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Local and Sectoral Import Spillovers in Sweden

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Abstract
In this paper I investigate the relevance and explore the nature of import spillovers on the firms' decision to start importing using an exceptionally detailed data set on Swedish firms' imports, at the product-level and by source-country, spanning the period between 1997 and 2011. I study whether the presence of established importers located in the same area and/or operating in the same industry influences the import behavior of individual firms. The import side of trade has received relatively less attention in the literature and this tendency carries over to the study of spillovers that have mainly been researched from the exporters' perspective. There are however reasons to believe that import spillovers are indeed a relevant phenomenon. This paper bridges the gap in the literature and further contributes to the understanding of import spillovers by laying out a theoretical framework that formalizes the main forces at play. I develop a model for firms' import decisions featuring heterogeneous firms, product and country specific fixed costs of sourcing while additionally accommodating spillovers. To the best of my knowledge, this is one of only a handful of papers to study spillovers for import activities, and the first to provide theoretical insights for this mechanism.

Keywords: importers, spillovers
JEL Classifications: F; R

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1 Introduction:

A well known finding in the *"new new"* trade literature is that firm characteristics matter for firms' participation in international activities. Both exporting as well as importing involve significant fixed entry costs that only the most productive firms can afford to incur.

A significant part of the costs associated with importing can be thought of as informational transaction costs. These include *inter alia* costs related to acquiring information about the availability, prices and quality of foreign intermediates, the specific technical characteristics of these goods and their compatibility with domestic regulations but also with the the firm's production process and its workers' skills; identifying potential suppliers and verifying their credentials as well as familiarizing with a different business environment and the conditions of contract enforcement in a foreign country. In Appendix 6 I summarize in more detail the difficulties faced by Swedish importers as they are presented in a survey conducted by the Kommerskolegium[1]. In the same Appendix, I also cite the difficulties of international sourcing as they have been identified by other national authorities, like the Canadian Board of Trade and the respective services of the United Kingdom and Northern Ireland.

This paper, explores whether the presence of established importers located in the same area and/or operating in the same industry influences the import decisions of Swedish manufacturing firms. I build on the idea that the agglomeration of importers in a certain region/industry may generate important information that can be accessible by other firms in the region/industry, lowering the fixed costs related to sourcing inputs from abroad and hence facilitating their decision to follow suit.

The import side of trade has received relatively less attention in the literature and this tendency carries over to the study of spillovers. The effect of peers located in the same region or operating in the same industry on firms' international decisions has mainly been studied in an empirical framework and from the exporter's perspective[2]. There are however reasons to believe that import spillovers are indeed a relevant phenomenon that should be explored more.

The export bias in the trade literature is at odds with the preponderance of trade in intermediates in global trade flows. Indeed, trade in intermediates has grown to be a salient part of global trade, representing more than half of the global trade volume. Fully understanding the determinants of the decision to import intermediates from abroad as well as the mechanisms that facilitate international sourcing is interesting from a policy perspective since trade in intermediates is known to be a vehicle of knowledge transfers across the borders. In addition, access to a wider variety of intermediates or to intermediates of higher quality is known to translate into productivity gains for firms as documented in Halpren et al. (2015) but also Kasahara and Rodrigue (2008), Kasahara and Lapham (2012) etc. In a recent paper Boler et al., 2014 provide evidence that R&D and international sourcing are complementary activities.

Policy makers have long prioritized export promotion. Thereby, as opposed to gathering information related to exporting activities, public interventions are rare in the case of importing. As a result, infor-

[1] The Swedish National Board of Trade

[2] The literature on export spillovers has been developed among others by Aitken et al. (1997), Greenaway and Kneller (2008), Koenig (2009), Koenig et al. (2010), Karpaty and Kneller (2010), Andersson and Weiss (2012), Bernard and Jensen (2004), Barrios et al. (2003) etc. but also Krautheim (2013) and Rauch and Watson (2003) on the theoretical side.

mal informational transfers across firms may be an important channel for lowering the cost of entry into international markets for intermediates.

This paper bridges the gap in the literature providing support for the existence and going further in developing an understanding of import spillovers. Having access to a more comprehensive data set (presented right below) I am able to look at a broader set of questions compared to Lopez and Yadav, 2010 (the only other paper on import spillovers) and provide insights not only on the existence of import spillovers but also detail their nature and the mechanisms through which they operate..

I further contribute to the understanding of import spillovers by laying out a theoretical framework that formalizes the main forces at play. The main challenge is that as opposed to exporting, international sourcing affects the firm's marginal cost of production. In the presence of heterogeneous fixed costs (either country and/or product specific) the theory features no general predictions for the extensive margin of importing. The reason is that import decisions feature *interdependencies* that in turn arise from the *interdependencies* between the different inputs in the firms' production process. Hence, contrary to the general approach in the exporting literature, firms' entry decisions in the case of importing cannot be viewed in isolation by default.

The particularities of modeling the import decision have been formalized in two recent papers by Antras, Fort and, Tintelnot (2014) and Blaum, Lelarge and, Peters (2013) that are further discussed in **Section, 5**. I build on these two frameworks and draw the modeling of spillovers from Krautheim, 2012. I derive a sharp characterization of the firm's extensive margin (defined here in terms of the firm's product and market specific import decision) in the presence of spillover effects, under restrictions for parameter values that allow me to treat different sourcing decisions as independent. This result (**Equation 19**), forms the theoretical basis of the estimation process. I then depart from this "knife-edge" case and establish more general results for the interaction of spillover effects and international sourcing decisions to be explored further in the future.

The empirical analysis is based on an exceptionally detailed dataset of the universe of Swedish firms providing information on imports at the product, firm and country of origin level for the period 1998-2011. I investigate whether the individual decision to start importing a specific product and source market combination (i.e. intermediate variety) is influenced by the presence of nearby importers (spillover variables) controlling for a variety of observed and unobserved heterogeneity. Several definitions of spillovers are considered in order to explore different dimensions of the variety-specific import decisions and different channels of information diffusion.

The study of spillovers is in general challenging from an econometric point of view. Being aware of all the limitations and given the lack of a truly exogenous variation, endogeneity concerns are meticulously addressed by introducing relevant controls and a rich set of fixed and year effects. I find support for a mechanism of import spillovers. Results survive the inclusion of more rigorous fixed and year effects and a series of further robustness checks. While being exposed to the identification concerns that are inherent to this literature, I believe I come as close to providing evidence on import spillovers as possible.

In more detail, I find that the nature of import spillovers is specific to the product and the source market. Moreover, I find evidence of spillovers both at the regional but also at the sectoral level suggesting that the mechanism is not only locally bounded but also transmitted through intra-sectoral and inter-sectoral channels. A potentially interesting reading of this finding is that among all the other benefits (detailed by Porter, 1998) arising from being located close to other firms in the same industry, is the easier access to imported intermediates. Intra-industry spillovers are reinforced by physical proximity, suggesting that learning from competitors' importing activities is facilitated when they are geographically close and hence directly observable. Firms seem to be influenced more by neighbors that are similar in organizational form, ownership type and nationality. More productive same variety importers in the region weigh more in firms' individual import decisions. Spillovers exhibit spatial decay and they seem to matter more for less obvious source-markets.

The remaining of the paper is organized as follows. Section 2, describes the data and the operations that lead to my working data set. In Section 3, I detail the empirical strategy, discuss the caveats and the ways to deal with estimation concerns as well as the construction of the spillover variables. Section 4 presents the results of the estimation and Section 5 lays out the theoretical motivation and Section 6 concludes.

2 The Data:

In this section I provide a general, high level overview of the data set. A more detailed description and the reasoning behind the cleaning, restrictions and other operations performed to obtain the working data are detailed in the Data Appendix, (A.1).

The estimation process utilizes an exceptionally detailed data set supplied by Statistics Sweden (S.C.B.) covering *all* active firms in the Firms' Registry and spanning the period from 1997-2011. The data set provides information about each firm's unique identifier (as well as the unique identifier of its subunits), its location at the finest administrative level i.e. the municipality[3], information on firm characteristics (industry classification, ownership category, legal form, international ownership etc.) and firm performance measures (number of employees, value of output produced, net value added, labour costs, input costs etc.) offering a large pool of available controls.

The data also contains information on firms' international activities specifying the traded product codes[4] and source/destination markets. Note however that the data does not allow me to observe purchases of domestic intermediates at the product level neither purchases of imported intermediates from wholesalers since these transactions are bundled as input costs in the firms' balance sheets data. This is not posing problems as I am focusing on the effect of neighbors on direct intermediate imports rather than on inter-

[3]Kommun

[4]Product classification follows the Combined Nomenclature of the European Union (CN8), which integrates the HS nomenclature (i.e. the Harmonized System consisting of 5,000 distinct product categories identified by 6-digit codes) and comprises additional 8-digit subdivisions. I round up the product codes to a 4-digit nomenclature which is sufficiently detailed and more stable. I am left with 1250 distinct codes down from 13937

mediate input adoption in general[5].

Using this rather rich data set, I am able to address a broad set of questions and examine the role of spillover effects on different dimensions of the import decision of individual firms but also perform several robustness checks that strengthen my results. [6].

As the research question is to investigate spillover effects on firms' import demand for intermediate inputs, the analysis focuses on *manufacturing firms* only, and on product codes corresponding to broad economic classification categories (BEC) 2 and 4 (i.e. *industrial supplies and capital goods*). Manufacturing firms represent 7.3% of the firms in the Registry data, whereas after dropping products not falling within the two aforementioned categories I am left with 891 unique product codes (down from 1250).

For reasons further detailed in the Data Appendix, I concentrate on the import decisions of single-plant, Swedish-owned firms, which represent 99.4% and 97.3% of the firms in the data respectively. I observe the import histories of approximately 10,850 firms.[7] between 1997 and 2011. Swedish firms in my data import 847 distinct product codes from 153 source markets, or 15,682 distinct intermediate varieties.

Table A provides insights of the patterns in the import behavior of Swedish firms. In line with other studies, this table illustrates that the import activity of Swedish firms is highly concentrated geographically, in the product space but also at the firm level. The median country is only involved in 42 firm-product cells but the top 1% of Sweden's trade partners are present in 5,824 distinct firm-product cells. Half the imported product codes are only present in 46 firm-country cells but the most intensively sourced products are active in more than 538 firm-country combinations.

Import activity is also highly concentrated at the firm level with the median firm sourcing only 4 intermediate varieties (product-country combinations) per year but the most active firms sourcing more than 54 varieties per year[8]. Similarly, three quarters of importing firms in Sweden import varieties that worth around 4% of the highest value firm-product-country combinations. These results should not be viewed as a oddity of the Swedish data. The fact that only few firms engage in international sourcing and that the big bulk of importers only source a handful of products from a handful of source markets confirms the findings of Blaum et al., 2014 for French firms and Gopinath and Neiman, 2012 for Argentinian firms. The last four rows of the table indicate that there is also considerable heterogeneity in Swedish firms' sourcing behavior at the extensive margin. Around half the firms that import intermediates at some point in my data, import from only one market, and only import one product code. The top 1% sources from as many as 17 distinct markets more than 30 different product codes. There is also significant heterogeneity and concentration along the variety margin. Around half the firms source each intermediate from a single source market but the top 1% of the most geographically diverse sourcing firms import more than 7 varieties per product. In the same vein, 75% of importers source at most 3 product codes

[5]The fixed costs associated with directly importing intermediates from abroad are arguably higher and hence spillovers more relevant.

[6]Having access to a more comprehensive data set I am able to look at a broader set of questions compared to Lopez and Yadav, 2010 (the only other paper on import spillovers) and provide insights not only on the existence of import spillovers but also detail their nature (are they for example product and/or destination specific) and the mechanisms through which they operate.

[7]in the restricted data set.

[8]There are firms in the data sourcing internationally as many as 400 varieties per year

Table I: Imports of Swedish firms are highly concentrated

Quantiles	25%	50%	75%	90%	99%
# of annual trade interactions per source-market	1	2	42	472	5,824
# of annual trade interactions per product	3	15	46	142	538
# of annual trade interactions per variety	0	1	4	8	28
# of annual trade interactions per firm	0	1	4	13	54
value of annual trade interactions per firm (mn SEK)	0.2	2	17.5	136.6	3,458
# of source markets per imported variety	1	1	2	3	7
# of products per source market	1	1	2	3	8
# of source markets per firm	1	1	3	7	17
# of products per firm	0	1	3	8	30

Note: see Data Appendix for a detailed description of the data.

per market while 1% source more than 8 products per market. **Table II** displays the relationship between firm characteristics and the firm-level extensive margin of importing. Data suggest that there is a clear positive correlation between firm-performance measures and the number of intermediate varieties that firms import. Firms that import a greater range of intermediate varieties tend to be larger (both in terms of employment and production), pay higher wages, spend more for intermediates and feature higher productivity. They are also more likely to be affiliated with business groups or foreign groups and be exporters.

Table II: The variety margin of importing (A)

varieties	Employment	avg. wage *(SEK)*	input costs *(tsd SEK)*	productivity *(VA per worker)*	output *(tsd SEK)*	age	foreign ownership *(%share)*	BG affiliation *(%share)*	exporters *(%share)*
1	12.5	265,474	9,264	1,534,091	18,520	11.2	3.2	35.5	36.1
2	15.0	271,310	12,611	1,759,787	24,037	11.3	4.9	40.9	51.2
3	17.7	277,299	15,697	1,792,859	29,177	11.4	6.0	46.4	62.1
4	18.7	281,849	16,961	1,883,161	31,216	11.4	7.4	50.7	68.0
5	22.4	286,764	22,395	1,950,803	40,008	11.3	9.2	55.0	72.8
> 10	74.9	305,894	99,136	2,182,129	166,835	11.8	24.9	78.9	92.9

Note: Firm performance measures correspond to means over the entire period for the working sample. An intermediate variety is defined as a product-source market pair.

Next, TableII displays similar results for the source market dimension of the extensive margin. Larger and better performing firms source more varieties of the same product (i.e. the same product from more than one countries).

Table III: The variety margin of importing (B)

varieties	Employment	avg. wage *(SEK)*	input costs *(tsd SEK)*	productivity *(VA per worker)*	output *(tsd SEK)*	age	foreign ownership *(%share)*	BG affiliation *(%share)*	exporters *(%share)*
1	29.4	280,950	32,251	1,783,594	56,793	11.4	10.1	51.4	61.6
2	42.7	292,690	52,621	2,311,545	91,222	11.6	14.1	61.6	74.4
3	44.9	296,199	58,336	2,221,142	96,446	11.5	15.2	65.9	80.2
4	40.8	301,735	66,684	2,365,353	103,320	11.5	18.8	67.8	79.5
5	50.6	302,090	104,814	2,568,170	157,156	11.3	22.0	69.7	87.5
> 10	110.3	357,695	188,961	3,134,673	330,480	11.5	43.6	84.6	98.7

Note: Firm performance measures correspond to means over the entire period for the working sample. An intermediate variety is defined as a product-source market pair.

3 Empirical Strategy:

The dependent variable is a dummy taking the value 1 if the firm starts importing any intermediate variety j at time t. Each firm's import history is therefore a sequence of zeroes and ones. For a given firm-variety pair we may have several starts. Continuing importers and import links that come to a halt are denoted as missing. I also denote as missing the first year in the data i.e. 1997 as it would't be possible to identify this as an import start.

3.1 The Spillover Variables:

The explanatory variables of interest are the spillover variables. These are constructed at different levels of disaggregation. The regional disaggregation is the county level [9] and the industrial classification is at the 2-digit NACE level. For each firm i, seated in region r and operating in industry k at time t four baseline measures of spillovers are defined: The *general spillover* (i.e. the number of other importing firms in the county, importing any good from any source market), the *origin-specific spillover* (i.e. the number of other firms in the county importing any intermediate from the same source market), the *product-specific spillover* (i.e. the number of other importing firms in the county importing the same intermediate from any source market) and the *product-and-origin-specific spillover* (i.e. the number of other firms in the county importing the same intermediate from the same source market). Counting the number of firms in a certain region or industry to proxy for agglomeration effects is common practice in the urban economics literature (Lopez and Suedekum, 2009). Each spillover measure is associated with different assumptions regarding the *nature* and the *scope* of the externalities.

The *general spillover* variable treats all information related to the importing decision as homogeneous, i.e. not attached to a specific product or country of origin. The underlying assumption is that the informational barriers that are related to entry in the import markets are of rather general nature (e.g. familiarizing with customs' bureaucracies).

The *origin-specific spillover* treats the import-relevant information as attached to specific origin market characteristics (general availability, price level and quality of intermediates, credentials of local suppliers, business climate and contracting environment, bilateral business relations and trade bureaucracies etc) and hence transferrable across products but not necessarily transferrable across markets.

The *product-specific spillover* on the other hand, assumes that the import-relevant information is bound to specific product characteristics (technological requirements, energy standards, production compatibility, workforce skill requirements etc.).

In the same vein, the *product-and-orgin specific spillover*[10] variable makes the strongest assumptions

[9] The data specifies each firm's location at the finest level of administrative organization , i.e. the municipality (Kommun). There are 290 municipalities in Sweden. The next broader level of administrative classification is the county (Lan). The 290 municipalities are organized in 21 counties. For a country as extended in terms of area and as sparsely populated as Sweden, the municipality is too fine a classification leaving us with many regions with no import activity. An alternative considered in **A.2.1** is to define regions according to functional economic areas. I therefore define the regions in terms of the Labor Areas that are based on commuting patterns rather than administrative borders. The main results are hardly affected.

[10] I will hence on refer to an intermediate product - source market pair as an intermediate variety

regarding import-relevant information that is considered to be associated with both product as well as origin market characteristics.

In the baseline approach I focus on regional spillovers and assess the importance of local channels via which import spillovers operate. In *Section 4.2* I further explore the idea that intra-industry and inter-industry linkages may also be relevant channels for the exchange of import-specific information between the firms.

Throughout the paper additional definitions and measures of spillovers are considered. In *Section 4.1*, *non-overlapping* measures of spillovers are employed in order to examine the predominance of the spillovers' product-and-origin dimension over the product only and country only dimensions. In *Section 4.4* spillover measures are constructed by weighing each neighbor by its employment size, the imported volume or its productivity. Moreover, in **Table 15** I also employ different measures of spillovers calculating them as the share of importers in the region or as the density of importers, i.e. normalizing the measure by the region's area. **Table A.1.4** lays out summary statistics for the main spillover variables.

3.2 Estimation Issues

Several issues merit further clarifications. When studying of import spillovers on the decision of Swedish firms to start importing, the underlying hypothesis is that the presence of other firms in the region importing the intermediate variety in question, positively impacts the variety-specific import decision. In order to be able to derive a convincing interpretation from the observed positive relationship between the agglomeration of importers in the area and the decision to start importing (as it is summarized in Table 1 featuring the baseline specification), it is necessary to account for other variables/factors not related to spillovers that may lie behind it as well as to address simultaneity and reverse causality concerns.[11]

3.2.1 Omitted Variables:

Firm characteristics: Firms that are active in international markets (either through importing or through exporting) are materially different from purely domestic firms along several dimensions. Importers, just like exporters are more productive, operate at a larger scale, are likely to be bigger in terms of employment and pay higher wages. In **TableIV** we observe summary statistics for core firm performance measures (employment, wage, input costs, output and productivity) and other firm characteristics (age, ownership), for firms that are differentiated along their international activity. A familiar pattern emerges. Firms with some international activity (importers and exporters) outperform firms that operate exclusively within the national boundaries along all aforementioned measures. Firms that both import and export are the top performers.

More productive firms are more likely to be importers since they are more likely to be able to cover

[11]The identification of spillovers remains a very hard study area and in the absence of a truly exogenous variation it is very hard to claim that neighboring importers, *cause* a certain response. By exploiting the data as well as I can and employing an extensive set of controls and fixed effects but also performing a series of robustness exercises I try to address at least the main concerns related to the identification of peer effects and come as close as possible to a causal interpretation of the observed relationship.

Table IV: Firms with international activity differ

	firm neither imports nor exports	firm only exports	firm only imports	firm both imports and exports
employment	8.5	13.7	12.3	40.6
wage (SEK)	251,834	263,464	266,986	289,545
input costs (thsds SEK)	5,115	10,338	11,315	48,055
productivity	1,258,671	1,573,119	1,689,238	1,951,218
output (thsds SEK)	11,015	20,607	20,338	83,214
age	11.7	12.2	10.9	11,7
foreign group affiliation (% share)	1.6	2.4	4.0	14.2
business group affiliation (% share)	27.5	39.7	35.0	61.9

Note: Firm performance measures correspond to means over the entire period for the working sample.

the fixed costs of international activities. Moreover, more productive firms are more likely to self select themselves to denser areas (Baldwin and Okubo, 2006 and Melitz and Ottaviano, 2008) since they are better equipped to survive the tougher competition. Not accounting for firm productivity could lead to an overestimation of spillovers.

Larger firms and firms with more qualified workers are also more likely to engage in international activities. I therefore further account for firm's employment size and average wage. The effect of labor costs on firms' import behavior is ambiguous. Firms that pay higher wages are more likely to source intermediates from abroad by means of a cost saving behavior to lower their production costs. On the other hand, firms with more qualified workers are also likely to be sourcing intermediates of higher quality from abroad. In a recent paper Boler et al., 2015 provide evidence that R&D and international sourcing are complementary activities.

I also include in the vector of firm characteristics a binary variable indicating whether the firm is serving market c as an exporter, which would grant the firm with market-specific knowledge. Exporters are more integrated in international markets and have more experience in cross border transactions, they are therefore more likely to be sourcing foreign intermediate inputs from abroad. Moreover, it is likely that part of the informational transaction costs related to breaking in international markets may be transferrable between importing and exporting activities[12].

Firms that form part of business groups (either domestic or foreign owned) are more likely to engage in international activities (either importing or exporting), because they enjoy better reputation, better access to finance, and increased bargaining power[13]. I therefore include a binary variable to indicate whether a firm is affiliated with a business group.

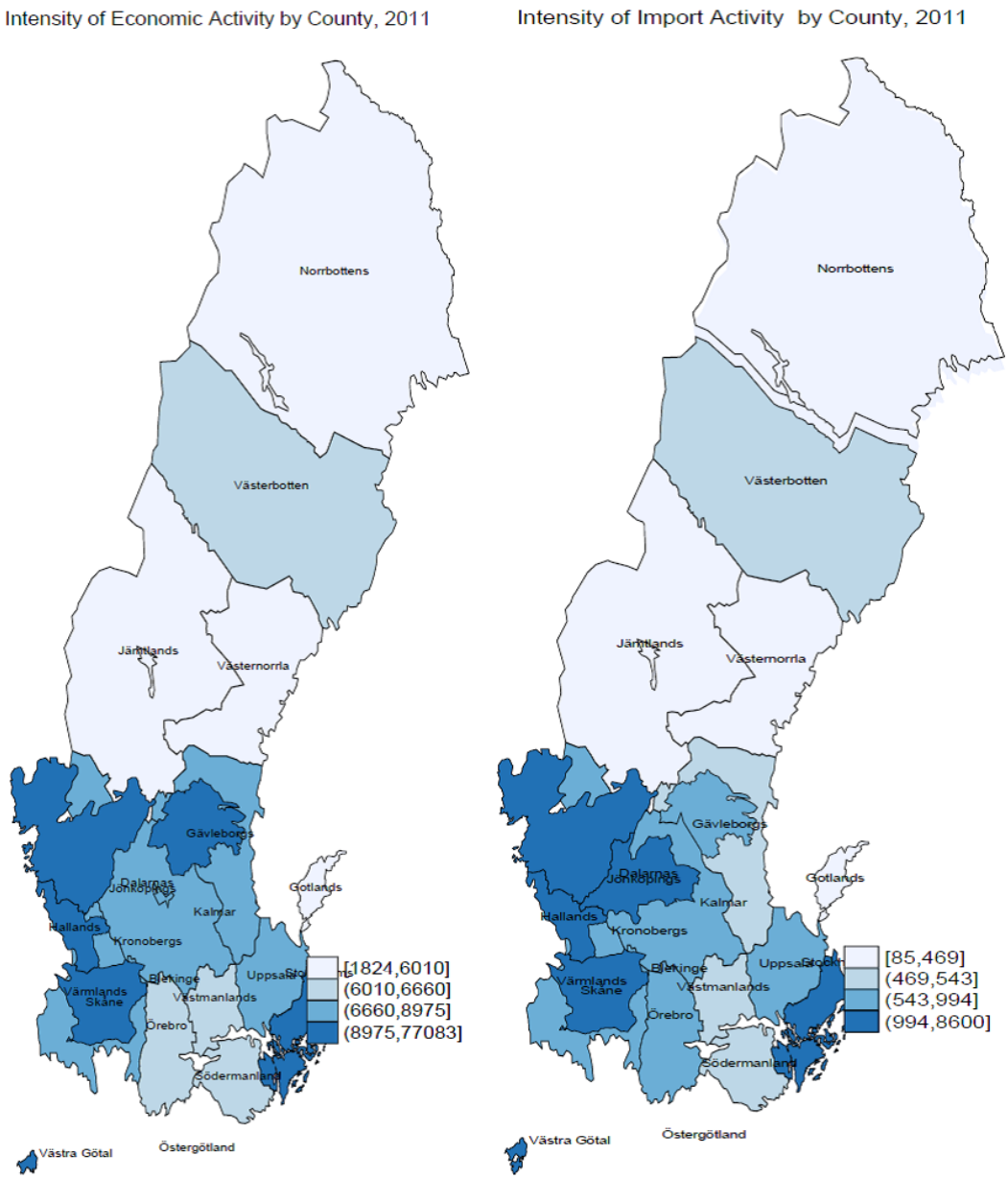
The inclusion of firm-product-country fixed effects in the preferred specification, through the firm dimension captures remaining unobserved time-invariant firm level heterogeneity, reflecting inter alia differences in managerial quality, organizational and ownership structure, reputation etc.[14].

[12] For example customs services etc.

[13] Affiliates are less likely to be liquidity constrained and hence more able to cover the fixed costs related to exporting and/or importing

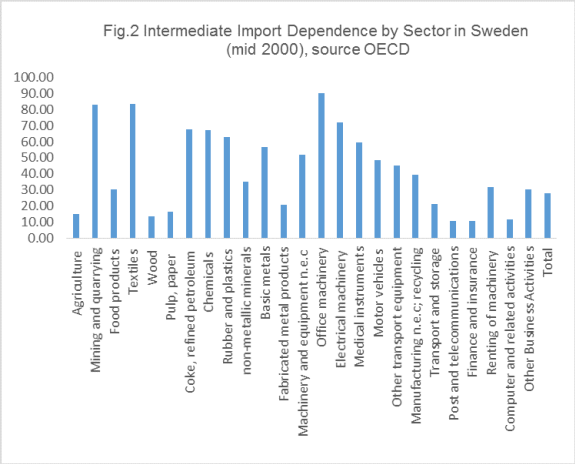
[14] If unobserved characteristics vary over time then assuming that they are orthogonal to other firms' import decisions would alleviate concerns about them affecting the coefficient of spillovers.

Figure I: Concentration of Economic and Import Activity



Area-Industry Characteristics: As noted by Aitken et al. 1997, evidence of spillovers is observationally equivalent to agglomeration arising from exogenous site-specific characteristics. Observed and unobserved characteristics of locations such as natural advantages (proximity to the border or the sea) as well as advantages related to the area's infrastructure (transportation networks, proximity to ports and/or airports, availability of logistic facilities, proximity to government services) turn these areas more attractive to firms. In this context, if the agglomeration of import activity is just a consequence of the agglomeration of economic activity in general in a given area, then failing to account for the area's economic importance and innate characteristics will lead to over interpreting the importance of import spillovers in the data. Indeed, as it can be seen in Fig.1 below the geographical concentration of import activity follows a similar pattern as the concentration of the economic activity across Swedish counties. Similar concerns arise with respect to the industry in which each firm operates. Some industries are

Figure II: Intermediate Import Dependence



more dependent on technologies that rely on the use of foreign intermediates, hence it is both more likely to have a larger pool of established importers operating in these industries but it is also more likely that a firm operating in such industry engages into importing of specific varieties at some point. This is illustrated in Fig.2. which features the intermediate import dependence (i.e. the share of imported intermediates) by sector, in the Swedish economy. Moreover, one should make sure that what is being captured does not simply reflect the area's specialization in a given industry. Stockholm is a leading centre in the production of communications equipment. Firms located in Stockholm are therefore more likely to import or start importing a specific type of inputs intensively used in that industry for reasons reflecting Stockholm's specialization in communications technology rather import spillovers.

The firm dimension of the triadic fixed effects will capture all time invariant characteristics of the area in which the firm is located but also all time invariant sectoral attributes since I have dropped firms that have changed location and/or sector over the period covered. Respectively, any characteristics that are specific to the area where the firm is seated and the source market, such as lower trade costs due to shorter distances, historical and cultural ties etc [15] and are also likely to affect the coefficient of import spillovers, will be picked up by the firm-country dimension of the triadic fixed effects. The firm-product dimension should capture time invariant aspects of the regional specialization patterns (since a firm is attached to a specific region and industry).

Note that this paper focuses on assessing spillovers arising from the transfer of import-specific knowledge and information between the importing and non-importing firms rather than general agglomeration effects related to area and/or industry specific characteristics. These general agglomeration effects involve positive market (e.g. cost sharing) as well as non market externalities (e.g. informational exchanges); negative externalities (e.g. congestion of logistic facilities, customs bureaucracies etc), as well as competition[16]. Disentangling these effects and isolating the effect of informational transactions is not straightforward and we can in fact only capture the net effect of the forces in play.

In an effort to net out the informational component of the externalities from the general agglomeration

[15] for example the south of Sweden may have a natural advantage in doing business with Denmark

[16] Firms will be competing for the local inputs, crowding out each other on local facilities but also competing for exclusive contracts with suppliers etc.

effects, in the estimation progress I account for the degree of regional industrial agglomeration, by including the region-industry share in the country-wide industrial activity (at the 2-digit level) normalized by the region's share of manufacturing activity (following Aitken et al.1997). As a proxy for competition I also add the Herfindahl Index.

I further include in the control variables, the total employment in the area. The effect of the region's working population on individual firms' import decisions is not straightforward and its omission may result in either positive or negative biases. Total employment in the region is a measure of economic activity. Areas with higher levels of economic activity also attract domestic suppliers of intermediates. Since it is easier, in terms of informational requirements, and also cheaper to source inputs from domestic suppliers it could be that all else equal, in denser areas firms tend to favor domestic intermediates. Meanwhile, producers in such areas face larger congestion effects and increased competition for the domestic inputs, which could favor the quest of foreign intermediates, encouraging the decision to source intermediates from abroad.

Areas with denser economic activity don't only attract a larger working force but also a larger pool of qualified workers resulting in higher productivity and a higher propensity to source intermediates from abroad. What is more, in such areas the turnover of employees between firms is more pronounced. Mion and Oppromolla, 2014 and Chocqette and Meinen 2014, show that movements of managers and employees between firms are important channels of transmission of information related with exporting activities.

I also control for the source market's GDP, for Sweden's total imports of intermediates from that country to account for bilateral trade relationships (possibly reflecting the relative position of the two countries in a value chain, the source market's comparative advantage etc) and for the variety's firm-specific price[17].

3.2.2 Further endogeneity concerns

Common shocks: Changes in the EU's trade policy, exchange rate movements, shocks in the source markets as well as industry specific shocks could be confounded with the presence of import spillovers. An appreciation of the Swedish krona vis a vis the Euro, would for example boost imports of intermediates from Euro-Area countries and make it possible for even more firms to start sourcing intermediates from the Eurozone[18]. In my baseline specification I include year effects in order to capture shocks that are common to all industries and regions.[19]

In Section 4 and Table 16 I gradually add more dimensions to the year effects to account for shocks of different nature. Note however that the inclusion of year effects of different dimensions though accounting for a variety of unobserved shocks cannot fully address the concern that what we capture in the estimation process is rather the reaction to a shock affecting the propensity of firms in region r (and/or sector s) to import product k from country c. If some firms react to this shock earlier than others then our estimation

[17] The SCB dataset doesn't provide me with information about each variety's price. The price variable here is constructed as the total value of product-country specific imports for a given firm, divided by the weight of the respective transaction. This is obviously an imperfect measure of price since the kilogram is not the appropriate unit of measurement for all types of products

[18] Similar considerations would arise for events like China's accession to the WTO or the EU's enlargement.

[19] A common practice in the literature of spillovers, see Greenaway and Kneller 2008, Karpaty and Kneller 2010, Koenig et al., 2009 add more references papers.

is not in a position to fully correct for this. The reason is that we are constrained from including HS-4-source market-county-(sector)-year effects because these would be in the same dimension as the spillover variables. Acknowledging this shortcoming of the estimation process, one should however consider that in the presence of 15,682 distinct input varieties imported over 15 years by approximately 10,850 firms located in 21 counties it is not really plausible to expect that the results that survive a plethora of robustness checks are driven by shocks so specific in nature.

I perform a decomposition exercise to distinguish the effect arising from contemporaneous entrants versus continuing importers and systematic versus occasional importers in an attempt to further placate common shocks concerns. If the effects were primarily driven by contemporaneous and occasional importers then concerns that what we are actually capturing is the response to some common shock rather than import spillovers would be more pressing.

Reverse Causality and Simultaneity: We know that the direction of the causality between an individual firm's decision to start importing and the firm's productivity is not straightforward either. The literature on imports provides evidence both in favor of a selection mechanism (only the most productive firms are able to cover the fixed costs associated with sourcing intermediates from abroad) but is also supportive of the existence of "learning by importing" advocating that by gaining access to a wider range of intermediates firms realize productivity gains (Halpren et al., 2007 etc). There is a similar ambiguous relationship between productivity and agglomeration. As mentioned above, more productive firms are more likely to self select themselves to denser areas (Melitz and Ottaviano, 2008; Baldwin and Okubo, 2006) whereas at the same time firms in agglomerated areas are likely to experience further productivity gains, Martin et al. 2008.

Similar concerns arise with respect to other firm characteristics[20]. Reverse causality could also be an issue with respect to the spillover variables, were the import activity of the other local firms to depend on the import behavior of the firm in question[21]

Unobserved supply-side or demand shocks could affect both the observed firm characteristics as well as the firm's decision to import intermediates from abroad. A negative demand shock in the firm's domestic or export markets for example, could lead the firm to reduce its employment but also cut down on sourcing intermediates as a way to downscale its production.

I therefore lag all right-hand-side variables, including spillovers by a year[22].

4 Results

I assume that a firm starts importing a particular variety at time t if the subsequent profits from including this variety in its sourcing strategy are positive i.e. $\Pi_{irskct} = \pi_{irskct} + \epsilon_{irskct}$. Π_{irskct} consists of the

[20] Are bigger, in terms of employment firms more likely to be importers or do firms that engage into importing expand their employment?

[21] This is the "reflection problem" permeating the literature on peer effects.

[22] This, although being a common practice in the spillovers literature does not fully alleviate endogeneity concerns since there remains the possibility that some firms react with a lag

observed π_{irskct} and the unobserved part of the profit $\epsilon irskct$ where $\epsilon irskct$ in turn encompasses both a transitory $u_{irskct}$and a time invariant component δ_{ikc}. The net increase in firm's profit from including that variety in its bundle of intermediates is expected to be increasing with respect to firm performance measures and Sweden's demand capacity for intermediates from country c while it is expected to be decreasing in bilateral trade frictions. Our variables of interest are the spillovers which are assumed to operate via lowering the fixed costs of sourcing intermediates from abroad. Hence the probability that a firm starts importing a particular variety at time t reads:

$$Prob(y_{irskct} = 1|X_{irskct}, \epsilon_{irskct}) = Prob(X'_{irskct}\beta + \delta_t + \delta_{ikc} + u_{irskct} > 0) \quad (1)$$

where $y_{irskct=1}$ is an indicator variable signaling a switch from not importing that variety in $t-1$ to including it in the firm's intermediate space in time t, X_{irskct} is a vector of firm, industry, region, product and source market covariates understood to affect the import decision. I estimate 1with a *logit procedure* controlling for firm-product-source-market fixed effects. A motivation and a discussion of the characterization of the extensive margin of importing lying behind (1) follows in **Section 5**.

The inclusion of triadic firm-product-country fixed effects allows me to control for inter-firm heterogeneity within a given area and industry, as well as for firm-country and firm-product heterogeneity. Area and industry time-invariant characteristics are captured by the firm dimension of the triadic fixed effects since firms that switch location and/or industry have been dropped from the sample. The product-country dimension of the triad allows to control for mean effects in each product line as well as for the market conditions in the source countries. The only remaining variability is in the time dimension within a given firm-product-country triad. What I am estimating is therefore the effect of a change in the agglomeration variables over time with respect to the average level of agglomeration over the entire studied period, on the decision to start importing, at the firm-product-country level. Standard errors are clustered at the *intersection of the area level and industry classification* to deal with the possibility of misleadingly small resulting standard errors.[23]

The benchmark specification also includes year effects and as a robustness check, an additional set of year effects with more dimensions is included (4.6). In the baseline specification, all right hand side variables are lagged by one period to deal with endogeneity and simultaneity concerns, whereas all non-binary right hand side variables, except for the spillover variables, are expressed in natural logarithms. Spillover variables are used in levels[24].

4.1 Identifying spillovers on individual firms decision to start importing

Tables (1)-(3) provide evidence of regional import spillovers and detail their nature as product and source-market specific. **Table 1**, gradually builds up the baseline specification used to identify regional spillovers

[23]Regressing individual variables on aggregate variables is known to introduce a downward bias in the estimation of standard errors leading to erroneous conclusions regarding the significance of coefficients, Moulton (1990)

[24]In **Table A.1.1** I further address this point by investigating non linearities of spillovers. The results of this exercise provide support for my choice of baseline specification.

on firms' individual import decisions. The left-hand-side variable summarizes the most specific import decision i.e. the decision to start importing a given input from a given source market. Only the most specific spillover variable, namely the number of other firms in the county importing the same variety, is used. In columns (1) to (5), regressions are performed employing gradually more controls. In the first column only the spillover variable is included in the controls. In column (2), I add a set of **firm-level characteristics** accounting for the firm's size (number of employees), productivity (value added per worker), average wage paid by the firm, a dummy variable indicating whether the firm is affiliated to some business group and a dummy indicating whether the firm is acquainted with the source market in question via exporting activities. Column (3) further includes a **set of area-wide and industry-wide characteristics**. The region's economic size and industrial activity are captured by the county-level employment and a measure of the region's industrial concentration, as detailed earlier in *Section 3*. The number of active firms in the region captures the intensity of competition and congestion effects. Column (5) additionally controls for a **set of source-market characteristics**, accounting for the trade partner's GDP and for the total intermediate imports from that country. Column (3) also accounts for the **variety's firm-specific price**. Column (5) will be referred to as the *baseline (or benchmark) specification*.

Firm-level controls all enter with the expected sign. Bigger and more productive firms are more likely to start importing any product-country pair at any given time t, and so is true for firms that pay higher wages and firms that are affiliated with business groups. Firms that have familiarized themselves with international markets through exporting are also more likely to activate their product and country specific import status at any given time t. However, only the coefficients on size, productivity and the country-specific export status are significant at the 1% and the coefficient of the dummy variable indicating whether a firm is affiliated with a business group is significant but only at the 10% level. Not surprisingly, the coefficient on the variety's price is negative and highly significant. Area-wide controls enter with negative signs reflecting competition and congestion forces but also the availability of local intermediates in areas with concentrated economic activity, that are competing with foreign intermediates. The region's industry concentration has a positive sign but fails to enter significantly. The trade partner's GDP is positive and highly significant in line with the gravity theory predictions. So is true for the total intermediate imports from that country.

The coefficient on the product and origin specific spillover, is positive and highly significant, and remains significant and broadly unchanged in magnitude even as we add more controls. One additional neighbor (in the same county) importing the intermediate variety increases the probability that a firm in the same region will start importing the same variety by roughly 1.2 percentage points. [25].

In **Table 2**, I go one step further in exploring the nature of these spillovers by trying to identify the relevant source of information. In columns (1) to (4), the preferred specification is used, but now four different spillover variables are studied, moving from the most general to the most specific definition:

[25] Following Train 2009, the marginal effect in terms of pp changes of probability can be calculated as $0.012 = 0.0482 \times 0.45 \times (1 - .045)$, where 0.45 is the average probability of starting to import any intermediate variety at time t.

Table 1: Identifying import spillovers

	(1)	(2)	(3)	(4)	(5)
Spillover measures (t-1)					
Product-Country Spillover: # of (other) same variety importers in the region	0.0570***	0.0561***	0.0559***	0.0523***	0.0504***
	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)
Firm characteristics (t-1)					
ln(employment)		0.6120***	0.6122***	0.6159***	0.6184***
		(0.0134)	(0.0134)	(0.0145)	(0.0146)
ln(avg_wage)		0.0025	0.0028	0.0054	0.0051
		(0.0189)	(0.0189)	(0.0203)	(0.0203)
export_status (dest. specific)		0.3587***	0.3593***	0.3279***	0.3101***
		(0.0152)	(0.0152)	(0.0162)	(0.0163)
BG_affi		0.0437*	0.0447**	0.0418*	0.0460*
		(0.0171)	(0.0171)	(0.0184)	(0.0184)
ln(VA per worker)		0.3210***	0.3210***	0.3194***	0.3178***
		(0.0144)	(0.0144)	(0.0156)	(0.0156)
Industry-Region characteristics (t-1)					
HHI			-0.0001*	-0.0001**	-0.0001**
			(0.0000)	(0.0000)	(0.0000)
ln(county's ind_conc)			0.0242	0.0117	0.0146
			(0.0206)	(0.0224)	(0.0224)
ln(regional employment)			-0.5167***	-0.5869***	-0.5870***
			(0.0987)	(0.1062)	(0.1066)
Variety characteristics (t-1)					
ln(variety price)				-0.1225***	-0.1210***
				(0.0223)	(0.0225)
Source market characteristics (t-1)					
ln(partner_GDP)					0.6989***
					(0.0635)
ln(Int_Imports_Land)					0.2986***
					(0.0236)
# Observations	663,138	661,868	661,868	548,039	545,988
# id_panels	73,172	73,058	73,058	64,063	63,886
pseudo R-squared	0.008	0.019	0.019	0.019	0.021

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.

Table 2: Unbundling the nature of import spillovers (A)

	(1)	(2)	(3)	(4)
Spillover measures (t-1)				
General Spillover: # other importers in the county, any product-source	-0.0004			
	(0.0002)			
Product Spillover: # other importers in the county, same product-any source		0.0147***		
		(0.0009)		
Origin Spillover: # other importers in the county, any product-same source			0.0077***	
			(0.0002)	
Product-Origin Spillover: # other importers in the county, same product-source				0.0504***
				(0.0020)
# Observations	545,988	545,988	545,988	545,988
# id_panels	63,886	63,886	63,886	63,886
pseudo R-squared	0.018	0.019	0.022	0.021

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level. All regressions include all control variables that are omitted in the table for the sake of presentation.

The General Spillover (# of other importers in the county, across products and source markets), the Product Spillover (# of other importers in the county, same product, across source markets), the Origin Spillover (# of other importers in the county, across products, same source market) and the Product-Origin Spillover (# of other importers in the county, same product and source-market). The coefficient on the General Spillover is negative but not significant. The negative sign suggests that the negative externalities dominate. The more specific spillover variables all enter positively and with significant coefficients at the 1% level. The order of magnitude of the coefficient on the Origin Spillover is however very small. Results in **Table 2**, suggest that the most specific spillover variable appears to be import spillovers. In **Table 3**, I attempt to shed more light in the nature of import spillovers by examining the predominance of the spillovers' product-and-origin specificity over the product-only and/or origin-only specificity that appear significant in *2*. In Column (1), the General Spillover is decomposed in four non-overlapping spillover measures, the number of firms importing the same product from the same source (Product-Origin Spillover), the number of firms importing the same product from a different source, the number of firms importing a different product from the same source, and the number of firms importing a different product from a different source. Note that the coefficient on the number of importers of a different product from a different source-market is negative, suggesting that competition and congestion effects override any positive information gains and market externalities, possibly because the scope for the latter is rather limited in the case of importing neighbors that source in different intermediates from different origins. The coefficients on all other measures of spillovers are positive and highly significant but there is a clear ranking in terms of magnitudes confirming the predominance of the product and origin specific spillover.

Table 3: Unbundling the nature of Import Spillovers (B)

	General Spillover	Product Spillover	Origin Spillover	Product-Origin Spillover
Spillover measures (t-1)				
Product-Origin Spillover: # of (other) same variety importers in the region	0.0394***	0.0495***	0.0435***	0.0504***
	(0.0021)	(0.0020)	(0.0020)	(0.0020)
# of other firms importing the same product from a different market	0.0074***	0.0070***		
	(0.0010)	(0.0010)		
# of other firms importing a different product from the same market	0.0054***		0.0071***	
	(0.0003)		(0.0002)	
# of other firms importing a different product from a different market	-0.0023***			
	(0.0003)			
# Observations	545,988	545,988	545,988	545,988
# id_panels	63,886	63,886	63,886	63,886
pseudo R-squared	0.024	0.021	0.024	0.021

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level. All regressions include all control variables that are omitted in the table for the sake of presentation.

In Column (2), I decompose the Product Spillover into the number of firms that import the same product-source-market pair and the number of firms that import the same product from a different source market. A similar decomposition is performed to the Origin Spillover, which in Column (3) is broken down to the number of firms that import the same product-source-market pair and the number of firms that import a different product from the same source market. The coefficients on the Product-Origin Spillover remain broadly unchanged whereas the coefficients on the additional variables although positive and significant further confirm that product and origin specific spillovers are stronger than product only or origin only spillovers, thus corroborating our baseline specification. Column (4) represents the baseline specification. In the following two sections I will consider whether the flow of import relevant information that I call *import spillovers* depends on the characteristics of firms that communicate their experience (*sender capacity*) but also the characteristics of the firms that receive this information (*absorptive capacity*).

4.2 Sender Capacity: Who carries import relevant information?

So far, in our baseline specification, as presented in Table 1, the study of spillovers on individual firms' import decisions treats all surrounding importers as identical, hence all firms enter symmetrically (i.e. as carrying equal weight) in the construction of the spillover variables. Next, in **Table 4**, I look at how the characteristics of neighbors affect the strength of the agglomeration effects. In other words, I focus on the determinants of the neighboring firms' "*sender capacity*". Column (1) replicates for one more time the baseline specification. In columns (2) and (3), I investigate the importance of neighbors' size (in terms of employment) on the individual import decision, in an attempt to understand whether import spillovers

arise from the presence of neighboring firms or from the size of surrounding importers. Thinking of size in terms of employment is in accordance with evidence that employee turnover across firms or casual interactions between workers promote the dissemination of knowledge among firms. A recent example in the literature is Mion and Opromolla, 2013 who provide evidence on how previously acquired export experience of managers transfers to their new employer as they switch firms.

In more detail, in Column (2) the Product-Origin Spillover variable is used while I am also including the average size of same variety importers in the region as a control, which enters significantly and with a negative sign[26]. In Column (3), I allow for bigger neighboring importing firms to exert greater influence by weighing each firm by its size (i.e. the number of employees) in the construction of spillover variables. Hence, the employment-weighed Product-Origin Spillover variable counts the number of employees working for other same variety importers in the county. The order of magnitude of this coefficient, although significant at the 1% level, is very small suggesting that indeed the size of importing neighbors doesn't matter [27]. In Columns (4) and (5) I repeat the same routine but focus on productivity instead. The average productivity of the same variety importers in the region enters significantly, though only at the 10% level and the productivity weighed Product-Origin Spillover is significant at the 1% level (though of a lesser magnitude compared to the unweighted spillover) suggesting that more productive importers have a greater weight in influencing their neighbors' import decisions.

The last column explores whether spillover effects arise stronger from neighboring importers that import larger volumes of the intermediate varieties in question. The average imported volume in the region is included in the controls but fails to enter significantly.

I continue to focus on the determinants of the sender capacity in **Table 5**. Column (1) summarizes the baseline specification. In Column (2), I investigate whether the *organizational structure* of neighboring firms matters for the strength of import spillovers. The Product-Origin Spillover is decomposed between *multi-plant* and *single-plant* firms. Only single-plant same variety importers have a significant impact on individual import decisions. In Column (3) the Product-Origin spillover is broken down to same variety importers that also register *exporting activity* and those that do not. Firms that engage both into exporting and importing are more integrated in international markets and more acquainted with international operations, hence we would expect that the information they generate proves to be more relevant. It appears however that most of the spillover effects arise from non-exporting importers, implying that more internationalized firms may pose greater competition in import markets. In Column (4) the Product-Origin Spillover is decomposed according to the *ownership structure* of the firm into neighboring importers that are affiliated with some *business group* and neighboring importers that are *stand alone* firms. Spillovers arising from firms that are not affiliated with business groups are stronger. In Column (5) importers that are affiliated with business groups are further decomposed according to the Business Group's country of origin (Sweden or abroad), whereas the set of non-affiliated importers is

[26] Reflecting increased competition/congestion effects arising in a denser area outweighs positive market and non-market externalities.

[27] These results provide support for using the unweighted Product-Origin Spillover variable as the preferred measure of spillover.

Table 4: *Does the size of neighbors matter?:*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Spillover measures (t-1)							
Product-Origin Spillover: # of (other) same variety importers in the region	0.0504***	0.0465***		0.0503***		0.0462***	
	(0.0020)	(0.0021)		(0.0020)		(0.0021)	
Employment weighed spillover measures (t-1)							
average size of same source-market same product importing firms in the county		-0.0230***					
		(0.0069)					
Product-Origin Spillover: # employees working for other importers in the county, same product-source			0.0001***				
			(0.0000)				
Productivity weighed spillover measures (t-1)							
average productivity of same source-market same product importing firms in the county				0.0584*			
				(0.0228)			
Product-Origin Spillover (productivity weighed):					0.0210***		
					(0.0012)		
Accounting for avg imported volume							
# avg imported volume in the region						0.0000	
						(0.0000)	
Firm characteristics (t-1)							
ln(employment)	0.6184***	0.5865***	0.6201***	0.6186***	0.6194***	0.5868***	
	(0.0146)	(0.0185)	(0.0145)	(0.0146)	(0.0145)	(0.0185)	
ln(avg_wage)	0.0051	0.0556*	0.0062	0.0053	0.0061	0.0553*	
	(0.0203)	(0.0264)	(0.0203)	(0.0203)	(0.0203)	(0.0264)	
export_status (dest. specific)	0.3101***	0.2958***	0.3121***	0.3102***	0.3115***	0.2958***	
	(0.0163)	(0.0209)	(0.0163)	(0.0163)	(0.0163)	(0.0209)	
BG_affiliation	0.0460*	0.0543*	0.0477**	0.0460*	0.0479**	0.0544*	
	(0.0184)	(0.0239)	(0.0184)	(0.0184)	(0.0184)	(0.0239)	
ln(VA per worker)	0.3178***	0.2528***	0.3161***	0.2949***	0.3151***	0.2530***	
	(0.0156)	(0.0194)	(0.0156)	(0.0180)	(0.0156)	(0.0194)	
Industry - Region characteristics (t-1)							
HHI	-0.0001**	-0.0001	-0.0001***	-0.0001***	-0.0001***	-0.0001	
	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	
ln(county's ind_conc)	0.0146	0.0400	0.0253	0.0135	0.0226	0.0376	
	(0.0224)	(0.0335)	(0.0224)	(0.0224)	(0.0224)	(0.0335)	
ln(regional employment)	-0.5870***	-0.6197***	-0.6694***	-0.5936***	-0.6446***	-0.6507***	
	(0.1066)	(0.1613)	(0.1067)	(0.1066)	(0.1066)	(0.1611)	
Variety characteristics (t-1)							
ln(variety price)	-0.1210***	-0.1077**	-0.1293***	-0.1211***	-0.1243***	-0.1068**	
	(0.0225)	(0.0384)	(0.0224)	(0.0225)	(0.0224)	(0.0384)	
Source market characteristics (t-1)							
ln(partner_GDP)	0.6989***	0.4022***	0.7308***	0.7000***	0.7406***	0.3982***	
	(0.0635)	(0.0854)	(0.0635)	(0.0635)	(0.0635)	(0.0854)	
ln(Int_Imports_Land)	0.2986***	0.2896***	0.3029***	0.2976***	0.2902***	0.2888***	
	(0.0236)	(0.0356)	(0.0236)	(0.0236)	(0.0236)	(0.0356)	
# Observations	545,988	296,486	545,988	545,988	545,988	296,486	
# id_panels	63,886	38,957	63,886	63,886	63,886	38,957	
pseudo R-squared	0.024	0.021	0.024	0.021	0.022	0.021	0.020

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.

decomposed into *state-controlled*[28], and *private firms*. Privately-owned Swedish firms that are not affiliated with business groups, are the main source of import spillovers, followed by Swedish business groups and foreign business groups, and last on state-controlled importers. Business groups have an advantage in negotiating contracts with suppliers posing more intense competition to other firms in accessing the import markets. The presence of foreign groups not only presents greater competition but moreover they may promote direct purchases of intermediates from their plants. In Column (6), I distinguish between neighboring headquarters and plants. The Product-Origin Spillover is broken into the number of headquarters in the area and the number of worksites (i.e. plants) importing a given input variety. There is a marginally stronger headquarter effect on individual import decisions. The stronger headquarter effect can be interpreted as implying that import decisions are primarily generated at the HQ level, but it could also mean that information acquired via neighboring headquarters is deemed as more credible. Having in mind that single plant firms in our sample are located in the same region as their headquarters, we can gain further insight for the results reported in Column (3), i.e. why most of the effect arrises from other single-plant firms in the area. Moreover, note hat the effect of importing plants is significant at the 5% level and of broadly the same magnitude, suggesting that a firm's sub-entities also bear import relevant knowledge that is either generated within them or communicated via intra-firm exchanges.

Interestingly, import spillovers are more important when arising from firms that are more similar in terms of organization and ownership structure. This finding can be understood as suggesting that more complicated business structures imply that information generated within these firms is not as directly accessible/observable. Given that I restrict my attention to the import decisions of single-plant, domestically-owned firms, this can also be interpreted as suggesting that firms characterized by simpler organizational structures are not able to assimilate information arising from more complex institutions.

4.3 Absorptive Capacity: How do firms differ in the way they assimilate import relevant information?

The question addressed in this section is to what extent do individual firm characteristics matter for the way they absorb spillovers, in other words whether firm characteristics matter for the assimilation of any import relevant information/opportunities arising from their neighbors.

In **Table 6**, I am looking for evidence of heterogeneity with respect to firms size (in terms of employment) and productivity (measured as value added per employee). Column (1) summarizes the baseline specification. In Column (2), I interact the benchmark spillover variable with the firm's size. The interaction term fails to enter significantly suggesting that agglomeration effects are broadly similar for firms of different employment classes [29]. In Column (3) the spillover variable is interacted with a binary variable indicating whether the firm's employment size is above the sample's median employment (8 employees), whereas in Column (4) the spillover variable is interacted with a binary variable indicating whether the firm's

[28] By state-control firms I refer to firms that are owned/controlled by the central government, the county or the municipality.

[29] This finding further alleviates concerns arising from my decision to exclude from the working sample firms with zero employees.

Table 5: Does the organizational/ownership structure of the firm matter?

	(1)	(2)	(3)	(4)	(5)	(6)
Spillover measures (t-1)						
Product-Origin Spillover: # other importers in the county, same product-source	0.0504***					
	(0.0020)					
Organizational structure:						
# of single-plant importers		0.0504***				
		(0.0020)				
# of multi-plant importers		0.0853				
		(0.0969)				
Export Status:						
# of exporters			0.0465***			
			(0.0024)			
# of non exporters			0.0663***			
			(0.0057)			
Ownership Structure:						
# of B.G.-affiliated importers				0.0450***		
				(0.0027)		
# of non-B.G.-affiliated importers				0.0605***		
				(0.0041)		
# of importers affiliated with foreign B.G.					0.0284***	
					(0.0056)	
# of importers affiliated with Swedish B.G					0.0513***	
					(0.0033)	
# of private-owned non-B.G.-affiliated importers					0.0591***	
					(0.0041)	
# of state-owned importers					0.0111***	
					(0.0347)	
Importance of Headquarters:						
# of HQ of importers						0.0509***
						(0.0021)
# of importing plants						0.0504**
						(0.0175)
# Observations	545,988	545,988	545,988	545,988	545,988	545,988
# triads (firm-product-source)	63,886	63,886	63,886	63,886	63,886	63,886
pseudo R-squared	0.024	0.021	0.024	0.021	0.022	0.021

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.

Table 6: Do bigger or more productive firms benefit more from import spillovers?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Spillover measures (t-1)							
Product-Origin Spillover: # other importers in the county, same product-source	0.0504***	0.0619***	0.0509***	0.0507***	0.1236***	0.0509***	0.0519***
	(0.0020)	(0.0037)	(0.0021)	(0.0020)	(0.0206)	(0.0021)	(0.0021)
Interaction terms (t-1)							
Product-Origin Spillover×size		-0.0044					
		(0.0012)					
Product-Origin Spillover×above_median_size			0.0021*				
			(0.0026)				
Product-Origin Spillover×above_mean_size				0.0051			
				(0.0048)			
Product-Origin Spillover×productivity					-0.0052		
					(0.0014)		
Product-Origin Spillover×above_median_productivity						-0.0013	
						(0.0016)	Product-Origin Spillover×above_mean_productivity
					-0.0070		
							(0.0020)
# Observations	545,988	545,988	545,988	545,988	545,988	545,988	545,988
# id_panels	63,886	63,886	63,886	63,886	63,886	63,886	63,886
pseudo R-squared	0.009	0.009	0.009	0.009	0.009	0.009	0.009

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.

employment size is above the sample's mean employment (28 employees). The two interaction terms are only slightly significant (at the 10% level) whereas their magnitude is very small, providing additional evidence on the lack of heterogeneity with respect to a firm's employment class. Columns (5)-(7) repeat the routine detailed in columns (2)-(4) but studying heterogeneity with respect to productivity instead of size. None of the interaction terms enters significantly. In all columns, the inclusion of the interaction terms doesn't affect the coefficients on the spillover variable. Findings in **Table 6** provide no evidence of heterogeneity in the effect of the presence of other importers in the area on individual import decisions for firms of different sizes or productivity levels.

In **Table 7**, I continue to explore how individual firm characteristics affect the strength of import spillovers. Results presented in this table provide no evidence of heterogeneity in the way individual firms assimilate import relevant information from the surrounding firms with respect to other firm-specific characteristics, besides productivity and size, such as a firm's export status (Column 2), a firm's affiliation to a business group (Column 3), or the firm's ownership structure (Column 4). None of the interaction terms is significant (with the exception of the interaction with the firm's export status which enters significantly but only at the 10% level) and their inclusion doesn't affect the coefficient on the spillover variable.

4.4 Further results

4.4.1 Different groups of source markets

I go on to investigate whether the importance of spillovers varies with the origin of imports, in other words, whether spillovers are more relevant for the decision to import intermediates from some source markets as compared to others. We could argue that spillovers may be be more relevant for some markets where the costs of acquiring information related to the availability and the characteristics of inputs or the credentials of potential suppliers and the contractual environment are expected to be higher.

Table 7: Firm characteristics and absorptive capacity

	baseline	exporter	consolidated	state-controlled
Spillover measures (t-1)				
Product-Origin Spillover: # of (other) same variety importers in the region	0.0504***	0.0530***	0.0518***	0.0504***
	(0.0020)	(0.0022)	(0.0023)	(0.0020)
textbfInteraction terms (t-1)				
Product-Origin Spillover×exporter		-0.0060*		
		(0.0020)		
Product-Origin Spillover×BG			-0.0027	
			(0.0022)	
Product-Origin Spillover×state_controlled				-0.0226
				(0.0171)
# Observations	545,988	545,988	545,988	545,988
# id_panels	63,886	63,886	63,886	63,886
pseudo R-squared	0.022	0.024	0.025	0.024

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.

In **Table 8**, countries are sorted in groups applying an imperfect criterion of accessibility. The respective groups consist of the Scandinavian countries (Finland, Norway, Iceland and Denmark), Sweden's closest neighbors but also very similar in terms of business practices, business climate etc.[30], the non-Scandinavian EU-27 countries (including Switzerland but excluding Denmark and Finland), the rest of the OECD (excluding EU members and Nordic members), the BRICS (Brazil, Russia, India China and South Africa) and the rest of the world, including Africa, the Americas, Oceania (excluding its OECD members), the Middle-East etc. Spillovers matter for all respective source groups, and not surprisingly they matter more for the "less accessible" partners grouped under *Rest of the World*. Note that what we call lack of accessibility is over and above the effect of distance, historical ties or culture which are time invariant and are therefore picked up by the firm-country dimension of the triadic fixed effects as well as the partner country's GDP and total imports which are already controlled for.

4.4.2 Do spillovers exhibit spatial decay?

In **Table 9**, I explore the geographic scope of regional import spillovers. The first column once more replicates the benchmark specification. In Column (2), I am using as a measure of spillovers the number of importers of the same variety that are located *anywhere* in the country. In Column (3) this measure is broken down to its regional and non-regional component, i.e. the number of other importers of that intermediate variety located in the same county and those located in a different county -regardless of distance-. One additional same variety importer located anywhere in Sweden increases the chances of an individual firm starting to import that variety by 0.3 percentage points.

[30]Nordic economies are also very integrated in terms of policies, trade etc

Table 8: Spillovers and source market accessibility

	baseline	Nordics	EU-27	OECD	BRICS	RoW
Spillover measures (t-1)						
Product-Origin Spillover: # of (other) same variety importers in the region	0.0570***	0.0268***	0.0368***	0.0388***	0.0511	0.0668***
	(0.0020)	(0.0035)	(0.0061)	(0.0030)	(0.0094)	(0.0167)
Firm characteristics (t-1)						
ln(employment)		0.5578***	0.8028***	0.4808***	0.4406***	0.6327***
		(0.0266)	(0.0267)	(0.0280)	(0.0608)	(0.0645)
ln(avg_wage)		0.0550	-0.0626	0.0119	-0.0058	-0.0399
		(0.0414)	(0.0424)	(0.0335)	(0.0669)	(0.0818)
export_status (dest. specific)		0.3556***	0.2398***	0.2914***	0.1769**	0.3447***
		(0.0288)	(0.0292)	(0.0331)	(0.0585)	(0.0838)
BG_affi		0.0058	0.0412	0.0073	0.2191**	0.2855***
		(0.0330)	(0.0314)	(0.0397)	(0.0765)	(0.0861)
ln(VA per worker)		0.3202***	0.4365***	0.2459***	0.2017***	0.3113***
		(0.0302)	(0.0300)	(0.0275)	(0.0589)	(0.0669)
Industry-Region characteristics (t-1)						
HHI		-0.0002**	-0.0001	-0.0001	-0.0003	-0.0003
		(0.0001)	(0.0001)	(0.0001)	(0.0003)	(0.0002)
ln(county's ind_conc)		-0.0036	0.0343	-0.0224	-0.1684	-0.1653
		(0.0407)	(0.0399)	(0.0450)	(0.0948)	(0.1045)
ln(regional employment)		-0.7814***	-0.2787	-0.1891	-0.6194	0.1743
		(0.1872)	(0.1921)	(0.2227)	(0.4542)	(0.4814)
Variety characteristics (t-1)						
ln(variety price)		-0.0236	-0.1109**	-0.0270	-0.3219***	0.0168
		(0.0370)	(0.0387)	(0.0590)	(0.0938)	(0.1066)
Source market characteristics (t-1)						
ln(partner_GDP)		-1.0554***	-1.9260***	1.1715**	3.6451***	4.0645***
		(0.1553)	(0.1673)	(0.4243)	(0.5225)	(0.5144)
ln(Int_Imports_Land)		0.5032***	-0.2011***	0.1704*	0.5421*	-0.3758***
		(0.1203)	(0.0423)	(0.0755)	(0.2446)	(0.0968)
# Observations	663,138	179,300	186,419	117,468	36,190	26,611
# id_panels	73,172	20,033	22,275	13,792	4,538	3,248
pseudo R-squared						

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.

Table 9: Do spillovers exhibit spatial decay?

	(1)	(2)	(3)
Spillover measures (t-1)			
Product-Origin Spillover: # of (other) same variety importers in the region	0.0504***		0.0248***
	(0.0020)		(0.0022)
Spatial breakdowns (t-1)			
# firms in Sweden (same variety)		0.0159***	
		(0.0004)	
# firms in the rest of Sweden (same variety)			0.0147***
			(0.0005)
# of firms in nearby counties (same variety)			
# of firms in more distant counties (same variety)			
# Observations	545,988	545,988	545,988
# id_panels	63,886	63,886	63,886
pseudo R-squared	0.021	0.025	0.03

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.

4.4.3 Physical proximity (same neighborhood) or industrial affinity (same 2-digit industry)?

I have so far treated the diffusion of import-relevant information among firms as a purely *regional* phenomenon. Through physical proximity that facilitates monitoring other firms' import practices, but also the exchange of firm-specific knowledge via (casual or business) interactions between employees, neighbors' import experience becomes accessible to other firms in the region.

Intra-industry linkages: The literature on export spillovers has also established a positive relationship between the presence of other firms *in the same industry* and individual firms' decisions to enter a certain market with a certain product (Koenig 2009; Koenig et al., 2010; Mayeneris and Poncet, 2013; Chocquette and Meinen 2014 etc.). These findings suggest that export-relevant information is not regionally bounded but is also diffused through intra-industry linkages. I explore the scope for spillovers operating through intra-industry linkages for the import case in Column (2) of **Table 10**, (Column 1 as usual reports the baseline specification).

The *intra-industry Product-Origin Spillover*, is now measured as the number of importers of the same variety that operate *in the same industry regardless of region.* Given that information regarding imports of intermediates is highly specialized, and bound to a firm's production process and technological requirements, one would expect that observing other firms in the same industry (i.e. firms likely to be sharing

similar technologies) matters as well for individual import decisions. Not surprisingly, this variable is also highly significant. One additional importer operating in the same 2-digit industry (irrespective of location) increases the probability that any firm starts importing this variety at time t by 0.9 percentage points.

Inter-industry linkages: The respective literature that has looked at the role of industrial linkages as a vehicle for informational transactions across firms, makes the distinction between *backward linkages* (i.e. linkages between a firm and its buyers) and *forward linkages* (i.e. linkages between a firm and its suppliers). The former type comes across as an important channel for export spillovers arising from the presence of multinational firms in Kneller and Pisu, 2007; as well as for productivity spillovers arising again from multinational firms as documented in Javorcik, 2004. Chocquette and Meinen, 2014 also find that backward linkages are an important channel for the transmission of country-specific export-relevant information among firms.

Buyer-seller relationships can indeed facilitate the dissemination of knowledge about specific source markets or available intermediates. One possible mechanism is that this informational exchange occurs through the regular contact between workers and managers of these firms. Moreover, a firm's buyers that are already using a particular type of input for some other process may have the bargaining power to ask the firm to customize its product and its production process by using the same input. In the same vein, a firm may require its suppliers to act accordingly. Another possible explanation is that the very nature of buyer-seller relationships is conducive to familiarizing with other firms' technologies and the inputs to their production.

The importance of inter-industry linkages as a channel through which import spillovers operate is explored in Column (3). Three alternative measures of spillovers are employed here. I use the intra-industry Product-Origin Spillover (i.e. the # of other same product-country pair importers operating in the same industry across locations) and two *channel variables* accounting for backward and forward linkages.

Channel variables: The construction of the channel variables for backward and forward linkages follows Javorcik, 2004, as it has been adapted for the study of export spillovers by Chocquette and Meinen, 2014. Since I do not have access to buyer-seller data, I will be using yearly input-output tables. Hence, the channel variable for backward linkages represents ties between a non-importing firm i operating in industry k that considers starting to import product g from country c at time t and its buyers' (i.e. firms that operate in buying -downstream- industries) import strategies. Respectively, the channel variable for forward linkages represents relations between a non-importing firm i operating in industry k that considers starting to import product g from country c at time t and its suppliers' (i.e. firms that operate in supplying -upstream- industries) import practices. In more detail, the channel variable for **backward linkages** is:

$$Backward\_Linkages_{kgjt} = \sum_{s \neq k} \alpha_{st} Spill_{isgjt} \tag{2}$$

where α_{st} is the share of sector $k's$ output that serves as an input to other manufacturing sectors $s \neq k$[31]. And, the channel variable for **forward linkages** is:

$$Forward\_Linkages_{kgjt} = \sum_{s \neq k} \beta_{st} Spill_{isgjt} \tag{3}$$

where β_{st} is the share (with respect to the total manufacturing input) of sector s' output that serves as an input to sector k. The results reported in Column (3) suggest that inter-industry spillovers do matter. We find that import spillovers arise stronger from a firm's buyers (i.e. backward linkages). Forward linkages are also positive, though of smaller magnitude and significant only at the 10% level.[32].

Spatial decay: In Columns (4)-(5), I attempt to hierarchize the importance of industrial linkages over the importance of regional ties and assess whether physical proximity matters more for intra-industry or inter-industry channels. In Column (4), I decompose the regional Product-Origin Spillover in its region-and-industry specific component (i.e. the number of firms in the county that also operate in the same industry), and the number of firms in the county that operate in different industries. The coefficients on the two components are both significant at the 1% level. Most of the effect though is coming from the most specific component, importers of the same product-source market combination that are located in the same county and operate in the same industry. One additional importer in the same county and industry increases the chances for the firm to start importing that product from the same source-market by roughly 2 percentage points. On the other hand, one additional importer in the same county but operating in a different region increases the chances for the firm to start importing that variety by hardly one percentage point. These findings advocate in favor of a "Porter" interpretation of regional spillovers. The last column further explores whether geographical proximity amplifies the importance of intra as well as inter-industry linkages for the decision to start importing. I allow the firm's decision to start importing a particular product-source-market combination to be influenced by the number of same product-origin importers located anywhere in the country and operating in any industry. This across industry and locations spillover is broken down to the number of importers in the same location and industry, the number of importers in the same location but different industry, the number of importers in the same industry but different location and the number of importers in a different industry and location. All these terms are highly significant and of the expected sign. The predominance of the *region-and-sector specific* Product-Origin Spillover gains further support. Moreover, it is clear that both inter-industry, and to a greater extent, intra-industry spillovers are accentuated by physical proximity implying that there is still some value for the importance of information transmitted through face-to-face interactions.

As noted by Choqette and Meinen (2014), geographical proximity may matter more for some channels than for others. The reasoning behind this claim is that face-to-face interactions that are facilitated

[31] I only consider the total manufacturing input, hence the share is constructed with respect to the manufacturing component of other sectors' input to sector s' production.

[32] The channel variables are indexes and as a result the interpretation of their respective coefficients is not directly comparable to the coefficient of the intra-industry spillover that counts the number of importers.

by geographical proximity may prove more important for monitoring the export strategy of competitors (peer firms operating in the same industry) but less less so for firms in other industries since inter-industry linkages are not necessarily bounded by geography as buyer-seller relationships provide channels for the diffusion of firm-specific knowledge and experience.

4.5 Robustness Checks

In this section I perform several robustness checks and further explore the nature of import spillovers.

4.5.1 Taking into account firms' own experience

The next two tables, **Table 11** and **Table 12** accommodate in the analysis different dimensions of a firm's own experience with respect to a specific product or source-market.

In **Table 11**, I study whether spillovers continue to be important for individual import decisions once we account for a firm's own past import experience. It is only intuitive to expect that through its past experiences with a certain variety, product or source market, the firm accumulates information that will likely prove to be useful in the future and contribute to lowering the fixed costs associated with importing. In Column (2), I include in the controls, a dummy variable indicating whether the firm has previously imported that same variety [33]. Having imported a specific variety in the past and having discontinued its use, has a large negative and significant effect on the probability to re-import that product-source market pair. A firm that has at some point in the past imported a variety and then dropped its use is approximately twice less likely to start importing that variety again. The coefficient of the Product-and-Origin specific spillover variable, but only significant at the 10% level. The negative sign on the variety-specific import experience can be understood as suggestive of variety-specific sunk costs associated with importing intermediates, or as reflecting a negative, unsatisfactory past experience with a particular variety that renders its future use less likely.

In Column (3), I account for a firm's product-specific past experience by including a dummy variable that takes up the value one if the firm in question has previously imported that 4-digit product code (from any source market), whereas in Column (4), I look more closely at the importance of the product-specific import experience by accounting separately for the firm's variety-specific import experience as well as for the firm's past experience in importing the same 4-digit product code but from a different source market. Both experience variables are highly significant at the 1% and 5% level respectively. A firm that has in the past imported the same 4-digit product code from a different source-market it is 15.8 percentage points more likely to start importing that product-code from the source market in question. Note that accounting for firm's product experience only slightly affects the magnitude of the coefficient on the product-and-origin specific spillover, doesn't affect its significance.

[33] To avoid any endogeneity concerns arising from the fact that this variable would be a linear combination of my dependent variable I restrict each firm's relevant import history so as to exclude the first "switch". As it has been discussed before I only focus on firms that appear in my data after the year 2000. What dictates this restriction for this exercise is the fact that since the firms' import histories extend prior to the first year in my dataset I cannot be sure that a firm's first decision really is the first decision or just the first decision I observe in my sample.

Table 10: Industry or Region?

	Regional Spillover (baseline)	Sectoral Spillover	Industrial Channels	within region breakdown by industry	Spatial Decay
Spillover measures (t-1)					
Product-Origin spillover: # other same product-same source importers in the county	0.0504***				
	(0.0020)				
Product-Origin spillover:# other same product-same source importers in the county		0.0367***	0.0309***		
		(0.0011)	(0.0012)		
# other same product-source importers in the same county-industry				0.0820***	0.0051***
				(0.0043)	(0.0006)
# other same product-source importers in the same county but a diff. industry				0.0385***	0.0015***
				(0.0025)	(0.0003)
# other same product-source importers in the same industry but diff. county					0.0028***
					(0.0002)
# other same product-source importers in a diff. industry and diff. county					0.0011***
					(0.0001)
Channel variables (t-1)					
forward_linkages			0.0132*		
			(0.0054)		
backward_linkages			0.0822***		
			(0.0065)		
Firm characteristics (t-1)					
ln(employment)	0.6184***	0.6137***	0.6140***	0.6181***	0.0527***
	(0.0146)	(0.0146)	(0.0146)	(0.0146)	(0.0013)
ln(avg_wage)	0.0051	0.0074	0.0064	0.0061	0.0016
	(0.0203)	(0.0204)	(0.0204)	(0.0203)	(0.0019)
export_status (dest. specific)	0.3101***	0.3096***	0.3090***	0.3095***	0.0280***
	(0.0163)	(0.0163)	(0.0163)	(0.0163)	(0.0015)
BG_affiliation	0.0460*	0.0451*	0.0458*	0.0455*	0.0047*
	(0.0184)	(0.0185)	(0.0185)	(0.0184)	(0.0018)
ln(VA per worker)	0.3178***	0.3171***	0.3164***	0.3189***	0.0264***
	(0.0156)	(0.0156)	(0.0157)	(0.0156)	(0.0014)
Industry-Region characteristics (t-1)					
ln(county's ind_conc)	0.0146	-0.0009	-0.0009	0.0053	-0.0007
	(0.0224)	(0.0225)	(0.0226)	(0.0225)	(0.0021)
ln(regional employment)	-0.5870***	-0.4906***	-0.4888***	-0.5878***	-0.0397***
	(0.1066)	(0.1040)	(0.1041)	(0.1066)	(0.0101)
HHI	-0.0001**	-0.0000	-0.0000	-0.0001**	-0.0000***
	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Variety characteristics (t-1)					
ln(variety price)	-0.1210***	-0.1130***	-0.1059***	-0.1208***	-0.0087***
	(0.0225)	(0.0225)	(0.0225)	(0.0225)	(0.0021)
Source market characteristics (t-1)					
ln(partner_GDP)	0.6989***	0.6653***	0.6120***	0.6924***	0.0595***
	(0.0635)	(0.0635)	(0.0637)	(0.0635)	(0.0066)
ln(Int_Imports_Land)	0.2986***	0.3044***	0.2944***	0.3011***	0.0247***
	(0.0236)	(0.0237)	(0.0237)	(0.0236)	(0.0023)
# Observations	545,988	545,988	545,626	545,988	751,567
# id_panels	63,886	63,886	63,827	63,886	110,754
pseudo R-squared	0.021	0.023	0.021	0.020	0.011

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level. For every column the Herfindahl index is adjusted to take into account the industry and regional definition employed.

Table 11: Accounting for firm's own experience (A)

	baseline	product-and-origin experience	product-specific experience		source-specific experience			time decay	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Spillover measures (t-1)									
Product-Origin Spillover: # other same product-same source importers in the county	0.0504***	0.0554*	0.0594***	0.0647***	0.0485***	0.0491***	0.0409***	0.0429	0.0642
	(0.0020)	(0.0232)	(0.0122)	(0.0131)	(0.0062)	(0.0064)	(0.0046)	(0.0276)	(0.0348)
Firm's past import experience (t-1)									
variety-specific		-4.7294***		-3.0345***		-2.6739***		-0.1727	-3.8005***
		(0.2891)		(0.1409)		(0.0936)		(0.3779)	(0.3282)
product-specific			0.1906**						
			(0.0652)						
product (other sources)				0.6375***					
				(0.1201)					
source-specific					0.5040***				
					(0.0379)				
source (other products)						0.6947***			
						(0.0420)			
firm's export experience (source-specific)							0.1776***		
							(0.0400)		
time decay of experience									
time (i.e. years elapsed since last time the variety was imported)								2.5125***	1.2744***
								(.1726)	(0.1101)
time×product-source-exp								-1.8910***	
								(.1733)	
time×Product-Origin Spillover									-0.0051
									(0.0072)
# Observations	545,988	2,463	12,027	12,027	38,960	38,960	67,961	2,626	2,626
# id_panels	63,886	657	2,610	2,610	7,751	7,751	12,364	708	708
pseudo R-squared	0.021	0.311	0.037	0.124	0.028	0.078	0.035	0.532	0.438

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. *Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level. All regressions include the full list of controls that are not included in the table for presentational issues*

In Column (5), I account for a firm's source-market specific past experience by including a dummy variable that takes up the value one if the firm in question has previously imported any product from that source market, whereas in Column (6), I account both for the firm's variety-specific import experience and the firm's past experience in importing a different 4-digit product code from the same source market. A firm that has in the past imported a different 4-digit product code from a given source-market it is 17 percentage points more likely to start importing the product-code in question from that source market. Accounting for a firm's source-market import experience hardly affects the magnitude of the coefficient on the product-and-origin specific spillover, and doesn't impact its significance. In Column (7) I am looking at firm's experience of the market via exporting. Exporting, is another way of familiarizing with a given source market and indeed I find that a firm that has been serving a market via exporting is 4 percentage points more likely to start importing any given intermediate variety from that market.

In the last two columns of Table 11, I explore whether the effect of a firm's own import experience exhibits time decay. In Column (8), I include in the controls the time that has elapsed (years) since the firm last incurred the variety-specific sunk cost (i.e. the last time that the firm switched to importing a particular variety). Moreover, I interact the time variable with the variable for variety-specific import experience. For a firm with previous import experience for a given variety, an additional year since the last variety-specific import switch decreases the chances that this variety will be re-imported by around 50 percentage points. The interaction term is highly significant. In the last column I include the time variable as well as its interaction with the Product-Origin spillover measure. The interaction term fails to enter significantly.

In Columns (2) and (3) of **Table 12**, I account for different measures of the diversity of the firm's import

Table 12: Accounting for firms' experience (B)

	baseline	scope of product-specific experience	scope of source-specific experience	scope of region-wide experience
Spillover measures (t-1)				
Product - Origin Spillover:# of (other) same variety importers in the region	0.0504***	0.0503***	0.0498***	0.0505***
	(0.0020)	(0.0020)	(0.0021)	(0.0020)
Experience measures (t-1)				
# additional sources		0.3300***		
		(0.0110)		
# additional products			0.0954***	
			(0.0022)	
# of distinct varieties imported in the county				-0.0001**
				(0.0000)
Interaction terms (t-1)				
Product Origin-Spill.× #other sources		-0.0044*		
		(0.0018)		
Product-Origin-Spill.× #other products			-0.0006*	
			(0.0003)	
# Observations	545,988	545,988	545,988	545,988
# id_panels	63,886	63,886	63,886	63,886
Adjusted R-squared	0.021	0.020	0.030	0.022

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. *Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level. All regressions include the full list of controls that are not included in the table for presentational issues*

experience; by including as controls the number of other source-markets from which a firm imports the product in question (2), and the number of other products imported from a specific source market (3). The former variable captures firm-level product-related experience as well as within-product category scope economies across different source markets. The latter is capturing origin-specific information or scope economies across products. A firm importing a particular product from one additional source, is 8 percentage points more likely to start importing that product from any other source market. A firm importing one additional product from any given market is 2.4 percentage points more likely to start importing a specific product that is not already purchased from that market. Note that, despite their importance, including these variables doesn't affect the coefficient of the spillover variable. In Column (4) I am taking into account the diversity of the regional import experience by including in the controls a variable that counts the number of distinct varieties imported by all other firms in the county. This variable although highly significant hardly matters for the individual import decisions as the coefficient's order of magnitude is very small. The negative sign of the coefficient could be reflecting regional crowding out effects. The inclusion of measures of firm's experience hardly affect the magnitude or significance of the spillover variable.

Table 13: Different specifications and subsamples (A)

VARIABLES	baseline	import_status instead of switch as lhs	restrict sample to fully observed import histories
Spillover measures (t-1)			
Product - Origin spillover: # of (other) same variety importers in the region	0.0504***	0.0496***	0.0486***
	(0.0020)	(0.0017)	(0.0051)
lagged import status		0.6188***	
		(0.0078)	
Firm characteristics (t-1)			
ln(employment)	0.6184***	0.5955***	0.5158***
	(0.0146)	(0.0121)	(0.0301)
ln(avg_wage)	0.0051	-0.0362*	-0.0547
	(0.0203)	(0.0171)	(0.0356)
export_status (dest. specific)	0.3101***	0.2186***	0.1949***
	(0.0163)	(0.0133)	(0.0418)
BG_affil.	0.0460*	0.0269	-0.0342
	(0.0184)	(0.0152)	(0.0443)
ln(VA per worker)	0.3178***	0.3131***	0.3294***
	(0.0156)	(0.0130)	(0.0306)
Industry-Region characteristics (t-1)			
HHI	-0.0001**	-0.0001**	-0.0002
	(0.0000)	(0.0000)	(0.0002)
ln(county's ind_conc)	0.0146	0.0429*	-0.1448*
	(0.0224)	(0.0185)	(0.0583)
ln(regional employment)	-0.5870***	-0.5227***	-1.9251***
	(0.1066)	(0.0883)	(0.2851)
Variety characteristics (t-1)			
ln(variety price)	-0.1210***	-0.1241***	-0.0905
	(0.0225)	(0.0186)	(0.0637)
Source market characteristics (t-1)			
ln(partner_GDP)	0.6989***	0.6097***	1.8653***
	(0.0635)	(0.0522)	(0.1947)
ln(Int_Imports_Land)	0.2986***	0.2598***	0.2011**
	(0.0236)	(0.0194)	(0.0773)
# Observations	545,988	712,847	65,875
# id_panels	63,886	74,050	11,858
pseudo R-squared	0.021	0.032	0.035

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. *Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.*

4.5.2 Robustness to different specifications and different subsamples

I investigate whether my findings are contigent on the choice of preferred specification and whether they are robust to using different subsamples/specifications. In **Table 13**, the first column repeats the benchmark specification. The second column uses the product-and-country specific import status instead of the switch variable as the LHS variable. Results survive the alternative specification and the coefficient on the Product-Origin Spillover is highly significant and of a broadly similar magnitude[34]. In the third column, I restrict the working sample to firms whose full import history can be observed. These would be firms that first appear in my data after year 2000. Results are robust to this exercise as well. In **Table 14**, I present an additional set of robustness checks. Column (2) repeats the baseline specification

[34] Under this specification, to distinguish between firms that now incur the fixed entry cost associated with importing and firms that have already incurred it I also control for the lagged import status. Including the lagged import status poses serial correlation concerns that are taken into account in the estimation routine.

Table 14: Different specifications and subsamples (B)

	baseline	restrict attention to most important inputs	restrict attention to most important origins	neighbors in HQ's region
Spillover measures (t-1)				
Product - Origin spillover: # of (other) same variety importers in the region	0.0504***	0.0504***	0.0451***	
	(0.0020)	(0.0020)	(0.0027)	
Product-Origin Spillover: # other same product-same source importers in the HQ's county				0.0507***
				(0.0020)
Firm characteristics (t-1)				
ln(employment)	0.6184***	0.6184***	0.6421***	0.6096***
	(0.0146)	(0.0146)	(0.0178)	(0.0143)
ln(avg_wage)	0.0051	0.0051	0.0229	0.0093
	(0.0203)	(0.0203)	(0.0250)	(0.0200)
export_status (dest. specific)	0.3101***	0.3101***	0.3490***	0.3092***
	(0.0163)	(0.0163)	(0.0195)	(0.0161)
BG_affi	0.0460*	0.0460*	0.0582**	0.0466*
	(0.0184)	(0.0184)	(0.0226)	(0.0182)
ln(VA per worker)	0.3178***	0.3178***	0.3456***	0.3151***
	(0.0156)	(0.0156)	(0.0190)	(0.0153)
Industry-Region characteristics (t-1)				
HHI	-0.0001**	-0.0001**	-0.0001**	-0.0001*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ln(county's ind_conc)	0.0146	0.0146	0.0050	0.0053
	(0.0224)	(0.0224)	(0.0274)	(0.0219)
ln(regional employment)	-0.5870***	-0.5870***	-0.5834***	-0.2490***
	(0.1066)	(0.1066)	(0.1302)	(0.0753)
Variety characteristics (t-1)				
ln(variety price)	-0.1210***	-0.1210***	-0.1054***	-0.1189***
	(0.0225)	(0.0225)	(0.0269)	(0.0223)
Source market characteristics (t-1)				
ln(partner_GDP)	0.6989***	0.6989***	0.8825***	0.7037***
	(0.0635)	(0.0635)	(0.0776)	(0.0629)
ln(Int_Imports_Land)	0.2986***	0.2986***	0.1392***	0.3062***
	(0.0236)	(0.0236)	(0.0282)	(0.0234)
# of (other) same variety importers in the region ProductCountryspillover # Observations	545,988	545,988	362,087	556,425
# id_panels	63,886	63,886	44,477	65,226
pseudo R-squared	0.021	0.021	0.021	0.020

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. *Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.*

but restricting attention only to each firm's most important inputs, i.e. inputs for which the firm-specific import share is above the median imported input share for the firm. Column (3) in turn, restricts attention to each firm's most important trade partners . These sample restrictions hardly affect the coefficients or the significance of the spillover variables. In the last column I enlarge the sample to include both single plant and multi plant firms. For the latter group, the spillover variable is instead constructed at the HQ's neighborhood. Results are not affected, which implies that the import relevant information generated at the plant-level is also weighing on the firm's decision and that the flow of intra-firm import-relevant information is not strictly top-to-down.

Further results and robustness checks are presented in **Table 15**. In Column (2), the baseline specification is used but the estimation now relies on a *fixed effects linear probability model.* The spillover coefficient remains highly significant in this specification as well though the implied magnitudes differ. Columns (3) and (4) employ different definitions for the product and country specific spillover measure. In Column

(3), the spillover measure is expressed as a ratio rather than level. Hence the spillover variable stands for the share of same variety importing firms in the county. A marginal increase in the ratio of same variety market importers in the county leads to an increase in the probability of starting to import that same intermediate variety of around 16 percentage points. In Column (4), the number of importers is normalized by the county's area expressed in square kilometers, i.e. the *density* of same variety importers in the county. A marginal increase in the density of same variety market importers leads to an increase of the order of 6.9 percentage points in the probability to start importing that particular variety.

In Column (5), I examine how strict is the product-specificity dimension of the spillover effect. I therefore include in the baseline specification, along with the number of same (4-digit) product and source market importers in the county, the number of firms that import a variety that falls in the same but broader (2-digit) product category (yet is different from the 4-digit one). This term is also highly significant but negligible in magnitude compared to the benchmark spillover measure, suggesting that informational transfers are specific in nature and exhibit decay as we consider them in a broader product context.

In Column (6), I consider an alternative specification and use as my LHS variable the probability to stop importing a particular variety in period t, if this was being imported in $t-1$. The coefficient on the spillover variable enters with a negative sign and is significant at the 1% level. One more neighbor in the county importing that same input variety implies that an individual firm is by 0.8 percentage points less likely to discontinue the use of that variety in its production process at time t. This result can be interpreted as spillovers being conducive to more long-lasting import decisions. A potential explanation is that this type of informational transactions is also operating via lowering per period fixed import costs hence facilitating the duration of the product-and-country specific import transactions.

The last column, (7) restricts the sample to durable starts only, i.e. switches that lead to imports of varieties that persist for at least three consecutive periods. Results are hardly affected, allowing me to conclude that it is less likely that the results presented so far are primarily driven by occasional imports, which are in turn more prone to be the result of reactions to common shocks, a crucial endogeneity threat discussed in the next section.

4.6 Spillovers or Common Shocks?

As it has already been discussed, the identification of spillovers is quite challenging from an econometric perspective. Though I have already taken steps to address the concerns raised in **Section 3.2**, in the absence of an exogenous variation in the data, a lingering concern is whether what is being captured by the estimation process is merely a response to common shocks. The baseline specification includes year effects that should be picking up shocks that are common to all firms across industries and regions irrespective of what input they import and what country they import it from. Year effects will be capturing shocks like the the 2007 financial crisis, the Euro Area crisis in 2010, changes in Sweden's trade policy or trade relations, economy-wide macroeconomic shocks etc.). What year effects *will not correct* is endogeneity arising from the following types of shocks.

Table 15: Different specifications and subsamples (C)

	baseline	logit	spillover expressed in shares	spillover normalized by the county's area	broader product definition	probability to drop variety as lhs	restrict sample to durable starts (3yrs)
Spillover measures (t-1)							
Product-Origin Spillover: # of (other) same variety importers in the region	0.0504***	0.0050***			0.0410***	-0.0342***	0.0410***
	(0.0020)	(0.0003)			(0.0033)	(0.0056)	(0.0019)
Product-and-Country-specific regional spillover: % share of other importing firm			0.6852***				
			(0.0310)				
Product-Country Spillover (density, importers per km2)				0.2792***			
				(0.0131)			
# of firms in the county importing the same 2-digit but a different 4-dig product (from the same market)					0.0063***		
					(0.0010)		
Firm characteristics (t-1)							
ln(employment)	0.6184***	0.0536***	0.6178***	0.5838***	0.4180***	-0.3565***	0.4656***
	(0.0146)	(0.0013)	(0.0145)	(0.0185)	(0.0285)	(0.0459)	(0.0138)
ln(avg_wage)	0.0051	0.0015	0.0056	0.0561*	0.0665	0.3075***	0.0101
	(0.0203)	(0.0019)	(0.0203)	(0.0264)	(0.0403)	(0.0577)	(0.0205)
export_status (dest. specific)	0.3101***	0.0283***	0.3109***	0.2957***	0.1323***	0.0320	0.2774***
	(0.0163)	(0.0015)	(0.0163)	(0.0209)	(0.0254)	(0.0394)	(0.0159)
BG_affi	0.0460*	0.0049**	0.0469*	0.0535*	0.0229	0.0217	0.0326
	(0.0184)	(0.0018)	(0.0184)	(0.0239)	(0.0324)	(0.0516)	(0.0179)
ln(VA per worker)	0.3178***	0.0265***	0.3159***	0.2509***	0.1155***	-0.3740***	0.2347***
	(0.0156)	(0.0014)	(0.0156)	(0.0194)	(0.0276)	(0.0413)	(0.0151)
Industry-Region characteristics (t-1)							
HHI	-0.0001**	-0.0000***	-0.0001**	-0.0001	-0.0002*	-0.0001	-0.0001**
	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0000)
ln(county's ind_conc)	0.0146	0.0012	0.0158	0.0430	-0.0419	-0.1215	-0.0003
	(0.0224)	(0.0022)	(0.0224)	(0.0335)	(0.0381)	(0.0623)	(0.0218)
ln(regional employment)	-0.5870***	-0.0515***	-0.5744***	-0.7194***	-1.0141***	0.7876*	-0.4909***
	(0.1066)	(0.0107)	(0.1067)	(0.1612)	(0.1812)	(0.3059)	(0.1038)
Variety characteristics (t-1)							
ln(variety price)	-0.1210***	-0.0104***	-0.1208***	-0.1047**	-0.1202**	0.1264	-0.1027***
	(0.0225)	(0.0021)	(0.0225)	(0.0385)	(0.0402)	(0.0648)	(0.0221)
Source market characteristics (t-1)							
ln(partner_GDP)	0.6989***	0.0645***	0.7096***	0.3492***	-0.3043**	1.0716***	0.8557***
	(0.0635)	(0.0067)	(0.0635)	(0.0856)	(0.1160)	(0.2365)	(0.0611)
ln(Int_Imports_Land)	0.2986***	0.0264***	0.2961***	0.2387***	0.3220***	0.4066***	0.1971***
	(0.0236)	(0.0023)	(0.0236)	(0.0357)	(0.0452)	(0.0759)	(0.0230)
# Observations	545,988	751,567	545,988	296,486	156,813	70,178	581,065
# id_panels	63,886	110,754	63,886	38,957	25,225	19,041	63,722
pseudo R-squared	0.021	0.021	0.020	0.020	0.012	0.105	0.012

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. *Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.*

Regional/sectoral shocks: Consider shocks that asymmetrically affect a region (natural disaster, county-level reform etc) or a sector (e.g. sector-specific reform). These shocks would affect import decisions of all firms within a given region or industry, irrespective of what they want to import and where they consider importing it from. Such unobserved shocks would bias the estimation of spillovers. I control for such events by including year effects with a regional and a sectoral dimension.

Industry or county specific demand shocks: It may be the case that all firms in a given industry k or region r (or their intersection) are hit by a productivity or production-process specific shock that affects their ability to produce and consequently their use of a specific input. If such shocks occur, all import starts associated with inputs used by the affected firms (irrespective of the source-market) would be affected. The resulting bias in the estimation of spillovers could be corrected by controlling for such shocks through year effects with a product-sector, product-county or product-county-sector dimension respectively. Import spillovers are then identified on the heterogeneity across destinations within a given product-sector-year, product-county-year or product-county-sector-year.

Source-market specific supply shocks: Consider a shock that affects the supply capacity of intermediate producers of input g in country c[35]. Such events (e.g. new aggressive trade union leadership organizes a prolonged strike) are unlikely to affect Swedish firms that are located in different counties or that operate in different industries unevenly, hence the inclusion of source-market-product-year effects should therefore account for the endogeneity threats posed by similar shocks. Spillovers are then identified on the variation of import switches across Swedish counties and across manufacturing sectors within a given variety-market and year. Product-origin year effects also control for shocks of lower dimensions i.e. shocks that affect a particular product (e.g. the discovery of a new production method) or shocks that are specific to a particular source-market, (like for example the Fukushima earthquakes in Japan in 2010 that severely disrupted Japan's economic activity.)

Shocks specific to a county and a source-market: Events like the opening of a trade promotion office or a subdivision of a trade chamber in a specific county, or even the acquisition of a local firm by a business group from a particular country, the installation of a group of immigrants in the area, the hiring of a foreign manager by a local firm, the construction of new infrastructure like the Oresund Bridge, etc are events that can affect the dynamics of bilateral trade relationships between a region and a source-market. The product-province year or product-county-year effects discussed above would not adequately deal with such shocks, hence the inclusion of county-source-market-year effects is warranted.

Shocks specific to a sector and a source-market: Consider the case that some firm in Germany pioneers by introducing a new version of an input g that is intensively used in industry k. This will affect the decision of firms to start importing that particular input from Germany and such a development could

[35] Note that the inclusion of total exports of intermediate g from country c to Sweden should also capture supply dynamics in the source-market.

be confounded with the presence of spillovers. Adding year effects with sector-source-market dimension would accommodate such issues.

County-product-source-market-year shocks: It could be the case that these unobserved by the estimation process shocks are specific to county r, product g, source market k and time t. The addition of the aforementioned year effects would not account for shocks of similar nature. And yet, introducing year effects with a couty-product-source-market dimension is not feasible since they would be in the same dimension as the benchmark spillover measure. Ideally, the spillover variable would be instrumented. The desired instrumental variable, would be highly correlated with the instrumented variable without directly affecting the product-source-market specific import decision. Unfortunately such an instrument proves difficult to identify in such a context as the literature on export spillovers would confirm.

As a further exercise, following Greenaway and Kneller 2008, I separate the agglomeration effects according to when entry of peers in the import markets occurred, between contemporaneous and continuing importers. If the effects are driven by contemporaneous importers then concerns that what we are actually capturing is the response to some common shock rather than agglomeration effects are accentuated. As contemporaneous importers I consider the firms that started to import the product-source market combination in question, at time t or $t-1$[36], whereas continuing importers are the firms that started in $t-2$ or earlier.(To go one step further, I perform an additional exercise and separate the agglomeration effects arising from occasional versus systematic importers arguing that in case the results are primarily driven by the former it is again more likely that I am picking up a response driven by favorable conditions, rather than the results of spillovers.)

While being exposed to the identification concerns that are inherent to this literature, I believe I come as close to providing evidence on import spillovers as possible. Lacking some truly exogenous variation in my data, or a reliable instrument though I cannot claim that the import behavior of neighbors (or peers) has a causal impact on individual import decisions. Nevertheless, results exhibit remarkable resilience to all discussed robustness controls. The endogneity issues raised above are addressed in In **Table 16**. Note that results are robust to the proposed exercises.

5 Theoretical Underpinnings

The effect of peers located in the same region or operating in the same industry on firms' international decisions has primarily been studied in an empirical context and from the exporters' perspective. Within the export spillovers literature few theoretical insights have been provided. Krautheim, 2008 shows how informational transactions between firms that export to the same destination lower the individual fixed costs associated with foreign market entry and increases the probability to export (extensive margin). Rauch and Watson, 2003 show how the agglomeration of exporters lowers the buyers' uncertainty over

[36]Since right hand side variables are lagged by a year that means that in fact "new" importers are firms that have been importing that particular product-source market combination for one or two years. Hence continuing importers are the firms that have been importing that product source market combination for at least three years (or more).

Table 16: Spillovers or response to common shocks?

	baseline	region shocks	sector shocks	sector-product shocks	region -product shocks	product-country shocks	region-country shocks	sector-country shocks	separate between old and contemporaneous entrants	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Spillover measures (t-1)										
Product-Origin Spillover: # of (other) same variety importers in the region			0.0410***	-0.0342***	0.0410***	0.0549***	0.0567***	0.0050***	0.0547***	
			(0.0033)	(0.0056)	(0.0019)	(0.0020)	(0.0020)	(0.0005)	(0.0020)	
Product-Origin Spillover: share of other importing firm	0.6852***									
	(0.0310)									
Product-Origin Spillover: (density, importers per km2)		0.2792***								
		(0.0131)								
# of firms in the county importing the same 2-digit but a different 4-dig product (from the same source)			0.0063***							
			(0.0010)							
# of new (contemporaneous) importers										0.0564***
										(0.0023)
# of old (continuing) importers										0.0581***
										(0.0031)
# Observations	545,988	296,486	156,813	70,178	581,065	663,138	663,138	751,567	663,138	663,138
# id_panels	63,886	38,957	25,225	19,041	63,722	73,172	73,172	110,754	73,172	73,172
pseudo R-squared	0.020	0.020	0.012	0.105	0.012	0.009	0.008		0.010	0.008

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. *Standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1. Errors are clustered at the county-(2-digit) industry level-variety level. All regressions include all control variables which are absent from the table for presentational purposes.*

the quality of their suppliers allowing for larger orders and having a positive impact on the firm-level intensive margin of trade.

This section aims to provide a theoretical framework to account for the mechanism of import spillovers on individual firms' import decisions The main difficulty we face is that as opposed to exporting, international sourcing affects the firm's marginal cost of production. In the presence of heterogeneous fixed costs (either country and/or product specific) the theory features no general predictions for the extensive margin of importing. Although more productive exporters are known to export more products to more markets than their less productive competitors -see Eaton , Kortum, and Kramarz (2011): Arkolakis and Muendler (2011); Tintelnot (2012); Mayer, Melitz and Ottaviano (2010)- a similar conclusion cannot be drawn with certainty in the case of importing.

The reason is that import decisions feature *interdependencies* that arise from the *complementarities* between inputs in the firms' production process. Contrary to the general approach in the exporting literature, firms' entry decisions in the case of importing cannot be viewed in isolation, which in turn, has interesting implications for the theoretical mechanisms through which import spillovers operate.

The particularities of modeling the import decision have been formalized in two recent papers. Antras, Fort and, Tintelnot (2014) study the extensive and intensive margins of firms' global sourcing decisions developing a quantifiable multi-country sourcing model that features selection into importing. Imposing parametric restrictions the model delivers the the strict hierarchical structure present in models of exporting. Their quantitative analysis allows them to distinguish between country's potential as a marginal cost reducing source of inputs and the fixed costs associated with sourcing intermediates from that country. Blaum, Lelarge and, Peters (2013) develop a general framework nesting most of existing theoretical frameworks of importing. They establish that the theory yields no general predictions for the extensive margin of importing but obtain a testable prediction of the homotheticity of import demand at the intensive margin, which they go on to test for French firm-level data.

I build on these two frameworks and draw the modeling of spillovers from Krautheim 2008 and derive a testable prediction (1) for the knife-edge case where parameter values allow for a sharp characterization of the import decision as in this case sourcing decisions are independent across intermediate varieties. I then depart from this case and establish some useful results for the interaction of agglomeration effects and firms' international sourcing decisions that will for the basis of my future research.

5.1 Preferences

The representative consumer's preferences are defined over the consumption of a homogeneous good (q_α^c), produced in the "agricultural" (i.e. external sector), as well as the consumption of a composite manufacturing good (Q_M^c)[37]. The upper tier utility has a Cobb Douglas form:

$$U_c = (q_\alpha^c)^{1-\eta}(Q_M^c)^\eta \tag{4}$$

[37]Assume that the share $1-\eta$ of the external sector in consumption is large enough to ensure that this good will be produced in *all* countries in an open economy equilibrium

The representative consumer's preferences for manufacturing goods are defined over the consumption of differentiated (local) varieties of manufactured goods according to a standard symmetric CES aggregator.

$$Q_M^c = \Big(\int_{\omega \in \Omega_c} = q(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \Big)^{\frac{\sigma}{\sigma-1}} \tag{5}$$

Where Ω_c is the of available varieties to country $c's$ consumers. In the benchmark case there is no international trade in final goods varieties. Solution to the consumer's problem yields the following demand for variety ω in country c.

$$q_c(\omega) = E_c P_c^{\sigma-1} p_c(\omega)^{-\sigma} \tag{6}$$

where $p_c(\omega)$ is the price of local variety ω, charged in the local market c, $P_c^{\sigma-1}$ is the ideal price index associated with (5), and E_c stands for the aggregate spending on manufacturing goods in country c which from the solution of the upper tier utility problem is equal to $\eta w_c L_c$. I will also define a market demand term B_c for market c as follows:

$$B_c = \frac{1}{\sigma} (\frac{\sigma}{\sigma-1})^{1-\sigma} E_c P_c^{\sigma-1} \tag{7}$$

5.2 Production Technology and Market Structure

Labor is the only factor of production. The following three sectors operate in each economy $c \in \mathcal{C}$:

Non-manufacturing (numraire):

This sector is operating under perfect competition and produces a homogeneous good that is freely traded between countries. Assuming that this sector is active in all countries, i.e. $1 - \eta$ is high enough, free trade leads to price equalization and pins down relative wages to relative productivities in this sector. Introducing this sector allows us to abstain from endogenous wage determination.

Intermediate goods sector:

Let K be the set of globally available intermediate inputs. All intermediates are produced with labour as their only input subject to the country specific technology under perfect competition. The model distinguishes between *products* and *varieties*. Varieties are differentiated by their country of origin within the same product class. Hence, the term variety refers to a product-country pair. [38] Intermediate input varieties are internationally traded and are subject to both variable (iceberg type, $\tau > 1$) and fixed costs. Firms are price-takers and the price of each variety $r = c, k$ that firms in the home country h face is: $\mathrm{p}_{hr} = \tau_{hc} a_r w_c$, where $\tau_{hc} > 1$ is the iceberg transportation cost for firms in h to source any good from country c, a_r is the unit labour cost reflected in country $c's$ technology for the production of product k, and wc is the prevailing wage rate in country c.

Final goods sector:

There exists a measure of N_c final-good producers in each country $c \in \mathcal{C}$ and *each* of these producers owns a blueprint that entitles them to the production of a single differentiated variety. Firms in the

[38] Note that, in the absence of a nested production function, in the current version, there is no *effective distinction* between products and varieties. Each product-country combination is treated as a distinct product in its own right.

final-goods sector operate in monopolistic competition.

Production of final-good varieties requires the assembly of a bundle of intermediate varieties. Intermediate varieties are thought of as product-and-country combinations. Intermediate varieties can be sourced either locally or from abroad. A key feature of the equilibrium will be determining the bundle of intermediate varieties. The bundle consists of a symmetric $\mathcal{CES}$ aggregator over imperfectly substitutable intermediate varieties, with a constant and symmetric elasticity of substitution equal to $\varrho > 1$.

$$I_{ic}(I(\phi)) = \Big(\sum_{j \in I_{ic}(\phi)} (\eta_{icj} x_{icj})^{\frac{\varrho-1}{\varrho}} \Big)^{\frac{\varrho}{\varrho-1}} \tag{8}$$

$I_{ic}(I(\phi))$ is the composite intermediate bundle as it has been assembled by firm i located in country c. The assembly of the bundle consists in the determination of the firm-specific *"sourcing strategy"*, i.e. the determination of the *extensive margin of sourcing*. Think of η_{icj} as parametrizing firm specific "quality" attributes attached to a particular variety j. Another way to consider η_{icj} as parametrizing the degree of compatibility of variety j with firm $i's$ production process. x_{icj} denotes firm $i's$ located in country c demand for variety j. Variety j refers to the product-country pair k, c' where $k \in \mathcal{K}$ and $c' \in \mathcal{C}$. $\mathcal{K}$ refers to the set of intermediate products (with n elements).

The firm's production technology is summarized by:

$$f_{ic}(\phi) = \frac{1}{\phi} I_{ic}(I(\phi)) \tag{9}$$

ϕ denotes firms' core productivity which governs the mapping between the equilibrium bundle of inputs and the production of final varieties. The Melitz timing applies. After incurring a fixed entry cost that is thereafter considered sunk, firms are entitled to a draw from a common (within each country) productivity distribution (that is assumed to be Pareto with curvature $\kappa > \sigma - 1$ and $\phi_{min} = 1$).

Since the focus of the paper is on the determinants of the composition if the bundle, we mute the other factors of production (labor). Final-goods producers only indirectly employ labour. Hence, the firms' core productivity *phi* governs the mapping between the bundle and final production. For simplicity, we assume away trade in final varieties.

The firm's problem

The firm's problem consists in choosing the scale of production (under monopolistic competition firms production is residually determined by demand for their products that is taken as given, hence firms choose instead their price) and optimally assemble their intermediate varieties bundle, in order to maximize their profits.

It is convenient to split the firm's problem into **(a)** describe firm's profit maximizing behavior *given its optimal sourcing strategy* (and demand for its output) and **(b)** characterize the choice of the optimal sourcing strategy *given the firm's cost function.*

Definition 1 *The firm's* ***sourcing strategy*** *describes the firm's decisions on the assembly of their composite intermediate bundle, in other words, the firm-level decisions as to which product-country pairs to include in their intermediate bundle, i.e. the firms' extensive margins of sourcing. More precisely a*

sourcing strategy $I_{ic}(\phi)$ is a subset of the global space of intermediate varieties ($n \times m$ elements).

Firm behavior conditional on a sourcing strategy Firms are subject to a profit maximizing behavior. Firm i with productivity ϕ located in country c maximizes the following objective profit function:

$$\pi_{ic}(\phi, I_{ic}(\phi)) = p_{ic}(\phi)q_{ic}(\phi) - \mathcal{C}_{ic}(\phi, I_{ic}(\phi))q_{ic}(\phi) - w_c \sum_{j \in I_{ic}(\phi)} fj(N_{cj}) \tag{10}$$

where $\pi_{ic}(\phi, I_{ic}(\phi))$ denotes the profits of firm i with productivity ϕ operating in country c, each firm i from c with productivity ϕ then charges price $p_{ic}(\phi)$ for the final variety it produces, taking demand for this final variety to be given ($q_{ic}(\phi)$ is the solution to the consumer's problem). Then, $\mathcal{C}_{ic}(\phi, I_{ic}(\phi))$ denotes the marginal cost faced by firm i from country c with productivity ϕ given its sourcing strategy $I_{ic}(\phi)$. Note that in the presence of spillovers fixed costs will be a function of same variety importers in the country.

Solution to this problem gives rise to the following standard form results for the firm's profit-maximizing price:

$$p_{ic}(\phi) = \frac{\sigma}{\sigma - 1}\mathcal{C}_{ic}(\phi, I_{ic}(\phi)) \tag{11}$$

Replacing for (11) in (10) the profit function shall read:

$$\pi_{ic}(\phi, I_{ic}(\phi)) = B_c\mathcal{C}_{ic}(\phi, I_{ic}(\phi))^{1-\sigma} - w_c \sum_{j \in I_{ic}(\phi)} fj(N_{cj}) \tag{12}$$

Optimal import demand The marginal rate of substitution between any two intermediate varieties j, j':

$$\frac{x_{icj}}{x_{icj'}} = \Big(\frac{p_j}{p_{j'}}\Big)^{-\sigma}\Big(\frac{\eta_{icj}}{\eta_{icj'}}\Big)^{\sigma-1} \tag{13}$$

Note that by allowing variety qualities to be firm specific, the marginal rate of substitution between distinct intermediate varieties depends not only on product characteristics but on product-firm characteristics. It is useful to define the term ξ_{icj} as the "quality flow" per dollar spent on variety j, that is also known as "pure price" of variety j. The "quality flow" per dollar spent on variety j can also be thought to reflect that variety's "sourcing potential".

$$\xi_{icj} \equiv \frac{\eta_{icj}}{p_{cj}} \tag{14}$$

Letting $x_{icj}(\phi, I_{ic}(\phi))$ stand for the optimal demand of firm i from c for variety j, we define the optimal share of intermediate input variety j purchases as:

$$\frac{x_{icj}p_{cj}}{\sum_{j \in I_{ic}(\phi)} x_{icj}p_{cj}} = \frac{\xi^{\varrho-1}}{\sum_{j \in I_{ic}(\phi)} \xi^{\varrho-1}} \tag{15}$$

It will be useful to define the denominator in (16) as $\Theta_{ic}(\phi, I_{ic}(\phi))$ denoting what we shall refer to as the firm's "sourcing capability". Then note that each variety's share in firm's total intermediate purchases corresponds in effect to that variety's contribution to its sourcing capability. Hence, varieties yielding a higher quality flow, i.e. characterized by a higher sourcing potential are expected to have higher input

shares in the aggregate input purchases of that firm.

$$\frac{x_{icj}p_{cj}}{\sum\limits_{j\in I_{ic}(\phi)} x_{icj}p_{cj}} = \frac{\xi^{\varrho-1}}{\Theta_{ic}(\phi, I_{ic}(\phi))} \tag{16}$$

Marginal Cost The margin cost reads:

$$\mathcal{C}_{ic}(\phi, I_{ic}(\phi)) = \frac{1}{\phi}\Big(\Theta_{ic}(\phi, I_{ic}(\phi))\Big)^{\frac{1}{1-\varrho}} \tag{17}$$

The firm's optimal sourcing strategy (characterizing the extensive margin) The firm's optimal sourcing strategy is the solution to the following problem:

$$\max_{I_{cr}\in\{0,1\}_{r=1}^{R}} \pi_c(\phi, I_{c1}, ...) = \phi^{\sigma-1}\Big(\sum_{r\in R} I_{cr}\xi_r^{\varrho-1}\Big)^{\frac{\sigma-1}{\rho-1}} B_c - w_c\sum_{r\in R} I_{cr}f_{cr}(N_{cr}) \tag{18}$$

Properties of the profit function:

- $\frac{\sigma-1}{\rho-1} > 1$: increasing differences give rise to complementarities across decisions
- $\frac{\sigma-1}{\rho-1} < 1$: decreasing differences, decisions are substitutes.
- $\frac{\sigma-1}{\rho-1} = 1$: independent decisions

The following propositions can be established:

Proposition 2 *The solution to the optimal sourcing strategy problem is such that the firm's sourcing capability $\Theta_c(\phi)$ is non decreasing in ϕ. Note that this is true irrespective of the value of $\frac{\sigma-1}{\rho-1}$ but it doesn't imply that more productive firms source more varieties*

Proposition 3 *In the presence of complementarities the solution to the optimal sourcing strategy problem delivers a pecking order in the extensive margin of sourcing $I_c(\phi^L) \subseteq I_c(\phi^H) if \phi^L \leq \phi^H$*

Assuming that parameters satisfy requirements so that the model features complementarities between the import decisions and further assuming that the available intermediate varieties can be uniquely ranked for *all* the firms in terms of an index of **"sourcing appeal"**, the measure of firms sourcing a particular variety will be increasing in that index.

Proposition 4 *A firm's sourcing capability and hence its marginal cost depend on the ranking of the varieties and therefore on the "sourcing appeal" index*

In such an environment firm with productivity ϕ will include variety r in its sourcing strategy iff

$$\phi_{cr}^{\sigma-1}\Big(\Theta_{cr}(\phi)^{\frac{\sigma-1}{\rho-1}} - \Theta_{cr-1}(\phi)^{\frac{\sigma-1}{\rho-1}}\Big)B_c \geq w_c f_{cr}(N_{cr}) \tag{19}$$

In the knife-edge case where $\frac{\sigma-1}{\rho-1} = 1$ (19) becomes:

$$\phi_{cr}^{\sigma-1}\xi^{\rho-1}B_c - w_c f_{cr}(N_{cr}) \geq 0 \tag{20}$$

This is the observed part of the additional profit accruing to the firm from including variety j in ints sourcing strategy. It comprises of firm, variety and market specific variables and provides the basis of our testable prediction in 1 The model is characterized by **free entry:**

$$\int_{\phi_c}^{\inf} \phi^{\sigma-1}B_c\Theta_c(\phi)^A - w_c\sum_{r\in R} f_{cr}(N_{cr})dG_c(\phi) = w_c f_{ec} \tag{21}$$

The modeling of spillovers draws on Krautheim, 2013. Fixed costs faced by a firm in country c importing variety r to decrease with an elasticity $\beta < \frac{\sigma-1}{\kappa} < 1$ in the number of firms in the country sourcing that same variety, where β stands for the strength of spillovers and δ_r is the variety specific, information decay.

$$f_{cr} = \tilde{f_{cr}}(\delta_r N_{cr})^{-\beta} \tag{22}$$

Combining 19, 21 and 22 yields the equilibrium expressions for the variety-specific productivity cut-off ϕ_r, the market demand term B_c and the number of entrants N_c. We therefore have that:

$$\phi_r^* = \Big[\frac{w_c}{B_c}\frac{\tilde{f_{cr}}(\delta r N_c)^{-\beta}}{\Delta\Theta_{cr}^A}\Big]^{\frac{1}{\sigma-1-\kappa\beta}} \tag{23}$$

$$B_c = \Big(f_{ec}\frac{\kappa-\sigma+1}{\sigma-1}\Big)^{\frac{\sigma-1-\kappa\beta}{\kappa(1-\beta)}} N_c^{\frac{-\beta(\kappa-\sigma+1)}{\kappa(1-\beta)}} w_c\Big(\sum_{r'\in R}\frac{(\Delta\Theta_{cr'}^A)^{\frac{\kappa(1-\beta)}{\sigma-1-\kappa\beta}}}{(\delta_{r'}^{-\beta} f cr')^{\frac{\kappa-\sigma+1}{\sigma-1-\kappa\beta}}}\Big)^{\frac{-(\sigma-1-\kappa\beta)}{\kappa(1-\beta)}} \tag{24}$$

and,

$$N_c = \frac{\sigma-1}{\kappa\sigma}\frac{\eta L_c}{f_{ec}} \tag{25}$$

It is straightforward that the following two facts can be established:

Proposition 5 *Spillovers magnify the reaction of the cutoffs to changes in the fixed costs (holding the market demand term constant).*

Proposition 6 *Taking into account the reaction of the demand term to in the fixed costs of sourcing tampers the cutoff's reaction. The magnitude of the scaling effect of spillovers determines the outcome.*

From a policy perspective the following consideration worths further attention. In the absence of differences in the fixed costs of sourcing (same for all varieties), then irrespective of the value of $\frac{\sigma-1}{\rho-1} > 1$, varieties will be ranked in terms of their sourcing potential. Firms include first in their sourcing strategy varieties associated with the highest sourcing capability, i.e. firms that yield the highest marginal benefits. Variety specific fixed costs insert a distortion in the ranking as when faced with every import decisions firms trade off the accruing benefit and the incremental fixed cost associated with sourcing this variety. Without imposing any restrictions on the relationship between a variety's sourcing capability and the respective fixed cost the following inefficiency may arise. High sourcing capability varieties may be crowded out by relatively less attractive varieties on the basis of accessibility, i.e. because they bear lower fixed costs. The presence of spillovers featuring variety specific components can further distort the order of sourcing. Such inefficiencies are of interest because of their implications for the firms' sourcing capability, marginal costs and eventually the equilibrium price index.

6 Conclusions

In this paper I investigate the relevance and explore the nature of import spillovers on the firms' decision to start importing, using an exceptionally detailed data set on Swedish firms' imports, at the product-level and by source-country, spanning the period between 1997 and 2011. This paper bridges the gap in the literature and further contributes to the understanding of import spillovers by laying out a theoretical framework that formalizes the main forces at play. I find that the number of same variety importers in the firm's neighborhood, is associated with a higher probability to start importing that same product-source market pair. Spillovers on the import decision

appear to be very specific in nature suggesting that the relevant information is attached to the characteristics of the particular intermediate and the market from which it is imported. I find evidence of spillovers both at the regional but also at the industry level. There is however evidence that intra-industry spillovers are reinforced by physical proximity suggesting that learning from competitors' international activities (importing in particular) is facilitated when they are geographically close and hence directly observable. Furthermore, spillovers seem to matter more for the decision to source intermediates from less familiar source-markets. Same-variety importers in the firm's region that feature higher productivity and organizational similarities with the firm weigh more in its import decisions. Results are robust to accounting for firm and region characteristics believed to influence the import decision.

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Appendices

A.0 Difficulties of International Sourcing

According to analysis of an interview survey of Swedish companies undertaken by the National Board of Trade[39] the main problems[40] reported by Swedish importers relate to: customs procedures, difficulties with payments and logistics, regulatory frameworks and technical barriers to trade. An indicative list of the difficulties with the highest share of positive responses includes product requirements, testing and certification and document requirements. Similar concerns are highlighted by the Canadian Board of Trade that lists legal considerations, import/export restrictions at either end of the transaction, whether technical standards in your supplier's country meet Canadian requirements, intellectual property rights, language differences, payment methods, understanding the business and social practices of the origin market, and identifying foreign suppliers as the main challenges of international sourcing. The respective government support services for the United Kingdom and Northern Ireland put forward the same list of concerns.

A.1 Data Appendix

The empirical analysis utilizes access to data provided by Statistics Sweden (S.C.B.) covering the universe of firms in the Firms' Registry (Foretagsregistret) and spanning the period from 1997 - 2011. As already mentioned in **Section 2**, this is an exceptionally detailed data set providing information about each firm's unique identification number, its location, a variety of firm characteristics and firm performance measures, as well as its international activities (importing and exporting) at the product - country level.

As the research question is to investigate agglomeration effects on firms' demand for intermediate inputs, the analysis focuses on *manufacturing firms*[41] only, and on product codes corresponding to broad economic classification categories (BEC) 2 and 4 (i.e. *industrial supplies and capital goods*). Manufacturing firms represent 7.3% of the firms in the Registry data, whereas after dropping products not falling within the two aforementioned categories I am left with 891 unique product codes (down from 1250).

Data are cleaned for inconsistencies. I therefore drop firms with gaps in their observed histories[42], firms declaring negative sales, or reporting negative/zero employment levels[43] at *any point of their history.*

Apart from these basic consistency checks, additional restrictions include dropping firms that change location and/or industry over the time period covered[44]. Doing so enhances the credibility of my data (in case the movement corresponds to a reporting mistake or an immaterial move of the headquarter), allows me to avoid dealing with more confounding factors associated with firms' endogenous change of location or activity and grants me the additional benefit that the triadic firm-product-country fixed effects that are employed in my baseline

[39] Kommerskollegium

[40] problems refer to importing from non-EU countries

[41] The manufacturing sector spans the industry classification codes (SNI) 10-33 according to the 2007 nomenclature revision.

[42] I wouldn't be able to identify switches in their import behavior in the presence of gaps

[43] Negative employment, like negative sales are clearly incidents of misreporting. There is a limited number of firms that register negative sales in the time frame covered and no firms registering negative employment. There are however many firms with zero employees. In theory, these are firms where the owner is the only employee. The reason for this restriction is that these firms may in fact be shadow firms set up for tax avoidance reasons or ancillary activities.

[44] As far as single-plant firms are concerned then these firms are completely dropped if there is a change in their location or industry classification. In the case of multi-plant firms I only drop the plants that change location and/or industry.

specification will also be capturing region as well as sector time invariant unobservable characteristics.

When analyzing firms' decisions to import intermediates from abroad, one potential problem is the presence of firms that engage in **"processing trade"**. In exchange for a fee these firms import, further process and then re-export goods that remain the property of a foreign party throughout. Processing trade poses problems for two main reasons. First, the observed import behavior of these firms is rather distinct as it associates with the firm's decision to place itself in a global value chain, and, as a result may be blurring my results on spillovers. Second, processing trade is a source of measurement error. Since the processing firm doesn't own, purchase or sell the underlying products for its own account, these flows don't appear in the firm's balance sheets. They do however appear in the trade data. Consequently, on several occasions, the value of imported intermediates as measured by the customs data is higher than the value of intermediate purchases given by the firm's balance sheets. The risk of the measurement error, is not so much of a concern in this context, since I am focusing on the extensive margin of importing. Focusing on manufacturing firms only limits the presence of processing firms[45]. I also drop from my sample firms that in a given year, both import and export a given product code (resellers). Moreover, I drop imports of intermediate varieties that are likely to be globally supplied by a unique producer[46].

I focus on the import decisions of Swedish-owned firms only, on the grounds that the determinants of foreign firms' import behavior may be materially different as these firms are likely to be more integrated with global markets through their parent firm. What is more, from a data perspective I wouldn't be able to distinguish between imports and intra-group purchases from the parent or other affiliates based abroad. This is also true for Swedish international firms, i.e. Swedish firms that have presence abroad. Swedish-owned firms represent 99.4% of the firms in the registry and 98.7% of manufacturing firms.

In the baseline specification, I limit my attention to investigating how local and sectoral import patterns affect the import decisions of single-plant firms. Import-export data are at the firm level, matching each transaction with the identification number of the importing firm without specifying the exact establishment to which imports are destined. This is naturally a disadvantage when the research question addressed is the analysis of local spillovers, since the agglomeration variables measure the number of importing neighbors in the vicinity of the establishment facing the import decision, which clearly poses a problem with multi-plants firms[47][48].

There are two ways to deal with this problem. The first and most straightforward is to focus on single-plant firms. The second, is to compute the spillover variable in the neighborhood of the headquarters assuming that all importing decisions are taken at the headquarter-level and that all imports end up in the headquarter. Here the former approach is chosen as the benchmark specification, while the latter is also considered as part of the robustness checks.

[45] According to the Eurostat definition the coverage of the manufacturing sector consists of units that process their own materials, subcontract a part of the processing of their own materials, own legal rights and concepts of the product but subcontract the whole processing, or carry out the aforementioned subcontracted processes. Assembly of the component parts (whether self-produced or purchased) of manufactured products is also considered manufacturing. Although a manufacturing firm can be a processing firm it has to own part of its inputs to be classified as a manufacturer.

[46] I identify these instances as transactions where all firms in Sweden import a product from a single country

[47] The distinction between multi-plant and single-plant firms is based on the notion of the "local kind-of-activity unit". The term KAU (kind of activity unit or Verksamhetsenhet, VE) groups all the parts of an enterprise contributing to the performance of an activity at the 4-digit level of NACE and corresponds to one or more operational subdivisions of the enterprise. KAUs are the minimum organizational levels for which information about the production value, intermediate consumption, manpower costs, operating surplus, employment and GFCF are available. The term local KAU, refers to the part of the KAU that corresponds to a local unit. The Swedish term is "Lokal Verksamhetsenhet" (LVE in abbreviation). The concept of the local KAU is not exactly that of the plant, which is better summarized by the variable "Arbetstallet", i.e. worksite, although according to the S.C.B. for most firms these two different entities in fact coincide.

[48] Note however that in each location I consider units belonging to the same firm as one single entity. Hence in the construction of the spillover variables different plants or rather activity units of the same firm located in the same region are only counted once when computing the number of neighbors.

This choice is motivated by at least two reasons. To start with, given that Sweden is a small open economy, not surprisingly, the great majority of firms are indeed single-plant firms. In fact, 97.3% of all firms in the registry and 99% of manufacturers are single-plant firms. The second reason is that the alternative approach relies on reasonable, albeit strong assumptions about how firms' import decisions interact with the organizational structure [49]. Assuming that the decision for any plant to start importing is taken at the headquarter level hence spillovers matter only in the headquarter's neighborhood, implies a top-down flow of import relevant information between the different units of the firm[50]. In **Table 14** I take up this alternative, consider both single and multi-plant firms and use as measures of spillover both the importing neighbors in the region where the plant is placed but also in the headquarter's neighbourhood. As it is further discussed in the respective section, the results provide support for my choice of baseline specification.

Therefore I will be focusing on how proximity to other importing firms affects the decision of individual, *Swedish-owned, manufacturing single-plant* firms to start importing a specific product-source-market combination. Note however that I allow both multi-plant as well as foreign-owned firms to influence the decisions of Swedish single-plant manufacturing firms by accounting for them in the construction of the spillover variables.

Table A.1.1 presents observations by year for the estimation sample (the unit of observation is the firm-product-country triad) and alternative samples (firm-product, firm country) and last, observations by year and firm for the firms in my restricted sample. **Tables A.2.1** and **Tables A.1.3** list observations by county and sector respectively.

Table A.1.1: Summary statistics - observations by year

Year	firm-product-country-year	firm-product-year	firm-country year	firm-year
1998	91,766	65,544	28,506	8,855
1999	92,562	65,916	28,575	9,007
2000	93,197	63,698	27,656	9,045
2001	89,578	63,538	27,506	9,000
2002	89,177	62,610	26,988	8,987
2004	86,152	61,541	26,654	9,045
2005	86,102	61,660	26,633	9,057
2006	82,850	59,502	25,792	9,034
2007	80,828	58,271	25,404	9,096
2008	78,115	56,493	24,605	8,750
2009	75,096	54,431	23,780	8,711
2010	73,273	53,087	23,445	8,596
2011	72,094	52,233	23,021	8,473

[49] Why would all imports end up in the headquarters?

[50] Information is generated at the HQ and diffused to the subunits whereas we don't allow for information generated at the level of a subunit to flow up and blend into decisions taken at the HQ level or affect other organizational units of the firm. Although these are definitely interesting aspects of the internal organization of the firm, they are beyond the scope of the current study, I therefore prefer to remain agnostic about these questions and try to adopt as few assumptions as possible.

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Table A.1.2: Summary statistics - observations by region (county)

County	firm-product-country-year	firm-product-year	firm-country year	firm-year
1	165,662	118,741	50,829	18,449
3	18,236	13,414	5,433	2,407
4	24,369	18,210	9,039	3,448
5	51,678	35,458	16,443	5,165
6	117,130	80,110	38,829	10,745
7	44,016	30,599	13,850	4,080
8	29,901	21,029	10,395	3,829
9	1,667	1,384	961	466
10	15,273	11,120	5,348	1,668
12	165,180	114,785	51,384	15,688
13	50,916	36,447	14,331	4,947
14	254,752	183,236	76,704	24,243
17	39,494	28,183	9,911	3,888
18	36,356	25,760	10,625	3,851
19	30,953	22,363	9,117	3,357
20	33,011	25,806	10,952	4,251
21	22,391	17,541	8,203	3,465
22	19,461	14,050	6,058	2,646
23	12,962	10,373	4,740	1,900
24	22,345	16,734	7,827	3,164
25	22,839	18,023	5,829	2,735

A1: Linear specification

In **Table A.1.1** I investigate the appropriateness of the linear specification of the spillovers. Column 1, replicates for comparison, the preferred specification using the most specific import spillover variable. In Column 2, the sample is restricted to observations for which the number of importers in the area, same product-same destination, is greater than three. Column 3 uses a dummy indicating whether the firm has at least one importing neighbor. In Column 4, I investigate the *shape* of import spillovers by decomposing import activities into dummy signaling the mere presence of importing firms for a given product-source-market pair, and the total population of same product-source-market importers in the neighborhood. This decomposition allows us to describe the shape of import spillovers by disentangling what is due to the scale of the import intensity in the area from the more general impact of the mere presence of importers. Results show that, *both* margins have a positive impact on domestic import switches.

In the last column I use dummies for different levels of the spillover variable. Results confirm the preferred linear specification since the effect on starting to import of having one neighbor exporting the same product to the same destination compared to zero (0.1327) is very similar to the effect of having two neighbors instead of one (0.2443), three instead of two (0.3469) and so on so forth.

Table A.1.3: Summary statistics - observations by industry (NACE 2)

Sector	firm-product-country-year	firm-product-year	firm-country year	firm-year
10	48,639	33,162	16,312	5,936
13	80,049	47,993	24,785	4,988
15	10,566	7,184	3,245	687
16	36,777	30,134	15,730	8,626
17	88,399	63,083	29,913	11,702
19	797	552	229	148
20	66,803	43,468	15,529	3,735
22	88,296	60,586	29,676	7,023
23	28,618	20,309	8,479	3,043
24	214,118	168,810	71,989	29,137
26	194,070	130,080	55,413	14,428
28	176,114	131,775	53,308	17,377
29	72,176	54,059	18,051	6,608
31	71,866	51,004	23,494	10,496
37	1,304	1,167	655	458

A2: Use the Employment Area instead of County as a definition of the "Region"

The main focus of my analysis is the study of regional spillover effects on the individual firms' import decisions. Hence the definition of "region" is of crucial importance. In the baseline specification, regions coincide with the counties of Sweden (Swedish: Ln), which are the top-level administrative geographic subdivisions of Sweden. Sweden is today divided into 21 counties. One could however argue that the appropriate definition of "region" should correspond to the concept of *employment areas* (Swedish: lokala arbetsmarkaden), a non-administrative geographic classification used by the Statistics Sweden. There are 85 employment areas in Sweden, which are defined on the basis of workers' commuting schemes. Because of their economic rather than administrative definition labour areas are considered as a relevant geographical classification [51].

I examine in **Table A.2.1** whether the main results hold once geographic spillover variables and other region-based variables are constructed using the employment areas instead of the counties. In columns (1)-(4) I regress the most specific import decision on the four broad measures of geographical spillovers (broken down to their non-overlapping components). This is in fact, a replication of **3** where the employment areas are used as regions in the construction of my agglomeration measures. Results are hardly affected. The remaining columns (5),(6), use the region-industry dimension of spillovers. This is in turn a replication of columns (4),(5) of **Table 10**. Results are broadly the same.

[51] In several papers in the export spillovers literature, employment areas, rather than any type of administrative geographic disaggregation is used.

Table A.1.4: Summary statistics - spillover variables

	number of observations	mean	SD	min	max
Regional Spillover Measures					
General Spillover	124,392	499.99	356.51	10	1094
Product Spillover	124,392	18.2	24.4	0	152
Country Spillover	124,392	158.12	174.8	0	717
Product - Country Spillover	124,392	3.8	7.89	0	80
# importers (same prod. other source)	124,392	33.68	48.98	0	324
# importers (other prod. same source)	124,392	173.71	192.60	0	910
# importers (other prod. other source)	124,392	330.51	260.89	5	1091
Product - Country Spillover (employment weighed)	124,392	260.47	538.54	0	4945
Sectoral Spillover Measures					
Product - Country Spillover	124,392	8.24	15.93	0	181
same ind. and region	124,392	1.01	2.93	0	61
other ind. same region	124,392	2.79	6.34	0	80
other ind. other region	124,392	22.29	33.45	0	258
Spillovers - Decompositions					
by level of organization					
# of HQs	124,392	3.73	7.74	0	79
# of plants	124,392	.22	.47	0	5
# of single-plant importers	124,392	3.80	7.85	-1	80
# of multi-plant importers	124,392	.003	.056	0	1
by import experience					
# of old importers	124,392	1.64	3.70	0	47
# of new importers	124,392	2.18	4.76	0	51
by ownership structure					
# of importers, BG	124,392	2.57	5.09	0	50
# of importers, stand alone	124,392	1.23	3.04	0	36
# of importers, Swedish BG	124,392	1.77	3.62	0	34
# of foreign-owned importers	124,392	0.79	1.76	0	17
# of private-owned importers	124,392	1.22	3.01	0	36
# of state-controlled importers	124,392	0.17	0.14	0	2
by export activity					
# of exporters	124,392	3.17	6.37	0	60
# of non-exporters	124,392	0.64	1.78	0	25
Spillover Measures, other definitions					
General Spillover (share)	124,392	.30	.043	.11	.38
Product Spillover (share)	124,392	.01	.01	0	.07
Country Spillover (share)	124,392	.09	.06	0	.28
Product - Country Spillover (share)	124,392	.00	.004	0	.042

Table A.1.1: Non linearities, the shape of spillovers.

	baseline	at least 3 neighbors	at least one neighbor	shape of spilllovers	non linearities
	(1)	(2)	(3)	(4)	(5)
Spillover measures (t-1)					
# of (other) same variety importers in the region	0.0504***	0.0361***		0.0469***	
	(0.0020)	(0.0023)		(0.0021)	
Presence (t-1) 0/1					
strictly positive			0.1767***	0.1095***	
Presence (t-1) [in brackets]					
			(0.0136)	(0.0140)	
one					0.1327***
					(0.0144)
two					0.2443***
					(0.0193)
three					0.3469***
					(0.0235)
four					0.4114***
					(0.0274)
five					0.4864***
					(0.0312)
six-ten					0.6168***
					(0.0298)
above-ten					0.9052***
					(0.0401)
# Observations	545988.0000	103917.0000	545988.0000	545988.0000	545988.0000
# triads (firm-product-source)	63886.0000	14105.0000	63886.0000	63886.0000	63886.0000
pseudo R-squared	0.0086	0.0105	0.0080	0.0086	0.0084

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. *Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.*

Table A.2.1: Employment Area as Region, Main Results

	General Spillover	Product Spillover	Origin Spillover	Product-Origin Spillover	within region breakdown by industry	Spatial Decay	
	(1)	(2)	(3)	(4)	(5)	(6)	
Spillover measures (t-1)							
Product-Origin Spillover: # other same product-source importers in the same county	0.0345***	0.0385***	0.0366***	0.0409***			
	(0.0023)	(0.0023)	(0.0023)	(0.0023)			
# of other firms importing the same product from a different source	0.0029**	0.0061***					
	(0.0010)	(0.0010)					
# of other firms importing a different product from the same source	0.0028***		0.0053***				
	(0.0004)		(0.0003)				
# of other firms importing a different product from a different source	-0.0034***						
	(0.0004)						
# other same product-source importers in the same county-industry					0.0765***	0.0572***	0.0533***
					(0.0056)	(0.0057)	(0.0057)
# other same product-source importers in the same county but a diff. industry					0.0305***		0.0138***
					(0.0027)		(0.0029)
# other same product-source importers in the same industry but diff. county						0.0458***	0.0446***
						(0.0018)	(0.0018)
# other same product-source importers in a diff. industry and diff. county							0.0035***
							(0.0003)
# Observations	486402.0000	486402.0000	486402.0000	486402.0000	486402.0000	486402.0000	618969.0000
# triads (firm-product-source)	58049.0000	58049.0000	58049.0000	58049.0000	58049.0000	58049.0000	68631.0000
pseudo R-squared	0.0202	0.0180	0.0197	0.0179	0.0181	0.0203	0.0106

Fixed effects conditional logit on the decision to take up importing a given intermediate variety. *Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.*

Table A.3.1: Evidence of spillovers on the imported volume, intensive margin (A)

	(1)	(2)	(3)	(4)	(5)	(6)
Spillover measures (t-1)						
# other same product-same source importers in the county	0.0061*	0.0068*	0.0059*	0.0057*	0.0058*	0.0025
	(0.0028)	(0.0028)	(0.0028)	(0.0028)	(0.0028)	(0.0031)
Firm characteristics (t-1)						
ln(size)		0.1101***	0.1488***	0.1497***	0.1490***	0.1243**
		(0.0246)	(0.0257)	(0.0257)	(0.0257)	(0.0429)
ln(avg_wage)		-0.1228***	-0.0286	-0.0293	-0.0270	-0.0519
		(0.0288)	(0.0300)	(0.0300)	(0.0300)	(0.0531)
export_status (dest. specific)		0.0322	0.0393	0.0400	0.0389	0.0466
		(0.0228)	(0.0232)	(0.0232)	(0.0232)	(0.0408)
BG_affil.		-0.0560	-0.0274	-0.0246	-0.0243	-0.1203*
		(0.0291)	(0.0302)	(0.0303)	(0.0303)	(0.0563)
ln(VA per worker)		0.0810***	0.0921***	0.0936***	0.0947***	0.0478
		(0.0217)	(0.0225)	(0.0225)	(0.0225)	(0.0378)
Variety characteristics (t-1)						
$price_prod_country$			-0.0008	-0.0007	-0.0006	-0.0383*
			(0.0084)	(0.0084)	(0.0084)	(0.0174)
Industry-Region characteristics (t-1)						
# firms_county				-0.0001	-0.0001	-0.0004*
				(0.0001)	(0.0001)	(0.0002)
ln(county's ind_conc)				-0.0323	-0.0337	-0.0980
				(0.0264)	(0.0265)	(0.0594)
ln(Employment_Lan)				-0.3730	-0.3748	-0.9000*
				(0.1946)	(0.1949)	(0.4494)
Source market characteristics (t-1)						
ln(partner_GDP)					0.2947*	0.2915
					(0.1394)	(0.2837)
Int_Imports_Land					-0.0123	0.0029
					(0.0477)	(0.1083)
# Observations	156,245	156,080	144,754	144,754	144,456	45,121
# triads (firm-product-source)	84,589	84,486	76,345	76,345	76,173	24,987
Adjusted R-squared	0.005	0.001	0.006	0.006	0.006	0.007

OLS on the imported volume of a given product-source-market combination. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level.

A3: Local spillovers on the intensive margin of imports

This paper investigates the existence and nature of local spillovers among importers. Using a unusually detailed dataset comprising Swedish firms trade transactions (both imports and exports) at the product, firm, and destination country level for 1997?2014, I focus on the impact of the geographical agglomeration of importers on individual firms' import decisions (i.e. the extensive margin). In this section I am looking for evidence of local spillovers on the other dimension of firms? import performance, namely their import volume (the intensive margin). Below I replicate **Tables 1, and 10**.

For the intensive margin, I use the logarithm of the volume of imports, expressed in tons, at the firm-product-country level. I am using the volume instead of the value to bypass firm-level quality sorting and pricing issues but also because values are more volatile than volumes for reasons not related to my research question. Also note that estimation results are conditional on the fact that firms import that particular product-country pair. The most specific spillover measure, the number of (other) firms in the region importing a particular product-country pair enters significantly but only at the 10% level. Moreover, note that once I restrict attention to cases of firms with at least 3 importing neighbors, the spillover measure of interest fails to enter significantly suggesting that results in previous columns reflect cases for which the number of neighbors is low.

Table A.3.2: Evidence of spillovers on the imported volume, intensive margin (B)

	Regional Spillover (baseline)	Sectoral Spillover	Industrial Channels	within region breakdown by industry	Spatial Decay
Spillover measures (t-1)					
# other same product-same source importers in the county	0.0058*				
	(0.0028)				
# other same product-same source importers in the industry		0.0132***	0.0131***		
		(0.0020)	(0.0021)		
# other same product-source importers in the same county-industry				0.0207**	0.0117
				(0.0065)	(0.0065)
# other same product-source importers in the same county but a diff. industry				0.0002	-0.0035
				(0.0034)	(0.0038)
# other same product-source importers in the same industry but diff. county					0.0137***
					(0.0024)
# other same product-source importers in a diff. industry and diff. county					0.0003
					(0.0006)
Channel variables (t-1)					
forward_link			0.0221		
			(0.0119)		
backward_link			-0.0241		
			(0.0165)		
# Observations	144,456	144,456	144,339	144,456	144,456
# idc -(_c)-panels	76,173	76,173	76,096	76,173	76,173
Adjusted R-squared	0.006	0.007	0.007	0.006	0.007

OLS on the imported volume of a given product-source-market combination. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions include firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level. All regressions include year effects, firm-product-country fixed effects and errors are clustered at the county-(2-digit) industry level-variety level.

Below in **Table A.3.2** I investigate whether sectoral spillovers operate via the intensive margin of trade, in other words whether the (log) of the firm-product-country imported volume is affected by the presence of importing firms in the same sector. Interestingly the sectoral product and country specific spillover measure has a significant effect on the imported volume. One more firm in the industry importing the product-country pair in question leads to a 1.32% increase in the imported volume of that variety.