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Abstract

This paper investigates the presence of local export spillovers on both the extensive (the decision to start exporting) and the intensive (the export volume) margins of trade, using data on French individual export flows, at the product-level and by destination country, between 1998 and 2003. We investigate whether the individual decision to start exporting and exported volume are influenced by the presence of nearby product and/or destination specific exporters, using a gravity-type equation estimated at the firm-level. Spillovers are considered at a fine geographical level corresponding to employment areas (348 in France). We control for the new economic geography-type selection of firms into agglomerated areas, and for the local price effects of firms agglomeration. Results show evidence of the presence of export spillovers on the export decision but not on the exported volume. We interpret this as a first evidence of export spillovers acting through the fixed rather than the variable cost. Spillovers on the decision to start exporting are stronger when specific, by product and destination, and are not significant when considered on all products or on all products-all destinations. Moreover, export spillovers exhibit a spatial decay within France: the effect of other exporting firms on the export decision is stronger within employment areas and declines with distance.

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1 Introduction

The concern of French policy makers relative to the performance of French firms on international markets is not new: back in 2003, the foreign trade minister allocated specific public spending

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to the promotion of French exports on targeted markets. At the beginning of 2007, following the publication of the French trade balance for 2006 showing a growing trade deficit, the existing dispositive was backed up by measures facilitating the flow of export-specific information among French firms (see the renewal of the Ubifrance device for example).

The idea behind such initiatives is that a better knowledge about foreign markets may have a positive impact at the microeconomic level on the export performance of firms. More generally, information on international markets may originate from public interventions but also from the pool of existing exporters. In the latter case, the mechanism is called export spillovers, i.e. positive information externalities provided by nearby firms relative to export opportunities on international markets. Proximity to other exporters may bring additional benefits like cost-sharing opportunities and mutualized actions on export markets. In this paper, we are interested in the broad effect, encompassing informational externalities and cost-mutualization economies, that agglomeration of exporters has on export performance of firms. In the following, we use the terms export agglomeration economies and export spillovers interchangeably.

This paper builds on the existing literature analyzing the existence and the nature of local export spillovers among exporters. Using a uniquely detailed dataset comprising French exports at the product, firm, and destination country level for 1998-2003, we analyse the impact of the geographical agglomeration of exporters on both aspects of firms' export performance: their export decision (the extensive margin) and their export volume (the intensive margin).

From the theoretical point of view, few insights have been provided for export spillovers. Building on network theory, Krautheim (2008) shows how the exchange of information between firms exporting to the same country reduces the individual fixed cost to export and increases the probability to export. As far as the intensive margin is concerned, Rauch and Watson (2003) show that when a commercial relationship begins, there might be uncertainty for the buyer on the ability of the supplier to successfully fill larger orders. The agglomeration of exporters can increase the buyer's information on the quality of the suppliers, favoring larger orders and hence more important exports at the firm-level.

Export spillovers have been mostly studied in empirical papers. Results show mixed evidence on the existence of export spillovers, however existing studies looking for export spillovers differ in several important aspects, among which the definition of export spillovers (restricted to multinational firms or including all exporters), or the level of data disaggregation (exporters in the same regional location or in the whole country). Aitken, Hanson, and Harrison (1997) study the export behavior of Mexican plants and 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 the presence of exporters in general. Greenaway, Sousa and Wakelin (2004) show that multinational firms located in the UK influence positively the export decision of domestic firms over 1993-1996. Further export spillovers from FDI are investigated by Kneller and Pisu (2007) on UK data from 1992 to 1999, who find that the presence of foreign multinationals in the same industry or region affect positively the intensive and extensive margins of trade.

Very recently and also on UK data, Greenaway and Kneller (2008) show that regional and industry agglomeration is benefic to the entry of new firms on export markets during 1988-2002. Two papers underline the absence of evidence of export spillovers. Barrios, Görg and Strobl (2003) study the export decision and the export intensity of behavior of Spanish firms between 1990 and 1998 and do not find evidence that Spanish firms benefit from spillovers through the presence of other exporters or multinational firms. Bernard and Jensen (2004) find no role for export spillovers on the export decision in a panel of U.S. manufacturing firms, be the exporters region-specific but outside the industry, industry-specific but outside the region, or region and industry-specific.

It appears that the existing literature has only been able to look at a reduced set of questions, surely because of the lack of detailed data both on the location of exporters and the destination of their exports. Important issues are for example the nature of export spillovers (are they specific to the product, or the destination country) and the channel through which they impact a firm's behavior (through a productivity effect or through a trade cost effect, and in the latter case, through the variable or the fixed cost). Recently, Koenig (2005), analyzing the individual decision to start exporting to a given country, uses French firm-level exports and detailed geographical information on exporters for the period 1986-1992. She identifies positive export spillovers from neighboring exporters at a detailed geographical level and finds that the mechanism is clearly destination-specific.

In the line of these results, the contributions of our paper are threefold. First, we build our analysis on a uniquely detailed dataset comprising French firm-level exports by 8-digit product and by destination country, for a recent period of time (1998-2003). With respect to the existing literature, the product dimension allows us to investigate spillovers at a more adequate level in terms of activity[1] and the destination-country dimension provides us valuable information to assess the nature of spillovers, as suggested by Krautheim (2008). Second, we explore the impact of export spillovers on both the decision of firms to start exporting abroad and the volume exported by each firm. As explained in Chaney (2008), if export spillovers act through the fixed cost, they are expected to affect the extensive margin of trade only. On the contrary, if spillovers act through the variable cost, they are expected to affect both the intensive and the extensive margins. Our analysis thus allows to provide the first empirical evidence to disentangle these channels. Third and finally, we wish to describe in details the effect of exporting firms agglomeration on the export behavior of individual exporters. The global picture states indeed that the agglomeration of firms in the same area may give rise to market and non-market externalities. An example of market interaction is the cost-sharing devices that allow firms to communicate together on their products to foreign consumers[2]. Non-market interactions involve information externalities, which may benefit local firms through a decrease in information-

[1] Industry classifications regroup very different producers under a same heading.

[2] See for example the *Cosmetic Valley*, a network of perfume and cosmetics producers located in Centre and Normandie regions, aimed at communicating on their know-how on international markets.

research costs. Our estimation procedure captures those two types of externalities. Further, for a given firm, an increase in the number of surrounding firms exporting the same product to the same country means, everything equals, higher competition. The competition effect on the exported good's market is also captured in our estimation. Consequently, we measure the net effect of positive externalities and higher competition associated with the agglomeration of exporters.

Our results show a positive effect of product and destination specific-exporters' agglomeration on the export decision, hence on the extensive margin, but not on the intensive margin of trade. Export spillovers are prevalent when considered product specific only, are stronger when destination and product specific, and exhibit a spatial decay within France. The effect remains through numerous robustness checks.

The paper is structured as follows. Section (2) presents the empirical strategy and estimation issues. In section (3), we present the export and firm data and show some descriptive statistics on exporters. Section (4) contains the results for the decision to start exporting and the export volume, and section (5) concludes.

2 Empirical strategy

The structure and the determinants of international trade flows are now commonly studied using gravity equations. We detail the two estimated equations for the decision to start exporting and export volume, both inspired by the gravity equation. Ideally, we would have liked to estimate those two equations in an integrated Heckman selection model. This proved impossible since similar explanatory variables are used in both the decision to start exporting and the exported volume equations: we do not have any valid excluded variable for the selection equation. Moreover, the Heckman procedure does not allow the inclusion of the fixed effects needed to estimate correctly our model (see section 2.2). We consequently estimate successively our two equations. We then go through the main estimation issues, among which the endogeneity problem, reverse causality and omitted variables.

2.1 The empirical model

We assume that a firm i starts exporting a product k to a country j at time t if the actualized sum of its profits abroad is positive, i.e. $U_{ijkt} = \pi_{ijkt} + \epsilon_{ijkt} > 0$. U_{ijkt} is the net export profit earned by a firm on market j. It is the sum of the observed part of the profit, called π_{ijkt}, and the unobserved part ϵ_{ijkt}, where ϵ_{ijkt} contains characteristics of firms, areas and destination countries.

The net export profit U_{ijkt} increases with the supply and demand capacities of respectively the firm and the importing country. It decreases with bilateral trade frictions, among which distance between France and the destination country. Export spillovers is our variable of interest. They are assumed to act through the cost variable, potentially lowering either the variable or the fixed cost of exporting. The probability that a firm i starts exporting a product k to country j at time t writes:

$$\text{Prob}_{ikjt} = \text{Prob}\left(\alpha_0 \text{empl}_{it} + \alpha_1 \text{demand}_{jkt} + \alpha_2 \text{dist}_j + \alpha_3 \text{spill}_{it} + \epsilon_{ikjt} > 0\right), \quad (1)$$

where empl_{it} is the log of the number of employees of firm i at time t, demand_{jkt} is the log of total imports of product k by country j at time t (in dollars), dist_j is the log of distance in kilometers between France and country j, and spill_{it} is the spillover variable for firm i at time t. Note that our left-hand side variable is constructed as a change of export status at the firm-product-country level, since it takes the value of 1 when firm exports product k to country j at time t whereas it did not at time $t-1$. In order to make sure that our coefficients will be estimated thanks to the time-variation of our right-hand side variables, we will estimate this equation with a logit procedure, controlling for firm-product-country fixed effects. Our effects are therefore estimated with the time variation within a firm-product-country triad.

We model the individual export volume by adapting the traditional gravity equation at the firm-level: everything equals, the larger i's supply potential and j's demand potential, and the lower bilateral trade costs, the more firm i will export to country j. After log-linearization of the basic gravity equation, the estimated equation is:

$$\text{exp}_{ikjt} = \beta_0 \text{empl}_{it} + \beta_1 \text{demand}_{jkt} + \beta_2 \text{dist}_j + \beta_3 \text{spill}_{it} + \nu_{ikjt}, \quad (2)$$

where exp_{ikjt} is the log of the volume of exports of product k from firm i to country j at time t (in tons).

Our variable of interest in both estimations is export spillovers, i.e. the effect of exporters agglomeration in the same area on the export behavior of a given firm. As detailed in the introduction, among the indirect effects of firms agglomeration are market and non-market interactions. Hence, in the estimation, the spillover variable will capture not only the flow of information among neighboring firms but also the fact that agglomerated exporting firms are able to mutualize the costs related to export activity like management of relationships with clients or communication on their product for instance. We are thus studying the presence of a broader microeconomic phenomenon which the literature has come to call spillovers. The construction of the spillover variable will be detailed in the next section.

Finally, in equation (1) and (2), ϵ_{ikjt} and ν_{ikjt} are supposed to be i.i.d disturbances. In the following we discuss some considerations about why one can have serious doubts about the orthogonality of the unobserved terms and the regressors. This leads us to incorporating different combinations of country, product or firm dummy variables to the estimation.

2.2 Estimation issues

If there are export spillovers, the number of neighboring exporting firms should have a positive influence on the export decision of a given firm i to country j at date t and/or on its volume of exports. However, in order to be sure of the causality, several estimation issues need to be covered.

2.2.1 Reverse causality and simultaneity biases

Equations (1) and (2) both suffer from a patent endogeneity problem. Bernard and Jensen (1999) show that good firms become exporters (exporting firms are ex-ante bigger, more productive and pay higher wages than the others); but also that exporting raises ex-post employment growth rates, for example. The sense of the causality between firms' size and their export behavior is consequently not clearly determined. Besides, an entrepreneur anticipating positive (or negative) demand shocks on export markets could hire (or lay off) employees to adapt its supply capacity to demand. We thus face a reverse causality and a simultaneity issue relative to firm characteristics variables.

Parallel issues can be raised on the spillovers variable. If firm i's export behavior depends on the surrounding firms' behavior, the latter is itself impacted by firm i's export performance, which induces a reverse causality problem. Further, simultaneity may be an issue, since unobserved supply-side or demand-side unobservable local shocks could affect both the export performance of firm i and the performance of its neighbors. To make up for the potential circularity and simultaneity problems, following Bernard and Jensen (2004), we lag all right-and side variables one year[3].

2.2.2 Omitted variables

Melitz and Ottaviano (2008) provide a first important reason why the link of causality between agglomeration of firms and the export performance of a given individual firm could be altered. They show that larger and more integrated markets exhibit in equilibrium more productive firms and lower markups, due to endogenous differences in the toughness of competition. Since only productive firms are able to face the higher competition, there is a selection of most productive firms in denser areas. Besides, the existence of Marshallian externalities can also explain that the agglomeration of firms in the same industry generates productivity gains. Martin, Mayer and Mayneris (2008) show on French data that agglomeration affects positively firms' productivity.

Hence, on the one hand, firms in agglomerated areas are more productive, because of a selection effect or due to a marshallian externalities. On the other hand, more productive firms export more. Omitting firm productivity could lead to an overestimation of export spillovers. We thus introduce a TFP variable in our regression (see subsection (3.2) for more details on the estimation of firms' TFP).

A second important concern refers to the reverse causality between the agglomeration variable and the export performance. Do firms export more because they are agglomerated or

[3]Note that in unreported regressions, we also lagged right-hand side variables two years and results remain qualitatively unchanged.

are they agglomerated because they export more? To export easily, you need, among others, airports, railroads or highways. All the areas are not equally endowed in transportation infrastructures; Therefore, our regression should control for time invariant geographic characteristics by appropriate fixed effects.

A further issue relates to the economic size of the area. Agglomerated areas are also areas where local demand is higher. As it is less costly to serve local than foreign markets, all else equal, in agglomerated areas, firms could tend to serve in priority local consumers. Moreover, everything equals, larger areas in terms of number of producers are subject to larger congestion effects on the use of local input, which could negatively impact firms' export performance. If the spillover variable is positively correlated to the size of the area, the absence of control would downward bias our estimation of export spillovers. We introduce the total number of employees in the area, which captures the crowding-out effect on the use of local amenities by a large number of firms, as well as the effect of local demand. We expect its coefficient to be negative.

Next, it is possible that omitted components of trade costs create the observed relationship between agglomeration of exporters and firms' export performance. The existence of a common border between the local area and the destination country, or the presence of immigrants networks could for example explain why there are a lot of firms located in Alsace that trade intensively with Germany. This area-country specificity will be controlled by fixed effects.

Finally, an important theoretical literature is now developing on multi-product firms and international trade. Empirical evidence acknowledge that exports in most countries are mostly due to multi-products firms, characterized by a main export product and several side export products. Bernard et al. (2006) develop a model in which they distinguish firm-level overall ability and firm-product expertise. Ability and expertise both determine the export behavior of the firm at the product level. In our data, we control for firm-level TFP, which is a good proxy for firm-level ability, however we lack firm-product expertise. In the case firms with high product expertise are all located in the same place[4], this could upward bias the estimation of spillovers. Figure (1) displays a very strong geographic concentration of exporters for different 2-digit products which corresponds to well-known industrial local specialisations and reflects the historical development of a product specific expertise in these areas (clocks and watches in Franche-Comté for example or textile in Northern France). In order to disentangle those inherited product specific regional patterns from export externalities, we have to control for firm-product fixed characteristics.

Our preferred regression contains firms' TFP and the size of the area. Moreover, the appropriate specification discussed above includes a firm-product-country fixed effect which will control for all the above-mentioned observable and unobservable time-invariant components.

[4]Because they depend on natural resources or, in a marshallian view, because the need specialized services, employees and know-how which are geographically very localized for example.

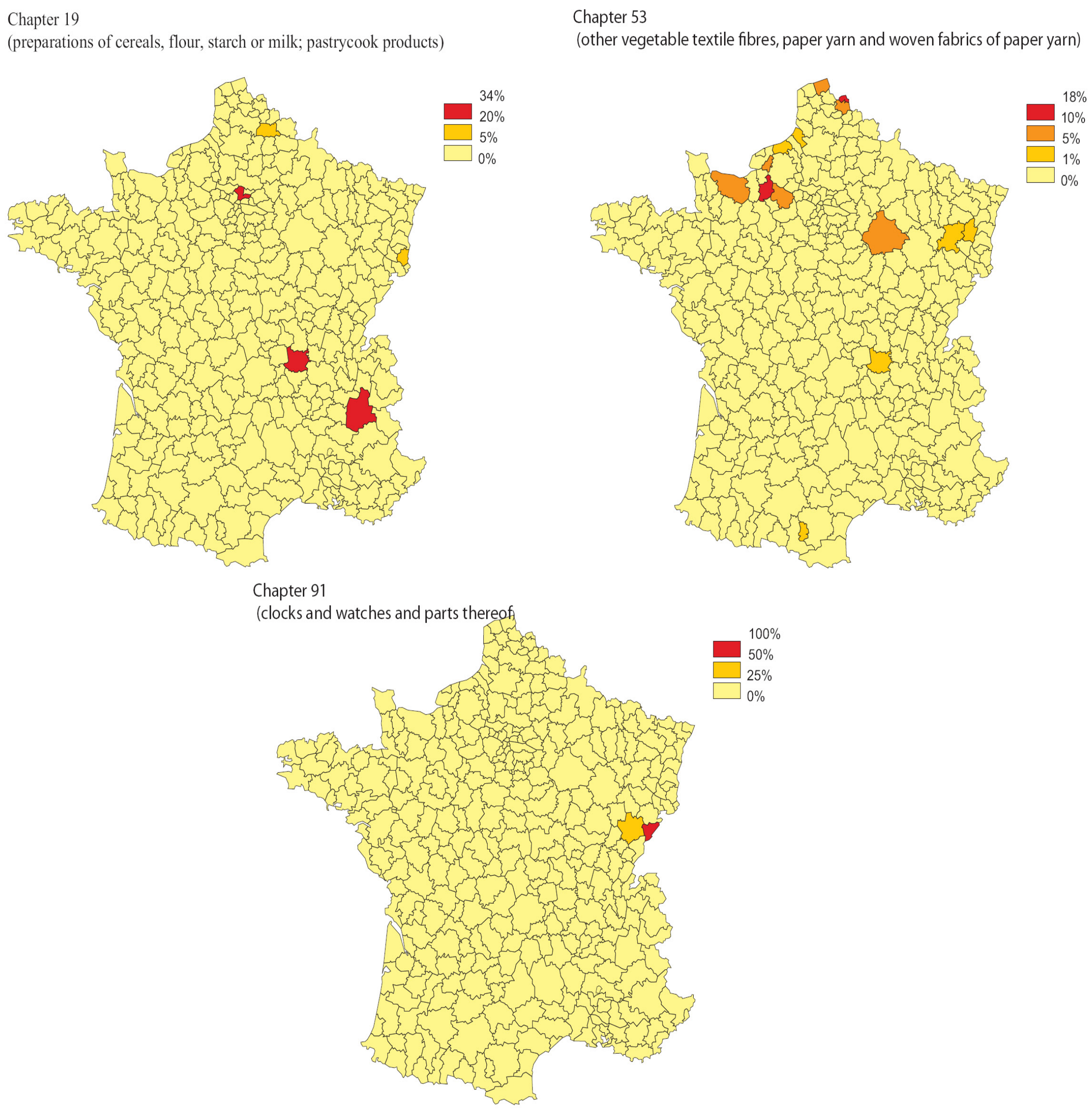

Figure 1: Share of French exports by employment area in 2003

3 Data and descriptive statistics

We explain how we build the final database by merging export data and firm data. We then detail the construction of the variables. Descriptive statistics follow, on the representativeness of the database and on the sample of exporters.

3.1 Sources

The main data source is a database collected by the French Customs.[5] It contains French export flows aggregated by firm, year, product (identified by a 8-digit code) and destination country, over the 1998-2003 period. As it does not provide information on the size of firms and on their location, we use a second data source, the French Annual Business Surveys[6] for the manufacturing sector over the same period, provided by the French ministry of Industry. Those surveys contain information on firms over 20 employees[7] such as the address, the identification number of the firm (*siren*), sales, production, number of employees, and wages.

The address of the firm is detailed up to the street name so that we can choose to investigate for export spillovers at different geographical scales. Two administrative levels coexist in France, the *region* (22 in metropolitan France) and the *département* (96), the latter being included in the former. The *employment area* (341 in continental metropolitan France) is an additional level used by the French statistical institute, which perimeter is based on workers' commuting schemes.[8] Because of their economic and non-administrative definition, in the following we choose to work at the employment area level, which we will simply call *areas*. Areas fit into regions but overlap with départements. Basic checks consist in dropping firms declaring negative sales, value added or employment. We also drop firms which change location during the period; indeed, we do not know whether this is an error or an actual move of the firm and we want to be sure that the firm-product-country fixed effect also captures area unobservable characteristics. Finally, firms located in Corsica or in overseas departments are left out of the sample.

Merging the firm information with the export data raises an important question relative to the sample of exporters. First, our sample covers manufacturing firms larger than 20 employees since the Annual Business Surveys do not provide information on small firms. Second, the export dataset gives the identification number of exporting firms however without detailing the plants from which the flows originate. Since spillovers are evaluated as the number of exporting

[5]Within the EU, French customs collect information on the product (NC8 categories) exported by firms when the annual cumulated value of all shipments of a firm (in the previous year) is above 100,000 euros from 2001 onwards. This threshold was 99,100 euros in 2000 and 38,100 euros before. For extra-EU exports, all shipments above 1,000 euros are reported. As regards intra-EU exports, we consequently restrict our attention to flows from firms with an annual cumulated value of intra-EU15 shipments above 100,000 euros in order to avoid the bias due to the evolution in the reporting thresholds imposed to exporting firms by the French customs.

[6]In French the *Enquêtes Annuelles d'Entreprises*.

[7]Smaller firms can also figure in these surveys, if their sales amount at least to 5 millions euros.

[8]In the sample used in our regressions, 340 employment areas are included, for which the average surface area is 1570 km^2. Assuming that employment areas are circular, we compute that the average internal distance, i.e. radius which is $\sqrt{Surface/\pi}$, is 23 kilometers.

neighbors next to the exporting firm, we face an important issue concerning multi-plant firms. This is why, among exporting firms represented both in the Customs' data and in the Annual Business Survey for the manufacturing sector, we choose to keep single-plant firms only, both for the left-hand side variable and for the definition of spillovers. Hence for a given single-plant firm, we evaluate the impact of other neighboring exporting single-plant firms on its export performance. The restriction of our sample makes sense in the light of a number of French public reports, which emphasize that the firms which encounter difficulties in entering and developing on international markets, and who are interested in support to export activities, are the small and medium ones (see for example Artus and Fontagné (2006)).

Another possibility is to consider that all multi-plant firms' export flows originate from the firm's headquarter. Spillovers variables for these firms are then computed as the number of neighbors in the headquarters' area. As explained more in details in Section (4.2.2) our results are robust to this alternative specification.

3.2 Variables

The dependent variables are as follows. For the extensive margin, we use a dummy variable which takes the value 1 if the firm starts exporting product k at time t to country j and 0 otherwise. We restrict our sample to firm-product-country series of zeros followed by a decision to start exporting.[9] We construct a specific database, incorporating the set of alternatives faced by each firm. These are defined as the product-country couples to which a firm exports at least once during the 1998-2003 period. Since we use firm-product-country fixed effects, taking into account a broader definition of possible exported products or destination countries would not change the subsample used for the estimation.

For the intensive margin, we use the volume of exports, expressed in tons, at the firm-product-country level. We use the export volume instead of the export value in order to avoid firm-level quality sorting and pricing issues mentioned in Crozet, Head and Mayer (2007).

The next step consists in building the export spillover variables. These are built at a detailed geographic and sectoral disaggregation level, using the French Business Annual Surveys. The geographic disaggregation chosen is the employment area; the manufacturing disaggregation level is the 4-digit product (1236 products) nomenclature. A 4-digit nomenclature is a rather fine decomposition. As an illustration, the chapter 91 (2-digit) which corresponds to clocks and watches and parts thereof is decomposed into 14 different 4-digit products, differentiating among final products between wrist-watch in precious metal and wrist-watch in base-metal case, alarm clocks, wall clocks, time registers and among components between clock movements, watch cases and watch straps. We compute the spillovers variable as the number of exporting plants (hence firms, because these are single-plant firms) in the area. In each case, spillovers can be of four different natures. For each firm and each year, we define general spillovers (the number of other

[9] For a given firm-product-country we can have several rounds of starts. For example, the subsequent export statuses 011001 become in our sample 1..0., with . denoting a missing value.

exporting firms in the area), destination specific spillovers (the number of other firms of the area exporting to the same destination), product specific spillovers (the number of other firms of the area exporting the same product) and product and destination specific spillovers (the number of other firms in the area exporting the same product to the same destination). Our sample covers 194 countries. The product and destination spillover variable for firm i, located in area z, exporting product k to country j at time t is defined as follows:

$$\text{spill}_{izkjt} = \#\text{ of other exporting firms}_{zkjt} \tag{3}$$

The size of the area is measured by the total number of employees in the area at year t, estimated by the French Statistical Institute (INSEE) from the 1999 French census. The TFP variable is obtained through the estimation of a production function using a GMM approach. The estimation of production functions is subject to several drawbacks (unobservable characteristics, simultaneity bias etc.). We use a GMM approach (see Griliches and Mairesse (1995) and Bond (2002)) and find coherent coefficients on labour and capital (respectively around 0.9 and 0.2); the estimate on labour is a little bit high but it is largely due to the restriction of the sample to single-plant firms, more labour intensive than the others (for more details on this estimation procedure on French data, see Martin et al. (2008)). We also tried the Olley and Pakes (1996) approach but it yields a singularly low coefficient on capital.

Last, we add the variables concerning destination countries. Distance between France and each destination country is provided by CEPII[10]. The demand variable gives, for each importing country, total imports from all over the world by product; in our estimation, it consequently controls for aggregate demand shocks specific to the product and the destination country. It is issued from the BACI database, a CEPII world database for international trade analysis at the product-level, detailed in Gaulier and Zignago (2008). All monetary variables are converted into dollars. At each one of these steps, observations are lost because of imperfect merges, but in reasonable proportions. The final database is an unbalanced panel.

3.3 Descriptive statistics

Tables (1) and (2) provide summary information on the firms in our database. Table (1) explains the representativeness of our sample of exporters, which is quite reasonable. Our regressions are done on exports by manufacturing single-plant firms larger than 20 employees. These account for nearly 12 % of total French exports (in value), 9.5% of total French exports (in volume) and 9% of the total number of French exporters. In addition, we evaluate in the last row the share of our firms (manufacturing single plant firms) in all manufacturing firms of more than 20 employees. Our sample represents 65.5% of large manufacturing exporters, and 23.5% of their exports in value (22.5% for the volume).

[10]Centre d'études prospectives et d'informations internationales, the French research center in International Economics, http://www.cepii.fr

Table 1: Descriptive statistics on the sample of exporters

	Share of total ...		
	export value	export volume	nb of exporters
Manufacturing multiplant firms >20 employees	38.70%	32.60%	4.72%
Manufacturing single plant firms >20 employees	11.75%	9.41%	8.94%
Other exporting firms	49.56%	57.98%	86.33%
Total French exports	**100.00**	**100.00**	**100.00**
Manufacturing single plants firms in all manufacturing exporting firms > 20 employees	23.29%	22.41%	65.44%

Table (2) describes the sample used for the estimations on the decision to start exporting. Firms in our sample are relatively large: 127 employees on average over the period. This number is upper-bounded by the exclusion of multi-plant firms, and lower-bounded by the reduction of our sample to exporting firms represented in the Annual Business Surveys, which mainly cover firms over 20 employees. The table further shows that firms export an average of 30 different products, and that each firm sells on average to nearly 27 foreign destinations. These relatively high numbers reflect the firm-level threshold of 100,000 euros of intra-EU15 shipments used by French customs (refer to footnote 5). The lower part of the table reports the values of the export spillovers variables. The more specific by product and/or by destination is the variable, the smaller is the mean. There are for example on average 64 exporting neighbors in the same area, when considering firms exporting all types of products to all possible destination countries. Considering only firms in the same product category and facing the same destination country, there are on average only 0.3 exporting neighbors in the same area. This very low number is not surprising given the high product and geographical level of disaggregation.

Table (3) further stresses that for 85% of the observations, there is no neighboring firms exporting the same product to the same country as the firm under scrutiny. In 9.5% of the cases, there is only one other exporting neighbor (to the same country-product pair) in the same area. The likelihood of having exporting neighbors increases from 15.1% when the definition of spillover is product-destination specific to 56.8% when it is product-specific, to 88.4% when it is destination-specific and to 99.9% when it is defined as all products-all destinations.

Table 2: Descriptive statistics (n=402638, result tables 3-5)

Variable	Mean	Std. Dev.	Min	Max
Employees	127	209	2	6201
Total employment$_{zt}$	195390	277514	4501	1690686
Value Added	6960	15741	13	810253
Destination country's Demand$_{jkt}$	443717	2226318	0.002	115000000
Distance	3873	4110	262	19264
# of exported products	30	30	1	285
# of destination countries	27	22	1	108
# other firms in the area, all products-all destinations	64	76	0	351
# other firms in the area, all products-same destination	15	26	0	230
# other firms in the area, same product-all destinations	3.0	6.6	0	67
# other firms in the area, same product-same destination	0.3	1.1	0	37
Nb of observations	402638			

Table 3: Distribution statistics of spillovers in terms of firms

	# other firms in the area			
	same product-same destination	all products-same destination	same product-all destinations	all products-all destinations
0	84.9%	11.6%	43.2%	0.1%
1	9.5%	10.0%	18.7%	0.2%
2	2.7%	8.3%	9.9%	0.3%
3-5	2.1%	17.2%	13.3%	2.0%
6-10	0.6%	14.5%	6.9%	5.5%
>10	0.3%	38.5%	7.9%	91.9%
Nb of observations	402638			

4 Results

The identification of spillovers on the decision to start exporting relies on a conditional logit estimation, whereas spillovers on firms' export volume are estimated with a linear model. Moulton (1990) showed that regressing individual variables on aggregate variables could induce a downward bias in the estimation of standard-errors. All regressions are thus clustered at the area level.

Estimation results on the identification of export spillovers are presented for the decision to start exporting in Table (4) and discussed in section (4.1). Further results on the decision to start exporting figure in Tables (5) to (8) and are examined in section (4.2). Estimation results on the export volume are displayed in Tables (11) to (13) and explained in section (4.3).

4.1 Identifying spillovers on the decision to start exporting

Table (4) details the estimation procedure to identify export spillovers on the individual decision to start exporting at year t. In Table (4), regressions are performed using the product and destination specific spillovers variable. From left to right, each column contains more control variables. All right-and side variables are lagged one year. All regressions contain firm-product-country fixed effects. The firm dimension of the triadic fixed effects allows to account for the characteristics of local areas such as transport infrastructures. First (natural) and second nature (human-made) local comparative advantages, according to Krugman's 1992 terminology, could explain the agglomeration of firms together with the fact that exporting firms are numerous. The product-country dimension of the triadic fixed effects allows to control for mean effects in each product line, as well as for the degree of competition in the destination market. Note that the firm-product-country fixed-effect makes the use of the distance variable not applicable because the distance between France and the destination country is invariant across time. Finally, the triadic fixed effects allow to control for inter-firm heterogeneity within a given area, as well as for firm-country and firm-product heterogeneity. The only remaining variability is in the time dimension within a given firm-product-country triad. Column (1) displays the basic estimation of the determinants of the decision to start exporting at the firm-level.

Column (2) adds the spillover variable. Its coefficient appears positive and significant, however this variable captures the overall effect of agglomeration on the individual export status, without any control for omitted variables nor reverse causality. Column (3) introduces the productivity of the firm in order to control for the fact that more productive firms are more often exporters and locate in agglomerated areas.

Table 4: Explained variable: Decision to start exporting /Logit estimation/Same product-same destination spillovers/Number of firms/Area level

Model :	(1)	(2)	(3)	(4)	(5)
ln (Employees_it)	0.578^a	0.578^a	0.606^a	0.608^a	0.457^c
	(0.099)	(0.099)	(0.097)	(0.097)	(0.274)
ln Imports_jkt	0.172^a	0.170^a	0.170^a	0.170^a	0.608
	(0.016)	(0.016)	(0.016)	(0.016)	(0.408)
# other firms in the area, same product-same destination		0.058^a	0.057^a	0.058^a	0.041^a
		(0.012)	(0.012)	(0.012)	(0.015)
ln (TFP_it)			0.109^b	0.109^b	0.238
			(0.047)	(0.046)	(0.180)
ln (Total employment_zt)				-0.226	-7.056^b
				(0.821)	(3.125)
Observations	402638	402638	402638	402638	5439
Year fixed effects	yes	yes	yes	yes	yes
Firm-Country-Product fixed effects	yes	yes	yes	yes	yes
R^2	18.5	18.6	18.6	18.6	29.5

Note: All regressions are conditional logit estimations. Standard errors in parentheses. ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels. All right hand side variables are lagged one year. Regressions are corrected for clustering at the area level.

Note: In Column 5 the sample is restricted to observations for which the number of firms in the area exporting the same product to the same destination is greater than 3.

The inclusion of the productivity variable does not however affect significantly the coefficient on the spillover variable. The coefficient on the spillover variable remains positive and significant while that on the productivity variable fails to be significant.

In column (4) we add total employment in the area (areas are labeled z). This variable has a negative, though insignificant effect on the decision to start exporting. Its inclusion does not affect the coefficient on the spillovers variable. It remains significant and positive with a coefficient equal to .058, which means that when the number of neighboring exporters increases, positive externalities dominate the negative competition effect on the decision to start exporting. An additional neighbor increases the probability to start exporting by roughly 1.4 percentage point.[11] With the controls we have used for product, area, and country unobserved characteristics, as well as firm productivity and area size, the agglomeration of exporting firms has a positive impact on the decision to start exporting of a given firm in the same area.

Column (5) investigates whether the effect of a higher number of neighbors exporting the same product to the same destination remains significant for the top end of our sample in terms of number of neighbors. The sample is restricted to observations for which the number of firms in the area exporting the same product to the same destination is greater than 3. The number of observations drops sharply from 402,638 to 5,439 but the explanatory power of the regression increases from 18.6 to 29.5%. The impact of spillovers declines but remains significant and positive with a coefficient equal to .041 suggesting that the effect measured in Column (5) does not only reflect the case of firms starting to export because the number of neighbors increases from 0 to 1. Export spillovers persist for firms surrounded by four or more neighbors.

Table (14) in the Appendix further investigates the appropriateness of the linear specification of the spillovers. Column (1) of Table (14) replicates, for comparison, the results of Column (4) in Table (5), hence using the most specific export spillovers variable. The linearity of the spillovers effect is investigated in the three remaining columns of Table (14). In Column (4), the sample is restricted to observations for which the number of firms in the area, same product - same destination, is greater than three. Column (2) uses dummies for different levels of the spillovers variable. Results are coherent with a linear specification since the effect on starting to export of having one neighbor exporting the same product to the same destination compared to zero (0.073) is very similar to the effect of having two neighbors instead of one, and of having three neighbors instead of two. Column 3 further highlights that firms with at least one neighboring exporter have a greater probability (+1.7 percentage point)[12] to start exporting than firms with no exporting neighbors.

[11] This figure is obtained from the derivative of the choice probabilities. As stated in Train (2003), the change in the probability that a firm i chooses alternative x (start exporting) given a change in an observed factor $z_{i,x}$, entering the representative utility of that alternative (and holding the representative utility of other alternatives (no exporting) constant) is $\beta_z P_{i,x}(1-P_{i,x})$, with $P_{i,x}$ being the average probability that firm i chooses alternative x (starts exporting). Our results, based on an average probability to start exporting of 37%, suggest that the derivative of starting exporting with respect to an additional neighbor is 1.4%=0.058×(1-0.37)×(0.37).

[12] This figure is the derivative of starting exporting with respect to having a strictly positive number of neighbors is 1.7%=0.073*(1-0.37)*(0.37).

4.2 The nature of export spillovers on the decision to start exporting

We investigate the specificity of export spillovers, and then address further issues about the mechanisms at work.

4.2.1 How specific are export spillovers?

We continue exploring the existence of export spillovers by detailing their nature, i.e. whether the effect remains when surrounding firms export different product lines, or when exporting to different destinations. Results in Table (5) are performed using the preferred specification, however with four different spillover variables: all products-all destinations, all products-same destination, same product-all destinations, and same product-same destination. The general spillover and the country-specific spillover variables are not significant. While the product specific spillover and the product-country spillover variables show positive and significant coefficients, the table displays a hierarchy ranking from .013 for product specific spillovers to .058 for product and country specific spillovers. It thus appears that the product specific characteristic raises the effect of agglomeration.

Nevertheless, a large coefficient does not mean that an independent variable x explains a large part of the variance of the dependent variable y. The explanatory power of a variable also depends on its own variability. We compute the explanatory power of the right-hand side variables. The question we ask is: "How much does the probability to export of a given firm vary if, all else equal, variable x increases by a standard-deviation with respect to its mean?"[13] Not surprisingly, Table (6) shows that the firm-specific and country specific variables such as the firm's size or TFP and the destination country demand have a larger explanatory power of the decision to start exporting than the spillovers variables.

Still, a one standard-deviation increase in each of the two significant agglomeration variables increases the probability to export by 0.5 to 0.7 percentage point for a given firm-product-country triad over time. It appears that even after controlling for the variance of independent variables, product-country specific spillovers are more decisive than other types of spillovers in the within dimension.

[13] Following Head and Mayer (2004), the explanatory power of variable x (which enters in log term) is obtained by the expression $[(1+\frac{\sigma_x}{\overline{x}})^{\beta}-1]\times 100$, where σ_x and $\overline{x}$ are the standard-deviation and the mean of x, and β its coefficient in the regression. The explanatory power of our spillover variable x which enters linearly is obtained by the expression $[\frac{e^{\beta(\overline{x}+\sigma_x)}}{e^{\beta(\overline{x})}}-1]\times 100$, where σ_x and $\overline{x}$. To express them in percentage point of probability, they are multiplied by 0.37, the average probability of exporting in our sample.

Table 5: Explained variable: Decision to start exporting /Logit estimation/Different product-destination spillovers/Number of firms/Area level

Model :	(1)	(2)	(3)	(4)
ln (Employees_i)	0.608^a	0.609^a	0.607^a	0.608^a
	(0.097)	(0.097)	(0.097)	(0.097)
ln (TFP_i)	0.109^b	0.110^b	0.110^b	0.109^b
	(0.046)	(0.046)	(0.046)	(0.046)
ln (Total employment_z)	-0.193	-0.241	-0.244	-0.226
	(0.839)	(0.824)	(0.822)	(0.821)
ln Destination country's Demand_jk	0.171^a	0.170^a	0.171^a	0.170^a
	(0.016)	(0.016)	(0.016)	(0.016)
# other firms in the area, all products-all destinations	-0.0003			
	(0.0018)			
# other firms in the area, all products-same destination		0.003		
		(0.003)		
# other firms in the area, same product-all destinations			0.013^b	
			(0.006)	
# other firms in the area, same product-same destination				0.058^a
				(0.012)
Observations	402638	402638	402638	402638
Year fixed effects	yes	yes	yes	yes
Firm-Country-Product fixed effects	yes	yes	yes	yes.
R^2	18.54	18.54	18.55	18.56

Note: All regressions are conditional logit estimations. Standard errors in parentheses ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels. Regressions are corrected for clustering at the area level. All explanatory variables are time specific and lagged one year with respect to the explained variable.

Table 6: Explanatory power - Decision to start exporting

Within variation			
Variable	Mean	Std-dev.	Expl. power (% point)
Employees	127.41	16.78	2.89
TFP	20.61	14.01	2.15
Destination country's Demand	443717	239729	2.82
# of other exporters in the area, same product-same destination	0.31	0.32	0.7
# of other exporters in the area, same product-all destinations	3	1.03	0.5
Between variation			
Variable	Mean	Std-dev.	Expl. power (% point)
Employees	127.41	211.02	30.01
TFP	20.61	16.33	2.43
Imports	443717	2227333	13.20
# of other exporters in the area, same product-same destination	0.31	1.11	2.47
# of other exporters in the area, same product-all destinations	3	6.47	2.21

Note: The table must be read as follows: a standard within deviation of the number of employees with respect to its mean generates an increase of probability to start exporting of 7.82% based on within variation and of 81.12% based on between variation.

The lower part of the table relies on between variation to compute standard deviation. Results logically suggest that spillover differences matter more in the cross dimension (i.e. to explain differences in terms of decision to start exporting across firm-product-country) than in the within dimension (over time). A one standard-deviation increase in each of the two significant agglomeration variables increases the probability to export by 2.21 to 2.47 percentage point across firm-product-country triads, which is similar in magnitude to the TFP impact.

4.2.2 Further issues

We perform several robustness checks and further investigations on the nature of export spillovers in Table (7). Agglomeration of firms in the area can generate tensions on the labor market and rise wages, weakening firms' propensity to export. Omitting wages could bias our estimation of spillovers. Using our preferred specification, in column (1) the estimation is done by including the firms' wage (wagebill divided by the number of employees). Surprisingly, the coefficient on wages is positive and significant, apparently due to multicollinearity with TFP. Still, the interesting result is that the coefficient on the spillovers variable remains positive, significant, and of the same magnitude as without the additional wage variable.

In the literature on agglomeration economies, besides intra-sectoral externalities, Jacobs (1969) argues that the diversity of local activity generates cross fertilizations and improves firms' performance. Column (2) investigates the possibility that the diversity of exported products manufactured in the same area impacts the export decision and affects our estimation of intra-product export spillovers. As a check for these urbanization economies, we perform our preferred specification and add the number of other exported products in the same area, whatever the destination country. This variable comes out positive and significant, revealing that the larger the diversity of exported goods produced in the neighborhood (for a given number of neighboring firms), the larger the probability to export. Note that the coefficient on spillovers remains the same, positive and significant.

In column (3), we explore the predominance of the spillovers' product and country specificity over the product only specificity. For a given firm-product-country triad, we decompose the product specific spillovers in two categories: firms exporting the same product to the same country and firms exporting the same product to other countries. We thus add to our preferred specification a variable counting the number of other firms in the area exporting the same product to different destinations[14]. Results show that the coefficient on our product-country export spillovers remains unchanged. The effect of the second spillover variable is positive but non significant. This means that our product specific spillover, which was significant in Column (3) of Table (5), was identified on the destination-specific variability. We thus confirm that destination and product specific export spillovers are stronger than product specific export spillovers.

[14]For firm i, located in area z and exporting product k to country j at time t, the definition of this variable is consequently # of other exporting firms$_{zkt}$ − # of other exporting firms$_{zkjt}$.

Table 7: Explained variable: export status /Logit estimation/Different product-destination spillovers/Number of firms/Robustness checks

Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln (Employees_i)	0.699^a	0.605^a	0.607^a	0.608^a	0.608^a	0.606^a	0.604^a	0.128^a	0.127^a
	(0.106)	(0.097)	(0.097)	(0.097)	(0.097)	(0.097)	(0.097)	(0.027)	(0.021)
ln (TFP_i)	0.066	0.110^b	0.109^b	0.109^b	0.109^b	0.110^b	0.111^b	0.025^c	0.025^b
	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.015)	(0.012)
ln Mean wage_i	0.393^a								
	(0.111)								
ln (Total employment_z)	-0.148	-0.317	-0.249	-0.212	-0.226	-0.242	-0.295	0.075	0.068
	(0.808)	(0.831)	(0.821)	(0.822)	(0.821)	(0.825)	(0.827)	(0.205)	(0.163)
ln Destination country's Demand_jk	0.168^a	0.170^a	0.169^a	0.171^a	0.170^a	0.163^a	0.167^a	0.037^a	0.037^a
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.005)	(0.004)
# other firms in the area, same prod./dest.	0.058^a	0.056^a	0.061^a		0.056^a	0.047^a		0.011^a	
	(0.012)	(0.012)	(0.013)		(0.013)	(0.011)		(0.003)	
ln (1+# other exported products in the area)		0.279^b							
		(0.112)							
# other firms in the area, same product-other destinations			0.009						
			(0.006)						
# employees in the area, other firms, same prod./dest.				0.00018^a					
				(0.00005)					
Mean size of other exporting firms, same prod./dest.					0.00004				
					(0.00007)				
# other firms in region other than the area, same prod./dest.						0.018^a		0.004^a	
						(0.005)		(0.001)	
# other firms in France other than the region, same prod./dest.						0.009^a		0.002^a	
						(0.001)		(0.0003)	
# other firms in the area, same prod.-all dest.							0.0102		0.002
							(0.006)		(0.001)
# other firms in region other than the area, same prod.-all dest.							0.0033^b		0.0006^c
							(0.0016)		(0.0003)
# other firms in France other than the region, same prod.-all dest.							0.00077^b		0.0002^b
							(0.00032)		(0.00007)
Observations	402115	402638	402638	402638	402638	402638	402638	402638	402638
R^2	18.60	18.58	18.56	18.55	18.56	18.60	18.56	19.4	19.4
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Firm-Country-Product fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Product year fixed effects	no	no	no	no	no	no	no	yes	yes
Number of groups	148893	148893	148893	148893	148893	148893	148893	148893	148893

Note: All regressions are conditional logit estimations except columns (8) and (9) which are linear probability estimations. Standard errors in parentheses ^{a}. ^{b} and ^{c} respectively denoting significance at the 1%. 5% and 10% levels. Regressions are corrected for clustering at area-destination level. All explanatory variables are time specific and lagged one year with respect to the explained variable. Estimations in columns (8) and (9) are done with product (SH2)-time fixed effects.

Columns (4) and (5) of robustness checks Table (7) investigate whether the effect of spillovers arises from the number of surrounding firms or from the size of the surrounding industry. In column (4) we replace the spillovers variable computed on the number of firms by a spillovers variable computed as the total number of employees working in exporting plants located in the area. The coefficient is positive and significant. However, in column (5), when the number of exporting firms and their average size are simultaneously controlled for, the former is the only one to be significant. This result suggests that for a given number of exporters in the area, a bigger size does not bring additional benefits.

Columns (6) through (9) investigate the geographical scope of the microeconomic mechanism. We estimate in column (6) the preferred specification, adding additional spillovers variables computed at different geographical scales: we consider firms in the employment area (as before), firms outside the initial employment area but within the administrative region, and finally firms in France outside the administrative region of the firm. Results show that spillovers seem to be highly localized, since coefficients on all three spillovers variables are positive and significant, and do show a decreasing trend with distance from the initial firm. The probability of starting to export increases by 1.1 percentage point when an additional firm exporting the same product to the same country locates in the same area. The effect is almost three times smaller for a firm locating in the region but in a different area (0.42 percentage point) and almost six times smaller when locating in a different region (0.2 percentage point).

Column (7) performs the same estimation, however using product specific spillovers variables only (hence all destinations, same product spillovers). Results confirm the spatial decay of export spillovers within France. The magnitude of the effect of other same product exporters is greater within employment areas (although it fails to be significant) and declines when neighbors are counted in the rest of the region and then in the rest of France. To summarize, results attest that spillovers on the export decision exist with product and destination specific neighbors, and decrease with the geographic extent in which we count the number of exporting firms. This is logical since one can reasonably think that the larger the distance, the more difficult and costly the cooperation between firms, and consequently the less powerful the spillovers. Moreover, flows of information have been shown to be geographically restricted by Jaffe, Trajtenberg and Henderson (1993), using patent citation data. Our results thus confirm the localized feature of the two positive effects on firms' export performance captured in the spillovers, i.e. market externalities of exporters agglomeration (cost sharing etc.) and information flows between exporters. The comparison of columns (6) and (7) confirm that product-country specific spillovers are more decisive than product only export spillovers.

The last two columns in Table (7) reproduce the two previous columns adding product-year fixed effects defined at the SH2 level.[15] We find that the spatial decay resists the inclusion

[15]Since it was impossible to account in a logit model for both the firm-product-country triadic fixed effects and for product-year fixed effects, these two columns report results based on linear probability estimations. Moreover, using product-year fixed effect at the SH4 level would have led to introduce more than 5000 dummies, which is beyond the computational capacities of our econometric software. This forced us to rely on the SH2 classification

Table 8: Are local externalities really local?

Within variation			
Variable	Mean	Std-dev.	Expl. power (% point)
# of other exporters in the area, same product-same destination	0.31	0.32	0.57
# of other exporters in region but the area, same product-same destination	1.76	0.88	0.6
# of other exporters in France but the region, same product-same destination	17.28	3.51	1.19
Between variation			
Variable	Mean	Std-dev.	Expl. power (% point)
# of other exporters in the area, same product-same destination	0.31	1.11	1.99
# of other exporters in region but the area, same product-same destination	1.76	4.78	3.33
# of other exporters in France but the region, same product-same destination	17.28	32	12.35

Note: The table must be read as follows: a standard within deviation of the product and destination specific spillover variable with respect to its mean generates an increase of probability to export by 1.53% based on within variation and of 5.37% based on between variation.

of product-year fixed effect controlling for product-specific factors that vary over time such as tariffs. The impact of all three spillovers (local, regional and national) is divided by three but remains significant.

In Table (8) we investigate whether the spatial decay exists in terms of explanatory power. Using the results from Columns (6) and (8) of Table (7), we compute the explanatory power of the three spillovers variables at different geographical scales (area, region, and nation). For both product and destination specific and destination specific spillovers, no spatial decay in terms of explanatory power is observed, due to stronger variability of spillover variables at the regional and national levels.

We are aware of a possible selection bias in our estimation due to the use of a specific sample of firms. We now show that our results are robust to using a variety of different sub-samples and alternative measures of spillovers. Table (9) reproduces column (6) of Table (7) using different samples and indicators. Identical results are obtained while relying on the SH2 nomenclature instead of the SH4 nomenclature. While the sample size was roughly divided by two (the number of observations is reduced from 402638 to 235465), our product-country specific spillover variable retains its spatial decay feature. Similarly, the enlargement of our sample to both single and multi-plant firms (Columns (3) and (4))[16] does not affect the results.

In columns 3 to 10 of Table (10), we further find that the influence of spillovers does not

to compute product-year fixed effects.

[16]We consider that all multi-plant firms' export flows originate from their headquarter. Spillovers variables for these firms are thus computed as the number of neighbors in the headquarters' area. For computational reasons, the estimations are based on a 50% random selection of firms.

depend on the firm's size. In Column (3) we interact our spillover indicator with the firm's number of employees. In Columns (4) to (7) we successively run separate regressions for low-employment and high-employment firms. In Columns (4) and (5) the cut-off corresponds to the median size (66 employees) while in Columns (6) and (7) we use the mean size. Our results do not suggest any clear heterogeneity of our spillover effect according to the firm's size. While the interactive term in Column (3) fails to enter significantly, the effect of spillovers does not seem to depend on the sub-sample used. The last three columns investigate heterogeneity between single and multi-plant firms. Our sample is restricted to single-plant firms in column (8) and to multi-plant firms in column (9), whereas column (10) investigates heterogeneity of spillovers according to firms's size on the complete sample. It seems that multi-plant firms benefit less from spillovers than single-plant ones; the insignificance of the interaction term in column (10) suggests that this is not due to size differences. However, it is difficult to assess if the detected differences in coefficients reflect measurement errors or a true heterogeneity of the impact of exporters agglomeration across those two types of firms.

Robustness checks continue in Table (7) with the use of an export dummy instead of the decision-to-start-exporting dummy as the dependent variable. In the right-hand side panel of the table, instead of restricting our attention to firm-product-country series of no exporting followed by exporting, we include the full series of firm-product-country observations (over our sample period from 1998 to 2003), whether exporting continues the year after the initial start or not. The explained variable is a dummy variable which takes the value 1 if the firm exports a product k at time t to country j. The sample size is tripled. Again our results are virtually unchanged. Nevertheless, the explanatory power of the regressions is very weak (R^2 smaller than 1%), suggesting that gravity-type equations are not well suited to explain the yearly decision to export at the firm-product-destination level.

Finally, in the first two columns of Table (10), we question the comparison between export spillovers captured by the number of exporting neighbors and export economies within the firm. Column (1) reproduces our benchmark estimation (Column (4) of Table (14)) adding the number of other destinations to which product k is exported by firm i. This variable captures product-specific information on how to export product k or scope economies across destinations. Column (2) alternatively includes the number of other products which are exported to the destination j. This variable captures destination-specific information on how to export to country j or scope economies across products. We expect those two variables to affect positively the probability of starting to export. Our results confirm these predictions while leaving our external spillovers impact unchanged.

Table 9: Explained variable: Export decision /Logit estimation/ Different product-destination spillovers/Number of firms/Area level

Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
product nomenclature	SH4	SH2	SH4	SH2	SH4	SH2	SH4	SH2
firm type	Single-plant firms		All firms		Single-plant firms		All firms	
	decision to start exporting				decision to export			
ln (Employees_i)	0.606^a	0.611^a	0.567^a	0.697^a	0.569^a	0.626^a	0.438^a	0.679^a
	(0.097)	(0.103)	(0.105)	(0.085)	(0.066)	(0.061)	(0.079)	(0.050)
ln (TFP_i)	0.110^b	0.097^c	0.110^c	0.128	0.149^a	0.161^a	0.177^a	0.164^a
	(0.046)	(0.053)	(0.057)	(0.079)	(0.030)	(0.032)	(0.034)	(0.039)
ln (Total employment_z)	-0.242	0.105	0.994	-0.182	0.294	0.417	0.650	-0.076
	(0.825)	(0.864)	((1.026)	(0.818)	(0.436)	(0.446)	(0.591)	(0.401)
ln Destination country's Demand_jk	0.163^a	0.345^a	0.149^a	0.269^a	0.137^a	0.304^a	0.125^a	0.244^a
	(0.016)	(0.040)	(0.016)	(0.038)	(0.010)	(0.020)	(0.008)	(0.017)
# other firms in the area, same prod./dest.	0.047^a	0.015^c	0.016^a	0.011^b	0.041^a	0.014^b	0.016^a	0.010^a
	(0.011)	(0.009)	(0.003)	(0.004)	(0.008)	(0.006)	(0.002)	(0.002)
# other firms in region other than the area, same prod./dest.	0.018^a	0.008^a	0.007^a	0.003^a	0.011^a	0.004^a	0.007^a	0.003^a
	(0.005)	(0.002)	(0.002)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)
# other firms in France other than the region, same prod./dest.	0.009^a	0.002^a	0.005^a	0.001^a	0.007^a	0.001^a	0.005^a	0.001^a
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Observations	402638	235465	550038	298168	1315440	822908	1861771	1080654
R^2	18.60	20.47	19.01	19.53	0.44	0.55	0.37	0.55
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Firm-Country-Product fixed effects	yes	yes	yes	yes	yes	yes	yes	yes

Note: Standard errors in parentheses ^{a}. ^{b} and ^{c} respectively denoting significance at the 1%. 5% and 10% levels. Regressions are corrected for clustering at the area level. All explanatory variables are time specific and lagged one year with respect to the explained variable.

Table 10: Explained variable: Decision to start exporting /Logit estimation/Same product-same destination spillovers/Number of firms/Area level

Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Employment				Firm type	
				< 66	≥ 66	< 127	≥ 127	Single-plant	Multi-plant	All
ln (Employees_i)	0.507^a	0.552^a	0.607^a	0.550^a	0.755^a	0.572^a	0.825^b	0.420^a	0.588^a	0.575^a
	(0.097)	(0.099)	(0.097)	(0.123)	(0.167)	(0.115)	(0.335)	(0.130)	(0.156)	(0.105)
ln (TFP_i)	0.084^c	0.104^b	0.109^b	0.183^a	0.017	0.164^a	0.002	0.110^c	0.136^c	0.108^c
	(0.049)	(0.047)	(0.046)	(0.058)	(0.061)	(0.052)	(0.074)	(0.065)	(0.080)	(0.057)
ln (Total employment_zt)	-0.414	-0.360	-0.225	1.796	-2.411^b	1.127	-3.801^b	-1.835^c	3.212^c	1.010
	(0.780)	(0.792)	(0.822)	(1.253)	(1.070)	(1.014)	(1.640)	(1.077)	(1.719)	(1.023)
ln Destination country's Demand_jk	0.172^a	0.163^a	0.170^a	0.140^a	0.198^a	0.148^a	0.221^a	0.158^a	0.151^a	0.157^a
	(0.017)	(0.016)	(0.016)	(0.023)	(0.023)	(0.019)	(0.026)	(0.025)	(0.021)	(0.016)
# other firms in the area, same product-same destination	0.058^a	0.058^a	0.045	0.054^a	0.063^a	0.056^a	0.062^a	0.030^a	0.014^a	0.035^a
	(0.012)	(0.012)	(0.043)	(0.014)	(0.015)	(0.013)	(0.021)	(0.011)	(0.004)	(0.013)
# other destinations, same firm-same product	0.098^a									
	(0.006)									
# other products, same firm-same destination		0.096^a								
		(0.012)								
# other firms in the area, same product-same destination interacted with ln (Employment)			0.003							-0.003
			(0.010)							(0.002)
Observations	402638	402638	402638	202849	199789	292357	110281	223488	299410	550038
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Firm-Country-Product fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	19.38	19.39	18.56	19.64	17.60	19.26	19.64	20.35	19.38	18.98

Note: All regressions are conditional logit estimations. Standard errors in parentheses ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels. All right hand side variables are lagged one year. Regressions are corrected for clustering at the area level.

Note: Columns (1) to (7) rely on mono-establishment firms only while columns (8) to (10) cover mono and pluri-establishments firms.

4.3 Spillovers on the export volume

We now present the results relative to the presence of export spillovers on the intensive margin of trade, hence on the volume exported by individual firms. The database contains all the observations for which firms export a product to a country. Estimations are thus conditional on the fact that firms export. Results are displayed in Tables (11), (12) and (13).

Table (11) contains the results of the base estimations in a similar way as Table (4) did for the extensive margin. From left to right, again, the columns include more control variables, ending with the preferred specification in Column (4). Column (5) investigates whether our spillover effect remains significant when the sample is restricted to observations for which the number of firms in the area exporting the same product to the same destination is greater than 3. Traditional gravity variables impact the export volume in the expected way. Estimations of the coefficient on the spillovers variable however do not perform as well as on the extensive margin in assessing the presence of export spillovers. Columns (2) through (4) show a positive coefficient on the spillover variable, significant at the 5% confidence level. In Column (5) which restricts the sample to the top end observations in terms of number of neighbors, the number of observations drops sharply from 722,739 to 27,599. The impact of spillovers declines and loses its significance indicating that the spillover effect measured in Column (4) does mainly reflect the case of firms for which the number of neighbors is low. The coefficient thus appears less general as on the extensive margin.

Table 11: Explained variable: exported volume /OLS/Same country-same product spillovers/Number of firms/Area level

Model :	(1)	(2)	(3)	(4)	(5)
ln (Employees_it)	0.227^a	0.227^a	0.244^a	0.232^a	0.413^b
	(0.068)	(0.068)	(0.062)	(0.061)	(0.191)
ln Imports_jkt	0.121^a	0.120^a	0.118^a	0.116^a	0.339
	(0.022)	(0.022)	(0.022)	(0.021)	(0.217)
# other firms in the area, same product-same destination		0.019^b	0.019^b	0.019^b	0.014
		(0.009)	(0.009)	(0.009)	(0.008)
ln (TFP_it)			0.067^a	0.065^a	0.142^a
			(0.017)	(0.018)	(0.054)
ln (Total employment_zt)				1.034^b	1.879^a
				(0.522)	(0.540)
Observations	722739	722739	722739	722739	27599
R^2	0.1	0.1	0.1	0.2	1.2
Year fixed effects	yes	yes	yes	yes	yes
Firm-Country-Product fixed effects	yes	yes	yes	yes	yes

Note: Standard errors in parentheses ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels. Regressions are corrected for clustering at area level. All explanatory variables are time specific and lagged one year with respect to the explained variable.

Note: In Column 5 the sample is restricted to observations for which the number of firms in the area exporting the same product to the same destination is greater than 3.

Table 12: Explained variable: exported volume /OLS/Different product-destination spillovers/Number of firms/Area level

Model :	(1)	(2)	(3)	(4)
ln (Employees_i)	0.233^a	0.233^a	0.232^a	0.232^a
	(0.061)	(0.061)	(0.061)	(0.061)
ln (TFP_i)	0.065^a	0.065^a	0.065^a	0.065^a
	(0.018)	(0.018)	(0.018)	(0.018)
ln (Total employment_z)	1.001^c	1.030^c	1.040^b	1.034^b
	(0.523)	(0.526)	(0.526)	(0.522)
ln Destination country's Demand_jk	0.117^a	0.116^a	0.117^a	0.116^a
	(0.021)	(0.021)	(0.021)	(0.021)
# other firms in the area, all products-all destinations	0.002			
	(0.001)			
# other firms in the area, all products-same destination		0.002^c		
		(0.001)		
# other firms in the area, same product-all destinations			0.003	
			(0.003)	
# other firms in the area, same product-same destination				0.019^b
				(0.009)
Observations	722739	722739	722739	722739
R^2	0.2	0.2	0.2	0.2
Year fixed effects	yes	yes	yes	yes
Firm-Country-Product fixed effects	yes	yes	yes	yes

Note: Standard errors in parentheses ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels. Regressions are corrected for clustering at area level. All right-hand side variables are lagged one year.

Table 13: Explained variable: exported volume /OLS/Different product-destination spillovers/Number of firms/Robustness checks

Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln (Employees_i)	0.240^a	0.232^a	0.233^a	0.232^a	0.232^a	0.232^a	0.233^a	0.223^a	0.224^a
	(0.065)	(0.060)	(0.061)	(0.060)	(0.060)	(0.061)	(0.061)	(0.055)	(0.055)
ln (TFP_i)	0.060^a	0.065^a	0.065^a	0.065^a	0.065^a	0.065^a	0.065^a	0.067^a	0.067^a
	(0.021)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.017)	(0.017)
ln Mean wage_i	0.041								
	(0.058)								
ln (Total employment_z)	1.047^b	1.018^c	1.024^c	1.040^b	1.035^b	1.029^b	1.037^c	0.999^b	1.001^b
	(0.532)	(0.518)	(0.524)	(0.523)	(0.521)	(0.518)	(0.528)	(0.465)	(0.469)
ln Imports_jk	0.115^a	0.116^a	0.115^a	0.116^a	0.116^a	0.113^a	0.116^a	0.105^a	0.106^a
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.020)	(0.021)	(0.019)	(0.020)
# other firms in the area, same prod./dest.	0.019^b	0.018^b	0.018^b		0.018^b	0.015^c		0.013	
	(0.009)	(0.009)	(0.009)		(0.009)	(0.008)		(0.008)	
ln (1+# exported products in the area)		0.063							
		(0.044)							
# other firms in the area, other products-same destination			0.001						
			(0.001)						
# employees in the area, other firms, same prod./dest.				0.00008^c					
				(0.00004)					
Mean size of other exporting firms, same prod./dest.					0.00005				
					(0.00007)				
# other firms in region other than the area, same prod./dest.						0.007^c		0.006^c	
						(0.004)		(0.003)	
# other firms in France other than the region, same prod./dest.						0.001		0.0003	
						(0.001)		(0.0005)	
# other firms in the area, all products-same destination							0.001		0.001
							(0.001)		(0.001)
# other firms in region other than the area, all prod.-same dest.							0.0002		0.0003
							(0.0002)		(0.0002)
# other firms in France other than the region, all prod.-same dest.							-8.10^{-6}		-9.10^{-6}
							(0.00002)		(0.00002)
Observations	722201	722739	722739	722739	722739	722739	722739	722739	722739
R^2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Firm-Country-Product fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Product year fixed effects	no	no	no	no	no	no	no	yes	yes

Note: Standard errors in parentheses [a]. [b] and [c] respectively denoting significance at the 1%. 5% and 10% levels. Regressions are corrected for clustering at the area level. All explanatory variables are time specific and lagged one year with respect to the explained variable. Estimations in columns (8) and (9) are done with product (SH2)-time fixed effects.

Table (12) investigates the nature of potential export spillovers on the export volume. The positive and significant coefficient discussed above on the product and country specific spillovers variable appears in the last column, however none of the other coefficients are significant at the 1 or 5% levels.

Table (13) reports various robustness checks similar to those in Table (7). The coefficient on spillovers appears positive and significant (at the 5% level) throughout the controls in columns (1)-(3) and (5). Columns (6) and (8) examine the geographical scope of the agglomeration variable in order to look for a spatial decay. We include the number of exporting neighbors computed respectively at the area, region and national levels in column (6). Column (8) replicates this estimation using product-time fixed effects defined at the SH2 level. Again results are not as clear as on the extensive margin. While the coefficient does appear positive and significant on export spillovers in column (6), no spatial decay structure comes out of the results. More, the inclusion of product-time fixed effects eliminates the spillovers effect in column (8); Results on spillovers may thus have been driven by product-specific factors that vary over time, such as trade barriers.

Finally, results available upon request check the presence of spillovers on the intensive margin at the SH2 level of product nomenclature, and examine whether the inclusion of multi-plant firms in the sample affects the outcome. The regressions exhibit unstable results and again very weak explanatory power of the regressions. Consequently, by contrast with our analysis on the extensive margin, we believe that our results globally suggest the absence of export spillovers on the intensive margin.

5 Conclusion

This paper investigates the impact of exporters' agglomeration on the export behavior of firms, using a detailed dataset on French exports by firm, product, year and destination country for 1998-2003. We extend the existing literature by questioning the existence of the microeconomic mechanism between exporters both on the decision to start exporting and on the exported volume. If export spillovers exist, they are likely to benefit a given firm through a decrease in its trade costs, allowing the firm to export a larger volume of the good abroad and/or to facilitate its export decision. With the inclusion of controls, results show a distinct effect of exporters' agglomeration on the intensive and extensive margins of trade. The number of product-country specific exporters in a given area positively affects the export decision of a firm, however it does not seem to have an effect on the volume exported by the firm. Spillovers on the export decision are stronger when specific, by product and destination, and are not significant when considered on all products or all products-all destinations. More, export spillovers exhibit a spatial decay: the effect of other exporting firms on the decision to start exporting declines with distance but remains when computed at the regional and national scale. From a policy point of view, our results thus tend to show that devices aimed at promoting exports should be concentrated on specific product and country markets. Moreover they would need to be limited to the outlines of smaller geographical areas.

Table 14: Explained variable: Decision to start exporting /Logit estimation - Specification test of spillovers

Model :	(1)	(2)	(3)	(4)
ln (Employees_i)	0.608^a	0.609^a	0.609^a	0.457^c
	(0.097)	(0.097)	(0.097)	(0.274)
ln (TFP_i)	0.109^b	0.109^b	0.109^b	0.238
	(0.046)	(0.046)	(0.046)	(0.180)
ln (Total employment_z)	-0.226	-0.221	-0.211	-7.056^b
	(0.821)	(0.821)	(0.822)	(3.125)
ln Destination country's Demand_jk	0.170^a	0.170^a	0.170^a	0.608
	(0.016)	(0.016)	(0.016)	(0.40 8)
# other firms in the area, same product-same destination	0.058^a			0.041^a
	(0.012)			(0.015)
Dummy if 1 firm in the area, same product-same destination		0.063^b		
		(0.025)		
Dummy if 2 firms in the area, same product-same destination		0.143^a		
		(0.036)		
Dummy if 3 firms in the area, same product-same destination		0.190^a		
		(0.059)		
Dummy if 4 firms in the area, same product-same destination		0.199^a		
		(0.072)		
Dummy if 5 firms in the area, same product-same destination		0.226^b		
		(0.089)		
Dummy if 6-10 firms in the area, same product-same destination		0.346^a		
		(0.127)		
Dummy if more than 10 firms in the area, same product-same destination		0.624^b		
		(0.310)		
Dummy if strictly positive # firms in the area, same product-same destination			0.073^a	
			(0.025)	
Observations	402638	402638	402638	5439
Year fixed effects	yes	yes	yes	yes
Firm-Country-Product fixed effects	yes	yes	yes	yes
R^2	18.56	18.56	18.55	29.49

Note: Standard errors in parentheses ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels. Regressions are corrected for clustering at the area level. In Column 4 the sample is restricted to observations for which the number of firms in the area, same product-same destination is greater than 3. All explanatory variables are time specific and lagged one year with respect to the explained variable.

Appendix

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