without change of their manufacturing perimeter (76 pairs)	(2) All switchers with one control firm per switcher (186 pairs)	(3) All switchers with two control firms per switcher (543 pairs)
Workforce in the French perimeter	0.032 (0.039)	0.101** (0.043)	0.093*** (0.034)
Workforce in the French manufacturing perimeter	0.001 (0.037)	0.074* (0.043)	0.077** (0.032)
Share of employees in the French manufacturing perimeter	-0.031** (0.014)	-0.026** (0.013)	-0.0157 (0.010)
Exports	0.017 (0.130)	0.392*** (0.132)	0.342*** (0.118)
Imports	0.161 (0.219)	0.181 (0.138)	0.189* (0.107)
Value added (i)	0.125* (0.075)	0.191*** (0.053)	0.182*** (0.047)
Labour productivity (i)	0.118* (0.062)	0.065* (0.038)	0.080** (0.037)
Capital intensity (i)	0.052 (0.052)	0.002 (0.048)	-0.015 (0.041)
Mean wage (i)	0.075** (0.036)	0.036** (0.018)	0.047** (0.021)

Legend : \*\*\* indicates a significance at 1%, \*\* at 5%, \* at 1%. Standard errors are in parenthesis and computed with bootstrapping methods (100 replications). (i) indicates that variables only describe the manufacturing perimeter of firms. For columns (1) and (2), there is only one control firm per switcher.

The table reports the value of coefficients. With  $\beta$  a given coefficient, we can estimate the associated effect of outward FDI with the following expression:  $100 \times (\exp(\beta) - 1)$ .

Reading : Two years after switching, the average workforce of switchers in France is 10.6% than the average workforce of firms which remained domestic or invested abroad later.

Sample : Firms switching between 2001 and 2005, matched with similar domestic firms.

Sources : LiFi survey, French annual census for manufacturing (EAE), French customs - Author's calculation.

Therefore, the positive impact of outward FDI which was found at the LE level (Barba Navaretti and Castellani, 2008; Barba Navaretti *et al.*, 2010; Hijzen *et al.*, 2009) is not compensated by a negative impact on other LEs in the domestic perimeter. However, although investing abroad strengthens the manufacturing perimeter *ex-post*, firms allocate a growing share of their workforce to auxiliary functions<sup>13</sup> (however, this finding does not hold when considering two control firms). This suggests that outward FDI has contributed to the deindustrialization of high-income countries and implies the reconversion manufacturing sites on the long-run.

## CONCLUSION

This paper is a first try of analyzing the impact of outward FDI on the domestic perimeter of multinational firms. This empirical work anticipates a major reshape of business statistics, which does not consider Legal Entities (LEs) as the relevant unit for economic analysis. This allows us to account for two recent trends: on the one hand, the use of dedicated entities (holdings, headquarters) as vehicles for FDI; on the other hand, the fact that a growing number of firms are organized as business groups, gathering several Legal Entities (LEs). Not only empirical studies conducted at the LE level are

<sup>13</sup> It is even possible that we under-estimate this reallocation of workforce to auxiliary functions, given that the increase of employees in the manufacturing perimeter might also concern R&D activities, storage, business services or commercial activities.

not able to correctly identify multinational firms, but they are also unable to correctly estimate their performance at home. This paper aims at solving these two problems.

Reasoning at the group level does not challenge the strong correlation between outward FDI and performance: the domestic perimeter of multinational groups is larger and more productive than the perimeter of domestic groups, regardless of industry. Taking into account the group dimension enriches this finding in multiple ways. First, output, trade and FDIs are often concentrated by a minority of manufacturing LEs in each group: heterogeneity even lies within business groups. Moreover, reasoning at the LE level leads to under-estimating the gap between multinational firms and domestic firms, since domestic LEs which belong to a multinational group outperform other domestic LEs.

The impact of outward FDI on the domestic perimeter of business groups is positive and significant. The number of employees increases both in the manufacturing perimeter and in LEs related to auxiliary functions. This positive trend might come from the increase of market shares abroad and a significant increase of exports. The exact outcome in terms of job creations/destructions remains unknown, since the increase of workforce might also result from changes of perimeter and M&A operations (although our methodology significantly reduces the influence of important acquisitions). Furthermore, this paper shows that the positive impact which was already found by empirical studies at the LE level is not compensated by a negative impact on some LEs within the same group.

Finally, our paper also shows that switchers affect a growing share of their workforce to non-manufacturing activities. However, more detailed data concerning the composition of the workforce is necessary to understand the implications of this result in terms of professional development and reconversion of manufacturing sites.

## REFERENCES

- Bandick, R. and Karpaty, P. (2011) Employment effects of foreign acquisition, *International Review of Economics and Finance*, 20(2):211–224.
- Barba Navaretti, G., Castellani, D. and Disdier, A-C. (2010) How does investing in cheap labour countries affect performance at home? Firm-level evidence from France and Italy, *Oxford Economic Papers*, 62(2):234–260.
- Barba Navaretti, G. and Castellani, D. (2008) Do Italian Firms Improve Their Performance at Home by Investing Abroad? in *Foreign Direct Investment and the Multinational Enterprise*. Brakman et Garretse (eds), Cambridge, MIT Press, pp 199-224.
- Becker, S.O., Ekholm, K. and Muendler, M-A. (2009) Offshoring and the Onshore Composition of Tasks and Skills, Stirling Economics Discussion Paper No 2009-18.
- Castellani, D., Mariotti, I. and Piscitello, L. (2008) The impact of outward investments on parent company's employment and skill composition: Evidence from the Italian case, *Structural Change and Economic Dynamics*, 19(1):81–94.

- Chang, S.J. and Hong, J. (2000) Economic performance of group-affiliated companies in Korea: Intragroup resource sharing and internal business transactions, *Academy of Management Journal*, 429–448.
- Dervieux, L. (2002) Démarrage de l'unité statistique Peugeot, La lettre du SSE No 51, janvier quatrième trimestre.
- Dervieux, L. (2001) Tour de chauffe pour la démarche de traitement des grands groupes : le cas Peugeot, La lettre du SSE No 44, janvier février.
- Eurostat (2010a) Business register recommendations manual, Eurostat methodologies and working papers.
- Eurostat (2010b). ESSnet on profiling large and complex MNEs: 1st SGA
- Gonzalez, L. and Picart, C. (2007) Diversification, recentrage et poids des activités de support dans les groupes (1993-2000), *Economie et statistique*, 405(1):77–97.
- Greenaway, D. and Kneller, R. (2007) Firm heterogeneity, exporting and foreign direct investment: A survey, *Economic Journal*, 117(517):134–161.
- Head, K. and Ries J. (2002) Offshore production and skill upgrading by Japanese manufacturing firms, *Journal of International Economics*, 58(1):81–105.
- Hecquet, V. (2010) Le profilage et son impact sur la représentation de l'appareil productif, *Contribution au colloque de l'Association de Comptabilité Nationale*, juin.
- Helpman, E., Melitz, M.J. and Yeaple, S.R. (2004) Export Versus FDI with Heterogeneous Firms, *American Economic Review*, 94(1):300–316.
- Hijzen, A., Jean, S. and Mayer, T. (2009) The Effects at Home of Initiating Production Abroad: Evidence from Matched French Firms, CEPII working paper No 2009-39.
- Rosenbaum, P. and Rubin, D. (1983) The central role of the propensity score in observational studies for causal effects, *Biometrika*, 70(1):41.

## **Appendix I: Computation of performance premia across and within business groups**

### **FDI premia accross business groups.**

We use the following econometric model in order to compute the performance premia of business groups (indexed i) with international activities:

$$\ln X_i = C + \beta_1 \times EXP + \beta_2 \times IMP + \beta_3 \times EXPIMP + \beta_4 \times FDI + \beta_5 \times GET + \sum_j \gamma_{1j} \times SEC + \varepsilon_i \quad (1)$$

The regression excludes independent LEs.  $X$  represents a performance indicator, which is successively value-added, workforce, labour productivity, capital intensity or mean wage (all computed for the manufacturing perimeter of the group).

The dummy  $EXP$  marks firms which only export (no FDI),  $IMP$  groups which only import (no FDI),  $EXPIMP$  groups which both exporting and importing, and finally  $FDI$  equals 1 for multinational groups (which, in our sample, both export and import). The reference group for internationalization gathers firms with no international activities. We introduce the dummy  $GET$  in order to account for foreign-owned groups.

Finally, we control for the main industry of the group with the variable  $SEC$  (Summary Economic Classification with 36 levels).

We estimate equation (1) using OLS regression, including only the last year of the sample (2007). We do not use a panel of groups since we would have to restrict the sample to those whose parent company does not change over the whole period. This would force us to drop a significant number of observations. Moreover, changes in the perimeter of business groups might lead to misinterpret the results.

#### **FDI premia of LEs within the same group**

We check whether manufacturing activities are distributed equally across LEs within the same business group. The econometric framework is very similar to equation (1):

$$\ln X_s = C + \delta_1 \times EXP + \delta_2 \times IMP + \delta_3 \times EXPIMP + \delta_4 \times FDI + \delta_5 \times SEC + \delta_6 \times GR + \varepsilon_i \quad (2)$$

The regression only includes LEs (indexed  $s$ ) which belong to a manufacturing group where there are both domestic manufacturing LEs and manufacturing LEs which invest abroad. This gathers 2 022 LEs which belong to 402 different groups. We use group fixed effects (vector  $GR$ ) in order to control for the global performance of the group.

#### **Performance of domestic LEs according to ownership**

We assess to which extent reasoning at the group level affects the level of FDI premia, by estimating the gap of performance between domestic independent LEs and domestic LEs which belong to a multinational group. The econometric framework is the following:

$$\begin{aligned} \ln X_s = C + \gamma_1 \times EXP + \gamma_2 \times IMP + \gamma_3 \times EXPIMP + \gamma_4 \times GFR\_DOM + \gamma_4 \times GFR\_FDI \\ + \gamma_5 \times SEC + \varepsilon_i \quad (3) \end{aligned}$$

The regression only includes the 12,920 LEs without FDI in 2007. We account for international activities and include two dummies,  $GFR\_DOM$  and  $GFR\_IDE$ , which respectively mark domestic LEs part of a domestic group and domestic LEs part of a multinational group.