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Agglomeration and the Export Decision of French Firms*

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Résumé

Cet article étudie l'impact des spillovers d'exportation sur le comportement à l'export des firmes françaises. J'utilise une base de données contenant les flux d'exportations par firme et pays importateur entre 1986 et 1992. J'estime la décision de commencer à exporter à l'aide d'un modèle Logit, en contrôlant pour les caractéristiques spécifiques aux firmes, endroits, et pays. L'identification des spillovers est basée sur deux éléments. Premièrement, les spillovers peuvent être spécifiques à un secteur et au pays de destination. Ensuite, ils sont calculés à un niveau fin de désagrégation géographique. Les résultats montrent un impact positif de la présence d'un grand nombre d'exportateurs au niveau local sur la décision d'une firme de commencer à exporter vers un pays donné. Ces effets sont spécifiques au pays de destination, et davantage apparents à l'intérieur d'un secteur.

Abstract

This paper investigates whether export spillovers influence the export behavior of French manufacturers. I use a database containing export flows by firm and importing country between 1986 and 1992. The decision to start exporting to a country is estimated using a Logit model, controlling for specific characteristics of firms, places, and countries. The identification of export spillovers allows the effect to be industry and destination specific, and the spillovers to be computed at a very disaggregated geographical level. Results show evidence that the pool of local exporters affect positively the decision to start exporting to a country. These effects are clearly destination-specific, and appear mostly within industries than with overall exporting activity.

J.E.L. classification: F1, R12, L25
Keywords: export decision, export market, destination specific spillovers.

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1 Introduction

Facilitating exports by domestic firms today appears as an important priority of policy makers in developed as well as developing countries. In December 2004, the French Foreign Trade minister argued that "Export is a national cause for which the government is mobilized". He announced a set of measures to be taken by the government in order to "consolidate the international presence of firms already exporting, and broaden the number of exporters (...)".

From the economic point of view, such interventions are justified in case of markets failures, and one possibly important failure in the case of exporting is positive information externalities, i.e. export spillovers. The underlying mechanism of export spillovers is that the export specific knowledge of firms that are experienced on foreign markets can benefit nearby firms and allow them to start exporting to a given market. The existence of export spillovers has been studied by several papers, but the empirical evidence is either indirect or questioned. Indeed, the identification of export spillovers requires data on a panel of exporting firms, so as to disentangle the export spillovers from the firm specific effects. Furthermore, using a panel of exporting firms, one will need to handle the probable existence of a sunk export cost, hence control for the fact that some firms continue to export while some others start to export. Finally, because spillovers are known to decrease with geographic distance (Jaffe, Trajtenberg and Henderson, 1993), identifying them also requires data on the presence of exporters at an adequately defined geographic disaggregated level.

Direct evidence of exports spillovers has been recently provided by two papers. Aitken, Hanson and Harrison (1997) find that the probability that Mexican plants export in 1986 and 1989 is positively linked to the presence of multinational firms in the same state, but uncorrelated to proximity to overall exporters. Greenaway, Sousa and Wakelin (2004) show that the presence of multinational firms in the UK influence positively the export decision of domestic firms over the 1993-1996 period. Indirect evidence of export spillovers is given by Lovely, Rosenthal and Sharma (2004). Assuming that exporting requires specialized knowledge of foreign markets, they show that headquarters of exporting firms are more spatially concentrated than those of non-exporting firms. More, their results assess an increasing spatial concentration of exporters' headquarters with the difficulty of the destination country. On the other hand, two papers underline the absence of any evidence of export spillovers. Barrios, Görg and Strobl (2003) do not find evidence that Spanish firms benefit from spillovers through export activity of other firms nor from multinationals' activity between 1990 and 1998. Bernard and Jensen (2004) find no role for export spillovers on a panel of U.S. manufacturing firms, be they from nearby exporters or from export activity from other firms in the same industry. However, unlike the rest of the literature, they handle the asymmetry between 'starters' and 'continuers' using the lagged export status of the firm.

While the evidence on export spillovers appears rather mixed, it appears that the empirical literature has only looked for general export spillovers: In the first four papers, the underlying assumption is that the presence of multinationals or domestic exporters impacts the variable cost of a firm at exporting and hence facilitates the overall export decision. Bernard and Jensen (2004) assume that established exporters can reduce either the sunk entry cost or the variable cost, but in both cases the spillovers affect the overall export decision. In this context, one question comes to mind concerning the nature, and thus the identification of export spillovers: What if export spillovers are in fact destination specific? Indeed it appears quite reasonable to think that the relevant information that is able to influence a firm to start exporting somewhere is destination-specific. When looking for foreign markets to sell its product, a manufacturer will want to learn details about the preferences of consumers and the structure of distribution markets abroad, which are both destination-specific information.

In this paper, I investigate the presence of export spillovers, precisely allowing these effects to be general, industry specific, or industry and destination specific. I use a database provided by the French Customs, containing individual export flows by French manufacturers and destination countries between 1986 and 1992. The Customs data are matched with firm-level information such as the address of the firm, sales, value added and number of employees. I then estimate a discrete choice model on the probability that a firm starts to export to a country. In doing so, I handle the existence of a sunk cost because all firms in the sample have to pay the sunk cost to enter the foreign market. Firm fixed effects, and dummies for years and countries allow me to control for unobserved characteristics of places, firms, years and countries. In the end, I identify potential export spillovers by studying the effect of the presence of nearby industry and/or destination specific exporters on a firm's decision to start exporting to a given country.

The paper is structured as follows. In section (2) I describe the theoretical foundations of the logit model on the decision to start exporting. Section (3) describes the sources of the data and the variables that will be used in the estimation. I also emphasize several important aspects of the database, among which the number of exporters per country. In section (4), I comment the results of the logit estimations, detailing how we get to the preferred specification, and section (5) concludes.

2 The empirical model

Consider a firm i facing the decision of exporting or not to a country j. By exporting to that country, the firm is able to make an annual profit equal to Π_{ij}. However, if the firm has never exported to that country before, it must incur a f_j sunk cost to cover the cost of entering the market. For each year and country, there will thus be firms that continue and firms that start to export to that country, corresponding to firms that have already paid the sunk cost and those that have not. This asymmetry between continuers and starters imposes to control for the firms that have paid the sunk cost: indeed, it is one potential reason for which to remain on the export market in year t. Following Roberts and Tybout (1997), most of the empirical literature on the export decision uses the lagged export status as a proxy for those firms. However, as noted by Robert and Tybout (1997) and Bernard and Jensen (2004), the use of this variable creates substantial econometric difficulties because the identification of the spillovers also requires the specification to control for unobserved firm heterogeneity.

The approach chosen in this paper is to consider only the firms that start to export to a given market. In doing so, I handle the potential existence of a sunk cost, because none of the firms in the sample have paid the sunk cost. Hence, the firms all have the same lagged export status. In concentrating on the decision to enter a foreign market, I also focus on a phenomenon that is more likely to be influenced by export spillovers. Indeed, once a firm has enough information on a country in order to start to export there in year t, it is less likely that the firm in year $t+1$ will need information from established exporters in order to decide on her export behavior to that country.

Let us now model a firm's export behavior. A firm i starts to export to a country j if the present value of future profits is larger than the sunk entry cost f_j:

$$\sum_{t=0}^{+\infty} \frac{\Pi_t}{(1+r)^t} > f_j, \tag{1}$$

which, assuming no uncertainty on future profits, can be written

$$\frac{\Pi}{r} > f_j. \tag{2}$$

The probability that a firm starts to export to country j is then:

$$Pr(S_{ij} = 1) = Pr(\Pi_{ij}/r > f_j). \tag{3}$$

Equation (3) contains two elements that we will now define: the profit of the firm abroad and the sunk entry cost. The firm is assumed to trade within a Dixit-Stiglitz-Krugman monopolistic competition framework. Under standard assumptions of a CES utility function, the demand from country j for firm i's product is given by:

$$x_{ij} = \frac{p_{ij}^{-\sigma}}{P_j^{1-\sigma}} \mu_j Y_j, \tag{4}$$

with $P_j = \left[\int_l p_{lj}^{1-\sigma} dl\right]^{1/(1-\sigma)}$ the local price index, σ the elasticity of substitution between goods, μ_j the share of expenditures devoted to the representative industry, and Y_j the income in j, which equals the national aggregate expenditure level.

The final price paid by consumers, p_{ij}, is the mill price set by the firm multiplied by the trade cost: $p_{ij} = p_{ij}\tau_j$. Trade costs are ad-valorem and assumed to be of the 'iceberg' type, i.e. a fraction of the good melts away during the journey. Trade costs are a function of the distance to the destination country: $\tau_j = d_j^{\delta}$. The price set by the firm is obtained through optimization of the following gross profit: $\Pi_{ij} = p_i x_{ij} - a_i w_i x_{ij}$. Production costs for x_i units of the good correspond to $a_i w_i$, where w_i is the nominal wage and a_i represents the number of units of labor used by the firm. Following Melitz (2003), firms are heterogeneous in that they differ by their productivity: Each firm i has an inverse productivity level a_i. With mill price $p_i = \frac{\sigma}{\sigma-1} a_i w_i$, the gross annual profit of a firm on market j writes

$$\Pi_{ij} = \left[\frac{a_i w_i \ \tau_j}{(\sigma-1)P_j^{1-\sigma}}\right]^{1-\sigma} \mu_j Y_j. \tag{5}$$

In order to complete the description of equation (3), let us define the sunk entry cost as $f_j(z_{ij})$, where z_{ij} is local exporting employment specific to the industry and/or to the destination country. Hence, the size of the local labor force working in firms that already export to market j measures the potential spillovers from neighboring firms that decrease the sunk cost of entry for firm i on market j. Written in logs, equation (3) gives

$$Pr\left(S_{ij}=1\right) = Pr\left(\ln \Pi_{ij} > \ln r + \ln f_j(z_{ij})\right), \tag{6}$$

with the profit abroad and the sunk cost described by

$$\ln \Pi_{ij} = \beta_0 + \beta_1 \ln a_i + \beta_2 \ln w_i + \beta_3 \ln d_j + \beta_4 \ln \mu_j + \beta_5 \ln P_j + \beta_6 \ln Y_j \tag{7}$$

$$\ln f_j(z_{ij}) = \gamma_0 + \gamma_1 \ln z_{ij} + \varepsilon_{ijt}, \tag{8}$$

where ε_{ijt} contains the effects specific to firms, places, countries, and years.

The probability to start exporting writes

$$
\begin{aligned}
Pr\left(S_{ij}=1\right) = \quad & Pr\left(\beta_0 + \beta_1 \ln a_i + \beta_2 \ln w_i + \beta_3 \ln d_j + \beta_4 \ln \mu_j + \beta_5 \ln P_j + \beta_6 \ln Y_j\right. \\
& \left. > \ln r + \gamma_0 + \gamma_1 \ln z_{ij} + \varepsilon_{ijt}\right).
\end{aligned} \tag{9}
$$

Rearranged, we obtain:

$$
\begin{aligned}
Pr\left(S_{ij}=1\right) = Pr & \left(\beta_0 - \gamma_0 - \ln r + \beta_1 \ln a_i + \beta_2 \ln w_i + \beta_3 \ln d_j\right. \\
& \left. + \beta_4 \ln \mu_j + \beta_5 \ln P_j + \beta_6 \ln Y_j - \gamma_1 \ln z_{ij} > \varepsilon_{ijt}\right)
\end{aligned} \tag{10}
$$

Assuming ε_{ijt} is distributed logistically, equation (10) can be estimated using a Logit model. The next section describes how the final database is built and how the explanatory variables are computed.

3 Data

The final database is constructed using two different sources of data, which are described in the first sub-section, as well as some restrictions that I made to the sample of firms and to the geographical dimension of the database. I then illustrate some salient features of exporters and markets, in particular the number of starters per destination country.

3.1 Sources

The main data source is a database collected by the French Customs until 1992, comprising French export flows aggregated by firm, year and destination country. Four recent papers exploit different aspects of this database. The first two explore the relationship between export behavior and employment structure of individual firms. Biscourp and Kramarz (2003) look at the impact of exporting on the level of employment of the firm, and Maurin, Thesmar and Thoenig (2002) show that firms that export make more use of skilled labor because of development and marketing purposes. Two papers by Eaton, Kortum and Kramarz (2004a, 2004b) provide a detailed "dissection" of trade at the individual level. Eaton et al. (2004a) establish key features of market penetration by individual French firms according to destinations, suggesting the existence of different types of barriers to exporting to national markets. Eaton et al. (2004b) develop a Ricardian model of trade with firm heterogeneity to explain these stylized facts in firm level export behavior. In this paper, I use the same firm-level exports database, and match the information provided by the Customs with administrative data from the *Enquête Annuelle d'Entreprises* (EAE), which contains firm and establishment-level information on all firms over 20 employees of the manufacturing sector: address and identification number of the firm (*siren*), sales, production, employees, wages.

In order to build the final database, I restrict the yearly customs data in two aspects. The first restriction is due to the sample of firms. Indeed, the sample of firms retained to match the export database contains single-plant firms of the manufacturing sector, with more than 20 employees, that are continuously operating throughout the years 1986-1992.

The EAE is a set of annual surveys covering six broad fields of the productive system, of which I keep and use the manufacturing part, collected by the French ministry of industry. In 1986, the manufacturing EAE contains 22,943 firms, of which I retain the 14,095 that also appear in the six subsequent years, in order to avoid dealing with firms births and deaths phenomena. The next step is to match the firm information with the export data. However, the export data gives the identification number of the firm that exports but does not detail the establishment from where the export flows originate. Therefore, among these firms, I choose to keep the 6,131 single plant firms.

The second restriction I impose on the customs database affects its geographical dimension. 67 destinations are kept in the final database, comprising 27 OECD countries (30 members; France is excluded; Belgium and Luxembourg, and the Czech republic and Slovakia are both one destination) and 40 other countries.

I generate the dependent variable S_{ij}, which is a dummy variable indicating whether the firm starts to export to country j in year t. The values of S_{ij} depend on the export status of the firm at $t-1$ and t: S_{ij} equals one when the firm was not an exporter to that country the year before. It equals zero if the firm was not an exporter to that country in $t-1$ and does not start in t. The missing values of S_{ij} are dropped. They correspond to the cases where the firm continues to export, or stops to export to a country, and to the year 1986 because it is the first year of the database.

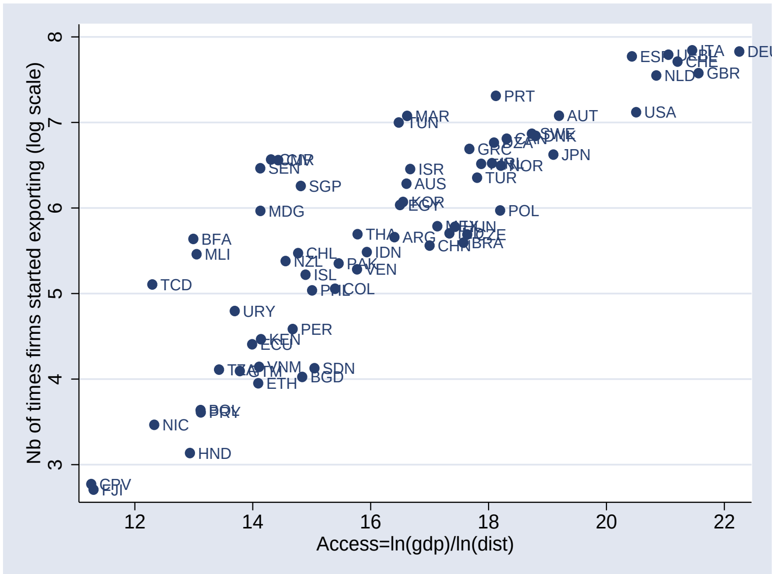
Finally, I compute the distance and export spillovers variables. The latter variable depends on the level of geographic disaggregation of the data. Three levels are available: the region (22 entities), the département (94 entities) and the "employment area" (350 entities), the last measure appearing the most adequate as the employment areas (henceforth areas) are designed by INSEE to fit geographical locations comprising work and residence of employees. The distance variable is the distance between France and each market (see Appendix for more details). The export spillovers variable is employment in the same industry, located in the same area as the firm, that exports to country j in year t.

The observations report the following information on the situations where a firm did or did not start to export to a given country: (i) industry, total employment, wages, and total sales, (ii) employment area, département and region, the distance to each export country, (iii) the number of (exporting) firms by area, industry, country and year, and (iv) gdp of the destination country. Hence, the final database is an unbalanced panel of 5,203 French manufacturers that have started to export at some point during 87-92.

3.2 Characteristics of exporters and markets

Table (8) summarizes some characteristics of the 5203 firms of the sample. The firms belong to 33 manufacturing sectors. The average size of firms is small (98 employees) compared to the samples used in the literature; this is due to the restriction on single-plant firms. The last column of table (8) displays the number of times where the firms of the given industry have started to export to one of the 67 countries in the sample. The four industries that distinguish by their high level of 'starts' are metal work, industrial equipment and textile and clothing.

Figure 1: Number of times firms started to export, by destination



Let us now look at the number of 'starts' by destination country. Following Eaton et al. (2004a), I express the volume of trade between France (F) and a foreign country j as $m_{Fj} = N_{Fj}\overline{x}_{Fj}$, with m_{Fj} being total exports from F to j, N_{Fj} the number of French exporters to j, and $\overline{x}_{Fj}$ average sales per firm in j. The gravity equation can then be written

$$N_{Fj}\overline{x}_{Fj} = \frac{Y_F Y_j}{d_{Fj}}, \tag{11}$$

Y_F and Y_j representing respectively French supply capacity and foreign demand capacity, and d_{Fj} the geographical distance between France and country j. Holding Y_F and $\overline{x}_{Fj}$ constant, the number of firms that export to j is likely to vary with a measure of the foreign country's market access, broadly defined as its market size weighted by its distance from France. Figure (1) illustrates this relationship, with both variables expressed in log. The number of times that the firms started to export to each of the countries is plotted on the vertical axis. On the horizontal axis is the market access. As shown, the number of 'starts' increases systematically with market access. This feature is in line with the theoretical predictions of new models of trade with heterogeneous firms, in the case there are different country sizes (Melitz and Ottaviano, 2003).

A second feature stands out when looking at the countries that clearly lie above the main trend outlined by the majority of countries. Compared to other countries with the same market access measure, a distinctly higher number of firms export to these countries, which also happen to be former French colonies: Senegal, Ivory Coast, Mali, Tunisia and Morocco. The cost of entering these markets, which have kept tight links with France, is likely to be less than for other destinations with the same market access, and thus explain the larger number of 'starts'. While spillovers are not visible at this level of data aggregation, this feature may highlight that destination-specific information is relevant in entering a foreign market.

Tables (9) and (10) describe some further characteristics of the data according to the destination market. Countries are ordered in decreasing order of the number of times that firms started to export there. In column 4, the number of 'starts' decreases with a decrease in market access, a feature already emphasized in Figure (1). Column 5 contains average labor productivity per employee, according to destination countries. The firms with lowest average productivity export to the most accessible countries, whereas the average productivity of firms that started to export to the least accessible countries is the highest. This feature is in line with the profitability of exports varying across destinations: countries with a higher market access are more profitable, which means that the marginal exporter to that country will have a lower productivity than the marginal exporter to a less profitable destination. The two last columns contain a description of the industry and destination -specific spillovers variable: "Industry spillovers" corresponds to local industry-specific employment that exports to the given country. It appears that the average number of employees that work in firms exporting to large or close countries is higher than for small or remote countries. However, the coefficient of variation (standard error/mean) is much larger for countries with a low market access. On average there are few firms that export to these countries, but when a large firm exports there, this generates large variations with respect to the mean.

Having illustrated the main characteristics of the data, we now detail how they are used in order to estimate the presence of export spillovers.

4 Firm level estimations

In this section, I explain the method used to identify export spillovers through the estimation of the coefficient on the spillovers variable in equation (10). Then I describe how we compute the firm and country level explanatory variables.

If there are export spillovers, we can expect local country-specific exporting employment to impact positively the decision to start exporting to a given country. But in order to be sure that the spillovers variable does not capture a false intuition, we have to control for the other variables that can result in the same positive relationship between local employment and the decision to start exporting. Indeed, there are other possible reasons why local employment could appear to favor exporting. First, exogenous characteristics of places such as first nature advantages (natural advantages) or second nature advantages (transport infrastructure) attract a large number of firms, among which there will be a large number of exporting firms. If not controlled for, these comparative advantages of cities and regions could be misinterpreted in a positive influence of the presence of exporting firms on firms that start to export.

Firm heterogeneity is the second factor that we want to control for in the estimations. A firm, because of its product, or the preferences of the manager, can match with a given country and start exporting to that country for no other reason than the characteristics inherent to the firm. In the following estimations, I thus use firm level fixed effects to control for these factors. The fixed effects will capture the variability of the explained variable that is due to time and country-invariant characteristics of firms, thus controlling for unobserved characteristics of locations. Finally, country dummies are used in the estimation in order to control for time invariant characteristics of countries. Assuming μ_j and P_j are constant over time, both of those country-specific variables are supposed to be taken into account by the country dummies and thus do not appear in the final estimation.

Because there is still time variability in other firm and country-level variables, some of them remain throughout the inclusion of the controls. They are computed as follows: a_i is the apparent productivity of labor of the firm, and is measured as value added divided by the number of employees. I expect labor productivity to influence positively the export behavior of the firm. The wage w_i, which is computed as total wages divided by the number of employees, was used during the estimation but does not appear in the final results. Its coefficient was most of the time not significant, and it did not increase the explanatory power of the estimations. The size of the firm e_{ht}, is added to the estimations as an additional proxy for productivity. It is measured as the number of employees, and I expect it to have a positive impact on the decision to start exporting. The next two variables are specific to the destination country. d_j stands for trade costs and is the distance between France and the final destination. Y_{jt} is the demand capacity of market j. It is measured as the gdp of the destination country.

Finally, z_{ij} is the spillovers variable and is computed as indicated in the precedent section. Four versions of this variable have been used in the estimations: the first two are total exporting employment in the area, across industries and industry-specific. The last two are industry specific exporting employment, across destinations and specific to the given country. I expect the impact of the spillovers variables to be positive on the probability to export to a given country.

The strategy to identify export spillovers is illustrated in Table (1), which contains five columns. From left to right, the columns represent estimations that comprise an increasing number of controls for heterogeneous characteristics of places and firms, and for country specific effects. Column 1 is the base estimation with only controls for time trends. Column 2 adds industry dummies. Column 3 is done using firm fixed effects and time controls. Column 4 will be the preferred specification which I use in the remaining estimations. The model in column 4 eliminates the effects due to firm heterogeneity, and thus also the time-invariant characteristics of places that can be correlated with the probability to export. It also controls for specific characteristics of destinations and years with country and year dummies. The remaining variability captured in the coefficient of the spillovers variable represents, for a given firm, the effect of local exporting employment across years and countries. Finally, column 5 represents an extreme case, in which the effect of a change in the export spillovers variable is explained entirely by the time variation within the firm-country group.

The coefficients in Table (1) have the expected signs. The firm level variables influence positively the export decision. Country demand is positive and significant. However, note that in columns 4 and 5, the variability captured by the coefficients on productivity, size of the firm, and country demand are only due to an inter-temporal variation. Finally, results concerning the coefficient in which we are mostly interested in are shown in the last row: the coefficient on the spillovers variable remains positive and significant throughout the inclusion of controls. As shown in column 4, the presence in the same area of firms that export to the same country, whatever their industry, appears to impact positively the decision of a firm to start exporting to that country. Table (2) is complementary to Table (1) and gives more details on the nature of the spillovers, using the preferred specification. A central feature appears when comparing the effect of different spillovers variables: the use of a general variable comprising all exporting firms across destinations inverses the sign of the coefficient and generates a negative relationship between local exporters and the probability to start exporting. Hence, everything equals, having more exporting firms in the same location does not benefit a firm in its decision to start exporting to a specific country. The results in Table (2) are important in two respects. First, they provide essential information on the nature of spillovers: they show that export spillovers are destination specific, in the sense that the benefits that a newly exporting firm can draw from neighboring exporters are probably linked to the characteristics of the foreign market. Second, the negative effect of the presence of overall exporting firms can be interpreted as a competition effect between firms arising on the local labor market. The presence of some firms can benefit the export decision, however adding more firms only raises the degree of competition for inputs.

How important is the effect of spillovers on the probability to start exporting? The magnitude of the coefficients in columns 3 and 4 in Table (2) can be linked to the probability elasticity with respect to local exporting employment, η. If $\hat{\beta}$ is the estimated coefficient and Pr the probability to start exporting to a country j, then $\eta = \hat{\beta}(1 - Pr)$. In this case, on average Pr will be equal to $1/2$, which gives a probability elasticity of 0.0565 for destination specific exporting employment and 0.0485 for destination and industry specific exporting employment. The difference between the two variables is small. A 10% increase in local employment that exports to a country j increases the probability of starting to export to that country of 0.5%. In other words, doubling the number of employees that export to country j increases the probability by 5%.

Another way of understanding the significance of the estimated coefficients consists in taking into account not any percentage variation, but the actual variation in the explanatory variable, by computing the effect of a one standard deviation increase in the spillovers variable on the probability to start exporting. Consider an area with the mean level of destination specific exporting employment, and denote its probability of being chosen as $\overline{P}$. Then reallocate the spillovers variable so as to increase the area's level of exporting employment by one standard deviation, and denote the new probability $\overline{P'}$. Then the increase in the probability to start exporting generated by the one standard deviation change in the spillovers variable is equal to:

$$\frac{\overline{P'}}{\overline{P}} = exp\left(\beta\left[ln(\overline{z} + stdev(z)) - ln(\overline{z})\right]\right) = (1 + cv(z))^{\beta},$$

where $cv(z) = stdev(z)/mean(z)$ is the coefficient of variation of the spillovers variable. The coefficients of variation are 3.48 and 1.84, respectively for the general and industry specific spillovers variable, which give 1.125 and 1.156 for the ratio of the probabilities. Thus, a one standard deviation increase in local exporting employment will increase the probability of starting to export by 12% in the case of overall employment, and by 15% in the case of industry specific employment. This result inverses the comparison of the two variables and tends to show that export spillovers are more industry specific than general, although the difference between the two is not large. Moreover, these figures assess the presence of export spillovers of substantial size.

The next step in assessing the existence of export spillovers is to investigate whether they vary with a measure of market accessibility. Are there more spillovers in the case of remote countries, for example? In Tables (3) and (4), for the industry-specific variable and in Tables (6) and (7) for the general variable, countries are sorted in groups which represent a measure, although imperfect, of their accessibility[1]. In this situation too, we can evaluate the effect of export spillovers by using the two methods used above for the general case. The comparison across groups of countries of the coefficients for the industry and destination specific spillovers variable reveal a situation in which the differences among groups are not clear cut. The effect of a 10% increase in local industry and destination specific exporting employment generate an increase in the probability to start exporting to the country that ranges between 0.1% and 0.5%. The effect is quite small, although significative for all but one group of countries. The coefficients estimated on the general spillovers variable (Tables 6 and 7) vary a lot more across groups of countries, and a much smaller number of them are significant.

While the picture arising from the comparison of the estimated coefficients does not help much in understanding the potential variation of export spillovers across firms that export to different destinations, the analysis of the effects of a one standard deviation increase in the spillovers variable shed more light on the cross destinations phenomenon. Table (5) contains the increase in probability, for each group of countries, due to a one standard deviation increase in local industry employment that exports to the countries included in the group. Remembering that all but one of the groups have positive and significative coefficients, it appears that, for example, a one standard deviation increase in industry-specific employment that exports to North-African countries increases the probability of a firm to start exporting to one of these countries by almost 9%. Furthermore, there is a form of ordering that appears,

[1] Border=(UEBL, Germany, Italy, Spain, Switzerland), Other EEA=(Netherlands, Irland, Danmark, Greece, Portugal, Iceland, Norway, Sweden, Finland, Austria), Afr=(Marocco, Algeria, Tunisia, Egypt, Soudan , Mali, Burkina-Faso, Chad, Cape Verde, Senegal, Côte d'Ivoire, Cameroun, Ethiopia, Kenya, Tanzania, Madagascar), South America=(Guatemala, Honduras, Nicaragua, Colombia, Venezuela, Equador, Peru, Brazil, Chili, Bolivia, Paraguay, Uruguay, Argentina), CEEC=(Poland, Tchech Republic, Hungary), Asia=(Pakistan, India, Bangladesh), Oceania=(Australia, New-Zealand, Fidji), West-Asia=(China, Korea, Japan).

Table 1: Spillovers from local destination-specific exporting employment

	Dependent Variable: prob(S_{hjt})				
Model :	(1)	(2)	(3)	(4)	(5)
productivity	0.541^a	0.628^a	0.107^a	0.108^a	0.131^a
$ln(va/empl_{ht})$	(0.040)	(0.041)	(0.027)	(0.027)	(0.032)
size	0.564^a	0.585^a	0.341^a	0.364^a	0.607^a
$ln(empl_{ht})$	(0.024)	(0.023)	(0.036)	(0.037)	(0.044)
distance	-0.540^a	-0.552^a	-0.589^a		
$ln(d_j)$	(0.007)	(0.007)	(0.005)		
demand	0.305^a	0.314^a	0.318^a	0.616^a	1.238^a
$ln(gdp_j)$	(0.005)	(0.006)	(0.004)	(0.051)	(0.061)
local spillovers	0.110^a	0.114^a	0.552^a	0.113^a	0.076^a
$ln(1+eepz_i)$	(0.009)	(0.009)	(0.011)	(0.009)	(0.016)
Year dummy	yes	yes	yes	yes	yes
Industry dummy	no	yes	n/a	n/a	n/a
Firm FE	no	no	yes	yes	n/a
Country dummy	no	no	no	yes	n/a
Firm-country FE	no	no	no	no	yes
N	1909572	1909572	1909060	1909060	123620

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels.

showing a smaller presence of export spillovers for close and accessible countries and larger export spillovers for less accessible countries: Central-American countries, and Australia and New-Zealand, are among the groups that have the highest computed coefficients.

5 Conclusion

This paper builds on the existing empirical literature analyzing the existence of export spillovers. I investigate the impact of proximity to other exporters on the export behavior of individual French manufacturers. This paper distinguishes from the previous literature in two respects. The identification of export spillovers is deepened in that I allow the spillovers to be general, industry specific, or industry and destination specific. Second, the spillovers are computed at a very disaggregated geographical level, which is consistent with the empirical evidence on the distance-decreasing nature of spillovers. Results show evidence of the presence of export spillovers. Local exporters influence positively the probability to start exporting to a given country. These effects are clearly destination-specific, and appear mostly within

Table 2: The nature of spillovers: local exporting employment...

Model :	Dependent Variable: prob(S_{hjt}) (1)	(2)	(3)	(4)
productivity	0.108[a]	0.116[a]	0.108[a]	0.105[a]
$ln(va/empl_{ht})$	(0.027)	(0.028)	(0.027)	(0.027)
size	0.370[a]	0.394[a]	0.364[a]	0.357[a]
$ln(empl_{ht})$	(0.037)	(0.037)	(0.037)	(0.037)
demand	0.651[a]	0.652[a]	0.616[a]	0.601[a]
$ln(gdp_j)$	(0.051)	(0.051)	(0.051)	(0.051)
... total	-0.322[a]			
$ln(1 + eez_i)$	(0.087)			
... industry specific		-0.258[a]		
$ln(1 + iez_i)$		(0.009)		
... destination specific			0.113[a]	
$ln(1 + eepz_i)$			(0.009)	
... industry and destination specific				0.097[a]
$ln(1 + iepz_i)$				(0.004)
	Firm FE, year dummy, country dummy			
N	1909060	1909060	1909060	1909060

Note: Standard errors in parentheses with [a], [b] and [c] respectively denoting significance at the 1%, 5% and 10% levels.

Table 3: Spillovers from local industry- and destination-specific exporting employment, I

Model :	Dependent Variable: prob(S_{hjt}) Border	Other EEA	Afr	S-Amer	Ocea	W-Asia
productivity	0.117[b]	0.198[a]	0.036	-0.082	0.442[b]	0.120
$ln(va/empl_{ht})$	(0.052)	(0.057)	(0.071)	(0.134)	(0.183)	(0.135)
size	0.357[a]	0.458[a]	0.283[a]	0.411[b]	0.533[c]	0.369[c]
$ln(empl_{ht})$	(0.068)	(0.075)	(0.090)	(0.186)	(0.287)	(0.196)
demand	1.594[a]	0.977[a]	0.354[a]	0.461[a]	0.649	0.067
$ln(gdp_j)$	(0.241)	(0.174)	(0.119)	(0.156)	(0.877)	(0.387)
local spillovers	0.079[a]	0.033[a]	0.070[a]	0.068[a]	0.078[b]	0.115[a]
$ln(1 + iepz_i)$	(0.011)	(0.009)	(0.010)	(0.017)	(0.038)	(0.022)
	Firm FE, year dummy, country dummy					
N	105334	155868	206625	51226	7975	13640

Note: Standard errors in parentheses with [a], [b] and [c] respectively denoting significance at the 1%, 5% and 10% levels.

Table 4: Spillovers from local industry- and destination-specific exporting employment, II

Model :	Dependent Variable: prob(S_{hjt}) EEA	N-Amer	CEEC	Central-Amer	Asia	N-Afr
productivity	0.149^a	-0.027	0.118	-0.529	0.023	-0.006
$ln(va/empl_{ht})$	(0.038)	(0.109)	(0.183)	(0.497)	(0.208)	(0.102)
size	0.399^a	0.506^a	0.725^a	0.169	0.396	0.280^b
$ln(empl_{ht})$	(0.050)	(0.157)	(0.274)	(0.718)	(0.341)	(0.129)
demand	1.143^a	1.471^a	0.345	-0.479	0.630	0.705^a
$ln(gdp_j)$	(0.139)	(0.302)	(0.245)	(0.444)	(0.533)	(0.159)
local spillovers	0.058^a	0.092^a	0.006	0.159^b	0.074^b	0.062^a
$ln(1 + iepz_i)$	(0.007)	(0.020)	(0.027)	(0.063)	(0.032)	(0.016)
	Firm FE, year dummy, country dummy					
N	376301	21963	7856	1243	5756	35427

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels.

Table 5: Increase in the probability to start exporting due to a one standard deviation increase in the industry and destination specific spillovers variable

Countries	Border	EEA	Other EEA	North-Afr	CEEC	North-Amer
β	0.079	0.058	0.033	0.062	n/s	0.092
cv(z)	2.07	2.43	2.605	2.837	3.83	2.826
$(1 + cv(z))^\beta$	*1.092*	*1.074*	*1.043*	*1.086*	n/a	*1.131*
Countries	**Afr**	**S-Amer**	**Ocea**	**Central-Amer**	**W-Asia**	**Asia**
β	0.07	0.068	0.078	0.0159	0.115	0.074
cv(z)	3.8	5.375	4.02	9.084	3.325	5.032
$(1 + cv(z))^\beta$	*1.116*	*1.134*	*1.134*	*1.444*	*1.183*	*1.142*

Note: β is the coefficient on the spillovers variable found in Tables 3 and 4. $cv(z)$ is the coefficient of variation of the spillovers variable. $(1 + cv(z))^\beta$ is the increase in the probability of starting to export due to a one-standard deviation increase in the spillovers variable.

Table 6: Spillovers from destination-specific exporting employment, I

Model :	Dependent Variable: prob(S_{hjt}) Border	Other EEA	Afr	S-Amer	Ocea	W-Asia
productivity	0.115^b	0.20^a	0.040	-0.086	0.442^b	0.135
$ln(va/empl_{ht})$	(0.052)	(0.057)	(0.071)	(0.134)	(0.183)	(0.135)
size	0.357^a	0.461^a	0.289^a	0.414^b	0.545^c	0.380^c
$ln(empl_{ht})$	(0.068)	(0.075)	(0.090)	(0.186)	(0.287)	(0.195)
demand	1.288^a	0.991^a	0.362^a	0.465^a	0.622	0.134
$ln(gdp_j)$	(0.242)	(0.174)	(0.119)	(0.156)	(0.878)	(0.386)
local spillovers	1.045^a	0.045	0.065^a	0.008	0.042	0.162^a
$ln(1 + eepz_i)$	(0.085)	(0.028)	(0.019)	(0.022)	(0.070)	(0.047)
	Firm FE, year dummy, country dummy					
N	105334	155868	206625	51226	7975	13640

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels.

Table 7: Spillovers from destination-specific exporting employment, II

	Dependent Variable: prob(S_{hjt})					
Model :	EEA	N-Amer	CEEC	Central-Amer	Asia	N-Afr
productivity	0.151^a	-0.020	0.119	-0.534	0.019	-0.008
$ln(va/empl_{ht})$	(0.038)	(0.109)	(0.184)	(0.496)	(0.208)	(0.102)
size	0.404^a	0.512^a	0.714^a	0.241	0.396	0.286^b
$ln(empl_{ht})$	(0.050)	(0.157)	(0.274)	(0.710)	(0.341)	(0.129)
demand	1.138^a	1.478^a	0.318	-0.516	0.660	0.717^a
$ln(gdp_j)$	(0.139)	(0.304)	(0.246)	(0.446)	(0.532)	(0.159)
local spillovers	0.151^a	0.204^a	0.103^b	-0.018	-0.010	0.059
$ln(1 + eepz_i)$	(0.026)	(0.067)	(0.052)	(0.059)	(0.049)	(0.045)
	Firm FE, year dummy, country dummy					
N	376301	21963	7856	1243	5756	35427

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels.

industries than with overall exporting activity. Last, industry and country-specific export spillovers tend to be more present among firms that export to remote and difficult countries.

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A Data Appendix

A.1 Descriptive statistics

Table 8: Descriptive statistics by industry

Industry	Total	Avg size	Avg pdty	Nb start (67 countries)
Metal work	955	59	87.2	5285
Industrial equipment	476	62	120.8	4729
Textile	457	68	196.1	3934
Garment industry	310	63	116.8	2410
Plastic processing	289	68	122.4	2342
Printing and editing	337	64	120.8	1919
Transport equipment	192	162	128.0	1506
Machine tools	124	65	94.2	1426
Paper & Cardboard	195	94	130.9	1406
Miscellaneous	132	59	99.8	1345
Electrical equipment	137	81	100.9	1323
Furniture	201	76	87.1	1257
Mining/civil egnring eqpmt	110	87	102.4	1235
Precision instruments	95	85	91.4	1170
Electronical equipment	106	79	106.5	1086
Agricultural machines	97	84	111.4	1058
Mechanical woodwork	216	64	98.7	1026
Parachemistry	75	73	168.7	765
Leather products	76	50	109.8	761
Foundry	124	113	79.9	702
Shoe industry	83	84	59.6	644
Ceramic and building mat.	135	61	103.6	633
Chemicals	49	130	200.8	613
Rubber	50	120	78.3	468
Pharmaceuticals	36	110	186.3	397
Steel processing	40	77	151.9	359
Glass	29	138	113.1	300
Domestic equipment	13	224	111.4	193
Metallurgy	22	123	233.1	175
Aeronautical building	16	179	75.6	161
Ship building	12	41	123.3	125
Iron and steel	7	303	240.9	84
Minerals	7	113	135.6	55
Total	5203	98	123.8	40892

Note: The average size is computed in number of employees. The average productivity is in 1000 usd by employee.

A.2 Distances

Distances are calculated as the distance between France and the destination country. All distances are computed using the geographic coordinates of cities. I use three different procedures according to the countries involved. For nearby or particularly large countries (Austria, Canada, Hungary, Italy, Germany,

Table 9: Descriptive statistics: countries 1-34 sorted by number of 'starts' received

Country	Code	Nb obs	Nb start	Avg pty	Access	Industry "spillovers" mean	Industry "spillovers" sd/mean
Italy	ITA	20900	2548	98.8	21.5	1378	2.1
Germany	DEU	16904	2513	99.4	22.3	1616	2.0
Belgium/Lux	UEBL	14826	2421	101.4	21.1	1596	2.0
Spain	ESP	22605	2374	105.2	20.4	1331	2.1
Switzerland	CHE	19263	2234	108.0	21.2	1447	2.2
United-Kingdom	GBR	21577	1951	101.9	21.6	1378	2.1
Netherlands	NLD	23243	1899	107.8	20.8	1212	2.1
Portugal	PRT	26761	1497	106.4	18.1	982	2.4
United-States	USA	25537	1236	110.9	20.5	1082	2.4
Austria	AUT	27016	1186	110.7	19.2	936	2.4
Marocco	MAR	27096	1184	109.4	16.6	850	2.4
Tunisia	TUN	27964	1096	112.1	16.5	755	2.6
Sweden	SWE	27363	961	112.6	18.7	929	2.4
Danemark	DNK	27722	938	111.6	18.8	846	2.5
Canada	CAN	27817	907	111.6	18.3	838	2.7
Algeria	DZA	28656	866	114.7	18.1	584	3.1
Greece	GRC	28233	805	110.5	17.7	821	2.6
Japan	JPN	28540	753	110.8	19.1	782	2.7
Cameroun	CMR	28702	711	113.6	14.3	635	2.7
Cote d'Ivoire	CIV	28629	706	114.3	14.4	641	2.8
Ireland	IRL	29308	681	111.2	18.1	644	2.8
Finland	FIN	28593	676	113.0	17.9	731	2.6
Norway	NOR	29013	662	113.0	18.2	714	2.7
Senegal	SEN	29161	642	114.8	14.1	557	3.0
Israel	ISR	29144	636	113.8	16.7	626	2.8
Turkey	TUR	29932	575	112.7	17.8	562	3.1
Australia	AUS	29382	536	113.2	16.6	635	2.8
Singapore	SGP	29858	522	114.6	14.8	571	3.0
Korea	KOR	30128	433	112.5	16.5	510	3.3
Egypt	EGY	30188	418	115.0	16.5	471	3.4
Poland	POL	30457	392	113.3	18.2	404	3.6
Madagascar	MDG	30444	390	115.7	14.1	376	3.8
Mexico	MEX	30516	326	114.4	17.1	396	3.5
Hungary	HUN	30463	324	113.6	17.4	397	3.7

Note: "Industry spillovers" is the average employment in industry and area that exports to the country. "Access" is $ln(gdp)/ln(dist)$.

Table 10: Descriptive statistics: countries 35-67 sorted by number of 'starts' received

Country	Code	Nb obs	Nb start	Avg pty	Access	Industry "spillovers"	
						mean	sd/mean
India	IND	30181	300	113.3	17.3	344	3.9
Thailand	THA	30464	297	114.8	15.8	385	3.8
Czech republic	CZE	30677	296	113.0	17.6	327	4.2
Argentina	ARG	30624	287	115.2	16.4	368	3.9
Burkina-Faso	BFA	30439	281	115.8	13.0	350	4.0
Brazil	BRA	30524	269	115.0	17.6	404	3.6
China	CHN	30746	260	113.9	17.0	324	4.4
India	IDN	30732	241	114.8	15.9	321	4.4
Chile	CHL	30642	238	115.3	14.8	370	4.0
Mali	MLI	30661	235	115.7	13.0	313	4.2
New-Zealand	NZL	30534	217	115.1	14.6	356	4.0
Pakistan	PAK	30730	211	114.7	15.5	269	4.9
Venezuela	VEN	30799	197	115.4	15.8	327	4.1
Iceland	ISL	30743	185	115.7	14.9	310	4.0
Chad	TCD	30879	165	115.0	12.3	242	5.1
Colombia	COL	30861	157	115.1	15.4	288	4.6
Philippines	PHL	30860	154	115.2	15.0	230	4.8
Uruguay	URY	30931	121	115.8	13.7	213	5.1
Peru	PER	30964	98	115.7	14.7	208	5.9
Kenya	KEN	30980	87	115.4	14.1	218	5.6
Ecuador	ECU	31052	82	115.9	14.0	179	6.3
Vietnam	VNM	31149	63	115.8	14.1	143	7.5
Soudan	SDN	31122	62	115.9	15.0	157	7.0
Tanzania	TZA	31126	61	115.8	13.4	114	9.0
Guatemala	GTM	31111	60	115.9	13.8	133	7.3
Bangladesh	BGD	31121	56	115.9	14.8	129	7.7
Ethiopia	ETH	31121	52	115.8	14.1	159	7.0
Bolivia	BOL	31164	38	116.0	13.1	117	8.7
Paraguay	PRY	31138	37	116.0	13.1	131	7.6
Nicaragua	NIC	31176	32	116.1	12.3	106	9.5
Honduras	HND	31170	23	116.1	12.9	84	11.2
Cape Verde	CPV	31201	16	116.1	11.3	76	11.9
Fidji	FJI	31195	15	116.1	11.3	77	10.2

Note: "Industry spillovers" is the average employment in industry and area that exports to the country. "Access" is $ln(gdp)/ln(dist)$.

Greece, Netherlands, Poland, Spain, United-Kingdom, USA), I compute a weighted distance. I calculate bilateral distances between the exit-city and the country's regions and weight those distances by the economic size of the regions. The external distance is then the sum of all regional weighted distances. For the economic size of regions, I use regional population data at the NUTS 1 level (Nomenclature des Unités territoriales Statistique, Eurostat) for European countries, provided by the Regio database. For Canada, population for provinces and territories was provided by Statistics Canada. For smaller countries, I computed a non-weighted distance by using the great circle formula on capital's geographic coordinates (Ireland, Denmark, Portugal, Norway, Sweden, Finland, Turkey and Mexico). For four of our countries, we applied a special procedure (Korea, Japan, Australia and New-Zealand): I compute great circle distance but impose a stop-over city because traditional journeys to these countries are not supposed to travel through the poles.