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Local Export Spillovers in France

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NON-TECHNICAL SUMMARY

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 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. Very large amounts of money were allocated to clusters initiatives. For example, 0.5 billion euros is spent yearly on the new policy of competitiveness clusters launched in 2005 for three years and extended to 2009-2011.

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. Proximity to other exporters may bring benefits like positive information externalities, cost-sharing opportunities and mutualized actions on export markets. Several national and local organizations are specifically aimed at fostering these effects through conferences on specific destination countries, financial support to participate to international fares, etc.

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).

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 than the industry classifications traditionally used 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), a change in the fixed cost is expected to affect the extensive margin of trade only. A change in the variable cost is 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 exporters in the same area may give rise to market and non-market externalities, but also to higher competition on the export market. An example of market externality is the cost-sharing devices that allow firms to communicate together on their products to foreign consumers. 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 is a good example. Non-market externalities involve informal information transfers, which may benefit local firms through a decrease in variable or fixed export costs.

Our estimation procedure captures those two types of externalities, as well as the competition effect on the exported good's market. We measure the net effect of positive externalities and higher competition associated with the agglomeration of exporters.

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. 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. An additional neighbor exporting a given product to a given destination increases the probability to start exporting the same product-destination pair by roughly 1.07 percentage point. Export spillovers are prevalent when considered destination or product specific, are stronger when destination and product specific and are not significant when considered 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. This result is consistent with the fact that information sharing is easier over shorter distances.

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-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.

JEL Classification: F1, R12, L25.

Keywords: Firm-level export data, product and destination specific spillovers, agglomeration.

Les externalités locales à l'exportation en France

Résume non technique

En France, la préoccupation des autorités politiques quant à la performance des firmes sur les marchés internationaux n'est pas nouvelle : déjà en 2003, le ministre du Commerce extérieur attribuait un budget spécifique à la promotion des exportations à destination de certains marchés. Au début de 2007, suite à la publication des chiffres de la balance commerciale de 2006 faisant état d'un déficit commercial record, le dispositif existant a été renforcé par des mesures facilitant l'échange entre firmes d'informations relatives à l'exportation (le renouveau de l'agence française pour le développement international des entreprises, Ubifrance, en est un exemple). Un budget colossal a été affecté aux politiques de "clusters". Par exemple, 0,5 millards d'euros est dépensé annuellement au titre de la politique des pôles de compétitivité lancée en 2005 pour trois ans et renouvelée en 2009-2011. L'idée derrière ces initiatives est qu'une meilleure connaissance des marchés étrangers est susceptible d'améliorer la performance des entreprises à l'export. De manière générale, l'information sur les marchés étrangers peut provenir des interventions publiques, mais également de l'ensemble des exportateurs existants. La proximité d'autres exportateurs est bénéfique dans la mesure où elle donne lieu à des externalités (spillovers) positives informationnelles, des opportunités de réduction des coûts ainsi qu'à des possibilités de mutualisation des démarches vers les marchés internationaux.

Ce papier s'intéresse à l'existence et à la nature des externalités à l'export entre exportateurs. Sur la base de données très détaillées provenant des douanes françaises sur les exportations des entreprises, nous analysons l'impact de l'agglomération géographique des exportateurs sur les deux aspects de leur performance : la probabilité qu'ils exportent (la marge extensive) et le volume exporté (la marge intensive). Les contributions de ce papier sont de trois ordres.

D'abord, notre analyse s'appuie sur une base de données unique comprenant les exportations par pays selon une nomenclature produits très fine (nomenclature 8 chiffres) sur une période récente (1998-2003). Cette dimension produit permet d'étudier les externalités à un niveau plus approprié que la classification-industrie utilisée habituellement dans la littérature. Quant à la dimension pays de destination, elle fournit une information clef pour établir la nature des externalités (Krautheim, 2008).

Deuxièmement, nous explorons l'impact des externalités à l'export non seulement sur la décision d'exporter des firmes mais également sur le volume qu'elles exportent. Comme l'explique Chaney (2008), si une modification du coût fixe à l'exportation est susceptible de modifier la marge extensive du commerce, un changement dans le coût variable devrait, lui, affecter à la fois la marge extensive et la marge intensive. Notre analyse fournit ainsi le premier test empirique permettant d'identifier le canal précis de l'impact des externalités à l'export.

Troisièmement, nous décrivons en détail l'effet de l'agglomération géographique des firmes exportatrices sur le comportement des exportateurs sur les marchés étrangers. Globalement, on s'attend à ce que l'agglomération des exportateurs donne naissance à des externalités marchandes et non-marchandes, mais aussi renforce la concurrence sur le marché d'exportation. Un exemple d'externalité marchande est un dispositif qui permet aux firmes exportatrices de partager les coûts de leur communication destinée

aux consommateurs étrangers. Le réseau Cosmetic Valley constitué de producteurs de parfum et de cosmétiques localisés dans les régions Centre et Normandie est une bonne illustration de ces dispositifs destinés à communiquer à l'international sur un savoir-faire commun spécifique. Les externalités non-marchandes correspondent à des transferts informels d'informations qui peuvent être bénéfiques aux firmes locales à travers une réduction des coûts variable et fixe à l'export. Notre procédure d'estimation permet de mesurer l'effet net de l'ensemble des externalités positives et de la hausse de la concurrence associées à l'agglomération des exportateurs.

Notre analyse empirique porte donc sur la présence et l'ampleur des externalités locales à l'export sur les marges extensive (la décision de commencer à exporter) et intensive (le volume exporté) à l'export au niveau des entreprises. Nous analysons à partir d'une équation de gravité estimée au niveau firme, si la décision d'une firme de commencer à exporter ainsi que le volume exporté sont influencés par la présence alentour d'autres exportateurs du même produit et/ou vers le même pays. Les externalités sont considérés à un niveau géographique fin correspondant aux zones d'emploi (348 en France).

Nos résultats confirment la présence de externalités à l'export sur la décision d'exporter, mais pas sur le volume exporté. Nous interprétons ceci comme le signe que les externalités à l'export jouent sur le coût fixe plutôt que sur le coût variable d'exporter. La probabilité qu'une firme exporte un produit donné vers un pays donné augmente de 1,07 point de pourcentage par entreprise voisine supplémentaire qui exportait le même produit vers le même pays l'année précédente. Les externalités sur la décision d'exporter sont plus forts lorsqu'ils sont définis comme le nombre de firmes exportant le même produit vers le même pays. Ils ne sont en revanche pas significatifs au niveau lorsqu'ils comprennent l'ensemble des exportateurs quels que soient le produit exporté et le pays de destination.

Enfin, les externalités sont décroissants avec la distance : l'effet sur la décision individuelle d'exporter d'une firme du nombre d'autres exportateurs environnants est plus fort si ce nombre est mesuré à l'intérieur de la zone d'emploi. L'impact est moindre lorsque l'on s'intéresse aux firmes dans le reste de la région et encore moindre si l'on prend en compte les firmes des autres régions. Ce résultat est cohérent avec l'idée que les échanges d'information sont plus intenses et faciles sur des petites distances.

RÉSUMÉ COURT

Nous étudions la présence de "spillovers" locaux à l'export sur les marges extensive (la décision de commencer à exporter) et intensive (le volume exporté) à l'export. Nos estimations sont conduites sur des données d'exportations des firmes françaises au niveau produit et pays de destination entre 1998 et 2003. Nous analysons, à partir d'une équation de gravité estimée au niveau firme, si la décision d'une firme à commencer à exporter ainsi que le volume exporté sont influencés par la présence alentour d'autres exportateurs du même produit et/ou vers le même pays. Nos résultats indiquent la présence de externalités à l'export sur la décision d'exporter, mais pas sur le volume exporté. Nous interprétons ceci comme le signe que les externalités à l'export jouent sur le coût fixe plutôt que sur le coût variable d'exporter. Les externalités sur la décision d'exporter sont plus forts lorsqu'ils sont définis comme le nombre de firmes exportant le même produit vers le même pays et ne sont pas significatifs lorsqu'ils comprennent l'ensemble des exportateurs, quels que soient le produit exporté et le pays de destination.

Classification JEL : F1, R12, L25

Mots clés : Données individuelles de commerce, externalités à l'exportation spécifiques au produit et à la destination, agglomération.

LOCAL EXPORT SPILLOVERS IN FRANCE[1]

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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 to 2003, the foreign trade minister allocated specific public spending 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). Very large amounts of money were allocated to clusters initiatives. For example, 0.5 billion euros is spent yearly on the new policy of competitiveness clusters launched in 2005 for three years and extended to 2009-2011.

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. Proximity to other exporters may bring benefits like positive information externalities, cost-sharing opportunities and mutualized actions on export markets. Several national and local organizations are specifically aimed at fostering these effects through conferences on specific destination countries, financial support to participate to international fares, etc. For example, the Chamber of Commerce of Val-de-Marne (a French département near Paris) organizes gatherings dedicated to sharing export experiences. Its clubs Maghreb/Middle-East and America propose specific support to member firms in their attempts to develop their export activities in these regions. The usefulness of such actions to develop

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trust and informal relationships between local firms and successfully conquest new markets is attested by several entrepreneurs.

This paper builds on the existing literature analyzing the existence and the nature of local export spillovers[2] 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 sectoral agglomeration is beneficial 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 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 destina-

[2]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.

tion 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 (2009), 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[3] 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), a change in the fixed cost is expected to affect the extensive margin of trade only. A change in the variable cost is 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 exporters in the same area may give rise to market and non-market externalities, but also to higher competition on the export market. An example of market externality is the cost-sharing devices that allow firms to communicate together on their products to foreign consumers[4]. Non-market externalities involve informal information transfers, which may benefit local firms through a decrease in variable or fixed export costs. Our estimation procedure captures those two types of externalities, as well as the competition effect on the exported good's market. 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 destination or product specific, 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.

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

[4] 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.

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 us to include the fixed-effects needed to estimate correctly our model (see section 2.2). We consequently estimate successively our two equations. We first 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 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 part of the profit π_{ijkt} which contains observable characteristics of firms, areas and destination countries, and of the part ϵ_{ijkt} which depends on unobservable characteristics such as the manager's ability. 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:

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

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 current 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 1 when a firm exports product k to country j at time t whereas it did not at time $t-1$. We estimate this equation with a logit procedure, controlling for firm-product-country fixed-effects. Our effects are therefore estimated on 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:

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

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.

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 spillover variable. While 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 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-hand side variables one year.

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[5] 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 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 area 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

[5]Firm's TFP and the spillover variable is weakly correlated, 0.003 for the variables expressed in differences to the mean and 0.002 for the variables in levels.

high product expertise are all located in the same place[6], this could upward bias the estimation of spillovers. Figure 1 displays a very strong geographic concentration of exports[7] 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 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.

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.[8] It contains French export flows aggregated by firm, year, product (identified by a 8-digit code) and destination country, over the 1998-2003 period.[9] 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 (*Enquêtes Annuelles d'Entreprises*.) for the manufacturing sector over the same period, provided by the French ministry of Industry. Those surveys contain information on firms over 20 employees[10] 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' commut-

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

[7]The maps highlights the share of each employment area in total exports by single-plant firms over 20 employees.

[8]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.

[9]We drop product lines that changed classification at the 4-digit level over the period.

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

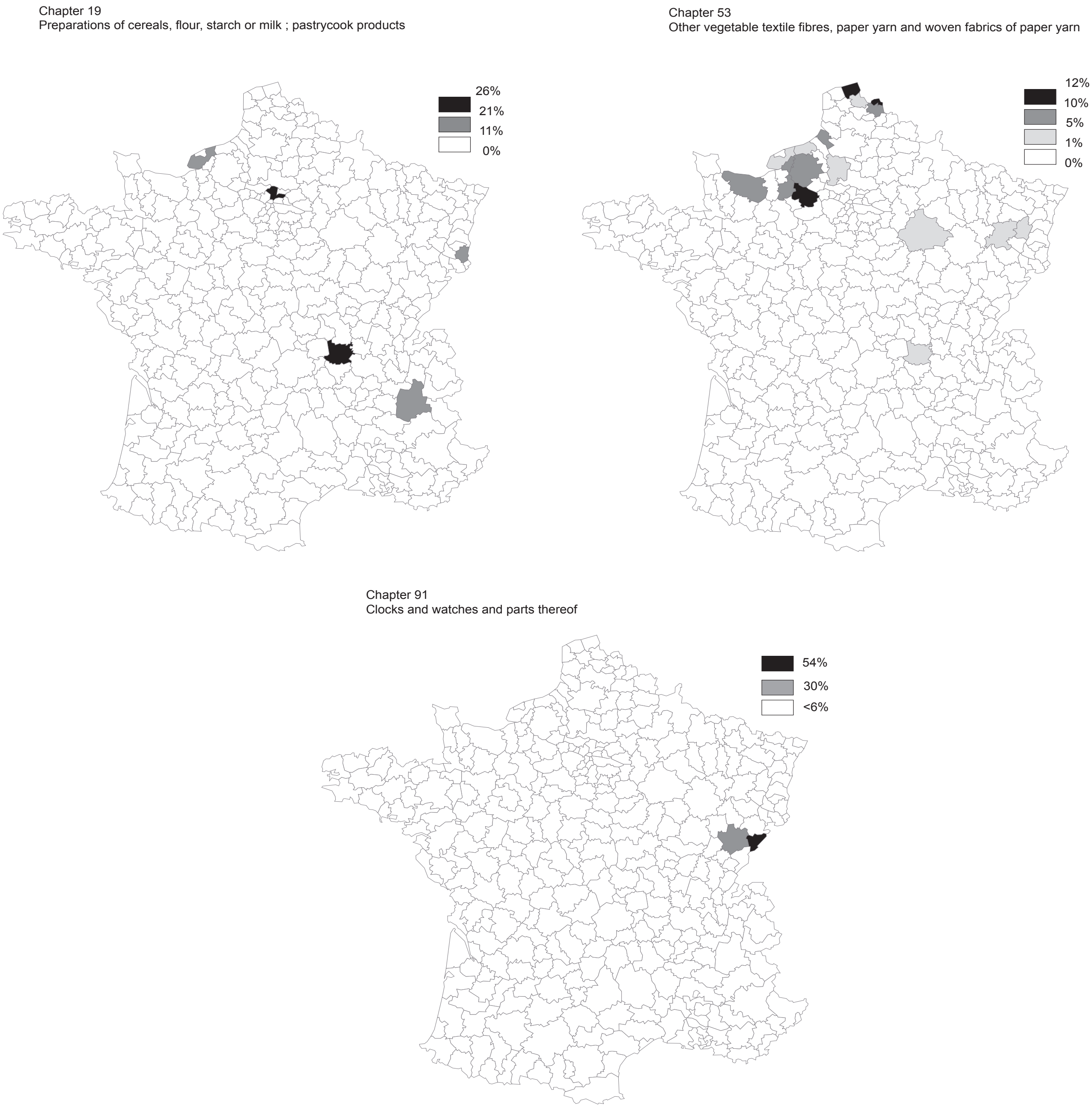

Figure 1 – Share of each employment area in total French exports by single-plant firms over 20 employees

ing schemes.[11] 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 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. Spillover 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.[12] We construct a specific database, incorporating the set of alternatives faced by each firm. These are defined as the product-country couples for which we observe at least one export start 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 sub-sample 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

[11] 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.

[12] For a given firm-product-country we can have several starts. For example, the subsequent export statuses 011001 become in our sample .1..01, with . denoting a missing value.

volume instead of the export value in order to avoid firm-level quality sorting and pricing issues mentioned in Crozet, Head and Mayer (2009).

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 wrist-watches in precious metal from wrist-watches in base-metal, alarm clocks, wall clocks, and time registers. Components disentangles clock movements, watch cases and watch straps. We compute the spillover 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 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 197 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:

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

While the other explanatory variables are expressed in logs, the spillover variable is used in levels (see end of section 4.1 for a discussion of this point). 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 the approach developed by Levinsohn and Petrin (2003), which attempts to solve both omitted variables (ability or risk aversion of the entrepreneur for example) and simultaneity bias (anticipation of macroeconomic shocks that could affect the choice of the level of inputs made by the entrepreneur) the estimation of firm-level productivity usually suffers from. We use the Annual Business Surveys to estimate Cobb-Douglas production functions at the 2-digit industry level. The observations for which value-added, employment or capital is missing, negative or null[13] are dropped. We deflate value-added data by a branch price-index and capital data by a an investment price index valid for all industrial sectors. Production functions are estimated on single plant firms only first, and then on the whole sample for our robustness checks. The coefficients we obtain are credible, lying between 0.1 and 0.3 for capital and 0.6 and 0.8 for labor according to industries, the sum of both being generally slightly below 1. Note that all our results are not sensitive to alternative TFP measures (OLS and GMM).

[13]We also dropped outliers, dropping 1% extremes for the following variables: capital intensity, yearly capital growth rate, yearly employment growth rate, yearly average work productivity growth rate, yearly average capital intensity growth rate.

Last, we add the variables concerning destination countries. Distance between France and each destination country is provided by CEPII[14]. 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).

Table 2 describes the sample used to estimate the decision to start exporting. Firms employ 77 workers 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 in average 11 products, and that each firm sells on average to nearly 11 countries. These relatively high numbers reflect the firm-level threshold of 100,000 euros of intra-EU15 shipments used by French customs (refer to footnote 7). The lower part of the table reports the values of the export spillover variables. The more specific by product and/or by destination is the variable, the smaller is the mean. There are for example on average 59 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 0.47 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 nearly 85% of the observations, there is no neighboring firms exporting the same product to the same country as the firm under scrutiny. In 9.4% of the cases, there is only one other exporting neighbor (to the same country-product pair) in the same area. The likelihood of having at least one exporting neighbor increases from 15.2% when the definition of spillovers is product-destination specific to 56.9% when it is product-specific, to 87.9% when it is destination-specific and to 99.9% when it is defined as all products-all destinations.

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

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 12 and are examined in section 4.2. Estimation results on the export volume are displayed in Tables 13 to 15 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. Regressions are performed using the product and destination specific spillover variable. From left to right, each column contains more control variables. All right-hand side variables are lagged one year. All regressions contain firm-product-country fixed-effects. Since we drop firms that change location, 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. We are thus estimating the effect of a change in the spillover variable in time on a change in the decision to start exporting. More precisely, the firm-product-country fixed-effect computes the difference to the mean within the firm-product-country triad. Hence, we are evaluating the effect of a change in the level of agglomeration in time, with respect to the average level of agglomeration over the entire period, at the firm-product-country level.

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 decision to start exporting, 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. The inclusion of the productivity variable, which coefficient appears positive and significant, does not however affect the coefficient on the spillover variable. The coefficient on the spillover variable remains positive and significant.

In column 4 we add total employment in the area. This variable has an insignificant effect on the decision to start exporting. Its inclusion does not affect the coefficient on the spillover variable. It remains significant and positive with a coefficient equal to .051, 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 1.07 percentage point.[15] 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 645,268 to 9,007 but the explanatory power of the regression increases from 9.17 to 14.42%. The impact of spillovers declines but remains significant and positive with a coefficient equal to .033 suggesting that an additional neighbor increases the probability to start exporting by roughly 0.69 percentage point.[16] We conclude 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 A-1 in the Appendix further investigates the appropriateness of the linear specification of the spillovers. Column 1 of Table A-1 replicates, for comparison, the results of column 4 in Table 4, hence our preferred specification using the most specific export spillover variable. The linearity of the spillovers effect is investigated in the three remaining columns of Table A-1. 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 spillover 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 (0.072) 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 (+1.68 percentage point)[17] to start exporting than firms with no exporting neighbors.

Table 4 has allowed us to investigate the presence of export spillovers. We now turn to further

[15] 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 30%, suggest that the derivative of starting exporting with respect to an additional neighbor is 1.07%=0.051×(0.30)×(1-0.30).

[16] This figure is the derivative of the probability of starting to export with respect to having at least 3 neighbors: 0.69%=0.033×(0.30)×(1-0.30).

[17] This figure is the derivative of the probability of starting to export with respect to having a strictly positive number of neighbors: 1.68%=0.08*(1-0.30)*(0.30).

estimation results analyzing their nature and scope.

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

We first 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 obtained using the preferred specification, 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 variable is not significant. While the three other spillover variables show positive and significant coefficients, the table displays a hierarchy ranking from .008 for country-specific spillovers to .051 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?"[18] 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's demand have a larger explanatory power of the decision to start exporting than the spillover variables. Still, a one standard-deviation increase in each of the three significant agglomeration variables increases the probability to export by 0.39 to 0.55 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.

Our results on the effect of neighboring exporters are estimated on the time variation within a firm-product-country triad, however the coefficient can also be interpreted as a theoretical experiment of moving a firm from her original region to a region where the level of spillovers is higher, everything else equal. This is what the lower part of the table does, by relying on between variation to compute standard deviation. Results 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 three significant agglomeration variables increases the prob-

[18] 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 0.30, the average probability of exporting in our sample.

ability to export by 1.87 to 7.01 percentage points across firm-product-country triads. This is because the much larger standard deviations across groups than within groups.

4.2.2. Wages, urbanization economies, and size of industry

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). The coefficient on wages is positive and significant, potentially because it is correlated with TFP. Still, the interesting result is that the coefficient on the spillover 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 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[19]. Results show that the coefficient on our product-country export spillovers remains unchanged. The effect of the second spillover variable is positive and slightly significant. This means that the 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.

Columns 4 and 5 of 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 spillover variable computed on the number of firms by a spillover 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 coefficient on firms' size is only significant

[19]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$_{zkjt}$.

at the 10% level. This result suggests that for a given number of exporters in the area, a bigger size does not bring large additional benefits.

4.2.3. Spatial decay

Columns 6 through 9 investigate the geographical scope of the microeconomic mechanism. We estimate in column 6 the preferred specification, adding additional spillover 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 spillover variables are positive and significant, and show a decreasing trend with distance from the initial firm. The probability of starting to export increases by 0.9 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 (0.3 percentage point) and almost six times smaller when locating in a different region (0.17 percentage point).

Column 7 performs the same estimation, however using product specific spillover 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 less 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 highlights the localized feature of the 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. Indeed, 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.

The last two columns in Table 7 reproduce the two previous columns adding product-year fixed-effects defined at the SH2 level.[20] We find that the spatial decay resists the inclusion of product-year fixed effect controlling for product-specific factors that vary over time such as tariffs. Columns 8 and 9 are estimated with a linear probability model. Coefficients on the spillover variables are the marginal effects: they are very close to the marginal effects computed in columns 6 and 7.

The explanatory power of the three spillover variables at different geographical scales (area, region, and nation) is investigated in Table 8. For both product and destination specific and

[20]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 to compute product-year fixed-effects.

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.

4.2.4. Robustness to different sub-samples

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 alternative measures of spillovers and a variety of different sub-samples. .

In the first two columns of Table 9, we question the comparison between export spillovers captured by the number of exporting neighbors and export economies within the firm. Column 1 reproduces our preferred specification (column 4 of Table 4) 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 these variables to affect positively the probability of starting to export. Our results confirm these predictions while leaving the impact of spillovers unchanged.

In columns 3 to 10 of Table 9, we find that the influence of spillovers does not depend on firm's size. In column 3 we interact our spillover indicator with the firm's number of employees. The interactive term fails to enter significantly. In columns 4 to 7 we run separate regressions for low-employment and high-employment firms. In columns 4 and 5 the cut-off corresponds to the median size (39 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. Indeed the difference in the coefficients does not seem to be significant. The last three columns investigate heterogeneity between single and multi-plant firms in the left-hand side variable. Column 8 refers to the whole sample. Columns 9 and 10 refer respectively to single-plant firms and multi-plant firms. It seems that multi-plant firms benefit less from spillovers than single-plant ones; the insignificance of the interaction term in column 8 suggests that this is not due to size differences. However the difference in the coefficients is not significant, and it is difficult to assess if the detected differences in coefficients would reflect measurement errors or a true heterogeneity of the impact of exporters agglomeration across those two types of firms.

We verify that the main message of the paper holds when restricting our attention to observations corresponding to significant export flows, in Table 10. First, we restrict the sample to export intensive firms defined as exporting at least 5% of their total sales, as in Mayer and Ottaviano (2008), in columns 1 to 4. Second, we focus on significant exported products, defined as products representing at least the sample median of the share of products in the firm's total sales, in columns 5 to 8. While the sample size is logically reduced, our estimates are unchanged.[21]

[21] We thank an anonymous referee for suggesting this robustness check. Note that we also estimate our preferred specification on the sub-sample of firms that, having started to export, do not revert back to a non-trade status. We use two definitions of permanent switchers: firms that start to export and export for at least one, or two additional

Finally, Table 11 reproduces the estimation relative to the spatial decay, column 6 of Table 7, using different samples. Identical results are obtained while relying on the SH2 nomenclature instead of the SH4 nomenclature. While the sample size is roughly divided by two (the number of observations is reduced from 645,268 to 322,903), 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)[22] does not affect the results.

4.2.5. Specification tests

Further robustness checks involve specification tests. In the right-hand side panel of Table 11, the explained variable is the export status of the firm, and not the decision to start exporting. It is defined as 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 doubled. Again our results are 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 export status at the firm-product-destination level.

In the benchmark regression based on fixed-effect, we are interested in the effect of a change in the levels of spillovers with respect to the average level of spillovers within the triad firm-product-country over the entire period. Table 12 provides an alternative specification test, in which we specify the right-hand variables in first differences. We thus explain the decision to start exporting by a one-year change in the explanatory variables. The effect of spillovers is here more short-run than in the fixed-effect specification, which, in identifying the effect on time-variations with respect to the mean, allows the impact of spillovers to last longer. Table 12 highlights that the effect of all spillover variables is smaller than in the benchmark results (Table 4). The product-country spillover variable is now the only one to be significant.

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. Estimation results are thus conditional on the fact that firms export. Results are displayed in Tables 13, 14 and 15.

Table 13 contains the results of the base estimation in a similar way as Table 4 did for the extensive margin. From left to right, 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

years. The sample is respectively divided by 6 and 20. This is consistent with the literature on volatility of the export status at the firm-product-destination level (Muraközy and Békes, 2009). The effect of product and destination specific spillovers remains significant at the 10% level.

[22]We consider that all multi-plant firms' export flows originate from their headquarter. Spillover 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.

variables impact the export volume in the expected way. Estimations of the coefficient on the spillover 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 10% 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 691,132 to 26,618. 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 14 investigates the nature of potential export spillovers on the export volume. The positive and significant coefficient discussed above on the product and country specific spillover variable appears in the last column, however none of the other coefficients are significant.

Table 15 reports robustness checks similar to those in Table 7. The coefficient on spillovers appears positive and significant (at the 10% level) with the controls in columns 1 and 2. In the remaining columns, the estimates fail to show significant export spillovers. 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. A spatial decay structure does come out of the results, however without any significant coefficient. In column 8, the inclusion of product-time fixed-effects lowers the coefficient on spillovers, which is still not significant.

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 A-1 Logit on the decision to start exporting / Specification test

Model :	(1)	(2)	(3)	(4)
ln (firm's employees)	0.570^a	0.570^a	0.571^a	0.311
	(0.075)	(0.075)	(0.075)	(0.202)
ln (firm's TFP)	0.118^a	0.118^a	0.118^a	0.241^c
	(0.035)	(0.035)	(0.035)	(0.138)
ln (total employment in area)	0.884	0.887	0.891	-1.416
	(0.585)	(0.585)	(0.585)	(1.664)
ln (destination country's imports)	0.174^a	0.174^a	0.175^a	0.586^c
	(0.013)	(0.013)	(0.013)	(0.321)
# other firms in the area, same prod./dest.	0.051^a			0.033^a
	(0.009)			(0.010)
1 firm in the area, same prod./dest.		0.072^a		
		(0.018)		
2 firms in the area, same prod./dest.		0.127^a		
		(0.028)		
3 firms in the area, same prod./dest.		0.184^a		
		(0.045)		
4 firms in the area, same prod./dest.		0.201^a		
		(0.060)		
5 firms in the area, same prod./dest.		0.234^a		
		(0.073)		
6-10 firms in the area, same prod./dest.		0.315^b		
		(0.135)		
More than 10 firms in the area, same prod./dest.		0.528^a		
		(0.196)		
Strictly positive # firms in the area, same prod./dest.			0.080^a	
			(0.018)	
Observations	645268	645268	645268	9007
Year fixed-effects	yes	yes	yes	yes
Firm-country-product fixed-effects	yes	yes	yes	yes
R^2	0.09	0.09	0.09	0.14

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 prod./dest. is greater than 3. All explanatory variables are time specific and lagged one year with respect to the explained variable.

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 – Descriptive statistics (sample used in Tables 3 to 5)

Variable	Mean	Std. Dev.	Min	Max
Firm employees	77.1	170.9	2.5	6166
Total employment in the area	181556.8	283560.8	4630.75	1689989
Firm value added	3751.1	12196.5	219.1	575363
Destination country's demand, product specific	351897.5	1474511	0.6	4.62×10^7
Distance	3107.2	3451.3	262.4	19263.9
# of exported products	11	13.8	1	277
# of destination countries	10.5	12.9	1	116
# other firms in the area, all products-all destinations	58.8	72.9	0	350
# other firms in the area, all products-same destination	18	30.1	0	223.3
# other firms in the area, same product-all destinations	3	6.6	0	62
# other firms in the area, same product-same destination	0.47	1.7	0	35.5
Nb of firms	8071			

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	84.8%	12.1%	43.1%	0.1%
1	9.4%	10.1%	18.7%	0.2%
2	2.7%	8.2%	9.9%	0.3%
3-5	2.2%	17.3%	13.3%	2.1%
6-10	0.7%	16.9%	7.9%	6.8%
>10	0.2%	35.4%	7.1%	90.5%
Nb of observations	645268			

Table 4 – Logit on the decision to start exporting / Same product-same destination spillovers

Model :	(1)	(2)	(3)	(4)	(5)
ln (firm's employees)	0.572^a	0.571^a	0.579^a	0.570^a	0.311
	(0.077)	(0.077)	(0.075)	(0.075)	(0.202)
ln (destination country's imports, product specific)	0.177^a	0.175^a	0.175^a	0.174^a	0.586^c
	(0.013)	(0.013)	(0.013)	(0.013)	(0.321)
# other firms in the area, same product-same destination		0.051^a	0.051^a	0.051^a	0.033^a
		(0.009)	(0.009)	(0.009)	(0.010)
ln (firm's TFP)			0.120^a	0.118^a	0.241^c
			(0.034)	(0.035)	(0.138)
ln (total employment in area)				0.884	-1.416
				(0.585)	(1.664)
Observations	645268	645268	645268	645268	9007
Year fixed-effects	yes	yes	yes	yes	yes
Firm-country-product fixed-effects	yes	yes	yes	yes	yes
R^2	0.09	0.09	0.09	0.09	0.14

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. In column 5 the sample is restricted to observations for which the number of firms in the area, same product-same destination is greater than 3.

Table 5 – Logit on the decision to start exporting / Different product-destination spillovers

Model :	(1)	(2)	(3)	(4)
ln (firm's employees)	0.570^a	0.570^a	0.568^a	0.570^a
	(0.074)	(0.075)	(0.075)	(0.075)
ln (firm's TFP)	0.118^a	0.119^a	0.119^a	0.118^a
	(0.035)	(0.035)	(0.035)	(0.035)
ln (total employment in the area)	0.869	0.842	0.874	0.884
	(0.582)	(0.586)	(0.586)	(0.585)
ln (destination country's imports, product specific)	0.176^a	0.172^a	0.175^a	0.174^a
	(0.013)	(0.013)	(0.013)	(0.013)
# other firms in the area, all products-all destinations	0.001			
	(0.001)			
# other firms in the area, all products-same destination		0.008^a		
		(0.003)		
# other firms in the area, same product-all destinations			0.012^b	
			(0.005)	
# other firms in the area, same product-same destination				0.051^a
				(0.009)
Observations	645268	645268	645268	645268
Year fixed-effects	yes	yes	yes	yes
Firm-country-product fixed-effects	yes	yes	yes	yes
R^2	0.09	0.09	0.09	0.09

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 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)
Firm's employees	126.1	19.07	2.57
Firm's TFP	67.6	26.8	1.24
Destination country's demand, product specific	426157	248572	2.56
# of other exporters in the area, same product-same destination	0.31	0.35	0.55
# of other exporters in the area, same product-all destinations	3.03	1.07	0.39
# of other exporters in the area, all products-same destination	14.51	2.11	0.53
Between variation			
Variable	Mean	Std-dev.	Expl. power (% point)
Firm's employees	126.1	209.46	22.92
Firm's TFP	67.6	48.95	2.04
Destination country's demand, product specific	426157	2109558	11.19
# of other exporters in the area, same product-same destination	0.31	1.16	1.87
# of other exporters in the area, same product-all destinations	3.03	6.54	2.45
# of other exporters in the area, all products-same destination	14.51	25.53	7.01

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 2.57% based on within variation and of 22.92% based on between variation.

Table 7 – Logit on the decision to start exporting / Different product-destination spillovers / Robustness checks

Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln (firm's employees)	0.63^a	0.56^a	0.569^a	0.570^a	0.570^a	0.566^a	0.564^a	0.122^a	0.122^a
ln (firm's TFP)	0.08^b	0.12^a	0.118^a	$0. 118^a$	0.118^a	0.119^a	0.119^a	0.027^a	0.027^a
ln (firm's mean wage)	0.29^a								
ln (total employment in the area)	0.91	0.81	0.871	0.889	0.884	0.868	0.831	0.288^c	0.282^c
ln (destination country's imports)	0.17^a	0.17^a	0.174^a	0.175^a	0.174^a	0.166^a	0.171^a	0.039^a	0.040^a
# firms (area), same prod./dest.	0.05^a	0.05^a	0.054^a		0.048^a	0.042^a		0.010^a	
ln (1+# other exported products)		0.37^a							
# firms (area)			0.01^b						
# employees (area)				0.0002^a					
Mean size of exporting firms					0.0001^c				
# firms (region), same prod./dest.						0.014^a		0.003^a	
# firms (France), same prod./dest.						0.008^a		0.002^a	
# firms (area), same prod.-all dest.							0.008^c		0.002
# firms (region), same prod.-all dest.							0.003^a		0.0008^b
# firms (France), same prod.-all dest.							0.0007^a		0.0003^a
Observations	644740	645268	645268	645268	645268	645268	645268	645268	645268
R^2	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08
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

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 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 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	0.35	0.45
# of other exporters in region but the area, same product-same destination	1.76	0.93	0.41
# of other exporters in France but the region, same product-same destination	17.10	3.95	1.02
Between variation			
Variable	Mean	Std-dev.	Expl. power (% point)
# of other exporters in the area, same product-same destination	0.31	1.16	1.51
# of other exporters in region but the area, same product-same destination	1.76	4.86	2.21
# of other exporters in France but the region, same product-same destination	17.10	31.98	9.33

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 start exporting by 0.45% based on within variation and of 1.51% based on between variation.

Table 9 – Logit on the decision to start exporting / Different product-destination spillovers / Robustness checks

Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
				Employment					Firm type	
				<39	≥39	<69	≥69	All	Single-plant	Multi-plant
ln (firm's employees)	0.470^a	0.503^a	0.569^a	0.410^a	0.657^a	0.423^a	0.829^a	0.388^a	0.540^a	0.316^b
	(0.067)	(0.070)	(0.075)	(0.110)	(0.096)	(0.084)	(0.119)	(0.112)	(0.095)	(0.135)
ln (firm's TFP)	0.093^a	0.110^a	0.118^a	0.116	0.120^a	0.137^a	0.083^c	0.094^b	0.034	0.167^a
	(0.033)	(0.033)	(0.035)	(0.071)	(0.045)	(0.045)	(0.049)	(0.037)	(0.050)	(0.052)
ln (total employment in the area)	0.778	0.928^c	0.884	2.241	0.400	1.705^c	-0.185	2.472^a	1.921^a	2.950^b
	(0.542)	(0.532)	(0.585)	(1.564)	(0.674)	(0.964)	(0.943)	(0.929)	(0.717)	(1.397)
ln (destination country's imports)	0.173^a	0.165^a	0.174^a	0.195^a	0.168^a	0.172^a	0.179^a	0.167^a	0.177^a	0.158^a
	(0.013)	(0.013)	(0.013)	(0.025)	(0.015)	(0.018)	(0.017)	(0.014)	(0.017)	(0.017)
# firms, same prod./dest.	0.051^a	0.050^a	0.041	0.039^a	0.059^a	0.049^a	0.054^a	0.022^a	0.033^a	0.023^a
	(0.010)	(0.010)	(0.031)	(0.010)	(0.012)	(0.011)	(0.017)	(0.008)	(0.010)	(0.002)
# destinations, same firm-same dest.	0.103^a									
	(0.005)									
# products, same firm-same dest.		0.113^a								
		(0.010)								
# firms, same prod./dest.			0.002					0.001		
interacted with ln (firm's employees)			(0.008)					(0.001)		
Observations	645268	645268	645268	165671	479597	336464	308804	889193	363134	469388
R^2	0.10	0.10	0.09	0.10	0.09	0.09	0.09	0.09	0.10	0.09
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

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 area level. All explanatory variables are time specific and lagged one year with respect to the explained variable.

Table 10 – Logit on the decision to start exporting / Different product-destination spillovers / Intensive exporters

Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Exports at least 5% of total sales				Exclusion of bottom half of products			
ln (firm's employees)	0.575^a	0.576^a	0.574^a	0.576^a	0.540^a	0.540^a	0.538^a	0.540^a
	(0.084)	(0.084)	(0.084)	(0.084)	(0.078)	(0.078)	(0.078)	(0.079)
ln (firm's TFP)	0.117^a	0.117^a	0.117^a	0.116^a	0.100^a	0.100^a	0.100^a	0.100^a
	(0.037)	(0.037)	(0.037)	(0.037)	(0.035)	(0.035)	(0.035)	(0.035)
ln (total employment in area)	0.872	0.840	0.873	0.879	1.000	0.974	1.005	1.015
	(0.611)	(0.614)	(0.613)	(0.612)	(0.830)	(0.826)	(0.834)	(0.832)
ln (destination country's imports)	0.174^a	0.171^a	0.173^a	0.173^a	0.190^a	0.187^a	0.189^a	0.189^a
	(0.014)	(0.013)	(0.013)	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)
# other firms, all prod./dest.	0.001				0.001			
	(0.001)				(0.002)			
# other firms, all prod./dest.		0.008^b				0.008^b		
		(0.003)				(0.003)		
# other firms, same prod.-all dest.			0.009^c				0.011^b	
			(0.005)				(0.005)	
# other firms, same prod./dest.				0.050^a				0.052^a
				(0.010)				(0.012)
Observations	574158	574158	574158	574158	484152	484152	484152	484152
R^2	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10
Year fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes
Firm-country-product fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes

All regressions are conditional logit estimations. The sample is restricted to "intensive exporters". They are defined as firms exporting at least 5% of total sales in columns 1 to 4 and as products representing at least the sample median of the share of products in the firm's total sales, in columns 5 to 8. 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.

Table 11 – Logit on the decision to start exporting & export status / Different product-destination spillovers / Robustness checks

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				export status			
ln (firm's employees)	0.566^a	0.551^a	0.385^a	0.504^a	0.557^a	0.587^a	0.432^a	0.534^a
	(0.075)	(0.073)	(0.109)	(0.096)	(0.068)	(0.061)	(0.068)	(0.066)
ln (firm's TFP)	0.119^a	0.126^a	0.095^a	0.110^a	0.138^a	0.162^a	0.106^a	0.144^a
	(0.035)	(0.038)	(0.037)	(0.030)	(0.029)	(0.032)	(0.026)	(0.031)
ln (total employment in area)	0.868	1.065^c	2.471^a	0.425	0.132	0.183	1.445^b	-0.086
	(0.588)	(0.628)	(0.933)	(0.528)	(0.486)	(0.443)	(0.734)	(0.546)
ln (destination country's imports)	0.166^a	0.346^a	0.157^a	0.275^a	0.134^a	0.315^a	0.122^a	0.259^a
	(0.013)	(0.029)	(0.013)	(0.025)	(0.010)	(0.020)	(0.009)	(0.020)
# firms (area), same prod./dest.	0.042^a	0.017^c	0.020^a	0.015^a	0.033^a	0.017^a	0.017^a	0.012^a
	(0.009)	(0.009)	(0.003)	(0.002)	(0.007)	(0.005)	(0.001)	(0.002)
# firms (region), same prod./dest.	0.014^a	0.005^b	0.010^a	0.003^a	0.008^a	0.004^a	0.005^a	0.002^b
	(0.004)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
# firms (France), same prod./dest.	0.008^a	0.002^a	0.005^a	0.002^a	0.006^a	0.001^a	0.004^a	0.001^a
	(0.001)	(0.0005)	(0.001)	(0.0003)	(0.001)	(0.0002)	(0.0003)	(0.0002)
Observations	645268	322903	889193	419564	1262111	674256	1777736	900292
R^2	0.09	0.10	0.09	0.10	0.0043	0.0055	0.0037	0.0045
Year fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes
Firm-country-product fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes

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 area level. All explanatory variables are time specific and lagged one year with respect to the explained variable.

Table 12 – Logit on the decision to start exporting / Different product-destination spillovers (first differences)

Model :	(1)	(2)	(3)	(4)
Δ ln (firm employees)	0.268^a	0.268^a	0.268^a	0.268^a
	(0.044)	(0.044)	(0.044)	(0.044)
Δ ln (TFP_it)	0.010	0.010	0.009	0.009
	(0.023)	(0.023)	(0.023)	(0.023)
Δ ln (Total employment_zt)	1.355^a	1.331^a	1.343^a	1.337^a
	(0.505)	(0.504)	(0.505)	(0.504)
Δ ln Imports_jkt	0.069^a	0.069^a	0.069^a	0.069^a
	(0.008)	(0.008)	(0.008)	(0.008)
Δ # other firms in the area, all prod./dest.	-0.001			
	(0.002)			
Δ # other firms in the area, all prod.-same dest.		0.002		
		(0.002)		
Δ # other firms in the area, same prod.-all dest.			0.001	
			(0.003)	
Δ # other firms in the area, same prod./dest.				0.025^a
				(0.007)
Observations	583440	583440	583440	583440
R^2	0.07	0.07	0.07	0.07
Year fixed-effects	yes	yes	yes	yes
product (SH2)-time fixed-effects	no	no	no	no

All regressions are logit estimations with right hand side variables in first difference. 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.

Table 13 – OLS on the export volume / Same country-product spillovers

Model :	(1)	(2)	(3)	(4)	(5)
ln (firm's employees)	0.231^a	0.231^a	0.238^a	0.229^a	0.383^c
	(0.063)	(0.063)	(0.060)	(0.059)	(0.195)
ln (destination country's imports, product specific)	0.120^a	0.120^a	0.118^a	0.116^a	0.318
	(0.022)	(0.022)	(0.022)	(0.021)	(0.208)
# other firms in the area, same product-same destination		0.012^c	0.012^c	0.012^c	0.010
		(0.007)	(0.007)	(0.007)	(0.007)
ln (firm's TFP)			0.058^a	0.056^a	0.113^c
			(0.019)	(0.019)	(0.065)
ln (total employment in area)				0.899^c	1.691^a
				(0.467)	(0.525)
Observations	691132	691132	691132	691132	26618
R^2	0.001	0.001	0.001	0.002	0.010
Year fixed-effects	yes	yes	yes	yes	yes
Firm-country-product fixed-effects	yes	yes	yes	yes	yes

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 5 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.

Table 14 – OLS on the export volume / Different product-destination spillovers

Model :	(1)	(2)	(3)	(4)
ln (firm's employees)	0.229[a]	0.229[a]	0.229[a]	0.229[a]
	(0.059)	(0.059)	(0.059)	(0.059)
ln (firm's TFP)	0.056[a]	0.056[a]	0.056[a]	0.056[a]
	(0.019)	(0.019)	(0.019)	(0.019)
ln (total employment in area)	0.865[c]	0.897[c]	0.902[c]	0.899[c]
	(0.464)	(0.470)	(0.469)	(0.467)
ln (destination country's imports, product specific)	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		0.001		
		(0.001)		
# other firms in the area, same product-all destinations			0.002	
			(0.003)	
# other firms in the area, same product-same destination				0.012[c]
				(0.007)
Observations	691132	691132	691132	691132
R^2	0.002	0.002	0.001	0.002
Year fixed effects	yes	yes	yes	yes
Firm-Country-Product fixed effects	yes	yes	yes	yes

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.

Table 15 – OLS on the export volume / Robustness checks

Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln (firm's employees)	0.24^a	0.23^a	0.23^a	0.23^a	0.23^a	0.23^a	0.23^a	0.22^a	0.22^a
ln (firm's TFP)	0.05^b	0.06^a	0.06^a	$0.\ 06^a$	0.06^a	0.06^a	0.06^a	0.06^a	0.06^a
ln (firm's mean wage)	0.05								
ln (total employment in the area)	0.91^c	0.88^c	0.89^c	0.90^c	0.90^c	0.90^c	0.90^c	0.93^b	0.93^b
ln (destination country's imports)	0.12^a	0.12^a	0.12^a	0.12^a	0.12^a	0.12^a	0.12^a	0.11^a	0.109^a
# firms (area), same prod./dest.	0.01^c	0.01^c	0.01		0.01	0.01		0.01	
ln (1+# exported products)		0.07							
# firms (area), other prod.-same dest.			0.01						
# employees in the area, same prod./dest.				0.01^c					
ln (mean size, same prod./dest.)					0.01				
# firms (region), same prod./dest.						0.004		0.01	
# firms (France), same prod./dest.						0.01		0.01	
# firms (area), all prod.-same dest.							0.01		0.01
# firms (region), all prod.-same dest.							0.01		0.01
# firms (France), all prod.-same dest.							0.01		0.01
Observations	690606	691132	691132	691132	691132	691132	691132	691132	691132
R^2	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.004
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

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.

6. References

AITKEN B., G. H. HANSON AND A. E. HARRISON, 1997, "Spillovers, foreign investment, and export behavior", *Journal of International Economics*, 43(1-2), 103-132.

ARTUS P., AND L. FONTAGNÉ, 2006, "Evolution récente du commerce extérieur français", *Rapport CAE* No. 64

BARRIOS S., H. GÖRG AND E. STROBL, 2003, "Explaining Firms' Export Behaviour: R&D, Spillovers and the Destination Market", *Oxford Bulletin of Economics and Statistics* 65(4), 475-496.

BERNARD A. AND J. B. JENSEN, 2004, "Why Do Firms Export", *The Review of Economics and Statistics*, 86 (2), 561-569.

BERNARD A. AND J. B. JENSEN, 1999, "Exceptional Exporter Performance: cause, effect or both?", *Journal of International Economics*, 47, 1-25.

BERNARD A., S. J. REDDING AND P. K. SCHOTT, 2006, "Multi-product Firms and Trade liberalization", Working paper.

CHANEY, T., 2008, "Distorted Gravity: the Intensive and Extensive Margins of International Trade", *American Economic Review*, 98(4).

CROZET M., K. HEAD AND T. MAYER, 2009, "Quality sorting and trade: Firm-level evidence for French wine", CEPR Discussion paper #7295.

GAULIER G., S. ZIGNAGO, 2008, "BACI: A World Database of International Trade at the Product-level, 1995-2004 version", CEPII working paper.

GREENAWAY D., R. KNELLER, 2008, "Exporting, Productivity and Agglomeration", *European Economic Review*, 52: 919-939.

GREENAWAY D., N. SOUSA AND K. WAKELIN, 2004, "Do Domestic Firms Learn to Export from Multinationals?", *European Journal of Political Economy*, 20, 1027-1043.

HEAD K., AND T. MAYER, 2004, "Market Potential and the Location of Japanese Firms in the European Union", *Review of Economics and Statistics*, 86(4): 959-972.

JACOBS J., 1969, "The economy of cities", New-York : Random House.

JAFFE A.B., M. TRAJTENBERG AND R. HENDERSON, 1993, "Geographic Localization of knowledge spillovers as evidenced by patent citations", *Quarterly Journal of Economics*, 108, 577-598.

KNELLER R., M. PISU, 2007, "Industrial Linkages and Export Spillovers from FDI", *The World Economy*, 30(1), 105-134.

KOENIG P., 2009, "Agglomeration and the Export Decisions of French Firms", *Journal of Urban Economics*, forthcoming.

KRAUTHEIM S., 2008, "Gravity and Information: Heterogenous Firms, Exporter Networks and the 'Distance Puzzle"', *EUI Mimeo*.

LEVINSOHN J. AND A. PETRIN, 2003, "Estimating Production Functions Using Inputs to Control for Unobservables", *The Review of Economic Studies*, 70(2):317-342.

MARTIN P., T. MAYER AND F. MAYNERIS, 2008, "Spatial Concentration and firm-level productivity in France", *CEPR Discussion Paper* No. 6858.

MAYER T. AND G.I.P. OTTAVIANO, 2008, "The Happy-few: the internationalisation of European firms", *Intereconomics: Review of European Economic Policy*, 43(3):135-148.

MELITZ M., 2003, "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", *Econometrica*, 71(6), 1695-1725.

MELITZ M. AND G.I.P. OTTAVIANO, 2008, "Market size, Trade and Productivity", *The Review of Economic Studies*, 75(1), 295-316.

MOULTON B. R., 1990, "An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Unit", *The Review of Economics and Statistics*, 72(2), 334-338.

MURAKÖZY B. AND G. BÉKÉS, 2009, "Temporary Trade", Institute of Economics, Hungarian Academy of Sciences, Discussion paper 2009/09.

OLLEY, S. G. AND PAKES, A., 1996, "The dynamics of productivity in the telecommunications equipment industry", *Econometrica*, 64(6), 1263-1297.

RAUCH J. E. AND J. WATSON, 2003, "Starting small in an unfamiliar environment", *International Journal of Industrial Organization*, 21(7), 1021-1042.

ROBERTS M. J AND J. R. TYBOUT, 1997, "The decision to export in Colombia: an empirical model of entry with sunk costs", *American Economic Review*, 87(4), 545-564.

TRAIN K., 2003, Discrete Choice Methods with Simulation, Cambridge University Press.

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