The Jobs at Risk from Globalization: the French Case

Abstract

This article analyzes the effect of outward Foreign Direct Investment (FDI) on the composition of work in French firms. We use a detailed employer-employee database constructed with four comprehensive datasets of French manufacturing firms over the period 2002-2007, in order to analyze changes in the workforce composition in terms of skills and tasks. We employ instrumental variable techniques by using two original instruments (the level of infrastructure and GDP per capita in host countries). The fixed effect results show that FDI to low-income countries raises significantly the share of executives and reduces the share of blue-collar workers in company workforces in France. Outward FDI to high-income countries affects negatively the share of workers performing non-routine manual tasks. When controlling for endogeneity, the IV-results further show an overall positive effect of offshoring for employees performing interactive tasks, such as engineers and managers.

Keywords: FDI, Tasks, Inequality, Trade and labor market

JEL classification: J21, J24, F16, F14

1 Introduction

During the last two decades, the impact of offshoring on the labor market has been of huge interest in academic as well as in public debate. In particular, concerns are being expressed because offshoring of production stages could affect employment in most industrialized countries (Feenstra and Hanson (1996), Anderton and Brenton (1999), Becker et al. (2012)). Until now, the literature has shown little impact of offshoring on employment and has pointed out instead the effect of technical progress (Feenstra and Hanson 1999; Hijzen, Görg, and Hine 2005; Slaughter 2000; Autor, Levy, and Murnane 2003).

However, lack of available individual employer-employee data have led previous analyses to study the effect of offshoring on employment at the industry level (Ekholm and Hakkala (2005), Falk and Koebel (2012), Slaughter (2000), Hijzen et al. (2005)). This data gap enables to have detailed information on employees, in terms of tasks performed, qualifications and wages. Only a few countries have sufficient statistical information making it possible to combine information on employees with information concerning their employers. Head and Ries (2002) observed 1,070 multinational firms in Japan, between 1965 and 1989, and showed that higher employment in foreign subsidiaries is associated with greater use of non-production labor at home, relative to production labor. Hansson (2005) followed 75 multinational companies (MNC) in Sweden during the period 1990-1997 and also observed a positive association between vertical offshoring, defined as offshoring to low-income countries, and the share of skilled workers, in the parent company. Becker et al. (2012) used data on Germany for the years 1998 to 2001, and observed a statistically significant correlation between offshoring and the share of highly educated workers, and also between offshoring and the use of non-routine interactive tasks.

This study is interested in the effect of outward foreign direct investment (FDI) on the work-composition of French firms. Foreign Direct Investment is an important contributor of the internationalization of firms. In the United States, roughly one-half of U.S imports are transacted within the boundaries of multinational firms rather than across unaffiliated parties (Bernard et al. (2009)). In France, large multinational companies have favored internationalization through in-house foreign production, compared to Germany who has favored internationalization through arm's length production (Fontagné and Gaulier (2008)).

We use a comprehensive dataset linking detailed company and employee information, allowing us to contribute to the literature in different ways. First, we argue that the dataset permits to disentangle more carefully the direction of the bias of FDI towards occupations and tasks than do data at the industry level. The changing nature of the production process in *trade in tasks* is of particular importance in its consequences for the labor market. In recent times, several authors have shown that tasks give more information on the 'offshorability' of jobs than do occupations themselves (Blinder and Krueger 2013; Jensen and Kletzer 2010). However, to date, only a small number of studies includes task characteristics to analyze the effect of offshoring on workforce composition (Becker et al. (2012), Hakkala et al. (2014))[1]. In this study, we adopt the classification of occupations in terms of tasks, developed by Autor et al. (2003) to examine the relationship between offshoring and the composition of tasks inside the firm.

Second, the data allows the effect of FDI on the labor market to be identified from different points of view. On the one hand, the data identifies the number of subsidiaries abroad and their location, making it possible to disentangle the effect of FDI in low-income countries and high-income countries on employment. We include a second decomposition of FDI by distinguishing the employment effect of first-time investors from the effect of increasing the number of subsidiaries for already-established firms. On the other hand, the construction of the data allows the business group perimeter of each firm to be reconstructed, in order to examine changes in the firm's workforce composition consecutive to a shift in the offshoring strategy of the business group[2].

Finally, we control for endogeneity that could arise due to simultaneity and/or due to omitted variable bias. Our measure of offshoring focuses on in-house foreign direct investment (FDI) and does not account for outsourcing to independent suppliers, which implies that a part of the offshoring process could be captured in the error term. Only a small number of studies address the endogeneity problem in the literature. Becker et al. (2012) used a lagged instrument variable in the spirit of Blundell and Bond's estimation (2000), while Hummels et al. (2011) used an original set of instrumental variables to control for endogeneity associated with a firm's exports and imports. In this study, we control for the omitted variables bias by using an IV-model with two instruments: (i) the mean level of GDP per capita, and (ii) the average level of infrastructure in the host countries.

[1]Many countries and particularly France lack information on the task content of occupations. French studies often use the Reich classification that defines occupation categories according to the type of work performed: routine occupations, symbol managers, officials and farmers. The Reich classification shows that routine occupations are more sensitive to offshoring than farmers or officials (Allain, Collobert, and Fraboul 2004). Becker et al. (2012) and Spitz-Oener (2006) used a task classification based on German data.

[2]A group is composed of an independent parent company and all other entities controlled by the parent company. We include information at the group level, because foreign direct investment could not only impact employment inside the investing firm but also inside all other firms belonging to the same business group.

The analysis depicts different results depending on the destination country. On the one hand, a firm's FDI to low-wage countries negatively affects the firm's share of blue-collar workers and positively impacts the firm's share of skilled workers (managers and workers performing non-routine interactive tasks). On the other hand, offshoring to high-wage countries is associated with a lower share of workers performing non-routine manual tasks in the home country.

When distinguishing country destinations between EU-15, low-wage countries, high-wage countries, East European and emerging economies (BRICS), the negative effect of FDI to low-income countries is mainly driven by offshoring to emerging economies (BRICS). The results underscore a significant and positive impact of FDI to BRICS, both on the share of managers and non-routine occupations. The negative effect of FDI to high-wage countries on the share of workers performing non-routine manual tasks is driven by offshoring to high-income countries other than in the EU-15. Results show that FDI to high-income countries reduces significantly the share of skilled blue-collar workers inside the domestic firm. The results are stable when aggregating the foreign direct investment strategy at the level of the business group. We check for these effects on first time investors (extensive margin) and on already-established firms (intensive margin). The results highlight that firms significantly increase their share of managers at the extensive margin and reduce the share of blue-collar workers at the intensive margin. However, when controlling for endogeneity, the negative impact on the share of unskilled blue-collar workers is no longer significant, whereas the positive effect of FDI to low-income countries on the share of managers and on the share of workers performing skilled non-routine tasks remains significant.

The paper is organized as follows. Section 2 reviews the theoretical and empirical literature on the effect of offshoring on employment. Section 3 describes the data and the variables constructed. Section 4 details the methodology and Section 5 reports the results of the fixed-effect model. Finally, section 6 reports the results of the instrumental variable model, and Section 7 concludes.

2 Related Literature

Reduced barriers to international trade due to tariff reductions and falling transport costs have created incentives for firms to establish part of their production abroad. Production is now geographically widespread and involves tasks being undertaken in many different geographic locations. There are several theoretical models analyzing the labor market effect of international fragmentation, including Feenstra and Hanson (1996) and Grossman and Rossi-Hansberg (2008).

The Grossman and Rossi-Hansberg (2008) model identifies three channels through which offshoring could affect domestic wages. First, a relative price impact that works through a Stolper-Samuelson effect. Offshoring reduces the cost of unskilled tasks and lowers the relative price of unskilled intensive goods, resulting in a decrease of the relative wage of unskilled workers. The second effect comes from an excess of the low-skilled labor supply that implies a reduction of low-skilled workers' relative wages. Finally, offshoring can induce productivity gains that might translate into higher wages for both skilled and unskilled workers. The same reasoning may hold for employment (See Crinò (2009) for a review).

The Grossman and Rossi-Hansberg (2008) model places tasks rather than intermediate inputs as the central unit of analysis of international fragmentation of production

processes. Occupational task characteristics become a key component of understanding the 'offshorability' of jobs (Blinder and Krueger (2013)). According to Blinder (2009), the offshorability of a task depends on its potential to be carried out in another location, without loss of quality and on the importance of face-to-face contact with people other than fellow workers. According to Jensen and Kletzer (2010), the potential offshorability of a task is determined by the need for proximity with the customer.[3]

To date, only a small number of studies have analyzed the effect of offshoring on tasks. Hakkala et al. (2014) show a negative effect of horizontal investment on non-routine employment and Becker et al. (2012) show in-house offshoring to be associated with a statistically significant shift towards more non-routine and more interactive tasks.

A full range of tasks are needed to bring a product from its conception to its end use. A producer can choose between producing each of these activities in-house (inside a home or a foreign subsidiary) and outsourcing them from a local or a foreign supplier. The 'make-or-buy' decision is a trade-off between the cost of arm's-length relationships and the cost of in-sourcing through foreign direct investment. Grossman and Helpman (2002) identify different types of costs depending on the mode of integration. On the one hand, a vertically integrated firm may face a higher cost of producing components and services, because such a firm has many divisions to manage, and because the organization does not benefit from the learning that comes with specializing in a single activity. On the other hand, arm's length transaction costs stem from incomplete contracts and the search for partners. Several determinants influence the choice of integration and outsourcing: the type of industry (Antràs (2003), Antràs and Helpman (2004));[4] the life product cycle (Antràs (2005)); the extent of contractual incompleteness (Grossman and Helpman (2005)); and a firm's productivity (Antràs and Helpman (2004)).

One can argue that a firm's outward FDI has a specific impact on employment compared to international subcontracting, due to differences in terms of technology transfers and incentives to access foreign markets.

First, technology transfers may differ depending on the mode of internationalization. Several studies have highlighted that the international strategy (arm's length trade/FDI) determines skills formation and technology transfers (Grover (2008), Antràs (2005), Grossman and Helpman (2002)). The firm prefers to integrate through foreign direct investment when the good is high-technology intensive (Feenstra and Hanson (2005)) and non-standardized (Antràs (2005)), which implies human-capital intensive inputs.[5] Other studies have highlighted a higher speed of technological transfer and a higher investment in human capital in integrated subsidiaries compared to that of independent suppliers (Moran (2001), Mansfield and Romeo (1980)). Hence, technology transfer occurring through foreign direct investment could imply a specific effect on employment (see Chusseau et al. (2008) for a review on the employment effect of technological change).

[3]The underlying idea is that when industries and occupations are highly concentrated, the tasks performed in these occupations may *a priori* be performed remotely from a single work site. They add information on occupational task characteristics to complement their analysis.

[4]Antràs (2003) develops a framework in which there are two inputs, one controlled by the final-goods producer, the other by the supplier. Ownership is directed to the party whose investment contributes most to the value of the relationship. If the final-good is capital intensive, the final producer will prefer vertical integration in capital-intensive processes and arm's length transaction in labor intensive process.

[5]Moran (2001) cites Kodak as an interesting case study: Kodak used to produce conventional film in China through an unrelated affiliate, they started producing the latest digitized film and camera products when the Chinese government allowed Kodak to establish a parallel, wholly-owned plant.

Second, the motivation of FDI (vertical versus horizontal FDI) could have a specific impact on employment. On the one hand, FDI can act as a form of offshoring if the creation and/or the acquisition of a foreign company allow the value chain to be broken up, which is often referred to as vertical investment. On the other hand, FDI can be done for market-seeking reasons and does not necessarily increase the fragmentation of the production process, which is often referred to as horizontal investment.[6]

The effect on the labor market can vary considerably from one integration strategy to another. For Lipsey (2002), access to new markets (horizontal FDI) can increase firms' profits and competitiveness and a positive effect on home employment may occur. The extent to which domestic employment might benefit from firms' international expansion will depend on the share of foreign profits which are repatriated. If the parent company benefits from additional revenues from its foreign subsidiaries, domestic employment may increase.[7] Whereas vertical FDI is associated with relocation of low-skilled activities abroad, that could both increase the average skill-intensity for the investing firm at home, and reduce the share of unskilled workers, depending on whether domestic and foreign employment are substitutes or complements. The link between the complementary nature of foreign and domestic labor is not empirically clear. Several studies conclude that substitution may occur when FDI is horizontal (Konings and Murphy 2006; Cuyvers et al. 2005), whereas others conclude that substitution between domestic and foreign workers is more likely to arise when investments are made in low-wage countries (Riker and Brainard 1997; Head and Ries 2002; Strauss-Kahn 2004).

3 The Data and the Construction of Variables

Our database is constructed with four micro-data sources provided by the French National Institute for Statistics and Economic Studies (INSEE). Our database allows an original employer-employee database to be constructed for France, over the period 2002-2007.[8]

Employee Level Information. Employee level information comes from confidential yearly social security records, processed and transmitted by the INSEE, the so-called *Déclaration Annuelles des Données Sociales* (DADS Postes). All French employers, including national companies, public administrations and local governments are required annually to declare to state social security organizations and to the tax administration information about each of their employees. Every row in the declaration corresponds to a particular employee's position in a plant and reports information on the sex, age, occupation, number of worked hours, wages and the corresponding plant number. We sum each position (that corresponds to each line of the database) in groups of occupations for a given firm.[9] Hence,

[6]Vertical offshoring often takes place in low-income countries, whereas horizontal FDI is generally realized in high-income countries. Statistics suggest that FDI to low income countries is expanding rapidly with the development of emerging economies. In 2013, FDI flows to all major developing regions accounted for 54 per cent of global inflows (World investment report (2013)).

[7]This idea is close to the productivity effect developed in Grossman and Rossi-Hansberg (2008).

[8]We do not take into account information after 2007 because it could capture the labor market effect of the recent economic crisis. We do not use the data before 2002 because the occupational categories we use to define the groups of occupations (see below) changed that year.

[9]These include a group of skilled/unskilled workers, a group of managers and blue-collar workers, and a group of production/non- production workers for instance. A detailed description of occupational groups is given in the following sections.

the final database allows changes in the workforce composition for each French firm to be tracked, during the period 2002-2007.[10]

In order to obtain wage-bill shares for tasks, we add information on occupational tasks' content by using the ONET index. The ONET index is provided by the Department of Labor's Occupational Information Network. For the United States, the ONET database provides a detailed description of workers, occupations or jobs. We use information about occupation requirements that detail typical activities required across occupations to summarize the specific types of job behavior and tasks that may be performed within occupations.

The ONET index is built using a specific occupation classification based on the American SOC classification of occupations. We assume that the task content of occupations is identical in the United States and in France, so we can use the ONET classification to analyze the job content of French occupations.[11] The key point has been to link the ONET occupation classification with the French PCS-ESE classification. To do this, we build a mapping table from PCS-ESE to SOC 2010, thanks to the EurOccupations database.[12] The EurOccupations project aimed at building a publicly available database containing the most common occupations in multi-country data-collection. The database includes a source list of 1,594 distinct occupational titles within the ISCO-08 classification and provides a mapping table between the EurOccupation classification and the ISCO-08 classification, as well as a French translation of these occupations. We then match the 412 PCS-ESE occupational classification for which there is at least a perfect pair with occupations described in the EurOccupation database. Finally, a mapping table from the ISCO-08 to the SOC-2010 classification is used to link the PCS-ESE occupational classification with the SOC-2010. By creating this mapping table, we can use the ONET index to analyze the task content of French occupations. We build a score on the task importance for each firm by aggregating ONET scores on the work composition of each firm. Firms can then be identified by task vectors[13].

Firm Level Information. Firm level information comes from two confidential databases. The first is the *Liaison Finanière* survey (LIFI), that collects all the links between upstream and downstream firms and allows firms having at least one FDI project to be identified (i.e., firms having 10 % or more of voting stock). We are able to identify both a firm's parent company and a firm's foreign subsidiaries.[14] We have information on foreign subsidiaries' locations, on the balance sheet value of the ownership interest, and on the percentage of voting stocks at each subsidiary's general assembly. We distinguish the number of FDI holdings by country destination to BRICS, Eastern Europe, European Union countries, other high-income countries, and low-income countries[15].

[10] We only keep firms for which at least 90% of their work composition is referenced.

[11] This hypothesis is based on the idea that two countries with the same level of development should have the same production function, as suggested by traditional international trade theory.

[12] We are very grateful to Professor Kea Tijdens for having allowed us to use this database.

[13] Details on tasks are given in the following sections

[14] A small number of these firms are joint ventures, so we are unable to identify a unique parent company. In order to reconstruct the group perimeter by allocating one parent company to each legal entity, we decided to drop information about joint ventures. In 2007, there were 15,006 joint ventures, representing 6% of our sample.

[15] East European countries are composed of countries which joined the European Union after 2004; European countries include countries which joined the EU before 2004; high-income countries are composed of Iceland, Norway, Liechtenstein, Andorra, Gibraltar, Monaco, Switzerland, Japan, South Korea, Canada,

Finally, we use a threshold survey from the France's manufacturing census, called the *Enquête Annuelle Entreprise* (EAE). This data source provides the detailed income statement of all French manufacturing firms employing more than 20 employees. The database allows several control variables of company characteristics to be constructed, such as: value added, tangible assets, revenue, and different technology proxies.

The panel is unbalanced, with 42% of the sample being observed during the whole period. Firms observed during the 6-year period are on average more capital intensive, have higher R&D investment, more employees and higher revenues than firms lost due to attrition. These differences might alter our results, due to a selection bias effect. Therefore, we only report results in the balanced panel data.[16]

3.1 Measuring Foreign Direct Investment

There are different degrees of commitment when investing in a foreign subsidiary. A firm can choose to engage alone and maintain full control over the foreign subsidiary (wholly owned subsidiary), or to share the ownership with one or more partners to set up a joint venture.[17] The exercise of power (i.e. the mobilization of corporate assets in a joint stock company) is a matter of control which depends on the share of voting stocks held in a foreign subsidiary (Schott (1990)).

Moran (2004) has argued that the failure to differentiate between FDI with minority shareholding and investments with majority ownership makes it impossible to isolate the effect of FDI on the host country. The entry mode choice (a wholly-owned subsidiary versus a joint venture) has indeed several implications for the firm's management and technology transfer. A large number of shareholders can create an agency problem in which shareholders are passive in monitoring subsidiaries, because the benefits and costs of ownership are shared by a multitude of owners (Berle and Means (1932)). In addition, fear of a technology property leakage reduces technology transfer when the degree of ownership is low (Smarzynska-Javorcik and Spatareanu (2008), Abraham et al. (2010)). In contrast, the greater the concentration of ownership, the greater the degree of costs and benefits that are borne by any one owner (Demsetz and Lehn (1985)). Hence, owners operating under concentrated ownership have an incentive to discipline management and to supervise actively the controlled firm (Vermeulen (2013)).

The employment effect of making an FDI could thus vary depending on the entry mode choice. Bircan (2011) shows that greater foreign equity participation leads to the greater transfer of both tangible and intangible assets and also observed a higher wage premium, especially for skilled workers. In particular, Bircan (2011) shows that more than 15 percentage points of the multinational wage premium can be explained by the level of foreign ownership.[18]

---

the United States, Australia, New Zealand; and low-income countries are composed of other Asian, African and South American countries.

[16]The Hausman test fails to reject the hypothesis of random attrition, still, we find similar results with the unbalanced panel data and do not alter our principal conclusions.

[17]Foreign investment may be undertaken by constructing new operational facilities from the ground up (greenfield or brownfield investment), or without actually creating a new subsidiary (merger and acquisition).

[18]We have tested the impact of a change in the share of voting stocks held in a foreign subsidiary on the share of employment in the investing firm. Results reveal that increases in the share of voting stock in a firm's subsidiary raises significantly the share of executives and reduces the share of blue-collar workers. Results are available in the online appendix of the authors' website.

Our measure of FDI is calculated by summing the number of foreign subsidiaries controlled by each firm j over the period $t \in [2002, 2007]$. We weight this number by the firm j's percentage of votes at general meetings[19] in subsidiary k.

$$\kappa_{jt} = \sum_{k} Voting_{kjt} \tag{1}$$

Where voting is the share of voting stock held in firm j's subsidiary k at time t. The data provide information on the location of subsidiaries, which we group into low-income and high-income countries (as done by Becker et al. (2012) and Hijzen et al. (2011) among others). By doing so, we aim at capturing the motivations of foreign direct investment: horizontal versus vertical FDI (See Markusen (1995)).

The following table shows descriptive statistics on the number of subsidiaries by regions in which subsidiaries are located, for year 2007.

Table 1: MNC Subsidiaries

	Average number of subsidiaries		% change[a]		% of WOS[b]	
High income countries	0.704	[1,276]	0.164	[0,653]	51.9%	[0.499]
Low income countries	0.755	[1,666]	0.112	[0,876]	28.6%	[0.452]
BRICS	0.462	[1,096]	0.254	[0,809]	48.1%	[0.499]
Eastern Europe	0.251	[0,727]	0.191	[0,693]	56.6%	[0.495]
EU-15	1.736	[2,313]	0.086	[0,891]	44.6%	[0.497]

a. Measure the percentage change of subsidiaries between 2002 and 2007.
b. Measure the percentage of Wholly Owned Subsidiaries (WOS) in each region in 2007.
Lecture: The table gives the average number of subsidiaries in multinational firms by country destination for year 2007
Source: LIFI survey, French annual census for manufacturing (EAE);
Note: Balanced Panel; Standard deviations under brackets. Authors' calculations. High-income countries are composed of the United States, Canada, New Zealand, Japan, Norway, Switzerland, Iceland, Andorra, Monaco and Lichtenstein; Eastern Europe includes countries having joined the European Union after 2004; Low-income countries are composed of all other countries.

French multinational firms have on average more subsidiaries in high-income countries, low-income countries and in the European Union than in other parts of the world. The large number of subsidiaries in low-income countries is partly due to France's colonial history in North Africa and in sub-Saharan countries in the 19th century. French colonization has had an impact on language and the institutional proximity of France and the countries it colonized, by imposing French as an official language and by imposing legal and judicial institutions. Since lower geographic and cultural distance, as well as a common language have a positive impact on outward FDI (Bénassy-Quéré et al. (2007)), the number of subsidiaries in former French colonies is particularly important. In 2007, there were more than 1,500 subsidiaries established in Cameron, Côte d'Ivoire, Morocco, Tunisia and Algeria. In comparison, there were only 328 French subsidiaries in Japan in 2007, 996 in Switzerland, and 3,146 in the United States. The third main group of destination countries are the BRICS and which experienced the highest increase between 2002 and 2007. In 2007, there were 2,267 French subsidiaries in the BRICS, with 1,067 of them established in China.

Roughly one half of FDI in BRICS takes the form of wholly owned subsidiaries (see the last column of Table 1). Emerging economies (and BRICS in particular) continue to attract knowledge-intensive and technology-intensive FDI from developed countries (Gryczka

[19]For example, a firm having 2 subsidiaries controlled at 40% and 100% has a measure κ equals to 1.4.

2010), which could create incentives for French multinational firms to settle wholly owned subsidiaries in order to protect themselves against the leakage of technology, know-how and/or intangible assets. In contrast, French multinational firms seem to access low income countries by setting up a joint venture, since only 28.6% of FDI to low-income countries takes the form of wholly-owned subsidiaries. The need of a partner's experience of the foreign market is all the more important in a country where corruption and the cultural distance are high (Nunnenkamp and Andreis (2013), Brouthers and Brouthers (2001), Gatignon and Andersen (1988), Johansen and Vahlne (1977)). The predominance of joint-ventures in low-income countries suggests that FDI mainly concerns labor-intensive goods with standardized procedures and low-technology (Antràs (2005)). We also notice that internationalization in East European countries predominantly takes the form of wholly-owned subsidiaries. Firms prefer to avoid coordination with joint-venture partners in order to ensure quality standards and processes, by relying only on their own resources (Klug (2006), Stiegert et al. (2006)).

We control our result by building other proxies of outward FDI, as described in Appendix A. We find estimation results to be similar whatever the proxy retained (see Table 9 and 10).

3.2 Measuring tasks

In order to classify occupations by their task intensity, we follow the strategy of Autor, Levy, Murnane (2003): hereafter ALM. ALM use the US Department of Labor's Dictionary of Occupational Titles (DOT) to break down different tasks into five major components: non-routine analytical, non-routine interactive, non-routine manual, cognitive routine and manual routine tasks.

According to ALM, the codified nature of a task determines its potential for relocation. The more a task can be determined by specific rules, the less it relies on tacit knowledge and the easier it is to explain to someone else and also to control. As information on the task content of an occupation is very difficult to obtain, even more so because the given data is not available in every country, we use the US database of the Department of Labor's Occupational Information Network (ONET). Table 12 in Annex B reports the 41 work activities divided into five groups: non-routine analytical, non-routine cognitive, non-routine interactive, non-routine manual and routine manual.[20]

We follow Oldenski (2012) in linking the ONET routine/non-routine score to occupations. The score importance of each task i in group j is:

$$M_{ij} = \sum_{o} \gamma_{oj} l_{oi} \tag{2}$$

With γ_{oj} being the share of occupation o used in the production of firm j and l_{oi} being an index of the importance of task i in the occupation o. We normalize the task index, so that for every occupation a task intensity measure varies in the range of 0 to 1[21].

[20]Table 13 in Annex B gives examples of occupations in the metal industry, ranging from engineer to assembler. This table shows that engineers have a higher index of non-routine tasks and assemblers a higher index than manual tasks.

[21]However, because the ONET database does not provide information on workers, we are unable to follow the evolution of task requirements within a given occupation. Therefore, our empirical estimations only analyze inter-occupational change by assuming that there are no intra-occupation variations. This limitation can be avoided by using data that provides for the evolution of each task within an occupation,

Table 2 details the average workforce composition of different firms. MNCs are relatively more intensive in skilled white-collar workers, and less intensive in blue-collar workers, whatever their level of qualification.[22] Interestingly, the share of skilled blue-collar workers (composed of engineers, technicians and skilled laborers) is 1.4 percentage points lower in multinational companies than in domestic firms. The decomposition by occupation shows that this result is mainly driven by a lower share of skilled blue-collar workers in MNCs. Conversely, the share of managers, engineers and technicians is higher in MNCs, compared to domestic firms.

Table 2: Workforce Composition

	Domestic Firms		Exporting Firms		Multinational Firms	
Non-routine analytical	0.555	[0.122]	0.599	[0.112]	0.659	[0.093]
Non-routine interactive	0.377	[0.125]	0.424	[0.127]	0.499	[0.115]
Routine cognitive	0.512	[0.129]	0.576	[0.130]	0.641	[0.094]
Non-routine manual	0.556	[0.119]	0.514	[0.120]	0.472	[0.121]
Routine manual	0.531	[0.155]	0.458	[0.151]	0.376	[0.125]
Skilled blue-collar	63.7%	[0.224]	62.1%	[0.208]	62.3%	[0.186]
Skilled white-collar	9.1%	[0.109]	12.4%	[0.128]	18.4%	[0.147]
Unskilled blue-collar	16.9%	[0.193]	18.1%	[0.184]	11.3%	[0.134]
Unskilled white-collar	10.2%	[0.117]	7.4%	[0.068]	7.8%	[0.063]
Managers	3.7%	[0.060]	5.3%	[0.064]	9.1%	[0.080]
Engineers	6.2%	[0.074]	7.4%	[0.091]	13.2%	[0.113]
Technicians	12.1%	[0.125]	15.5%	[0.121]	22.2%	[0.114]
Foremen	6.5%	[0.087]	4.9%	[0.046]	4.8%	[0.046]
Office workers	10.1%	[0.195]	8.6%	[0.118]	8.9%	[0.084]
Skilled blue-collar	51.6%	[0.241]	44.7%	[0.220]	37.1%	[0.197]
Unskilled blue-collar	19.3%	[0.213]	20.2%	[0.204]	12.7%	[0.149]

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des donnés sociales (DADS); balanced panel data; year 2007. Authors' calculations.

The tasks performed inside the firm are on average less routine and less manual in multinational companies than in domestic or exporting ones. They are also more intensive in routine cognitive or non-routine analytical tasks. These results show that French multinational firms are more intensive in skilled employment not directly linked to production (such as managers) and more intensive in non-routine activities.

4 Estimation Strategy

In order to observe changes in the workforce composition consecutive to foreign direct investment, we follow the existing literature by considering a reduced-form equation of a firm's costs. We approximate the short-run cost function with a translog cost function. The Shepard's lemma yields the following conditional demand for work type i:

$$\theta_{ijt} = \alpha_{1j} W_{ijt} + \alpha_{2j} \ln K_{jt} + \alpha_{3j} \ln Y_{jt} + \alpha_{4j} \ln \kappa_{jt} + \sum_{r=1}^{R} \alpha_{rj} O_{jrt} + \alpha_t + \epsilon_{ijt} \tag{3}$$

We denote by θ_{ijt} the share of work type i of the total number of employees in firm j. The coefficient of interest is α_{3j} and captures an MNE's employment response to increasing

over time. This is the case with the British Skills Survey and with the German Labor Workforce Survey, BIBB/AB.

[22] White-collar workers are composed of managers, accountants or sales representatives.

in-house FDI, as described in equation 1. Here, in order to fit the economic reality, we assume that in every period $t \in [2002; 2007]$ firm j produces output Y by using capital K and different types of workers i. K_j is measured by the input of capital and Y_j by the revenue of firm j.

A source of potential bias arises from the inclusion of the variable W_{ij}. W_{ij} equals the ratio of the wage paid to work type i (w_{ijt}) out of the wage paid to the complementary work type not in i (w_{-ijt}). This wage variable captures trends in education and therefore firm j's cost share. Moreover, there could be collinearity between time dummies and wages if they are linearly dependent. We drop the wage variable by assuming that there is no exogenous variation across companies[23]. ϵ_{ijt} is the idiosyncratic error term that can be decomposed as $\epsilon_{ijt} = \eta_j + v_{ijt}$, where η_j is the constant individual-specific residual and v_{ijt} is a standard residual.

We add several control variables to the specification (captured in O_{jt}): a technology proxy, the amount of exports and domestic insourcing.

From an already-vast literature, we know that technological change is responsible for changes in the wage-bill share (Goos et al. (2009), Autor et al. (2003), Acemoglu and Autor (2011)). We account for technological change by building a technology proxy, measured as the *proximity* to the firm's technology frontier.[24] It represents the gap between the (log) productivity of a particular firm and the highest productivity (or the highest percentile productivity) in the same industry. The productivity of the firm is measured as the value added per worker such as: $Proximity_{ikt} = P^{95} \log\left(\frac{VA}{L}\right)_{kt} - \log\left(\frac{VA}{L}\right)_{ikt}$. We use the 95 order percentile in order to have a robust measure, by excluding outliers. The lower the variable, the more productive the firm is.

We also control for the value firms' exports (in €million), in order to disentangle the effect of exports linked to the effect of foreign direct investment.[25] Most heterogeneous firm models treat internationalization as a progressive process: the least productive firms exit the market, low productive firms remain in the domestic market, highly productive firms export; and top-notch productive firms integrate through foreign direct investment (Helpman et al. (2004)). In practice, multinational firms continue to reach foreign markets through exports rather than only through foreign subsidiaries. Roughly 90 percent of US exports and imports flow through multinational firms (Bernard et al. (2005)). Moreover, recent empirical findings have shown that exporting is a key step prior to international settlement. 95 percent of new FDI are preceded by exports in the same country (Gazaniol (2014)). Hence, including exports in the specification would reduce a potential endogeneity problem, in which exports may not only affect the FDI decision, but also employment (See Crinò (2009) for a review of studies analyzing the effect of trade on employment).

Finally, we control for the possibility of domestic in-sourcing. A firm can choose to keep the production of an intermediate input within its boundaries by producing the intermediate input at home or abroad. Domestic in-sourcing is considered as traditional vertical integration that could affect employment within the investing firm (Antràs and

[23]However, we report results by including wages in Annex A, and do not alter our conclusions.

[24]We have used different proxies for technological change, such as investment in R&D, proximity to the sector technology frontier and software investment. Whatever the variable retained, our results are not altered. However, we prefer the measure of proximity to the technology frontier for several reasons. First, the software investment variable is not referenced for all firms. Second the R&D variable is built from the EAE survey that accounts for fixed R&D, i.e., R&D accounted as capital expenditure in the balance-sheet rather than as an expense of research and development.

[25]The data we use do not allow control for a firm's imports of finished or intermediate goods.

Helpman (2004)). Domestic in-sourcing could also be a first step before undertaking a foreign direct investment. Indeed, Antràs and Helpman (2004) model the same pecking order as Melitz (2003), in which the least productive firms insource through domestic subsidiaries, whereas the most productive firms integrate via foreign direct investment.[26] A firm's productivity would determine whether a firm insources or integrates through foreign direct investment. In order to account for domestic in-sourcing, we build the same measure as described by equation 1, by summing the total number of French subsidiaries[27].

The following table presents some descriptive statistics of companies' characteristics, distinguishing between domestic, exporting and multinational firms. As already shown in the literature, multinational companies are on average bigger, more productive, more intensive in capital and also have higher revenue and value added. Multinational firms are also closer to their technology frontier, as shown by the last row of Table 3.

Table 3: Firm's Characteristics

	Domestic Firms		Exporting Firms		Multinational Firms	
Number of Firms	1,207		4,578		767	
Apparent labor productivity (value added/workforce) in K €	66.3	[67.33]	63.6	[79.86]	88.1	[154.39]
Capital Intensity (Property, Plant and Equipment) in K €	2264.9	[55687.36]	2665.6	[28556.15]	45022.3	[491608.2]
Value Added	6343.6	[20967.86]	11534.7	[26839.2]	64969	[139050.2]
Revenue	22975.3	[113723.5]	42552.9	[107501.5]	242731.8	[529145.3]
Workforce	113.7	[245.935]	200.7	[354.200]	914.1	[1932.06]
Proximity to the frontier technology frontier	0.471	[0.522]	0.455	[0.529]	0.194	[0.545]

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des donnés sociales (DADS); Year 2007; Balanced panel data; Standard deviation under brackets. Authors' calculations.

5 Estimation Results

Industry level studies use a classification of workers based on levels of skilled *versus* unskilled education (Feenstra and Hanson 1996; Feenstra and Hanson 1999; Hansson 2000). Other studies have used a more-detailed disaggregation of labor than the traditional skilled/unskilled dichotomy, by adding layers of educational categories (Ekholm and Hakkala (2005), Falk and Koebel (2002), Hijzen et al. (2005), Morrinson and Siegel (2001)), and by defining groups of occupations according to their link to production (Biscourp and Kramarz 2007; Head and Ries 2002). The underlying assumptions for making this classification is that MNCs may maintain their non-production *upstream* activities in the home country (such as R&D, coordination, accounting or marketing activities), while offshoring their production activities. Yet, jobs can significantly differ inside a same education group, due to different occupational characteristics. Indeed, some occupations are more manual or cognitive, even though they have the same level of education. For example, workers with a medium level of education may be administrative workers, while others are technicians. Occupation heterogeneity inside a group of education could lead to an overall effect of FDI which is insignificant.

[26] This result holds in a world with no outsourcing and if the final good is intensive in inputs brought by the final-good producer.

[27] All French subsidiaries controlled by another company are considered as French subsidiary.

In the following section, we define different groups of occupations in order to account for aggregation bias. The first selects occupations by their level of qualification and defines executives, blue-collar workers, intermediate professions and employees. The second selects occupations by their link to the production process, and identifies the skilled and unskilled workers who are linked to the production process and those who are not. Finally, we look at seven specific occupations (managers, engineers, skilled and unskilled blue-collar workers, employees, foremen and technicians). A detailed description of occupational groups is provided in Annex C. We also report results on task classifications and define manual versus analytical, cognitive and interactive tasks.

The Hausman test of exogeneity confirms the existence of constant unobserved variables correlated with the independent variables in all specifications. Consequently, our estimates based on the random effect model are biased and standard errors may be underestimated. To account for individual-level heterogeneity, the constant individual-specific residual η_j is differenced out and within-firm equation estimates are provided. Time dummies are used to control for common time trends. Equation 3 is run using robust and clustered standard errors.

5.1 Changes in the share of occupations

In a first regression, we consider four groups of occupations, differentiated by their level of qualification. The first group of executives is composed of skilled workers (engineers and administrative managers) in column (1); the group of intermediate professions is made up of middle-skilled workers, some of whom are skilled secretaries (primary or executive secretaries), while others are skilled production workers such as technicians or foremen, in column (3). We also define two other groups of unskilled workers, the first is composed of unskilled administrative employees (operators, receptionists and unskilled secretaries), in column (4) and the second is made up of blue-collar workers in column (2).

Controlling for unobserved firm-level heterogeneity, table 4 reveals a positive relationship between a firm's revenue and the share of skilled and middle skilled workers (i.e., executives and intermediate professions). In contrast, a negative correlation between the share of blue-collar workers and an increase in a firm's revenue is observed.

The results reveal a statistically significant and positive relationship between increasing FDI in low-income countries and changes in the share of executives in the home company. Conversely, the relationship between FDI in low-income countries and the share of blue-collar worker is significantly negative, at the 10% level. This result is in line with traditional international trade theory predictions.

In contrast, when identifying occupations according to their link to production [28] (as in Biscourp and Kramarz (2007), and Head and Ries (2002)),[29] we do not find any significant effect of offshoring on employment (see Table 16 in Appendix D). We argue that the non-

[28]The first two are composed of production workers. First, we define skilled production workers (i.e., engineers, technicians, foremen, skilled blue-collar workers), and second unskilled production workers (i.e., unskilled blue-collar workers). The last two are composed of non-production workers. The first are skilled (administrative managers and administrative intermediate professions, mostly composed of skilled secretaries) and the second are unskilled, mostly made up of administrative employees (i.e., receptionists, unskilled secretaries and typists).

[29]Biscourp and Kramarz (2007) found a negative effect of imports of intermediate inputs on the share of unskilled production workers, while Head and Ries found a positive effect of increasing employment in low-wage subsidiaries on the share of skilled non-production workers.

significant result is due to the high degree of heterogeneity in occupational categories, which could imply an aggregation bias.

When disaggregating occupational classifications into occupations, we are able to identify which occupations demonstrate the results obtained previously. We split occupations into seven major groups: administrative managers, engineers, employees, technicians, foremen, skilled and unskilled blue-collar workers (See Table 17 in Appendix D).

Table 4: Changes in the Share of Occupations by Qualification Groups

	FE (1) Executives	FE (2) Blue-collars	FE (3) Intermediate professions	FE (4) Employees
Subsidiaries in				
LI countries	0.015***	-0.008*	-0.005	-0.007
	[0.006]	[0.005]	[0.005]	[0.005]
HI countries	0.002	-0.008	0.007	0.001
	[0.008]	[0.008]	[0.007]	[0.007]
France	-0.002	-0.001	0.002	0.002
	[0.002]	[0.004]	[0.003]	[0.003]
Technology Frontier	0.001	-0.000	-0.000	-0.000
	[0.001]	[0.001]	[0.001]	[0.001]
Export	-0.000	0.001	-0.000	0.001
	[0.000]	[0.000]	[0.000]	[0.001]
Revenue	0.007**	-0.012***	0.006*	0.006
	[0.004]	[0.005]	[0.003]	[0.007]
Capital	-0.001	0.002	0.000	-0.000
	[0.001]	[0.002]	[0.001]	[0.002]
Constant	0.101***	0.625***	0.183***	0.052
	[0.020]	[0.025]	[0.019]	[0.039]
Observations	18,729	18,729	18,729	18,721
R^2 between	0.098	0.193	0.047	0.016
R^2 within	0.039	0.025	0.003	0.003
R^2 overall	0.083	0.159	0.048	0.024

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des données sociales (DADS); period 2002-2007. Authors' calculations. Note: Estimations are for firm fixed effects (FE) and variables are calculated at the level of the firm. Wage-bill shares are in percent, varying between zero and 100.

The negative correlation between a firm's foreign direct investment to low-income countries and the share of blue-collar workers is mainly driven by unskilled blue-collar workers, as shown by column (4) in Table 17. The positive correlation between FDI to low income countries and executives is only observed for skilled white collar workers (managers) and is not significant in the sample of skilled blue collar workers (engineers). Hence, results in Table 17 show that compensatory effects could occur when aggregating groups of occupations[30].

5.2 Changes in task intensity

In this section, we analyze change in the composition of tasks performed inside the firm. The theoretical and empirical literature has shown that some occupations might be easier to offshore because they perform offshorable manual and routine tasks (Acemoglu and Autor 2011b; Grossman and Rossi-Hansberg 2008; Hummels et al. 2011; Ebenstein et al. 2009). While other occupations, such as managers and engineers, might be less

[30]For instance, the coefficient associated with technicians is positive while the coefficient associated with foremen is negative, while there are both captured in the group of intermediate occupations.

'substituable' by offshored employees, because they perform specific tasks that can be difficult to offshore without loss of quality (such as interactive or analytical tasks).

Table 5 shows a positive and significant complementarity between a firm's capital intensity and the use of non-routine manual, interactive and analytical tasks. This result is also observed in Becker et al. (2012), who show a positive correlation between the ratio of a firm's capital over value-added and the non-routine task index in the manufacturing sector.

Table 5: Changes in Task Intensity

Model	FE (1)	FE (2)	FE (3)	FE (4)	FE (5)
Dependant variable	Routine manual	Non-routine manual	Non-routine interactive	Non-routine analytic	Routine cognitive
Subsidiaries in					
Low-income countries	-0.000	0.003	0.014*	0.004	0.004
	[0.007]	[0.007]	[0.007]	[0.006]	[0.007]
High-income countries	-0.011	-0.017**	-0.005	-0.004	0.005
	[0.010]	[0.009]	[0.009]	[0.008]	[0.007]
France	-0.005	-0.010**	-0.001	-0.002	0.000
	[0.005]	[0.004]	[0.004]	[0.004]	[0.004]
Technology frontier	-0.001	-0.002	-0.002	-0.002*	-0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Exports	-0.001	-0.001**	-0.000	-0.001	-0.000
	[0.001]	[0.001]	[0.001]	[0.000]	[0.001]
Revenue	0.004	0.002	0.007	0.004	0.001
	[0.006]	[0.005]	[0.005]	[0.004]	[0.005]
Capital	-0.002	0.003**	0.004**	0.005***	0.001
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Constant	0.446***	0.499***	0.380***	0.572***	0.571***
	[0.031]	[0.026]	[0.028]	[0.020]	[0.024]
Observations	18,246	18,246	18,246	18,246	18,246
R^2 between	0.005	0.027	0.016	0.000	0.005
R^2 within	0.002	0.024	0.039	0.032	0.021
R^2 overall	0.006	0.024	0.021	0.002	0.006

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des donnés sociales (DADS); period 2002-2007. Note: Estimations are for firm fixed effects (FE) and variables are calculated at the level of the firm. The wage-bill shares are in percent, varying between zero and 100.

Examining the results of exports on a company's task intensity, we notice that exports have a significant and negative impact on the share of workers performing non-routine manual tasks. This result mirrors the ones in Peri and Poole (2013) on Brazil, who find a rising demand for cognitive relative to manual tasks within the firm consecutive to a firm's openness.

Turning to the coefficients of the variables of interest, the results show that there is a negative effect of outward-FDI to high-income countries on the share of workers performing non-routine manual tasks. This result is driven by the capital goods industry.[31] The capital goods industry is relatively less fragmented at the top, as it requires heavy intermediate inputs which are costly to export, and requires heavy engineering, which involves skilled manual competences (see Table 18). Companies often choose relocation when exporting is costly in order to access foreign markets and to benefit from specific competences available in the North (Riker and Brainard (1997), Grossman et al. (2006)). In 2007, roughly 70% of FDI in capital goods industries was directed to high income countries. Production

[31] We split the data into the three main sectors composing our sample. Results are reported in Annex E.

offshored to high-wage countries in capital goods industries implies the substitution of skilled production workers, resulting in a decrease in the share of workers performing non-routine manual tasks.

By contrast, we notice a positive effect of FDI to low-income countries on the intensity of interactive tasks performed in the home country. The fragmentation of production processes to low-income countries increases the need for skilled workers in *upstream* production activities and raises the average skills-intensity of the investing firm at home. The positive effect of FDI to low-income countries on the share of workers performing interactive tasks is mainly driven by FDI in the intermediate goods sectors[32] and is not observed in the consumer goods industry. One explanation could be that vertical fragmentation in the consumer goods sector is mainly realized through international arms-length production, because the cost of importing intermediate-goods and exporting final-goods is relatively small compared to that in capital goods and in the intermediate goods sector.

To conclude, these two subsections have shown the importance of having micro data to understand which occupations are exposed to FDI. There is a clear *FDI bias* toward skilled executives, at the expense of blue-collar workers in the home country. More specifically, FDI to low-income countries raises the demand for skilled executives performing interactive tasks, whereas FDI to high-income countries reduces the demand for workers performing non-routine manual tasks. However, aggregate occupation classifications (such as production versus non-production workers) do not provide an understanding of which jobs are affected by the FDI strategies of French firms.

In the following subsections, we go a step further in order to understand what is driving the occupational bias: (i) the countries of destination; (ii) first-time investors or already established multinational firms; and (iii) the parent companies' strategies.

5.3 Country of destination

In this subsection, we estimate equation 3 by dividing FDI into five major destination country groups: the BRICS, Eastern Europe (countries belonging to the EU prior to 2004), the European Union (countries belonging to the EU before 2004), other high-income and low-income countries[33]. We report the results in Table 6, for executives, blue-collar workers and for occupational tasks[34].

The results show that there is a negative and significant correlation between a firm's exports and the share of workers performing non-routine manual tasks. Similar to the results obtained in Table 5, we observe that a firm's capital intensity has a positive and significant effect on the share of workers performing tasks more intensively which are non-routine manual, interactive and analytical. These tasks are features of skilled occupations such as managers and engineers (as described in Table 14 in appendix B).

Concerning the variable of interest here, we first notice that foreign direct investment in high-income countries does not affect the workforce composition in the domestic firm. This is true except for workers performing non-routine manual tasks intensively, which are adversely affected. These tasks are mainly performed by skilled production workers, such

[32]See Table 21 in Annex E.

[33]High-income countries include: Norway, Switzerland, the United States, Australia, Canada, New Zealand, Liechtenstein, Monaco, Gibraltar, Iceland, Alaska and Andorra, while other countries are considered as low-income countries.

[34]Our analysis is conducted at the firm level, rather than at the plant level, so we do not account for the replication of establishments in other countries.

as engineers, technicians and skilled blue-collar workers and need specific qualifications and experience (see Table 14 in appendix B). Hakkala and Huttunen (2014) also find a negative effect of imports of intermediate inputs on the share of non routine physical tasks in Finland.

Table 6: Changes in the Share of Occupations

VARIABLES	Executive (1)	Blue-collar workers (2)	Routine manual (3)	Non-routine manual (4)	Non-routine interactive (5)	Non-routine analytic (6)	Routine cognitive (7)
Subsidiaries in							
HI countries	0.002	-0.006	-0.010	-0.019**	-0.005	-0.004	0.003
	[0.008]	[0.008]	[0.010]	[0.008]	[0.010]	[0.007]	[0.007]
Eastern Europe	0.001	0.005	0.021*	0.021*	0.002	-0.003	-0.003
	[0.006]	[0.010]	[0.011]	[0.012]	[0.014]	[0.011]	[0.009]
BRICS	0.022**	-0.015*	-0.008	-0.003	0.025**	0.012	0.005
	[0.011]	[0.008]	[0.011]	[0.010]	[0.012]	[0.009]	[0.009]
LI countries	0.006	-0.002	-0.010	0.003	0.006	0.002	0.004
	[0.009]	[0.009]	[0.013]	[0.011]	[0.011]	[0.010]	[0.011]
EU-15	-0.004	-0.005	-0.001	-0.002	-0.004	-0.003	0.005
	[0.004]	[0.005]	[0.008]	[0.006]	[0.007]	[0.006]	[0.005]
France	-0.001	-0.001	-0.006	-0.010**	-0.001	-0.001	0.000
	[0.002]	[0.004]	[0.005]	[0.004]	[0.004]	[0.004]	[0.004]
Technology frontier	0.001	-0.000	-0.001	-0.002	-0.002	-0.002*	-0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Exports	-0.000	0.001	-0.001	-0.001**	-0.000	-0.001	-0.000
	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Revenue	0.007*	-0.012***	0.004	0.003	0.007	0.004	0.001
	[0.004]	[0.005]	[0.006]	[0.004]	[0.005]	[0.005]	[0.005]
Capital	-0.001	0.002	-0.002	0.004**	0.004**	0.005***	0.001
	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Constant	0.101***	0.625***	0.446***	0.495***	0.380***	0.572***	0.571***
	[0.020]	[0.025]	[0.031]	[0.020]	[0.028]	[0.025]	[0.024]
Observations	18,729	18,729	18,246	18,246	18,246	18,246	18,246
R-squared	0.038	0.024	0.002	0.024	0.041	0.033	0.026
Log Likelihood	44781.543	38957.739	28786.676	32071.302	30798.131	32840.598	33189.570

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des donnés sociales (DADS); period 2002-2007. Note: Estimations are firm fixed effects (FE) and variables are calculated at the level of the firm. The wage-bill shares are in percent, varying between zero and 100.

Amongst high-income countries, it is possible to separate out the EU-15, which is traditionally one of the main area of French foreign investment. We do not observe any significant results regarding the demand for skills and tasks. This may be due to the high heterogeneity of countries inside European Union. Indeed, the reasons for offshoring to the EU-15 are more diverse than relocation to other areas (Topiol and Héricher 2013). This could explain the overall insignificant effect of FDI on employment[35].

When isolating the Central and East European countries (CEECs), the effect of FDI on employment in France is clearer. Increasing FDI in CEECs raises the demand for manual workers. FDI in CEECs generally combines mixed strategies and includes both cost reductions and market access strategies. For example, car manufacturers have relocated to CEECs to benefit from low production costs, but also to be close to local markets with strong growth potential. The traditional logic of fragmenting production processes in CEECs by French and German firms consists of offshoring stages of production related to intermediate goods, by applying the logic of exploiting comparative advantages between countries. In contrast, the assembly and logistics stages in the production process are

[35]Some strategies may be linked to reasons of market access: for example, in Germany, the United Kingdom and the Benelux countries. Other FDI strategies may be carried out to take advantage of factor cost differentials: for example, in Portugal, Spain and Ireland.

concentrated in the home country, in a region which is geographically central to accessing the EU market (Moati and Mouhoud (2005), Martinez-Zarzoso et al. (2011)).[36] Indeed, when splitting our sample into different sectors, the positive significant result of FDI to the CEECs on the domestic share of manual workers is only driven by the intermediate goods industry. Therefore, FDI in the CEECs raises the demand for non-routine manual tasks, mostly carried out by skilled production workers, because firms mainly re-import intermediate goods, in order to assemble final products in France. This raises the demand for production workers performing skilled and unskilled manual tasks. This result is similar to Falk and Wolfmayr (2008) as well as to Konings and Murphy (2006).

The results are quite different when FDI is undertaken in major emerging countries. FDI inflows in developing economies increased by 68 percent between 2005 and 2007, and now surpass developed economies as recipients of FDI (World investment report, 2007, 2013). In France in 2002, the amount of imports of intermediate inputs reached €96.2 billion and rose to €197.16 billion by 2012, with the BRICS accounting for 10.6% percent of this growth.[37]. FDI to the BRICS could thus have a higher impact on employment compared to what was observed in the 1990s statistics (Krugman (2008), Autor et al. (2013)). Table 6 indeed reveals that the preceding results are driven by FDI to BRICS, which are favorable for executives and workers performing non-routine interactive tasks intensively (carried out by skilled workers) in France. In contrast, substitutability is observed between FDI to BRICS and the demand for blue-collar workers.

5.4 Increasing FDI and first-time investors

The preceding estimations included information on both multinational and domestic firms (composed of exporting and purely domestic firms). This section focuses on the sample of multinational firms. The sample is divided into firms that were already multinational at the beginning of the sample period and changed their number of subsidiaries abroad (we call this increasing intensive margin), and those that became multinational for the first time by undertaking at least one FDI project between 2002 and 2007 (we call this increasing extensive margin). The results are reported in Table 7.

First-time investors in low-income countries increase the demand for managers without reducing employment of blue-collar workers. In contrast, results indicate that, once firms are multinational, increasing FDI in low-wage countries decreases the demand for blue-collar workers.

Exports play a positive role in the demand for blue-collar workers. An increase in exports raises the share of blue-collar workers. But this result is only observed in the sample of first time-investors. We explain this result by the fact that export is an important determinant of the first settlement (Gazaniol 2012). International experience through exports allows a firm to collect additional information on the foreign market (legal and judicial institutions for instance), and is a good way to gain experience from internationalization before making the first settlement (Conconi et al. (2013)). Increasing exports prior to

[36]In France, for example, these assembly phases are concentrated in the North Eastern region, to be close to the EU market. We have run the equation per region and the region that leads these results are Alsace and Lorraine, which are two regions close to the German border. Trade in parts and components produced in the CEEC-10 for export to the OECD countries now accounts for approximately 30% of the OECD's total trade (Yeats 1998).

[37]These statistics are calculated from Comext, Eurostat sources stemming from aggregate input- output tables in national accounts. Intermediate goods are identified in three broad categories with the BEC classification (BEC 420, BEC 530, BEC 220).

a first investment could thus lead to an increase in domestic production, and therefore increase the proportion of blue-collar workers.

Table 7: Comparaison between First-Time Investors and Multinational Firms

	Extensive Margin		Intensive Margin	
	Executives	Blue-collar workers	Executives	Blue-collar workers
Subsidiaries in				
LI countries	0.024***	-0.003	0.009	-0.010*
	[0.008]	[0.008]	[0.006]	[0.005]
HI countries	0.007	0.003	0.003	-0.008
	[0.010]	[0.009]	[0.006]	[0.005]
France	-0.003	-0.106	-0.018	-0.007*
	[0.007]	[0.006]	[0.004]	[0.004]
Technology Frontier	-0.001	-0.003	-0.003	0.003
	[0.004]	[0.003]	[0.002]	[0.002]
Export	-0.000	0.005***	0.000	0.000
	[0.003]	[0.001]	[0.001]	[0.001]
Revenue	0.043***	-0.028**	0.010	-0.006
	[0.013]	[0.012	[0.007]	[0.007]
Capital	0.000	-0.001	-0.002	0.006*
	[0.004]	[0.003]	[0.003]	[0.003]
Constant	-0.051	0.598***	0.151***	0.466***
	[0.073]	[0.068]	[0.042]	[0.435]
Observations	990	990	2,299	2,299
R-squared	0.051	0.025	0.047	0.069
Log Likelihood	1851.183	1914.168	4684.909	4568.450

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des donnés sociales (DADS); period 2002-2007. Note: Estimations are of firm fixed effects (FE) and variables are calculated at the level of the firm. The wage-bill shares are in percent, varying between zero and 100.

Our results mirror those of Hijzen et al. (2011) and of Barba Navaretti et al. (2010). The study of Hijzen et al. (2011) uses French data over the period 1987-1999. They use a matching technique to measure the effect of FDI, three years after the first foreign investment. They show that investment in low-income countries has no significant effect on employment, only FDI to high-income countries does. The study of Barba Navaretti et al. (2010) analyze the effect of FDI on employment in France and Italy over the period 1993-2000. They show that first time investors in both developed and developing countries experience significantly higher employment relative to the control group. However, the two studies do not distinguish workers by qualification group, and are not able to observe the positive correlation between the first settlement in low-income countries and the average skill intensity of the investing firm at home.

The estimated coefficient of FDI to low-income countries on the share of executives is more than three times the size than that of the negative coefficient associated with FDI to low-income countries on the share of blue-collar workers. Hence, as in Barba Navaretti et al. (2010), we find evidence of an overall positive effect of outward investments to cheap labor countries on total employment.

5.5 Robustness test: Parent company strategies and Foreign acquisition

In the preceding estimations, the labor effect of foreign direct investment is exactly identified for each firm. However, carrying out the study at the firm level could tend to overestimate or underestimate the coefficient associated with outward-FDI.

Firms can be either independent or be part of a business group. A group is composed of an independent parent company and all other entities controlled by the parent company. In our sample in 2007, 81% of the firms belonged to a group (as a parent company or as a subsidiary) and 82% of them were not directly engaged in outward FDI (i.e., they do not directly control any foreign subsidiary). Foreign direct investment of a particular firm belonging to a group may not only affect the investing firm, but also all other French subsidiaries belonging to the group, if foreign subsidiaries are substitutes for domestic ones. Hence, FDI at the group level can affect the work-composition of all the group's subsidiaries; even those that are not engaged in outward FDI. For example, if a French group decides to offshore part of its production process, it can decide to restructure its whole perimeter by strengthening its tertiary functions (such as R&D, IT or sales) in the national territory inside its domestic subsidiaries (Gazaniol and Peltrault 2013). Therefore, domestic subsidiaries could go through major changes without directly investing abroad and this result would not be observed with estimation at the firm level.

In order to control for a firm's exposure to the group's FDI activities, we attribute to each firm the κ variable at the group level[38]. The results revealed by Table 11 are consistent with those obtained by taking into account the relocation strategy at the firm level, as detailed in appendix A.

In a second robustness test, we control for change in firm nationality. A recent literature has shown an impact of foreign acquisition on employment: more skilled and productive firms tend to be the targets of foreign acquisition (Bloningen et al. (2012), Almeida (2007))). Hence, the non-inclusion of foreign acquisition could alter our results for two reasons. First, if foreign-owned firms are on average more productive and more skills-intensive, foreign acquisition could affect both the share of skilled workers and the explanatory variables (such as a firm's size and productivity), resulting in an endogeneity problem.[39] Second, foreign-acquisition can imply an artificial change in the firm's balance-sheet information for fiscal optimization reasons (by transferring a firm's profits in countries where tax policies are more accommodating for instance), resulting in a measurement error bias. Results however show that the inclusion of the firm's nationality does not alter the conclusions (See Table 9 and 10 in Appendix A).

6 IV Results

After controlling for firm-specific heterogeneity, the main residual still contains time-varying and firm-specific factors that can affect the workforce's composition. A cause for concern is that simultaneity problems, measurement errors and/or omitted variable bias could affect the preceding estimations. First, simultaneity problems arise if unobserved components, such as change in the composition of shareholders, directors, head of human resources or changes in the strength of unions affect simultaneously the decision to make a foreign direct investment, and the composition of activities undertaken by the firm[40].

[38]We build the measure described in equation 1 by summing the number of subsidiaries of the business group. We attribute this measure to each firm belonging to the same group. All other variables are determined at the firm level. For simplicity, we only retained firms in our sample that did not change their parent company during the whole period of observation.

[39]The inclusion of firm fixed effects considerably reduces the bias, since only 1,138 firms observed during the period changed nationality.

[40]Dewit et al. (2009) have shown that high levels of employment protection tend to discourage outward FDI. In contrast, Kramarz (2008) shows that firms with strong unions increase offshoring and are associated with a decline in employment. France has strong labor market institutions. The OECD Employment Outlook 2004 presents an overall summary index of employment protection that relies on three main

In this case, the estimated coefficient of interest would be biased. Second, our estimation could suffer from measurement error bias because our proxy for in-house offshoring does not reflect the offshored activity composition of the firm. In particular, we do not account for foreign employment or sales.[41] Finally, an omitted variable bias could arise because we focus on in-house foreign direct investment and we do not account for outsourcing to independent suppliers. However, the offshoring strategy of a firm could include both foreign outsourcing from unrelated suppliers (international arm's-length production) and tasks performed abroad by subsidiaries or related entities of a multinational firm (Kroeger (2013).[42]

We answer these problems by using instrumental variable techniques to explain the FDI decision.[43] The first instrument is the host country's GDP per capita. A high level of GDP would capture relocation motivated by reasons of market access, and conversely, a low level of GDP would capture relocation decisions in order to take advantage of less costly labor (Brainard and Riker 1997; Markusen 1995; Kohler 2002). The second instrument is the host country's level of infrastructure. The quality of institutions and infrastructure have been highlighted as important sources of comparative advantage in the recent literature of offshoring (Gamberoni et al. (2010)).

In addition, GDP per capita and the level of infrastructure are important determinants of the development of intellectual property rights, and the level of corruption in the host country. These elements may not only influence a firm's choice to settle a foreign subsidiary in a particular country, but also influence the entry mode choice, between maintaining full control over the subsidiary or sharing ownership with one or more partners (Nunnenkamp and Andreis (2013), Broughter and Broughters (2001), Javorcik and Wei (2009)).

Based on these results, we construct the average level of GDP and infrastructure in the firm's host countries. For each of these two variables, we distinguish between subsidiaries in high-income countries and low-income countries, as done previously. The two variables are constructed as follows:

$$GDP_{cjt} = \frac{\sum_{k=1}^{K} GDP_{ckjt}}{K} \tag{4}$$

$$Infra_{cjt} = \frac{\sum_{k=1}^{K} Infra_{ckjt}}{K} \tag{5}$$

components. The first is related to protection of regular workers against dismissal; the second is related to specific requirements for collective dismissals; and the third is related to regulation of temporary forms of employment. On a scale from 0 to 6, France has an employment protection index of 2.9, the sixth highest index from a sample of 28 countries. In comparison, the US has an index of 0.6.

[41] Other studies, including Becker et al. (2012), Hanson (2005) and Head and Ries (2002) approximated transfers within multinationals by a multinational company's share of employment by subsidiaries in total employment.

[42] The literature often captures outsourcing by measuring the share of imported intermediate inputs from the same industry abroad, relative to total inputs used in the production (Feestra and Hanson (1996)) However, this measure is not able to distinguish imports from foreign subsidiaries and imports from subcontractors abroad.

[43] We have assumed clustered errors, i.e., that observations for firms in two different time periods are correlated, but not observations between different firms. Hence, in order to relax the assumption that the correlation of a firm's observations within a group is constant, we run a feasible, efficient two-step GMM, as described in Baum et al. (2007) and Baum et al. (2002).

$c = L, H$ corresponds to high-income and low-income countries and k is a firm's subsidiary. For each subsidiary, we measure the GDP per capita and the level of infrastructure in the country. K is the total number of firm j's subsidiaries. GDP per capita and infrastructure are calculated from the World Bank database. The GDP per capita variables are gross domestic product for 220 countries, converted into international dollars using purchasing power parity rates. The proxy for infrastructure is the number of broadband Internet subscribers with a digital subscriber line, cable modem, or other high-speed technology (per 100 persons).

There are two conditions for an instrument to work well. First, it must be valid, the instrument must be uncorrelated with the error term. Second, it must be powerful, i.e., the instrument must be sufficiently correlated to the endogenous variable.

Our instruments are valid if domestic employment is not related to the instruments other than through foreign direct investment, conditional on other multinational firm's (MNC) characteristics. While we consider this assumption to be plausible, GDP per capita could still influence MNCs' employment through trade. However, the Hanson-J statistic shows that the test of over-identifying restrictions cannot reject its null hypothesis: the instruments are distributed independently of the error process and they are properly excluded from the model.[44].

We then test to ensure that our instruments are not weak, i.e., that they are sufficiently correlated with the endogenous variables included. In each case, the F statistic is sufficiently large,[45] compared to Stock and Yogo critical value with two endogenous regressors (Stock and Yogo 2002)[46].

Table 8 reports results of the IV-GMM estimator. It analyzes the effect of FDI to low-income and high-income countries on the share of skilled managers (column (1)) and skilled and unskilled blue-collar workers (column (2)), and on the task index (columns (3) to (7)). Results of the first stage estimates are discussed in appendix F.

When controlling for endogeneity, the positive correlation between FDI to low-income countries and the share of managers in the domestic firm is stable and significant at the 5% level. Turning to the results on the composition of tasks executed inside the firm, we notice that FDI to low-income countries significantly and positively affects the share of workers performing intensively interactive tasks, at the 5% level. However, results on routine and non-routine manual tasks are non-significant, whatever the host country. Hence, the IV-GMM results confirm our previous findings and show that investing in low-income countries raises significantly the share of managers and skilled non-routine tasks. However, when controlling for endogeneity, the negative correlation between blue-collar workers and FDI to low-income countries is not significantly different to zero (still, the sign of the coefficient remains negative).

[44]Over identification tests are based on the assumption that one of the instruments is valid. We have therefore decided to report the IV results in a just-identified equation, by using GDP per capita on the one hand, and the level of infrastructure on the other hand. The results are reported in the online appendix and depict similar findings. In both cases the instruments are sufficiently strong. We prefer to report the over-identified results to prove the validity of our instruments.

[45]We use the Kleibergen-Paap rk statistic F statistic, as we do not assume i.i.d errors.

[46]In each case, the F statistic also exceeds the conventional 'rule of thumb' of the minimum standard of power of F=10. However, as we have multiple endogenous variables, this indicator may not be sufficiently informative (Baum et al, 2003). In this respect, the use of the Shea Partial R2 is preferable, as it accounts for the inter-correlations among the instruments. The Shea measure is always close to the partial R2. We therefore conclude that our instruments are relevant.

Table 8: IV-Results

	Managers	Blue-Collar workers	Routine manual	Non-routine manual	Non-routine interactive	Non-routine analytic	Routine Cognitive
Subsidiaries in							
Low-income countries	0.019**	-0.005	0.003	0.009	0.020**	0.011	0.012
	[0.008]	[0.007]	[0.008]	[0.009]	[0.009]	[0.008]	[0.008]
High-income countries	-0.003	-0.004	-0.008	-0.010	0.003	0.001	0.010
	[0.004]	[0.004]	[0.007]	[0.007]	[0.008]	[0.006]	[0.006]
First Stage Estimates (low income)							
High-income GDP per capita	-0.026***	-0.026***	-0.025***	-0.025***	-0.025***	-0.025***	-0.025***
	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]
Low-income GDP per capita	0.061***	0.061***	0.061***	0.061***	0.061***	0.061***	0.061***
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]
High-income infrastructure	0.029	0.029	0.031	0.031	0.031	0.031	0.031
	[0.023]	[0.023]	[0.022]	[0.022]	[0.022]	[0.022]	[0.022]
Low-income infrastructure	0.087***	0.087***	0.084***	0.084***	0.084***	0.084***	0.084***
	[0.027]	[0.027]	[0.027]	[0.027]	[0.027]	[0.027]	[0.027]
First Stage Estimates (high income)							
High-income GDP per capita	0.027**	0.027**	0.027**	0.027**	0.027**	0.027**	0.027**
	[0.011]	[0.011]	[0.012]	[0.012]	[0.012]	[0.012]	[0.012]
Low-income GDP per capita	0.012**	0.012**	0.011**	0.011**	0.011**	0.011**	0.011**
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
High-income infrastructure	0.123***	0.123***	0.124***	0.124***	0.124***	0.124***	0.124***
	[0.033]	[0.033]	[0.033]	[0.033]	[0.033]	[0.033]	[0.033]
Low-income infrastructure	-0.022	-0.022	-0.020	-0.020	-0.020	-0.020	-0.020
	[0.015]	[0.015]	[0.014]	[0.014]	[0.014]	[0.014]	[0.014]
Subsidiaries in France	-0.002	0.000	-0.005	-0.010**	-0.002	-0.002	-0.001
	[0.003]	[0.004]	[0.005]	[0.004]	[0.005]	[0.004]	[0.004]
Exports	-0.000	0.001	-0.001	-0.001**	-0.000	-0.001	-0.000
	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Revenue	0.007**	-0.012***	0.004	0.003	0.007	0.004	0.001
	[0.004]	[0.005]	[0.006]	[0.005]	[0.005]	[0.005]	[0.005]
Capital	-0.001	0.002	-0.002	0.004**	0.004**	0.005***	0.001
	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Technology Frontier	0.001	-0.000	-0.001	-0.002	-0.002	-0.002*	-0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Observations	17,474	17,474	16,981	16,981	16,981	16,981	16,981
R-squared	0.038	0.024	0.002	0.025	0.041	0.033	0.025
Under-identification							
Keibergen-Paap LM stat	127.772***	127.772***	130.398***	130.398***	130.398***	130.398***	130.398***
Weak indentification							
Kleibergen-Paap rk-stat	115,433	115,433	122,974	122,974	122,974	122,974	122,974
Stock-Yogo 5% max IV bias	11.04	11.04	11.04	11.04	11.04	11.04	11.04
Over-identification							
Hansen J statistic	0.914	3.016	1.620	0.137	6.678	3.498	2.100
P-value	0.633	0.2214	0.445	0.934	0.035	0.174	0.350

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des donnés sociales (DADS); period 2002-2007. Note: Estimations are for firm fixed effects (FE) and variables are calculated at the level of the firm. The wage-bill shares are in percent, varying between zero and 100.

7 Conclusion

This paper shows that foreign direct investment has a real impact on the composition of skills and tasks in the case of French manufacturing firms. Carrying out this type of analysis however requires access to available employer-employee specific data as well as information on job-related task requirements.

We use a detailed database for France to be able to observe the work composition of

French firms employing more than 20 employees, both in terms of skills and tasks. The results highlight the necessity of using detailed micro data to identify the jobs at risk from FDI. Aggregate groups of occupations are not able to disentangle the real effect of outward FDI on occupations and tasks.

The limitation of the study stems from the use of data reflecting the number of foreign subsidiaries without taking into account other strategies of the international fragmentation of production processes (such as outsourcing). This approach is suitable for horizontal offshoring which, by and large, takes place through FDI. However, vertical offshoring is probably under-estimated when based on data from subsidiaries, since offshoring often passes through international subcontracting. In order to control for the omitted variable bias, we use two original instruments and run an IV model.

The results show that, when controlling for the relevant variables, FDI in low-income countries impacts negatively on a firm's share of blue-collar workers and positively affects a firm's share of managers (particularly when offshoring occurs to the BRICS). On the other hand, horizontal FDI in developed countries removes the incentive for employing skilled production workers, who hold manual, non-routine tasks in manufacturing production. These results indicate a clear substitutablility between manual workers and offshored workers, and a clear complementarity with skilled managers, in the home country. Interestingly, we notice a positive effect of FDI to Central and East European countries on the share of routine manual tasks. This result is driven by intermediate goods industries, and reflects French firms' strategies of producing intermediate goods in Eastern Europe and to assemble final products in France. Increased assembly activity in France (in particular in the North of France) raises the incentive to hire manual workers.

Furthermore, we show that the rise of the share of managers consecutive to FDI is particularly marked in the sample of first-time investors, whereas the declining demand of blue-collar workers consecutive to FDI is observed when already established firms raise their number of foreign subsidiaries. Hence, becoming a multinational company changes the workforce composition in favor of managers and the intensification of vertical offshoring results in a decline of unskilled jobs and routine tasks.

In short, we highlight an overall positive effect of offshoring to low-income countries, especially to the BRICS; but the positive effect is concentrated on skilled workers, whose work is intensive in non-routine interactive tasks. In contrast, the data reveal that the potential jobs at risk from FDI are for: i) skilled production workers performing non-routine manual tasks when FDI occurs in high-wage countries; and ii) unskilled production workers when FDI occurs in low-wage countries.

The IV-model show a positive effect of FDI to low-income countries on the share of skilled executives and skilled non-routine tasks in the domestic firm. However, the negative effect on the share of blue-collar workers is no longer observed. We are thus more cautious about the interpretation of the negative effect of FDI to low-income countries on the share of blue-collar workers.

References

Abraham, F., J. Konings, and V. Slootmaekers. 2010. "FDI Spillovers, firm heterogeneity and degree of ownership: evidence from Chinese manufacturing." Technical Report, Katholieke Universiteit Leuven.

Acemoglu, D., and D. Autor. 2011a. *Skills, Tasks and Technologies: Implications for Employment and Earnings*. Volume 4 of *Handbook of Labor Economics*. Edited by O. Ashenfelter and D. Card. Elsevier.

———. 2011b. "Skills, Tasks and Technologies: Implications for Employment and Earnings."

Allain, B., J. Collobert, and S. Fraboul. 2004. "Emplois exposés en Pays de la Loire : une nouvelle approche." *Insee Pays de la Loire. Etudes*, no. 24.

Almeida, R. 2007. "The labor market effects of foreign owned firms." *Journal of International Economics* 72 (1): 75–96.

Anderton, B., and P. Brenton. 1999. "Outsourcing and low-skilled workers in the UK." *Bulletin of Economic Research* 51 (4): 267–286.

Antràs, P. 2003. "Firms, Contracts, And Trade Structure." *The Quarterly Journal of Economics* 118 (4): 1375–1418.

———. 2005. "Incomplete contracts and the product cycle." *The American economic review* 95 (4): 1054–1073.

Antras, p., and Elhanan H. 2004. "Global Sourcing." *Journal of Political Economy* 112 (3): 552–580 (June).

Autor, D., D. Dorn, G. H. Hanson, and J. Song. 2013, July. "Trade Adjustment: Worker Level Evidence." Nber working papers 19226, National Bureau of Economic Research, Inc.

Autor, D., F. Levy, and R. Murnane. 2003. "The Skill Content of Recent Technological Change: An Empirical Exploration." *Quarterly Journal of Economics* 118 (4): 1279–1333 (November).

Barba Navaretti, G., D. Castellani, and A-C. Disdier. 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.

Baum, C., M. Schaffer, and S. Stillman. 2002, November. "Instrumental variables and GMM: Estimation and testing." Boston college working papers in economics 545, Boston College Department of Economics.

———. 2007, May. "Enhanced routines for instrumental variables/GMM estimation and testing." Boston college working papers in economics 667, Boston College Department of Economics.

Becker, S. O, K. Ekholm, and M-A Muendler. 2012. "Offshoring and the onshore composition of tasks and skills." *Journal of International Economics*.

Bénassy-Quéré, A., M. Coupet, and T. Mayer. 2007. "Institutional determinants of foreign direct investment." *The World Economy* 30 (5): 764–782.

Berle, A., and G. Means. 1932. *The Modern Corporation and Private Property*.

Bernard, A., J. B Jensen, and P K. Schott. 2009. "Importers, Exporters and Multinationals: A Portrait of Firms in the U.S. that Trade Goods." In *Producer Dynamics: New Evidence from Micro Data*, NBER Chapters, 513–552. National Bureau of Economic Research, Inc.

Biscourp, P., and F. Kramarz. 2007. "Employment, skill structure and international trade: Firm-level evidence for France." *Journal of International Economics* 72 (1): 22–51 (05).

Blinder, A. S, and A. B Krueger. 2013. "Alternative measures of offshorability: a survey approach." *Journal of Labor Economics* 31 (2 Part 2): S97–S128.

Blinder, A S. 2009. "How many US jobs might be offshorable?" *World Economics* 10 (2): 41.

Blonigen, B A., L. Fontagné, N. Sly, and F. Toubal. 2012, September. "Cherries for Sale: Export Networks and the Incidence of Cross-Border M&A." Nber working papers, National Bureau of Economic Research, Inc.

Blundell, R., and S. Bond. 2000. "GMM estimation with persistent panel data: an application to production functions." *Econometric reviews* 19 (3): 321–340.

Brainard, S. L., and D. A. Riker. 1997, March. "Are U.S. Multinationals Exporting U.S. Jobs?" Nber working papers 5958, National Bureau of Economic Research, Inc.

Brouthers, K. D, and L E Brouthers. 2001. "Explaining the national cultural distance paradox." *Journal of International Business Studies* 32 (1): 177–189.

Conconi, P., A. Sapir, and M. Zanardi. 2013, February. "The Internationalization Process of Firms: from Exports to FDI." Cepr discussion papers 9332, C.E.P.R. Discussion Papers.

Crino, R. 2009. "Offshoring, Multinationals And Labour Market: A Review Of The Empirical Literature." *Journal of Economic Surveys* 23 (2): 197–249 (04).

Cuyvers, L., M. Dumont, G. Rayp, and K. Stevens. 2005. "Home Employment Effects of EU Firms Activities in Central and Eastern European Countries." *Open Economies Review* 16 (2): 153–174 (April).

Demsetz, Harold, and Kenneth Lehn. 1985. "The structure of corporate ownership: Causes and consequences." *The Journal of Political Economy*, pp. 1155–1177.

Dewit, G., H. Görg, and C. Montagna. 2009. "Should I stay or should I go? Foreign direct investment, employment protection and domestic anchorage." *Review of World Economics (Weltwirtschaftliches Archiv)* 145 (1): 93–110 (April).

Ebenstein, A., A. Harrison, M. McMillan, and S. Phillips. 2009. "Estimating the impact of trade and offshoring on American workers using the current population surveys." *Review of Economics and Statistics*.

Ekholm, K, and K. Hakkala. 2005, Dec. "The Effect of Offshoring on Labor Demand: Evidence from Sweden." Working paper series 654, Research Institute of Industrial Economics.

Falk, M., and B. Koebel. 2002. "Outsourcing, Imports and Labour Demand." *Scandinavian Journal of Economics* 104 (4): 567–86 (December).

Falk, M., and Y. Wolfmayr. 2008, June. "The Impact of Outward FDI in Central and Eastern Europe on Employment in the EU-15 Countries." Fiw research reports series I-016, FIW.

Feenstra, R., and G. Hanson. 1996. "Globalization, outsourcing and wage inequality." *american economic review* 86:240–245.

———. 1999. "Producctivity Measurement and the Impact of Trade and Technology on Wages: Estimates for rhe US, 1972-1990." *Quaterly Journal of Economics* 3 (114): 907–940 (august).

Feenstra, R. C, and G H Hanson. 2005. "Ownership and Control in Outsourcing to China: Estimating the Property-Rights Theory of the Firm." *The Quarterly Journal of Economics* 120 (2): 729–761.

Fontagne, L., and T. Mayer. 2005. *Applied Economics Quarterly* 51:9–34.

Gamberoni, E., R. Lanz, and R. Piermartini. 2010, November. "Timeliness and contract enforceability in intermediate goods trade." Policy research working paper series 5482, The World Bank.

Gatignon, H., and E. Anderson. 1988. "The multinational corporation's degree of control over foreign subsidiaries: An empirical test of a transaction cost explanation." *Journal of Law, Economics, & Organization*, pp. 305–336.

Gazaniol, A. 2012, April. "The impact of outward FDI on the domestic perimeter of manufacturing groups." Working papers DT/2012/03, DIAL (Développement, Institutions et Mondialisation).

Gazaniol, A., and F. Peltrault. 2013. "Outward FDI, performance and group affiliation: evidence from French matched firms." *Economics Bulletin* 33 (2): 891–904.

Goos, M., A. Manning, and A. Salomons. 2009. "Job polarization in Europe." *The American Economic Review* 99 (2): 58–63.

Grossman, G. M, and E. Helpman. 2002. "Integration versus Outsourcing in Industry Equilibrium*." *The Quarterly journal of economics* 117 (1): 85–120.

———. 2005. "Outsourcing in a global economy." *The Review of Economic Studies* 72 (1): 135–159.

Grossman, G. M, and E. Rossi-Hansberg. 2008. "Trading tasks: A simple theory of offshoring." *American Economic Review* 98 (5): 1978.

Grossman, G M., E. Helpman, and A. Szeidl. 2006. "Optimal integration strategies for the multinational firm." *Journal of International Economics* 70 (1): 216–238 (September).

Grover, A. 2008. "Vertical FDI versus Outsourcing: A Welfare Comparison from the Perspective of the Host Country." Technical Report, DEGIT, Dynamics, Economic Growth, and International Trade.

Hakkala Nilsson, K., F. Heyman, and F. Sjöholm. 2014. "Multinational firms, acquisitions and job tasks." *European Economic Review* 66 (C): 248–265.

Hakkala Nilsson, K., and K. Huttunen. 2014. "Displacing Tasks: Understanding the Employment Effects of Offshoring."

Hansson, P. 2000. "Relative demands for skilled in Swedish manufacturing: Technology or trade?" *Review of International Economics* 8 (3): 533–555.

———. 2005. "Skill Upgrading and Production Transfer within Swedish Multinationals." *Scandinavian Journal of Economics* 107 (4): 673–692 (December).

Head, K., and J. Ries. 2002. "Offshore production and skill upgrading by Japanese manufacturing firms." *Journal of international economics* 58 (1): 81–105.

Helpman, E., M. Melitz, and S. R. Yeaple. 2004. "Export Versus FDI with Heterogeneous Firms." *American Economic Review* 94 (1): 300–316 (March).

Hijzen, A., H. Görg, and R C Hine. 2005. "International Outsourcing and the Skill Structure of Labour Demand in the United Kingdom*." *The Economic Journal* 115 (506): 860–878.

Hijzen, A., H. Görg, and R C. Hine. 2005. "International Outsourcing and the Skill Structure of Labour Demand in the United Kingdom." *Economic Journal* 115 (506): 860–878 (October).

Hijzen, A., S. Jean, and T. Mayer. 2011. "The effects at home of initiating production abroad: evidence from matched French firms." *Review of World Economics (Weltwirtschaftliches Archiv)* 147 (3): 457–483 (September).

Hummels, D., R. Jørgensen, J. Munch, and C. Xiang. 2011, October. "The Wage Effects of Offshoring: Evidence from Danish Matched Worker-Firm Data." Nber working papers 17496, National Bureau of Economic Research, Inc.

Huttunen, K. 2007. "The effect of foreign acquisition on employment and wages: Evidence from Finnish establishments." *The Review of Economics and Statistics* 89 (3): 497–509.

Javorcik, B. S, and S-J. Wei. 2009. "Corruption and cross-border investment in emerging markets: Firm-level evidence." *Journal of International Money and Finance* 28 (4): 605–624.

Jensen, J. B, and L. G. Kletzer. 2010, 09. "Measuring Tradable Services and the Task Content of Offshorable Services Jobs." In *Labor in the New Economy*, NBER Chapters, 309–335. National Bureau of Economic Research, Inc.

Johanson, J., and J-E. Vahlne. 1977. "The internationalization process of the firm-a model of knowledge development and increasing foreign market commitments." *Journal of international business studies*, pp. 23–32.

Klug, M. 2006. "Market Entry Strategies in Eastern Europe in the Context of the European Union." *Wiesbaden: Deutcher Universitats-Verlag.*

Kohler, W. 2002, April. "The Distributional Effects of International Fragmentation." Economics working papers, Johannes Kepler University Linz.

Konings, J., and A. Murphy. 2006. "Do multinational enterprises relocate employment to low-wage regions? Evidence from European multinationals." *Review of World Economics* 142 (2): 267–286.

Kramarz, F. 2008. "Offshoring, Wages, and Employment: Evidence from data matching imports, firms, and workers." Technical Report, CREST-INSEE.

Kroeger, S. 2013. "The Contribution of Offshoring to the Convexification of the US Wage Distribution."

Krugman, P. 2008. "Trade and Wages, Reconsidered." *Brookings Papers on Economic Activity* 39 (1): 103–154.

Mansfield, Edwin, and Anthony Romeo. 1980. "Technology transfer to overseas subsidiaries by US-based firms." *The Quarterly Journal of Economics*, pp. 737–750.

Markusen, J.R. 1995. "The Boundaries of Multinational Enterprises and the Theory of International Trade." *Journal of Economic Perspectives* 9 (2): 169–89 (Spring).

Martínez-Zarzoso, I., A. Voicu, and M. Vidovic. 2011. "CEECs integration into regional and global production networks." Technical Report.

Moati, P., and E M Mouhoud. 2005. "Les nouvelles logiques de décomposition internationale des processus productifs." *Revue d'économie politique* 0 (5): 573–589.

Moran, T. 2001. "Parental Supervision: The New Paradigm for Foreign Direct Investment and Development." Technical Report, Washington DC: Institute for International Economics.

Morrison, C., and D. Siegel. 2001. "The Impacts of Technology, Trade and Outsourcing on Employment and Labor Composition." *Scandinavian Journal of Economics* 103 (2): 241–64 (June).

Nunnenkamp, P., and M S Andrés. 2013, May. "Ownership Choices of Indian Direct Investors: Do FDI Determinants Differ between Joint Ventures and Wholly-owned Subsidiaries?" Kiel working papers, kiel institute for the world economy 1841, Kiel Institute for the World Economy.

Oldenski, L. 2012. "The Task Composition of Offshoring by U.S. Multinationals." *Economie Internationale*, no. 131:5–21.

Peri, G., and J. Poole. 2013. "Offshoring and Firm-Level Task composition: Is there a gender component?" Technical Report, Working paper.

Riker, D., and S. Brainard. 1997, Mar. "U.S. Multinationals and Competition from Low Wage Countries." Nber working papers 5959, National Bureau of Economic Research, Inc.

Scott, J. 1990. "Corporate control and corporate rule: Britain in an international perspective." *British journal of sociology*, pp. 351–373.

Slaughter, M J. 2000. "Production transfer within multinational enterprises and American wages." *Journal of International Economics* 50 (2): 449–472 (April).

Smarzynska-Javorcik, B., and M. Spatareanu. 2008. "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 (February).

Spitz-Oener, A. 2006. "Technical Change, Job Tasks and Rising Educational Demands: Looking Outside the Wage Structure." *Journal of Labor Economics* 24 (2): 235–270.

Stiegert, K. W, A. Ardalan, and T L. Marsh. 2006. "Foreign-Market Entry Strategies in the European Union." *Journal of Food Distribution Research* 37, no. 03.

Stock, J.H, and M. Yogo. 2002, November. "Testing for Weak Instruments in Linear IV Regression." Nber technical working papers 0284, National Bureau of Economic Research, Inc.

Strauss-Kahn, V. 2004. "The Role of Globalization in the Within-Industry Shift Away from Unskilled Workers in France." In *Challenges to Globalization: Analyzing the Economics*, NBER Chapters, 209–234. National Bureau of Economic Research, Inc.

Topiol, A., and C. Héricher. 2013. "Les groupes français à l'étranger En 2010, 4,7 millions de salariés dont près de 2 millions dans l?industrie." *Insee Première*, no. 1439 (march).

Vermeulen, E P. 2013. "Beneficial Ownership and Control: A Comparative Study-Disclosure, Information and Enforcement." Technical Report, OECD Publishing.

Yeats, A. 1998, January. "Just how big is global production sharing?" Policy research working paper series 1871, The World Bank.

A Robustness Tests

The following section gives results of equation 3 by using different measures of offshoring. We define three other measures of FDI.

The first proxy is constructed by taking into account the possibility that a firm uses its blocking minority power.[47] The underlying idea for using blocking minority as a weighted measure is to assuming increasing control over the foreign subsidiary when the firm has the possibility to veto certain decisions at extraordinary general meetings of shareholders. The investing firm could thus have incentives to actively manage employment inside the subsidiary and to transfer its intangible assets.

The measure is built as follows:

$$\rho_{jt} = \sum_{k} subsidiary_{kjt} \tag{6}$$

$$\text{Where} \begin{cases} subsidiary_{kjt} = 1, \text{ when } Voting_{kjt} \geq 34\% \\ subsidiary_{kjt} = Voting_{kjt}, \text{ when } Voting_{kjt} < 34\% \end{cases}$$

Here, we assume that when a firm owns more than 34% of the voting stock, then the firm has a blocking minority and can intervene in important decisions concerning its subsidiary. Therefore the firm owns the subsidiary *entirely*, and the number of FDI projects is equal to 1. If the firm does not hold a blocking minority, then we do not consider that the firm holds the *entire* subsidiary, but only holds the subsidiary weighted by the voting stock.

The ρ measure controls for the blocking minority, but has the disadvantage of overriding the existing hierarchy when votes are held.

We also control our results by using a second proxy of a firm's FDI size, by weighting the firm's number of subsidiaries by firm j's average outward investment stock.[48] The third measure is constructed as follows:

$$\varphi_{jt} = \sum_{k} Value_{kjt} \tag{7}$$

Where $Value_{kjt}$ is the balance sheet value of firm j's subsidiary k at time t. However, information on the gross value of investment purchased in each subsidiary is not available prior to 2004. As it is a stock value, the average over a 4-year period gives a good proxy of a firm's mean size of foreign investments. We first measure the number of foreign subsidiaries controlled by each firm j over the period $t \in [2002, 2007]$. We weight this number by the firm j's mean outward investment stock amount over the period 2004-2007.

However, the measure φ does not account for all multinational companies, since information on subsidiaries' stock amounts are not referenced for each subsidiary in the LIFI survey.

[47] A blocking minority represents one quarter or one third of the shares plus one share, depending on the country and the legal form of the company.

[48] This corresponds to the gross value of shares owned in the foreign subsidiary, in thousands of euros. This measure corresponds to a book value and does not reflect the market value of the firm. The amount is identified in euros. Therefore, we deflate this nominal value by using the CPI base 2005, provided by INSEE

Finally, we use the number of subsidiaries abroad without weights (we call this δ).

The measure κ is preferred for different reasons. First, it allows the effect of a change in the share of voting stock held in a foreign subsidiary to be captured, even if the firm does not change its number of foreign subsidiaries. Several studies have highlighted the impact of control over wages and employment (see Bircan (2011) for a review). Second, it allows control for multiple authority sources in a group. Indeed, if two French subsidiaries inside a domestic group control the same subsidiary abroad, it allows firm holdings with a clear majority to be distinguished.

Tables 9 and 10 report results with the different measures of FDI on the share of executives and blue-collar workers respectively. Columns (1) and (7) report the results with the measure of offshoring κ. Columns (2) and (8) report the results with the measure of offshoring ρ. Columns (3) and (9) report the results with the measure φ. Columns (4) and (10) report the result with the measure of offshoring δ. Columns (5) and (11) report the results with the measure of offshoring κ, and include the variables on the wages paid by type of work i relative to the composite wage of work type not in i. Whatever the proxy retained, the preceding conclusions are not altered.

Table 9: Robustness Test with Different Measures of Offshoring (Executives)

	Executives					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	κ	ρ	φ	δ	κ	κ
Subsidiaries in						
LI countries	0.015***	0.015***	0.003***	0.013**	0.018***	0.016***
	[0.006]	[0.006]	[0.001]	[0.005]	[0.006]	[0.006]
HI countries	0.002	-0.002	0.002	-0.001	0.001	-0.001
	[0.008]	[0.004]	[0.003]	[0.004]	[0.008]	[0.008]
France	-0.002	0.002	-0.000	-0.002	-0.002	-0.001
	[0.002]	[0.003]	[0.001]	[0.002]	[0.003]	[0.002]
Technology Frontier	0.001	0.001	0.001	0.001	0.000	0.000
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Export	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Revenue	0.007**	0.007*	0.007**	0.007*	0.008**	0.007*
	[0.004]	[0.004]	[0.003]	[0.004]	[0.004]	[0.003]
Capital	-0.000	-0.001	-0.000	-0.001	-0.001	-0.000
	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]
w_{ij}/w_{-ij}					0.005***	
					[0.001]	
Nationality						0.006***
						[0.002]
Constant	0.101***	0.101***	0.117***	0.101***	0.091***	0.099***
	[0.020]	[0.020]	[0.042]	[0.020]	[0.021]	[0.021]
Observations	18,729	18,729	16,494	18,729	16,160	16,228
R-squared	0.039	0.039	0.039	0.038	0.040	0.094
Number of codesiren	6,474	6,474	5,740	6,474	6,279	6,108
Log Likelihood	44778.877	44780.333	39959.054	44780.333	41664.506	39956.032

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des données sociales (DADS); period 2002-2007. Note: Estimations are for firm fixed effects (FE), and variables are calculated at the level of the firm. The wage-bill shares are in percent, varying between zero and 100.

Table 10: Robustness Test with Different Measures of Offshoring (Blue-Collar Workers)

	Blue-collar workers					
	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	κ	ρ	φ	δ	κ	κ
Subsidiaries in						
LI countries	-0.008*	-0.009*	-0.003***	-0.006*	-0.007	-0.008*
	[0.005]	[0.005]	[0.001]	[0.003]	[0.005]	[0.005]
HI countries	-0.008	-0.002	0.000	-0.002	-0.005	-0.007
	[0.008]	[0.004]	[0.002]	[0.004]	[0.006]	[0.007]
France	-0.001	-0.001	0.000	-0.000	-0.001	-0.001
	[0.004]	[0.004]	[0.001]	[0.003]	[0.003]	[0.004]
Technology Frontier	-0.000	-0.000	-0.000	-0.000	-0.001	-0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Export	0.001	0.001	-0.000	0.001	0.001*	0.001
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Revenue	-0.012***	-0.012***	-0.014***	-0.012***	-0.012***	-0.012***
	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.003]
Capital	0.002	0.002	0.003	0.002	0.003	0.002
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
w_{ij}/w_{-ij}					0.032***	
					[0.004]	
Nationality						-0.001
						[0.003]
Constant	0.625***	0.625***	0.661***	0.624***	0.603***	0.624***
	[0.025]	[0.025]	[0.056]	[0.025]	[0.026]	[0.025]
Observations	18,729	18,729	16,494	18,729	17,160	16,228
R-squared	0.025	0.025	0.027	0.038	0.036	0.102
Number of codesiren	6,474	6,474	5,740	6,279	6,474	6,474
Log Likelihood	38956.014	38957.012	39959.054	36566.231	38957.012	39959.054

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des données sociales (DADS); period 2002-2007. Note: Estimations are for firm fixed effects (FE), and variables are calculated at the level of the firm. The wage-bill shares are in percent, varying between zero and 100.

Columns (6) and (12) report the results with the measure of offshoring κ, by including the variable of parent company nationality. We add a dummy that takes the value of 1 if a firm is controlled by a foreign parent company, and 0 otherwise. The coefficient associated with this dummy is identified for firms that changed nationality in the sample period. The inclusion of the firm's nationality does not alter the conclusions. FDI to low-income countries is significantly associated with a higher share of executives employees, and is associated with a lower share of blue-collar workers.[49]

Finally, we report the results when controlling for the FDI strategy at the group level (see Table 11). The results are consistent with those obtained by taking into account the relocation strategy at the firm level. A group's number of subsidiaries in low-income countries raises the share of executives inside domestic firms and reduces the share of blue-collar workers. Relocation in high-income countries does not show any significant impact on either types of jobs and tasks. However, contrary to results at the firm level, when the group raises its FDI in low-income countries, manual non-routine tasks are negatively

[49]We highlight a positive coefficient associated with change in a firm's nationality on the share of executives. We interpret the positive coefficient as a positive correlation between high-skilled firms and foreign-acquisition, reflecting the fact that foreign-owned firms are on average more skills-intensive than French-owned firms. Theories of ownership have shown that acquisition can result in a reduction of employment, because takeovers are a good way for shareholders to get rid of non-value-maximizing managers (Huttunen (2007)). However, changes in employment are likely to take time, because of attendant adjustment costs.

affected. The reason is certainly due to an overall effect on the rationalization of production processes by eliminating unnecessary domestic capacity at the group level. Indeed, when the group increases FDI to low-income countries it may decide to reduce the employment of blue-collar workers in dedicated subsidiaries, even those that are not directly engaged in outward FDI.

Table 11: International Strategies at the Group Level

VARIABLES	Executive (1)	Blue-collar workers (2)	Routine manual (3)	Non-routine manual (4)	Non-routine interactive (5)	Non-routine analytic (6)	Routine cognitive (7)
Subsidiaries in							
HI countries	-0.002	0.001	0.000	0.000	-0.002	-0.002	-0.003
	[0.002]	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
LI countries	0.004*	-0.004*	-0.002	-0.005*	0.001	-0.001	0.002
	[0.002]	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
France	-0.001	0.000	0.001	0.002	0.000	0.001	0.000
	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Exports	-0.000	0.001	-0.001	-0.001**	-0.000	-0.001	-0.000
	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Revenue	0.007**	-0.012***	0.004	0.002	0.007	0.004	0.001
	[0.004]	[0.005]	[0.006]	[0.005]	[0.005]	[0.005]	[0.005]
Capital	-0.001	0.002	-0.002	0.003*	0.004**	0.005***	0.001
	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Technology Frontier	0.001	-0.000	-0.001	-0.002	-0.002	-0.002*	-0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Constant	0.102***	0.626***	0.444***	0.497***	0.381***	0.573***	0.573***
	[0.020]	[0.025]	[0.031]	[0.026]	[0.028]	[0.025]	[0.024]
Observations	18,729	18,729	18,246	18,246	18,246	18,246	18,246
R-squared	0.037	0.024	0.001	0.025	0.040	0.033	0.026
Log Likelihood	44769.763	38961.518	28782.137	32064.988	30790.877	32837.520	33190.064

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des donnés sociales (DADS); period 2002-2007.
Note: Estimations are firm fixed effects (FE) and variables are calculated at the level of the firm, except for the number of foreign subsidiaries which is calculated at the group level. The wage-bill shares are in percent, varying between zero and 100.

B The Composition of Tasks within Occupations

ONET provides information on the characteristics of nearly 900 occupations in its latest version. These characteristics are listed in seven broad categories: abilities, interests, knowledge, skills, work activities, work context, and work value. The ONET database is composed of different files. We focus on work activities which are closest to the notion of task. To do so, we use the Generalized Work activity file. This file gives a score ranking from 0-100 for 41 different tasks, indicating the degree (or point along a continuum) to which a particular descriptor is required or needed to perform the occupation. We divide these tasks into the five major groups described above, and we normalize the index.

The following table lists the 41 main work activities. We choose to classify them into five major categories as in ALM (2003). They distinguish between: i) non-routine analytical tasks are usually performed in technical or managerial occupations. They require cognitive capacity in which responsiveness, creativity, decision making and problem solving are important. ii) The second major task category includes non-routine interactive tasks. These tasks require physical interaction and adaptability to certain types of situations. iii) The third category identifies cognitive routine tasks that are usually carried out by administrative or clerical occupations, such as secretaries and accounting officers who perform repetitive tasks using an identified procedure. iv) Manual routine tasks are

performed by production operators such as handlers, machine operators, workers in packaging and transportation. These tasks can be seen as unskilled manual tasks. v) Finally, the last category lists manual tasks that require specific knowledge and are considered as skilled manual tasks. These tasks are mostly performed by technicians or foremen.

Table 12: Occupational Tasks

Non-routine Analytical	Organizing, Planning, and Prioritizing Work; Getting Information; Analyzing Data or Information; Making Decisions and Solving Problems; Developing Objectives; Judging the Qualities of Things, Services, or People; Updating and Using Relevant Knowledge; Interacting with Computers; Thinking Creatively; Estimating the Quantifiable Characteristics of Products, Events, or Information; Evaluating Information to Determine Compliance with Standards; Scheduling Work and Activities; Interpreting the Meaning of Information for Others; Processing Information and Strategies
Non-routine Interactive	Guiding, Directing, and Motivating Subordinates; Communicating with Supervisors, Peers, or Subordinates; Communicating with Persons Outside the Organization; Developing and Building Teams; Resolving Conflicts and Negotiating with Others; Performing for or Working Directly with the Public; Staffing Organizational Units Providing Consultation and Advice to Others; Coordinating the Work and Activities of Others; Selling or Influencing Others; Training and Teaching Others; Assisting and Caring for Others; Coaching and Developing Others; Establishing and Maintaining Interpersonal Relationships; Monitoring and Controlling Resources
Routine Cognitive	Performing Administrative Activities, Documenting/Recording Information
Routine Manual	Handling and Moving Objects; Performing General Physical Activities ; Repairing and Maintaining Mechanical Equipment; Repairing and Maintaining Electronic Equipment
Non-routine Manual	Operating Vehicles, Mechanized Devices, or Equipment; Inspecting Equipment, Structures, or Material; Monitoring Processes, Materials, or Surroundings; Drafting, Laying Out, and Specifying Technical Devices, Parts, and Equipment

Source: Constructed using data from O*NET as described in Section 3.1.2

The following table gives examples of different types of tasks performed in four main occupations in the metal industry. The index for these tasks is normalized. Here we see that engineers have a higher score in *making decision*, whereas mechanics have the lower score. In contrast, skilled assemblers have a higher score in the task of *handling and moving objects* compared to engineers.

Table 13: Examples in the Metal Industry

Task Descriptions	Making decisions and solving problems	Guiding, directing and motivating subordinates	Communicating with supervisors and motivating subordinates	Performing adminisrative activities	Handling and moving objects
Engineers	0.741	0.589	0.731	0.608	0.421
Technicians	0.59	0.373	0.638	0.388	0.708
Skilled assemblers	0.558	0.306	0.362	0.176	0.857
Mechanics	0.375	0.171	0.329	0.256	0.838

Occupations in the metal industry, index values are normalized for each occupation. Sources: O*NET linked with EurOccupations.

Table 14 provides descriptive statistics, showing the mean intensity of each score for the seven major occupations.

Table 14: Tasks' Intensity within Occupations

	Employees	Managers	Engineers	Technicians	Foremen	Skilled blue-collar	Non-skilled blue-collar
Non-routine analytical	0.40	0.72	0.79	0.67	0.61	0.42	0.34
Non-routine interactive	0.34	0.62	0.56	0.42	0.62	0.29	0.25
Routine manual	0.34	0.19	0.35	0.47	0.50	0.69	0.70
Non-routine manual	0.24	0.24	0.62	0.59	0.56	0.59	0.53
Routine cognitive	0.51	0.75	0.74	0.66	0.63	0.41	0.33

Source: O*NET work activity normalized measure, merged with French PCS-ESE classifications using EurOccupation correspondence tables. Authors' calculations.

It shows that skilled production workers (composed of skilled blue-collar workers, engineers, technicians and foremen) have an important index of non-routine manual, interactive and analytical tasks. Managers and engineers are the two occupations having the highest score of routine cognitive tasks, whereas skilled and unskilled blue-collar workers perform routine manual tasks more intensively.

C Description of Variables

We report a detailed description of groups of occupations, set out in Subsections 5.1 to 5.4. We also refer to their French classification (PCS-ESE 2003), available at <http://www.insee.fr/>.

Table 15: Description of the Groups of Occupations

Major Occupations	Code PCS-ESE	**Major Qualification**	Code PCS-ESE	**Detailed Occupations**	Code PCS-ESE
Executives		Skilled Production Workers			
Licensed professionals	31	Engineers	38	Technicians	47
Administrative managers	37	Technicians	47	Foremen	48
Engineers	38	Foremen	48		
IP		Skilled handling BC workers	65	Employees	
Firm's administrative IP	45	Industrial skilled BC workers	62	*Firm's administrative employees*	54
Commercial administrative IP	46	Craft skilled BC workers	63	*Commercial employees*	55
Technicians	47			Engineers	38
Foremen	48	Skilled non-production workers		Managers	37
Employees		Administrative managers	37		
Supervising officers	53	Firm's administrative IP	45	Skilled BC workers	
Firm's administrative employees	54	Commercial administrative IP	46	*Skilled handling BC workers*	65
Commercial employees	55			*Industrial skilled BC workers*	62
BC workers		Non-skilled production workers		*Craft skilled BC workers*	63
Skilled handling BC workers	65	Industrial non-skilled BC workers	67		
Industrial skilled BC workers	62	Craft non-skilled BC workers	68	Non- skilled BC workers	
Craft skilled BC workers	63			*Industrial non-skilled BC workers*	67
Industrial non-skilled BC workers	67	Non-skilled non-production workers		*Craft non-skilled BC workers*	68
Craft non-skilled BC workers	68	Supervising officers	53		
Agricultural BC workers	69	Firm's administrative employees	54		
		Commercial employees	55		

Note: The abbreviation 'IP' stems from intermediate occupations and the abbreviation 'BC' stems from blue-collar.

D Regression on Groups of Occupations

Table 16: Changes in the Share of Occupations by Production Groups

Model	FE (1)	FE (2)	FE (3)	FE (4)
Dependant variable	Skilled production workers	Skilled non-production workers	Unskilled production workers	Unskilled non-production workers
Subsidiaries in				
Low-income countries	0.003	0.006	-0.006	-0.003
	[0.008]	[0.005]	[0.006]	[0.003]
High-income countries	-0.017	0.003	0.015	-0.001
	[0.012]	[0.006]	[0.010]	[0.005]
France	-0.004	-0.000	0.002	0.002
	[0.005]	[0.003]	[0.004]	[0.002]
Exports	-0.001**	-0.000	0.001***	-0.000
	[0.001]	[0.000]	[0.000]	[0.000]
Revenue	0.003	0.007*	-0.008*	-0.003
	[0.006]	[0.004]	[0.005]	[0.002]
Capital	0.007***	-0.002	-0.004**	-0.001
	[0.002]	[0.001]	[0.002]	[0.001]
Technology frontier	0.001	0.000	-0.001	-0.000
	[0.001]	[0.001]	[0.001]	[0.000]
Constant	0.597***	0.098***	0.207***	0.098***
	[0.031]	[0.023]	[0.026]	[0.015]
Observations	18,729	18,729	18,729	18,729
R^2 overall	0.000	0.015	0.015	0.019

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des données sociales (DADS); period 2002-2007. Note: Estimations are of firm fixed effects (FE), and variables are calculated at the level of the firm. The wage-bill shares are in percent, varying between zero and 100.

Table 17: Changes in the Share of Occupations by Occupational Groups

Model	FE (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)	FE (7)
Dependant variable	Managers	Engineer	Skilled blue-collars	Unskilled blue-collars	Employees	Technicians	Foremen
Subsidiaries in							
Low-income countries	0.007**	0.006	-0.006	-0.013**	0.001	0.006	-0.002
	[0.004]	[0.004]	[0.009]	[0.006]	[0.001]	[0.004]	[0.003]
High-income countries	-0.000	-0.000	-0.019	0.013	-0.001	0.007	0.001
	[0.004]	[0.005]	[0.013]	[0.011]	[0.002]	[0.005]	[0.004]
France	0.000	-0.002	-0.003	0.002	-0.000	0.003	0.001
	[0.002]	[0.002]	[0.005]	[0.004]	[0.001]	[0.003]	[0.001]
Exports	-0.000	-0.000	-0.001	0.001**	-0.000	-0.000	-0.000
	[0.000]	[0.000]	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]
Revenue	0.008***	0.014***	-0.008	-0.031***	0.000	0.017***	-0.001
	[0.002]	[0.003]	[0.006]	[0.005]	[0.001]	[0.003]	[0.002]
Capital	-0.000	0.002	0.006**	-0.010***	-0.001*	0.002	0.001
	[0.001]	[0.001]	[0.003]	[0.002]	[0.000]	[0.001]	[0.001]
Technology frontier	-0.000	0.001**	0.001	-0.002	0.000	0.000	-0.000
	[0.000]	[0.000]	[0.001]	[0.001]	[0.000]	[0.001]	[0.000]
Constant	0.008	0.014	0.478***	0.380***	0.005	0.064***	0.052***
	[0.010]	[0.012]	[0.025]	[0.021]	[0.004]	[0.012]	[0.007]
Observations	18,760	18,760	18,760	18,760	18,760	18,760	18,760
R^2 overall	0.032	0.067	0.020	0.006	0.000	0.024	0.121

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des donnés sociales (DADS); period 2002-2007. Note: Estimations are of firm fixed effects (FE) and variables are calculated at the level of the firm. The wage-bill shares are in percent, varying between zero and 100.

E Sector Decomposition

Table 18 presents the average wage bill share for seven broad occupations per sector. The consumer goods industries are relatively more intensive in administrative workers (managers and employees), while the capital and intermediate goods industries are more intensive in skilled production workers (engineers, skilled blue-collars and technicians). The share of unskilled blue-collar workers and foremen are relatively similar in the three sectors.

Table 18: Decomposition of the Wage-Bill Share by Sector

Mean wage-bill share (in %)	Consumer goods industries	Capital goods industries	Intermediate goods industries
Managers	12%	10%	11%
Engineers	7%	16%	10%
Skilled blue-collar workers	18%	26%	26%
Unskilled blue-collar workers	11%	9%	14%
Employees	3%	0.1%	0.5%
Technicians	16%	22%	17%
Foremen	2%	4%	4%

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des donnés sociales (DADS); period 2002-2007.

The following tables present the results of the fixed effect model by dividing the sample into three main industry categories. Firms belonging to consumer goods industries are reported in Table 19. Firms belonging to intermediate goods industries are reported in Table 21. Finally, firms belonging to capital goods industries are reported in Table 20. 20.82% of our sample are in the consumer goods industries, 23.69% are in capital goods industries and 50.99% are in the intermediate goods industries.

Table 19 shows no clear effect of offshoring on employment. Whereas Table 20 shows a positive effect of offshoring to low-income countries on the share of executives, and the share of workers performing intensively cognitive and analytical tasks.

Interestingly, Table 20 shows that the negative bias towards manual workers when offshoring occurs in high-wage countries and is mainly driven by firms in capital goods industries, as described in Section 5.2. We also observe a positive association between offshoring in high-income countries and the share of workers performing interactive tasks. This is similar to results obtained in Becker et al. (2012).

Table 21 shows a clear substitution between blue-collar workers and a complementarity between skilled executives and offshored employment in low-income countries. Similar results were obtained for Sweden by Hanson (2005).

Table 19: Fixed Effect Model for the Consumer Goods Industries

VARIABLES	Executive (1)	Blue-collar workers (2)	Routine manual (3)	Non-routine manual (4)	Non-routine interactive (5)	Non-routine analytic (6)	Routine cognitive (7)
Subsidiaries in							
LI countries	0.002	0.007	-0.002	-0.011	0.003	-0.005	0.004
	[0.014]	[0.015]	[0.020]	[0.016]	[0.019]	[0.017]	[0.018]
HI countries	0.005	-0.012	-0.001	0.006	-0.007	-0.004	-0.005
	[0.015]	[0.017]	[0.022]	[0.018]	[0.022]	[0.019]	[0.020]
France	-0.005	0.004	0.013	0.004	-0.012	-0.004	-0.004
	[0.007]	[0.008]	[0.010]	[0.008]	[0.010]	[0.009]	[0.009]
Export	-0.001	0.003***	0.003*	0.001	-0.004***	-0.004***	-0.003**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Revenue	0.026***	-0.051***	-0.014	-0.012	0.031***	0.027***	0.015
	[0.007]	[0.008]	[0.011]	[0.009]	[0.011]	[0.010]	[0.010]
Capital	0.002	0.007*	0.005	0.005	0.004	0.003	0.003
	[0.003]	[0.004]	[0.005]	[0.004]	[0.005]	[0.004]	[0.004]
Technology frontier	0.001	-0.001	-0.002	-0.005*	-0.000	-0.004	0.004
	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Constant	0.011	0.748***	0.430***	0.501***	0.287***	0.470***	0.521***
	[0.040]	[0.045]	[0.059]	[0.048]	[0.057]	[0.052]	[0.053]
Observations	2,635	2,635	2,564	2,564	2,564	2,564	2,564
R-squared	0.041	0.038	0.009	0.020	0.043	0.036	0.048
Log Likelihood	5032.439	4702.799	3959.114	4472.146	4034.450	4307.433	4259.349

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des données sociales (DADS); period 2002-2007. Note: Estimations are of firm fixed effects (FE), and variables are calculated at the level of the firm. The wage-bill shares are in percent, varying between zero and 100.

Table 20: Fixed Effect Model for Capital Goods Industries

VARIABLES	Executive (1)	Blue-collar workers (2)	Routine manual (3)	Non-routine manual (4)	Non-routine interactive (5)	Non-routine analytic (6)	Routine cognitive (7)
Subsidiaries in							
LI countries	0.026***	-0.010	-0.001	0.015	0.019	0.019	0.017
	[0.008]	[0.010]	[0.017]	[0.014]	[0.014]	[0.013]	[0.012]
HI countries	0.001	-0.007	-0.038*	-0.049***	0.021	0.004	0.024*
	[0.010]	[0.012]	[0.020]	[0.017]	[0.016]	[0.015]	[0.014]
France	-0.004	0.008	0.008	-0.009	-0.016**	-0.014**	-0.012*
	[0.004]	[0.006]	[0.010]	[0.008]	[0.008]	[0.007]	[0.007]
Export	0.000	0.000	-0.003**	-0.001	0.002**	0.001*	0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Revenue	0.008**	-0.013***	-0.011	0.006	0.016**	0.015**	0.017***
	[0.004]	[0.005]	[0.009]	[0.007]	[0.007]	[0.006]	[0.006]
Capital	-0.002	0.001	-0.006	-0.006	0.004	0.002	0.004
	[0.002]	[0.003]	[0.005]	[0.004]	[0.004]	[0.004]	[0.003]
Technology frontier	0.000	0.000	-0.003	-0.004*	-0.003	-0.002	-0.003*
	[0.001]	[0.002]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]
Constant	0.130***	0.551***	0.564***	0.555***	0.328***	0.536***	0.485***
	[0.022]	[0.028]	[0.049]	[0.041]	[0.039]	[0.036]	[0.033]
Observations	4,758	4,758	4,625	4,625	4,625	4,625	4,625
R-squared	0.054	0.040	0.015	0.065	0.036	0.025	0.029
Log Likelihood	9974.184	8917.406	6227.275	7063.281	7272.762	7650.419	8000.815

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des données sociales (DADS); period 2002-2007. Note: Estimations are of firm fixed effects (FE), and variables are calculated at the level of the firm. The wage-bill shares are in percent, varying between zero and 100.

Table 21: Fixed Effect Model for Intermediate Goods Industries

VARIABLES	Executive (1)	Blue-collar workers (2)	Routine manual (3)	Non-routine manual (4)	Non-routine interactive (5)	Non-routine analytic (6)	Routine cognitive (7)
Subsidiaries in							
LI countries	0.011**	-0.012**	-0.001	0.000	0.017*	-0.000	-0.004
	[0.005]	[0.006]	[0.009]	[0.008]	[0.009]	[0.008]	[0.008]
HI countries	-0.003	-0.001	0.002	-0.005	-0.021*	-0.011	0.002
	[0.006]	[0.008]	[0.013]	[0.012]	[0.013]	[0.011]	[0.011]
France	-0.001	-0.008**	-0.014**	-0.013***	0.006	0.002	0.005
	[0.003]	[0.004]	[0.006]	[0.005]	[0.005]	[0.005]	[0.005]
Export	-0.001*	0.000	-0.001	-0.002**	-0.001	-0.001	-0.000
	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Revenue	0.003	-0.001	0.017***	0.004	-0.002	-0.009	-0.009*
	[0.003]	[0.004]	[0.006]	[0.005]	[0.006]	[0.005]	[0.005]
Capital	-0.000	-0.000	-0.001	0.006**	0.001	0.005*	0.001
	[0.001]	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Technology frontier	0.001	-0.001	0.000	-0.000	-0.002	-0.002	-0.001
	[0.001]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.001]
Constant	0.103***	0.626***	0.384***	0.477***	0.428***	0.624***	0.614***
	[0.016]	[0.021]	[0.034]	[0.030]	[0.033]	[0.029]	[0.029]
Observations	10,387	10,387	10,120	10,120	10,120	10,120	10,120
R-squared	0.034	0.020	0.009	0.014	0.047	0.043	0.025
Log Likelihood	22753.005	19916.641	15005.990	16272.487	15428.356	16559.497	16425.647

Source: LIFI survey, French annual census for manufacturing (EAE), French Déclaration annuelles des données sociales (DADS); period 2002-2007. Note: Estimations are of firm fixed effects (FE), and variables are calculated at the level of the firm. The wage-bill shares are in percent, varying between zero and 100.

F First Stage Estimates

Results of the first stage estimates show that there is a positive correlation between our κ measure, reflecting the number of subsidiaries, in high-income countries and the average GDP per capita in the destination country. Conversely, there is a positive correlation between GDP per capita in low-wage countries and the number of subsidiaries in low-wage countries. Overall, we observe that increasing GDP per capita raises the incentive for firms to invest, whatever the type of country (low-income or high-income).

Interestingly, we observe a positive correlation between FDI to high-income countries and the GDP per capita in low-income countries. FDI to low-income countries and more particularly in emerging economies combines strategies of market access and saving labor costs (which are often called mixed investment strategies). On the one hand, production costs are lower than in developed countries, which increasingly drive efficiency-seeking investments. On the other hand, growing demand and strong market potential increase incentives to invest in emerging economies. Mixed investment strategies represent the major share of investment, since roughly 80% of FDI to low-income countries is directed towards only ten emerging countries with strong growth potential. Large firms in European countries and French CAC 40 companies, in particular, have created more jobs and business in emerging countries than in high-income European countries in recent years. This is because a part of the global demand and growth have shifted to emerging markets (UNCTAD, 2012). Therefore, increasing low-income countries' GDP per capita would raise consumer demand without increasing production costs as much as in developed countries. A firm could gain in efficiency and profitability as a result of increasing low-income countries' GDP, and would allow it to raise FDI in high-income countries.

In contrast, we observe a negative and significant correlation between high-income

countries' GDP per capita and FDI to low-income countries. These results show that, other things being equal, increasing market potential in high-income countries reduces the incentive for firms to invest in low-income countries. This corroborates the result that market access is a powerful force of attraction for companies (Fontagne and Mayer 2005).

Results for infrastructure variables are intuitive and are in line with the existing, vast literature. They show that the quality of infrastructure is an important source of comparative advantage. Increases in the level of infrastructure in low-income countries raise the incentive for firms to invest in these countries. The same conclusion holds for offshoring to high-income countries.