2011/8

Export performance of Chinese domestic firms: the role of foreign export spillovers

Florian Mayneris and Sandra Poncet

DISCUSSION PAPER

Center for Operations Research
and Econometrics

Voie du Roman Pays, 34
B-1348 Louvain-la-Neuve
Belgium
http://www.uclouvain.be/core

CORE DISCUSSION PAPER
2011/8

Export performance of Chinese domestic firms: the role of foreign export spillovers

Florian MAYNERIS [1] and Sandra PONCET[2]

February 2011

Abstract

We investigate how the proximity to multinational exporters influences the creation of new export linkages (extensive margin of trade) by domestic firms in China. Using panel data from Chinese customs for 1997-2007, we show that domestic firms' capacity to start exporting new varieties to new markets positively responds to the export activity of neighboring foreign firms for that same product-country pair. We find that foreign export spillovers are limited to ordinary trade activities. No foreign export spillovers are found for processing trade. More, export spillovers are stronger for sophisticated products indicating that proximity to foreign exporters may help domestic exporters to upgrade their exports. However we observe that foreign export spillovers are weaker when the technology gap between foreign and domestic firms is large, suggesting that upgrading may not occur when foreign firms have already a strong edge.

Keywords: export performance, spillovers, FDI, sophistication.

JEL Classification: F1, R12, L25

[1] Université catholique de Louvain, CORE and IRES, B-1348 Louvain-la-Neuve, Belgium. E-mail: florian.mayneris@uclouvain.be

[2] Paris School of Economics, Université Paris 1 Panthéon-Sorbonne and CEPII, France. E-mail: Sandra.poncet@cepii.fr

We thank Matthieu Crozet, Julien Martin, Laura Rovegno and the participants of the GSIE seminar for helpful suggestions.

This paper presents research results of the Belgian Program on Interuniversity Poles of Attraction initiated by the Belgian State, Prime Minister's Office, Science Policy Programming. The scientific responsibility is assumed by the authors.

1 Introduction

There is growing evidence that most of Chinese export rise is due to foreign firms. The share of foreign enterprises in China's exports has increased dramatically from 26 percent in 1992 to 57 percent in 2007 (China Statistical yearbook, 2008). This domination is even stronger for high technology products. The share of foreign firms in Chinese exports of high technology products rose from 68 percent to 84 percent over the same period. Several studies argue that foreign firms, typically engaged in processing trade, fully drive the skill content upgrading of Chinese exports (Amiti and Freund, 2010; Xu and Lu, 2009).[1] Amiti and Freund (2010) find that the skill content of China's manufacturing exports remains unchanged once processing trade is excluded. However, estimations of growth equations indicate that income gains from export performance and export upgrading are confined to improvements made by domestic firms. Jarreau and Poncet (2009) find that the positive association between GDP per capita growth and export sophistication at the province level is limited to ordinary export activities undertaken by domestic firms. While there are no direct gains from foreign firms export upgrading, there may still be room for indirect effects of foreign firms on domestic ones through emulation or export spillovers. By favoring the entry of domestic firms on export markets for more sophisticated goods, foreign firms could have an indirect impact on GDP per capita growth in Chinese provinces. In this paper we focus on the possibility that foreign firms act as export catalysts, fostering the creation of new export transactions by domestic firms. We also investigate the heterogeneity of these export spillovers from foreign firms according to the sophistication of exported products.

Since the pioneering study of Caves (1974), the existence of FDI spillovers has been widely investigated (Crespo and Fontoura, 2006). Most studies, whether applied to China or not, have focused on spillovers from foreign to domestic firms in terms of productivity. The empirical evidence surveyed in Görg and Greenaway (2004) and Blomström and Kokko (1998) is mixed. In the Chinese context, while several articles suggest a significant and positive impact of foreign presence on domestic firms' productivity (Cheung and Lin, 2004; Liu, 2001; Li et al., 2001; Hu and Jefferson, 2002), Hale and Long (2010) argue that the effect disappears when the various sources of estimation biases are controlled for (aggregation bias, selection bias, downward bias in standard errors).

[1] Xu and Lu (2009) find that previous results on the insignificant role of foreign firms and processing trade on Chinese export sophistication (Wang and Wei, 2010) may be due to the heterogeneity of Foreign Direct Investment (in terms of origin and contract form). They find that FDI matters for China's exports upgrading when it originates from OECD countries and consists of wholly foreign owned enterprises.

Here, we concentrate on another source of benefits stemming from foreign presence, export spillovers. We investigate the presence of foreign export spillovers on the extensive margin of domestic firms' trade, that is on the creation of new trade transactions by domestic firms. This focus is coherent with our interest in the determinants of export upgrading of Chinese domestic firms. We seek to understand what drives the diversification of exports into new (more sophisticated) goods. Our approach is complementary to studies on the quality of domestic firms' exports. For example, Harding and Smarzynska Javorcik (2010) find, based on a panel of 116 countries over the period 1984-2000, a positive effect of FDI on unit values of exports in developing countries, but not in developed countries, suggesting that FDI can help bridge the technological gap in production and marketing techniques between developing and high income countries. Our paper is applied to China, the country that everyone has in mind when thinking of the capacity to rapidly upgrade in international markets. Also, contrary to most studies, the Chinese data allow to focus not only on FDI *per se* but on export activities of foreign companies. Based on the city-product level, Chen and Swenson (2009) suggest that proximity to multinational firms is associated with higher quality (unit value) of new export transactions by domestic private Chinese traders. Bloningen and Ma (2010) find nevertheless that the share of foreign firms in Chinese exports by product category as well as the ratio of foreign to domestic unit values are increasing over time, both results running against the idea that Chinese firms are catching up. Our focus is different: we investigate the existence of foreign export spillovers on the creation of new trade links by domestic firms and their role in the upgrading of Chinese domestic exports. Since we also have information on exports realized by domestic producers, our analysis can differentiate between the upgrading induced by multinationals themselves and that resulting from the experience of domestic firms on export markets.

In the economic literature, growing evidence has emerged on positive export spillovers from foreign to domestic firms. Possible channels are information externalities, cost-sharing opportunities and mutualized actions on export markets. Being close to foreign exporters may facilitate the flow of export-specific information, valuable to domestic firms seeking international outlets for their products. In a pioneer study, Aitken et al. (1997) find that the export decision of local firms in Mexico in the period 1986-1990 is positively influenced by the proximity to multinational exporters, even after controlling for the overall industrial activity in the region and for local export concentration. The role of foreign firms as "catalysts" for domestic exporters has been confirmed by Kneller and Pisu (2007) on UK data and Kemme et al. (2009) on India.[2]

[2]Kokko et al. (2001) also investigate the existence of spillovers from MNEs on the export decision of domestic

By contrast, Barrios et al. (2003) do not find clear evidence of such export spillovers from foreign firms in Spain, while Ruane and Sutherland (2005) find that the export intensity of foreign-owned enterprises is negatively associated with the export decision and export intensity of domestic firms in Irish manufacturing. They argue that this result suggests that no (and even negative) export spillovers derive from third-country export-platform FDI. This prediction bodes ill for China where foreign firms are mostly engaged in processing trade.

However, it is noteworthy that these papers use rather aggregated industry-level information (2-digit to 4-digit ISIC) instead of fine product-level customs nomenclature. Moreover, none of these papers exploit the information on the destination country of exports. Yet, export spillovers have been shown to be stronger when product and destination specific. Based on French firm-level export data, Koenig et al. (2010) show that export spillovers are magnified when they are product and destination specific, while they are not significant when considered on all products-all destinations (they do not however decompose export spillovers into foreign and domestic ones). Our study further departs from the previous literature by looking at the decision to start exporting, and not just the export status. Focusing on the creation of new export linkages is consistent with our interest in the impact of FDI as a catalyst for upgrading the export portfolio of domestic firms.

In the context of China, three studies (Ma, 2006; Swenson, 2008; Chen and Swenson, 2009) investigate export spillovers emanating from foreign firms. Ma (2006) studies how the probability that a province exports in a given 2-digit SITC industry relates to the contemporaneous foreign export activity concentration in this industry. Her probit estimations over the period 1993 to 2000 suggest some positive link. Swenson (2008) focuses on the city-level value (or count) of the new HS2 product trade transactions made by private firms between 1997 and 2003. She finds a positive impact of same HS2 foreign export value (or count) in the previous year. Finally, Chen and Swenson (2009) show that, within a HS2 product-category, the number of new trade transactions is positively influenced by the level of exports or the count of export transactions made by multinational firms at the HS2-city level. These papers have two main characteristics in common: while the information is available at a finer product category, they re-aggregate the data and measure export spillovers at a broader activity level (less than 100 categories); they moreover do not investigate the specificity of export spillovers according to

firms in Uruguay, using cross-sectional firm-level data for 1998. However, their measure of spillovers is a simple measure of the presence of multinationals (not export activity) in terms of the output share of MNEs in an industry. The measured impact of multinationals' presence could thus be due to R&D spillovers for example and not to export spillovers.

the destination country of exports.

In our paper, we use provincial data at a much more disaggregated product dimension (1213 4-digit HS), and we exploit information on the destination country of exports over the period 1997-2007. We believe that exploitation of the detailed product and destination information provide two benefits. First, it allows to investigate spillovers at a more adequate level. Indeed, informational flows are likely to be product and country specific. Second, it helps to assess the nature of spillovers. We will discriminate between aggregate foreign presence likely to provide direct productivity gains to domestic firms and export spillovers (informational gains) that are likely to be product-destination specific. We believe our study makes three additional contributions. First, we decompose trade activities of both foreign and domestic firms into ordinary and processing trade, in order to investigate which trade type is more likely to generate and benefit from export spillovers. Second, we study whether export benefits from foreign exporters depend on the technology-content of the exported goods. We aim at verifying that positive information spillovers might be more intense for more sophisticated products. Since Jarreau and Poncet (2009) have shown that the sophistication of domestic exports positively impacts on GDP per capita growth at the province level, this would point at an indirect role of multinational firms on local growth. Third, we investigate the potential conditionality of foreign export spillovers, depending on the technology gap between foreign and domestic firms. Assuming that the capacity to absorb and exploit information on export opportunities depends on the technological distance between the domestic firm and the foreign source of inspiration, foreign export spillovers are expected to be higher when the technological leadership of foreign firms is not too high.

Using panel data from Chinese customs for 1997-2007, we show that domestic firms' capacity to start exporting new varieties to new markets positively responds to the export activity of neighboring foreign firms for that same product-country pair. We find that foreign export spillovers are limited to ordinary trade activities. Processing trade activities are not found to generate or to benefit from spillovers. More, export spillovers are stronger for sophisticated products, indicating that proximity to foreign exporters may help to upgrade the bundle of domestic exports. However we observe that foreign export spillovers are weaker when the technology gap between foreign and domestic firms is large, suggesting that upgrading may not occur when foreign firms have already a strong edge.

The rest of the paper is organized as follows. Section 2 describes the data, our empirical approach, and our measure of export spillovers. Section 3 presents and discusses our results.

Section 4 concludes.

2 Data and indicators

2.1 Trade data sources

The main data source is a database collected by the Chinese Customs. It contains Chinese export flows aggregated by province, year, product and destination country, over the 1997-2007 period.[3] In our estimations, we explain the creation of new export linkages based on a product classification at the 4-digit level. The HS 4-digit level is a fine level of disaggregation. As an illustration, the chapter 91 (2-digit), which corresponds to clocks and watches and parts thereof, is decomposed into 14 different 4-digit products, differentiating wrist-watches in precious metal from wrist-watches in base-metal, alarm clocks, wall clocks, and time registers. Components disentangles clock movements, watch cases and watch straps. An interesting feature of this dataset is that it allows to differentiate between domestic and foreign trading firms, and between processing trade and ordinary trade.[4] Processing trade includes all trade flows by firms operating in the assembly sector, that is, importing inputs to process them in China and to re-export the final products (these producers benefit from a preferential tax regime on imported inputs). We can imagine that firms engaged in this kind of activity are less embedded in their local environment, and consequently generate less (and possibly benefit less from) externalities.

2.2 Explained variable: creation of new export linkages

We investigate the determinants of new export transactions by Chinese domestic firms. We measure the creation of a new export transaction as a dummy which takes the value 1 if domestic firms in a province i start exporting product k at time $t+1$ to country j and 0 otherwise. We restrict our sample to province-product-country series of zeros followed by a decision to start exporting. For a given province-product-country we can have several starts. As in Koenig et al. (2010), ceasing and continuing export flows are not explained. For example, the subsequent

[3]The original data are identified by a 8-digit code. As there were major reclassifications in the international HS 6-digit classifications in 1996 and 2002, we convert them to the same HS 6-digit classifications used in 1992, to avoid problems related to codes reclassification. Moreover, in order to avoid classifying a product as a new variety just because there has been a new product code or because previous codes were split, we drop product lines that changed classification at the 6-digit level over the period due to nomenclature changes.

[4]The data also refer to a third category ("Others") that groups other flows such as aid, border trade and consignment, representing overall less than 1% of total trade value in each year. When considering the processing/ordinary trade distinction, this category is dropped.

Table 1: Summary statistics on domestic exports and foreign presence: number of observations

Year	Dom. Exp.>0			Dom. Exp.=0			All			
	For. Exp.		Share	For. Exp.		Share	For. Exp.		Total	Share
	=0	>0	For. exp.>0	=0	>0	For. exp.>0	=0	>0		For. exp.>0
1997	148,728	40,780	0.215	837,730	22,918	0.027	987,558	63,698	1,050,516	0.060
2000	205,471	59,359	0.224	757,474	27,852	0.035	962,945	87,211	1,050,516	0.083
2003	255,308	88,998	0.258	669,855	35,995	0.051	925,163	124,993	1,050,516	0.119
2006	354,655	141,129	0.285	509,791	44,581	0.080	864,446	185,710	1,050,516	0.177
Total	2,730,325	957,461	0.260	7,493,638	370,292	0.047	10223963	1,327,753	11,551,719	0.115

export statuses 00011001111 become in our sample .001..01..., with . denoting a missing value. This choice is motivated by our interest in the creation of new export transactions by domestic firms in Chinese provinces rather than in their export status. Note that all our results are robust when we consider "durable starts" only, that is cases corresponding to provinces where domestic firms start exporting a product to a country for at least two consecutive years (coded in the data as a sequence "011").[5]

We construct a specific database, incorporating the set of alternatives faced by each province. For a given province, these are defined as the product-country pairs for which we observe at least one export start over the period 1997-2007.[6] Since our estimations will include province-product-country fixed effects, taking into account a broader definition of possible exported products or destination countries would not change the final sample used for the estimations, since the behavior of province-product-country triads for which we observe positive export flows or null export flows every years of the period would be perfectly explained by the fixed effect. Our dataset covers 220 countries and 1213 HS4 products. As reported in Table 1, it includes 1,050,516 observations each year, resulting in a total of 11,551,716 (province/product/country/year) observations over the period 1997-2007. Around 32% of our observations correspond to strictly positive export flows by domestic firms.

As emphasized in Table 2, 1,268,768 observations out of the 11,551,716 observations of the entire database correspond to domestic starts, that is to provinces where domestic firms do not export product k to country j at time t but do export at time $t+1$.

[5]These results are available upon request.

[6]Since we are interested in the probability that domestic firms in a province start exporting a given product to a given country, all province-product-destination country triads for which we observe positive domestic export flows in each year of the period are excluded from our sample by definition. Regarding triads for which we do not observe any positive domestic export flow, they could be, strictly speaking, taken into account. However, two main issues arise: first, from a computational point of view, this would increase dramatically the number of observations so that the database would become hardly tractable. Second, from an economic point of view, it is not sure that a province can potentially export all the products to all the countries. There can be good reasons why we do not observe any positive domestic export flow for a given province-product-destination country triad over the period, these reasons being not directly linked to export spillovers from foreign firms (provincial specializations, geopolitics etc.).

Table 2: Summary statistics on domestic starts and foreign presence: number of observations

Year	Dom. start==1			
	For. Exp.		Total	Share
	=0	>0		For. exp.>0
1998	78,130	5,688	134,818	0.068
2001	100,001	7,889	107890	0.073
2004	136,288	11,211	147,499	0.076
2007	146,317	13,001	159,318	0.082
Total	1,174,078	94,690	1,268,768	0.075

2.3 Empirical approach

Our estimations focus on the impact of foreign firms' export activities on the creation of new trade linkages by Chinese domestic firms. The creation of a new linkage (product k/country j) by domestic firms of province i at year $t+1$ is regressed on our proxy of foreign export spillovers in the previous year t and on various controls (measured in t and in $t-1$) following a gravity-type equation. The relation we want to bring to data is the following:

$$\text{Prob}(\text{dom. start}_{ikj,t+1}) = \text{Prob}(\alpha \text{foreign\_spill}_{ikj,t} + \beta_1 \text{Z}_{j,t} + \beta_2 \text{Z}_{j,t-1} + \eta_{ikj} + \mu_t + \epsilon_{ikj,t+1} > 0) \quad (1)$$

As emphasized in the next subsection, our identification of foreign export spillovers in China relies on a conditional logit estimation, all regressions including fixed effects at the province-product-country level η_{ikj}. Year fixed effects μ_t are also added to control for aggregate shocks on Chinese export activities. The foreign export spillovers are thus identified based on the within (time) dimension of our data. Time invariant aspects such as bilateral trading distance, product specificity, province geography are hence controlled for. The conditioning set Z is described below in Section 2.4. It is made of three categories of variables. First, following the gravity literature, we control for demand side determinants of new export linkages. Second, we control for supply side determinants by introducing proxies for provincial and Chinese comparative advantages and export intensity. Third, since we are worried that the decision to start exporting by domestic firms captures the intrinsic dynamics of exports at the product level or country level, we include the lag of all the variables described above that aim at capturing local and Chinese export intensity at the product or destination country level.

2.4 Foreign export spillovers and control variables

In our empirical analysis, we explain the probability that domestic firms in province i start exporting a product k to country j in year $t+1$ on various characteristics of the province i, product k and country j at time t. The structure and the determinants of international trade flows are now commonly studied using gravity equations. We detail in this section the

explanatory variables we take into account in this gravity framework.

Foreign export spillovers

Our focus is on export spillovers, that are supposed to reduce the bilateral fixed export cost. There are two channels through which export spillovers can act: foreign firms can bring specific information on export markets, valuable to domestic firms to pay their fixed export cost (information about the tastes of foreign consumers, on the distribution networks abroad etc.). On the other hand, it could be the case that export spillovers are linked to the mutualization of some fixed export costs (participation to international fares, marketing etc.). In both cases, export spillovers could be linked to the presence of foreign exporters *per se* and/or to the value of exports by foreign firms. We thus decompose foreign export spillovers in a province into a dummy that identifies the presence of foreign exporters and the log of the value of exports made by foreign firms.

We follow Koenig et al. (2010) and consider different types of spillovers. Depending on the type of information needed to enter successfully on export markets, the export spillovers could be destination specific, product specific or both. For a given triad province-product-destination country ikj, we thus distinguish four types of spillovers: product (HS4) and destination country specific (presence in province i of foreign firms exporting product k to country j and value of these exports), country specific (presence in province i of foreign firms exporting other products than k to country j and value of these exports), product specific (presence in province i of foreign firms exporting product k to countries other than j and value of these exports) and general spillovers (presence in province i of foreign firms exporting other products than k to other countries than j and value of these exports). As displayed in Table 1, 11.5% of the observations in our sample have non-null product-country specific foreign export flows. The share rises to 26% if we consider observations for which domestic firms report positive exports. As emphasized in Table 2, for 7.5% of domestic starts, foreign firms in the province were exporting the same product to the same country the year before. Table 9 in the Appendix indicates that the proportion is 69.8% when considering foreign exports of the same product to other countries and 88.63% when looking at foreign exports of other products to the same country.

In our estimations, the coefficient on these spillovers variables will capture the net effect of the positive externalities described above and some negative effects, such as the competition exerted by foreign firms on domestic ones on local labor markets (possibly increasing wages) and congestion effects, such as the possible saturation of transport infrastructures etc.

Time-invariant determinants of exports

Several determinants, invariant across time, can explain the ability of firms in province i to export product k to country j, whether they are domestic or foreign. Not controlling for these determinants would bias our estimation of foreign export spillovers. First, province i can have better transport infrastructure or better endowments, which will impact on the export performance of domestic firms located in province i, whatever their activity and the countries they trade with. It can also influence the attractiveness of the province in terms of FDI and the ability of foreign firms to export. Second, province i can have specific relationships with country j, due to distance, to migrants networks, to the presence of a common border, to specific business partnerships between provincial authorities and country j etc. Again, these non-observed determinants, specific to the dyad ij, can impact on the export performance of both domestic and foreign firms. Third, province i can have a comparative advantage in product k, due to a specific ability developed across time or to specific development strategies implemented by local authorities. This would affect the export activities of both domestic and foreign firms. In order to take into account these unobserved determinants of export performance of domestic and foreign firms at the local level, we introduce a fixed effect for each triad province i-product k-destination country j.

This empirical strategy raises some issues about the interpretation of our results on export spillovers. First, given the definition of our dependent variable, the inclusion of the fixed effect means that we are in reality interested in the timing of entry: conditioning on the fact that domestic firms of province i start exporting product k to country j over the period, we relate the year of entry to the evolution of export activities of foreign firms in the province. Second, our empirical approach exploits the within dimension of our data and is thus focused on short-run determinants of the entry on export markets. Indeed, we study how the creation of export linkages by domestic firms in $t+1$ can be explained by the activity of surrounding foreign exporters in year t, once time-invariant province-product-country fixed effects are controlled for. More specifically, the impact of foreign export activities on domestic export transactions is estimated, within a given province-product-country triad, thanks to the apparition and/or size variations of export activities managed by foreign firms over the period. These province-product-country triads for which we do not observe changes in foreign export activities act as some kind of control groups. We believe that this approach is interesting, especially from a public policy point of view, since policy-makers, when implementing strategies aimed at attracting FDI, generally expect quick returns to investment. However, the impact of foreign

firms could be different in the long-run: a positive impact of foreign exporters on the probability that domestic firms start exporting in the short-run could become null or negative in the long-run if foreign firms exert a competitive pressure on local wages or on foreign markets, forcing domestic firms to exit export markets more rapidly. However, in the case of China, Chen and Swenson (2009) show that the presence of foreign exporters positively impact on the duration of new export flows, casting doubt on the existence of strong negative effects of foreign firms in the long-run.

Time-varying determinants of exports

So far, our empirical approach does not account for time-varying determinants of the entry on export markets, such as the foreign partner's demand. We need to account for the demand capacity of the destination country at the product level, which may determine simultaneously foreign and domestic export performance. We thus control for the destination country's import value defined at the 4-digit product level, taken from the BACI world trade dataset.[7] Our regressions will also include the GDP per capita of the importing country.[8]

Although the province-product-destination country fixed effects control for time-invariant specific ability of province i for product k, they do not account for the reshaping of China's comparative advantages relating to its rapid economic transformation and liberalization over the period 1997-2007, among which the entry in WTO. To control for time varying comparative advantages, we further introduce the log of province total export sales, province-product export sales and China-product export sales in year t. Since we also include year fixed effects that account for the evolution of total Chinese exports, controlling for these variables amounts to introducing the elements of a Balassa index of "revealed comparative advantage" at the province-product level. Indeed, the Balassa index is calculated as follows:

$$B_{ijt} = \frac{X_{ikt}/X_{it}}{X_{China,kt}/X_{China,t}} \tag{2}$$

where X denotes exports. An increase of the Balassa index reflects an increased comparative advantage of province i in product k, with respect to the rest of China. Since we introduce the elements of the Balassa separately, each of them controls for the fact that a potential positive

[7]This dataset, which is constructed using COMTRADE original data, provides bilateral trade flows at the 6-digit product level (Gaulier and Zignago, 2010). BACI is downloadable from http://www.cepii.fr/anglaisgraph/bdd/baci.htm.

[8]World countries real GDP per capita in PPP are taken from the World Development Indicators database (World Bank).

association between the export activity of foreign firms and the probability that domestic firms start exporting simply reflects a specific ability of the province or China for these activities. We also introduce total exports of province i to country j and total Chinese exports to country j to control for specific relationships between the province/China and the destination country. This is important given the use of business and trade agreements by Chinese authorities to manage their diplomacy. Finally, we also control for province GDP per capita to take into account supply-side determinants of exports such as workers' skills.[9]

We also need to make sure that our measure of multinational presence does not proxy for omitted unobservable growth in local economic opportunities at the product-level or destination country-level. Indeed, China has grown dramatically over the period 1997-2007 and the entry of domestic firms on foreign markets could be driven not only by current comparative advantages but by specific trends. We thus include the lagged value of all four variables described above (HS4 world demand of country j, total exports of the province, product-level exports of the province, country-level exports of the province in $t-1$). We also include the lagged value of China's exports at the product level and the lagged value of China's exports at the destination level to account for overall Chinese dynamics specific to the product and the destination country respectively.

Last, in order to further verify that our foreign export spillovers are not simply proxying for export spillovers among domestic firms or for past export experience of domestic firms, we further control for the local export activities undertaken by domestic firms in year t. By construction, since we look at the creation of new linkages at the product-country level, there is no export activity by domestic firms of the province in the previous year for the given product-country pair. We need however to account for export activities in other products for the same country, in other countries for the same product and in other products and other countries respectively. We control for both the presence and the value of these export activities, by introducing both a dummy identifying exporters and the log of exports.

3 Estimation of foreign export spillovers

3.1 Nature of foreign export spillovers

We explore in this section the existence and the nature of foreign export spillovers in China. We rely on a conditional logit estimation. We successively estimate in Table 3 the impact of

[9]Provincial GDP per capita are taken from the China Statistical yearbooks.

four different spillover variables, in increasing order of specificity, controlling for the demand in the destination country and for supply-side determinants of exports in the province and in China the year before the entry. Moulton (1990) showed that regressing individual variables on aggregate variables could induce a downward bias in the estimation of standard-errors. All regressions in this table and the following are thus clustered at the province level. We first use the value of exports by foreign firms as a proxy for foreign export spillovers. In column 1, we rely on the most aggregated measure of local foreign export activity, the total value of exports by foreign firms (all products-all destinations). This general spillover variable is significant but enters negatively, possibly due to crowding out effect: since we also control for total exports in province i in year t, the more these exports are covered by foreign firms, the less probable is the entry of domestic firms on foreign markets the following year. In column 2, we focus on country-specific spillovers (all products-same destination), while in column 3, we rely on a product-specific measure (same product-all destinations). These two spillover variables attract a negative sign but are not significant. In column 4 we use the most precise measure of foreign spillovers (same product-same destination). Interestingly, the product-country spillover variable is positive and significant at the 1% confidence level, attesting that the entry of domestic firms on export markets for product k and country j in year $t+1$ is positively influenced by export activities of foreign firms for product k and country j in year t.

To further assess the specificity of export spillovers, we decompose in column 5, for a given province-product-destination country triad ikj, the overall export value of foreign firms from province i in its four complementary components: exports of the same product k to the same country j, exports of the same product k to other countries, exports of other products to the same country j and exports of other products to other countries. In this column, we also control for the dynamics in demand-side and supply-side determinants of entry on export markets by introducing relevant controls in $t-1$. As can be seen in column 5, the country/product specific spillover measure is the only one to be positive and significant. Column 6 adds a final category of controls to ensure that the measured impact of foreign export spillovers does not simply reflect spillovers among domestic firms or past experience of domestic firms on export markets for product k or country j. Indeed, scope economies across destinations or across products may be at work for domestic exports. If the export performance of domestic firms on a destination country j (for other products than k) is correlated to foreign export performance and explains the entry of domestic firms for the product-country pair kj then, our estimation of foreign export spillovers will be biased. We thus include proxies for the domestic export performance

Table 3: Nature of foreign export spillovers

	Explained variable	Domestic new export link in t+1					
		(1)	(2)	(3)	(4)	(5)	(6)
Foreign export spillovers Year t	All product-country for. export	-0.338^{b}					
		(0.154)					
	Same country/all products for. export		-0.003				
			(0.003)				
	Same product/all countries for. export			-0.003			
				(0.002)			
	Same product-country for. export				0.020^{a}	0.020^{a}	0.023^{a}
					(0.002)	(0.002)	(0.001)
	Other product same country for. export					-0.001	0.004
						(0.003)	(0.003)
	Same product other country for. export					-0.003	0.007^{a}
						(0.002)	(0.002)
	Other product/country for. export					-0.331^{b}	-0.313
						(0.147)	(0.202)
Demand Year t	Ln country-product total imports	0.083^{a}	0.083^{a}	0.083^{a}	0.082^{a}	0.080^{a}	0.080^{a}
		(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)
	Ln country gdp per capita	0.758	0.601	0.606	0.585	0.746	0.784
		(0.718)	(0.912)	(0.915)	(0.912)	(0.704)	(0.658)
Supply Year t	Ln Export province	0.690^{a}	0.533^{b}	0.535^{b}	0.530^{b}	0.475^{b}	0.464
		(0.210)	(0.212)	(0.211)	(0.211)	(0.192)	(0.740)
	Ln Export province-product	0.178^{a}	0.181^{a}	0.182^{a}	0.179^{a}	0.169^{a}	0.007
		(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.009)
	Ln Export province-country	0.143^{a}	0.146^{a}	0.144^{a}	0.143^{a}	0.138^{a}	0.001
		(0.017)	(0.016)	(0.015)	(0.015)	(0.016)	(0.041)
	Ln Export China-product	0.418^{a}	0.415^{a}	0.416^{a}	0.413^{a}	0.354^{a}	0.340^{a}
		(0.017)	(0.019)	(0.019)	(0.019)	(0.018)	(0.018)
	Ln Export China-country	0.210^{a}	0.208^{a}	0.207^{a}	0.207^{a}	0.197^{a}	0.194^{a}
		(0.030)	(0.031)	(0.032)	(0.032)	(0.028)	(0.027)
	Ln Province gdp per capita	-0.540	-0.378	-0.384	-0.365	-0.545	-0.581
		(0.721)	(0.922)	(0.925)	(0.923)	(0.708)	(0.663)
Macro lags Year $t-1$	Lag Ln country-product total imports					0.009^{b}	0.009^{b}
						(0.004)	(0.004)
	Lag Ln Export province					0.261^{c}	0.255
						(0.158)	(0.155)
	Lag Ln Export province-product					0.027^{a}	0.027^{a}
						(0.006)	(0.006)
	Lag Ln Export province-country					0.013	0.011
						(0.010)	(0.009)
	Lag Ln Export China-product					0.079^{a}	0.074^{a}
						(0.013)	(0.013)
	Lag Ln Export China-country					0.020	0.019
						(0.015)	(0.016)
Domestic presence Year t	Ln Same product/other countries Domestic export						0.172^{a}
							(0.007)
	0/1 other products/same country Domestic export						-1.220^{a}
							(0.391)
	Ln Other products/same country Domestic export						0.139^{a}
							(0.038)
	0/1 same product/other countries Domestic export						-1.391^{a}
							(0.087)
	Ln Other prod./country Domestic export						-0.014
							(0.611)
	Observations	3575935					
	R-squared	0.121	0.120	0.120	0.120	0.122	0.123
	Fixed effects	province-product (HS4)-country triad & by year					

Heteroskedasticity-robust standard errors are reported in parentheses. Standard errors are clustered at the province level. ^{a}, ^{b} and ^{c} indicate significance at the 1%, 5% and 10% confidence level.

on other product-country pairs. We decompose past export performance of domestic firms in province i into three non-overlapping variables: domestic exports of product k to countries other than j, exports to country j of products other than k and exports of other products to other countries. Our main result holds: the coefficient on foreign product-country specific export spillovers even slightly increases to reach 0.023. Local foreign exports of product k to other countries enter with a positive and significant coefficient, but very small in magnitude (0.007).

In Table 4, we investigate the appropriate way to account for foreign export spillovers, given the large number of zeros. Indeed, in only 9.2% of the final sample observations[10] do we observe positive foreign export flows for the product-country specific spillovers variable. Columns 1 and 2 are benchmarks: Column 1 reproduces column 6 of Table 1 and column 2 focuses on product-country specific foreign export spillovers, controlling for the overall activity of foreign exporters (all destinations and all products) in the province. We then adopt two strategies to deal with the issue of zero foreign trade flows. First, we verify that our results hold when restricting our sample to cases where we observe non zero foreign presence for product k and country j in year t (columns 3 and 4). In this subsample, the average probability of new linkage creation by domestic firms rises from 0.23 to 0.38 (as reported at the bottom of the columns). Also, the size of the coefficient increases and is equal now to 0.047 (column 4). In columns 5 and 6, we further restrict our sample to province/product/country triads for which positive foreign exports are observed in 1997 (the first year of the sample). Overall, despite the reduction in the number of observations (84789 in columns 3 to 4 and 60928 in columns 5 to 6) our finding of a positive and significant impact of the product-country specific spillovers variable is confirmed.

The second way to deal with the zero foreign export flows, which is used in the rest of the paper, is to conserve the full sample and to decompose foreign export activities into the mere presence of foreign exporters for a given product-country pair and the value of their exports. Doing so, we are able to assess whether the impact detected in Table 3 is due to a switch in foreign export activities (from no export to positive exports) or to changes in the scale of exports realized by foreign firms. This is important when the number of observations for which we observe positive foreign export flows is small compared to the number of observations for which foreign export flows are null. In columns 7 and 8, foreign export spillovers are thus apprehended based not only on the foreign export value as previously, but also based on a

[10]This sample is different from the sample in Table 1 since ceasing and continuing export flows have been removed, as well as province-product-country triads for which we do not observe any domestic start over the period.

Table 4: Specification of foreign export spillovers

	Explained variable	Domestic new export link in t+1							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Benchmark		Positive foreign exports in year t		Positive foreign exports in 1997		Add dummies for exports >0	
Foreign export spillovers	Same product-country for. export	0.023^a	0.023^a	0.047^a	0. 047^a	0.022^a	0.022^a	0.016^a	0.016^a
		(0.001)	(0.001)	(0.008)	(0.008)	(0.003)	(0.003)	(0.004)	(0.004)
	0/1 same product-country for. export							0.067^c	0.072^b
								(0.035)	(0.036)
	Other product same country for. export	0.004		0.011		0.009		0.021^b	
		(0.003)		(0.014)		(0.001)		(0.009)	
	0/1 other prod./same country for. export							-0.191^c	
								(0.104)	
	Same product other country for. export	0.007^a		0.006		0.015^a		0.016^a	
		(0.002)		(0.006)		(0.005)		(0.004)	
	0/1 same prod./other country for. export							-0.102^b	
								(0.041)	
	Other product/country for. export	-0.313		-0.021		-0.323		-0.321	
		(0.202)		(0.331)		(0.326)		(0.200)	
	All product-country for. export		-0.308		-0.018		-0.398		-0.308
			(0.207)		(0.372)		(0.342)		(0.207)
Domestic presence	Same product other country dom. export	0.172^a	0.161^a	0.156^a	0.154^a	0.146^a	0.138^a	0.179^a	0.161^a
		(0.007)	(0.007)	(0.018)	(0.018)	(0.017)	(0.018)	(0.009)	(0.008)
	0/1 same prod./other country dom. export	-1.391^a	-1.317^a	-1.316^a	-1.302^a	-1.263^a	-1.212^a	-1.456^a	-1.314^a
		(0.087)	(0.089)	(0.211)	(0.213)	(0.175)	(0.178)	(0.101)	(0.090)
	Other product same country dom. export	0.139^a	0.123^a	0.126^b	0.113^b	0.146^a	0.123^b	0.166^a	0.123^a
		(0.038)	(0.034)	(0.052)	(0.049)	(0.066)	(0.059)	(0.038)	(0.034)
	0/1 other prod./same country dom. export	-1.220^a	-1.088^a	-1.797^b	-1.678^b	-0.308	-0.084	-1.486^a	-1.087^a
		(0.391)	(0.374)	(0.745)	(0.756)	(1.285)	(1.253)	(0.410)	(0.374)
	Other product/country dom. export	-0.014	-0.010	0.203	0.208	0.099	0.002	-0.006	-0.010
		(0.611)	(0.621)	(0.779)	(0.821)	(0.629)	(0.688)	(0.602)	(0.621)
	Control for imports and GDPs	yes	yes	yes	yes	yes	yes	yes	yes
	Control for Macro export	yes	yes	yes	yes	yes	yes	yes	yes
	Control for Macro export lags	yes	yes	yes	yes	yes	yes	yes	yes
	Share of domestic starts	0.233		0.384		0.305		0.233	
	Observations	3575935		84789		60928		3575935	
	R-squared	0.123	0.123	0.169	0.169	0.106	0.106	0.123	0.123
	Fixed effects	by province-product (HS4)-country triad & by year							

Heteroskedasticity-robust standard errors are reported in parentheses. Standard errors are clustered at the province level. ^{a}, ^{b} and ^{c} indicate significance at the 1%, 5% and 10% confidence level.

dummy indicating whether foreign exports are strictly positive. This allows us to disentangle what is due to the scale of foreign export activities from the more general impact of the presence of foreign exporters. In column 8, we use this approach to study the impact of foreign export spillovers for other products and/or other destinations. As can be seen in column 8, we find that product-country specific foreign export spillovers are linked to both the presence of foreign firms and the value of their export activities for the product-country pair kj. For the product-specific and the country-specific spillovers, the dummy enters with a negative and significant coefficient while the value of exports is on the contrary positively correlated to the entry of domestic firms on foreign markets. This means that foreign exports of the same product k (to other countries) or to the same country j (of other products) have a positive impact above a certain threshold only. However, results in column 1 show that the overall average effect is close to zero. Our results on the export spillovers for other products and countries confirm that there is no, on average, cross-products or cross-markets benefits from foreign export activities on the creation of a new export linkage by domestic firms.[11]

If we now try to have an idea of the magnitude of these product and destination country spillovers, we can make several thought experiments. Consider a province where there are no firms, neither foreign nor domestic, exporting product k to country j at year t and another province, where there are foreign firms exporting product k to country j, but in negligible quantities: the sole presence of foreign exporting firms raises the probability that domestic firms start exporting product k to country j in $t+1$ by 6.9% in the latter province compared to the former.[12] Considering the average probability to start exporting in the sample, equal to 23.3%, as a reference, the presence of foreign firms exporting product k to country j increases the average probability that domestic firms in the province start exporting the same product to the same country in $t+1$ by 1.6 percentage point. As summarized in Table 10, the marginal impact of the value of foreign exports is on the other hand much more modest, since a 10% increase in the value of foreign exports of product k to country j raises the probability that domestic firms start exporting the same product to the same country by 0.04 percentage point.[13]

[11]Note that the dummy 0/1 indicating whether foreign firms export is always 1 for other products and countries, this is why it does not appear in column 8.

[12]Given the form of the logistic function, the increase in probability generated by the sole presence of foreign firms exporting product k to country j is equal to $[e^{0.067}-1]\%$.

[13]If we consider a reference value $\bar{x}$ for variable x, the increase in probability generated by a 10% increase in x is equal to $(1.1^{\beta_x}-1)$, β_x being the coefficient on x. The increase expressed in percentage point of probability is equal to $(1.1^{\beta_x}-1)P_{\bar{x}}$.

3.2 Ordinary versus processing trade

Our results tend to show for the moment that domestic Chinese firms benefit from foreign export spillovers, but at a very specific level: the probability that domestic firms start exporting product k to country j is positively associated with surrounding foreign firms' exports of the same product to the same country the year before. Other foreign export activities have overall no significant or a very marginal impact.

However, one remaining question is whether the results hold when we account for the important role of processing trade. Indeed, since firms engaged in processing trade "simply" import inputs and re-export a transformed product, we can imagine that they are less embedded in their direct environment and consequently generate less externalities. In Table 5, we thus decompose our foreign export spillovers into the two trade regimes (ordinary and processing). Also, in order to identify whether export spillovers affect differently the creation of new linkages depending on the trade regime used by domestic firms, we study separately ordinary (ODT) export linkages creation (columns 3 and 4) and processing (PCS) export linkages creation (columns 5 and 6). Columns 1 and 2 indicate that foreign export activities in the assembly sector have no predictive power on the likelihood that domestic firms create new trade linkages. The coefficients on both the dummy for the presence of foreign exporters and their export value are insignificant.[14] By contrast, the two measures attract a positive and significant sign when export spillovers emanate from foreign exporters engaged in ordinary trade.

More interestingly, the comparison between columns 3 and 4 (restricted to ordinary export flows creation) and 5 and 6 (restricted to processing export new linkages) suggest that foreign export spillovers only derive from ordinary export activities of foreign firms and mainly apply to ordinary export activities of domestic firms. Only in this case both the presence of foreign exporters and the size of their export flows have both a positive impact on export starts by domestic firms. Moreover, processing trade appears to be a marginal trade regime for domestic firms compared to ordinary trade (222,838 observations for the former and 3,425,094 observations for the latter). It seems thus that processing trade activities are driven by different determinants.

In the end, when we focus on ordinary trade activities of both foreign and domestic firms, the presence *per se* of foreign firms exporting product k to country j increases the average probability that domestic firms in the same province start exporting this product to this country

[14] Only for the presence of processing foreign exports of other products to other countries do we observe a positive and significant coefficient, but this dummy equals 1 for 99.88% of the observations: given its very low variability, the coefficient we obtain is unreliable.

Table 5: Ordinary versus Processing trade (1999-2007)

	Explained variable	Domestic new export link in t+1					
		All		Ordinary		Processing	
		(1)	(2)	(3)	(4)	(5)	(6)
Foreign Spillovers	ODT same prod./country for. export	0.015^{a}	0.013^{a}	0.017^{a}	0.016^{a}	-0.017^{c}	-0.018^{c}
		(0.004)	(0.004)	(0.004)	(0.004)	(0.010)	(0.010)
	0/1 ODT same prod/country for. export	0.086^{a}	0.083^{a}	0.065^{b}	0.063^{b}	0.279^{b}	0.274^{b}
		(0.029)	(0.029)	(0.030)	(0.030)	(0.112)	(0.112)
	ODT same prod. other country for. export		0.021^{a}		0.021^{a}		0.010
			(0.005)		(0.005)		(0.010)
	0/1 ODT same prod. other country for. export		-0.132^{a}		-0.139^{a}		0.031
			(0.046)		(0.045)		(0.088)
	ODT other prod. same country for. export		0.021^{b}		0.021^{b}		-0.027
			(0.009)		(0.009)		(0.021)
	0/1 ODT other prod. same country for. export		-0.186^{b}		-0.185^{b}		0.382^{c}
			(0.093)		(0.088)		(0.231)
	ODT other prod./country for. export		0.025		0.017		0.226
			(0.102)		(0.105)		(0.162)
	PCS same prod./country for. export	0.006	0.006	0.007	0.007	0.009	0.009
		(0.006)	(0.006)	(0.006)	(0.006)	(0.015)	(0.015)
	0/1 PCS same prod/country for. export	0.080	0.068	0.040	0.028	0.201	0.195
		(0.049)	(0.050)	(0.045)	(0.046)	(0.168)	(0.169)
	PCS same prod. other country for. export		0.022^{a}		0.021^{a}		0.036^{a}
			(0.004)		(0.005)		(0.010)
	0/1 PCS same prod. other country for. export		-0.214^{a}		-0.207^{a}		-0.269^{a}
			(0.040)		(0.044)		(0.099)
	PCS other prod. same country for. export		0.010		0.007		0.040
			(0.007)		(0.007)		(0.026)
	0/1 PCS other prod. same country for. export		-0.122		-0.101		-0.341
			(0.084)		(0.085)		(0.257)
	PCS other prod./country for. export		-0.116		-0.121		-0.198
			(0.118)		(0.123)		(0.139)
	0/1 PCS other prod./country for. export		2.355^{c}		2.417^{c}		2.148
			(1.373)		(1.434)		(1.539)
Domestic presence	Other product same country Domestic export	0.130^{a}	0.163^{a}	0.127^{a}	0.157^{a}	0.128^{a}	0.170^{a}
		(0.040)	(0.042)	(0.042)	(0.043)	(0.049)	(0.056)
	0/1 other prod./same country dom. export	-1.163^{a}	-1.464^{a}	-1.083^{b}	-1.354^{a}	-1.168^{c}	-1.551^{b}
		(0.430)	(0.448)	(0.453)	(0.467)	(0.650)	(0.693)
	Same prod. other country Domestic export	0.162^{a}	0.189^{a}	0.162^{a}	0.189^{a}	0.183^{a}	0.214^{a}
		(0.008)	(0.010)	(0.007)	(0.009)	(0.030)	(0.032)
	0/1 same prod./other country dom. export	-1.325^{a}	-1.543^{a}	-1.319^{a}	-1.534^{a}	-1.636^{a}	-1.901^{a}
		(0.088)	(0.100)	(0.088)	(0.099)	(0.267)	(0.292)
	Other prod./country Domestic export	0.555	0.460	0.602	0.483	-0.894^{a}	-0.898^{b}
		(0.408)	(0.510)	(0.420)	(0.511)	(0.313)	(0.439)
	Control for imports and GDPs	yes	yes	yes	yes	yes	yes
	Control for Macro export	yes	yes	yes	yes	yes	yes
	Control for Macro export lags	yes	yes	yes	yes	yes	yes
	Average probability of domestic start	0.233		0.235		0.274	
	Observations	3575935		3425094		222838	
	R-squared	0.123	0.124	0.123	0.124	0.138	0.139
	Fixed effects	province-product (HS4)-country triad & by year					

Heteroskedasticity-robust standard errors are reported in parentheses. Standard errors are clustered at the province level. ^{a}, ^{b} and ^{c} indicate significance at the 1%, 5% and 10% confidence level.

by 1.52 percentage point[15] while a 10% increase in the value of foreign exports increases the average probability that domestic firms start exporting by 0.04 percentage point[16]. These results are in line with previous findings on the heterogenous impact of export upgrading depending on trade type. Jarreau and Poncet (2009) show for example that sophistication of foreign exports has no impact on provincial GDP per capita growth, and thus argue that processing exports performance must not be taken as signalling a process of technological adoption in China, but rather as an artefact due to China's participation in the increasing fragmentation of production processes.

4 Heterogeneity of foreign export spillovers

We now investigate the robustness of our results and the potential heterogeneity of export spillovers according to the sophistication of exported products and the sophistication gap between foreign and domestic firms. Given the results obtained in the previous section, we focus on ordinary trade activities of both domestic and foreign firms.

4.1 Robustness checks

We perform several robustness checks aimed at verifying that our results are not driven by potential remaining estimations biases or to the presence of potential outliers.

The first column of Table 6 reproduces the benchmark specification (corresponding to column 4 of Table 5). In columns 2 and 3, we check that the foreign export spillovers we measure are not due to the fact that China is the main supplier for some product-country pairs. We thus drop product-country pairs for which China accounts for more than 45% and 85% respectively of total imports. Thresholds at 45 and 85% correspond to the top quartile and top decile respectively of the distribution of China's share in total imports of product k by country j. Our results on foreign export spillovers are not qualitatively affected.

We also verify that our results are not driven by the main exporting provinces. In column 4, we exclude from our sample the observations for the three main exporters (Guangdong, Shanghai and Jiangsu). These three provinces account for around 60% of China's total exports over the period. Results are again qualitatively the same. Benchmark results are thus not specifically linked to these outward-oriented locations.

[15] This figure corresponds to $[e^{0.063} - 1] \times 0.233$ from column 4.
[16] This figure corresponds to $[1.1^{0.016} - 1] \times 0.233$ from column 4.

Some sectors have experienced dramatic changes over the period 1997-2007. In particular, the entry in WTO and the end of the Multi Fibre Agreement have resulted in massive reductions in tariffs and quotas for clothing, textile and footwear sectors (HS2 codes from 50 to 67), which may explain jointly the surge in both domestic and foreign exports. In column 5, we drop these sectors from the estimation sample and we observe that our results remain unaffected.

Despite the sharp reduction in sample size induced by these various restrictions, we thus confirm the positive and significant impact of foreign export spillovers limited to the same product/destination case.

The inclusion of various controls for the evolution of comparative advantages and trade relationships between China and other countries might however not control for all the product-specific shocks that affect both foreign and domestic exports (technology shock, product regulations etc.). This is why column 6 reproduces column 1 adding product-year fixed effects defined at the HS2 level. Results are obtained from a linear probability model since it was impossible to account in a logit model for both the province-product-country triadic fixed effects and for product-year fixed effects. We find that the product-country foreign export spillovers resist the inclusion of product-year fixed effects. Note that the coefficient on the presence of foreign exporters, equal to 1.3%, can be directly interpreted in this linear probability regression as a marginal impact; it is very close to the marginal impact of foreign exporters presence measured in other specifications.

Finally, some questions may arise on the temporal scope of export spillovers. The last column of Table 6 includes lags (by one year) of the variables capturing the different foreign export spillovers (same product-country, same product other countries, other products same country and other products other countries). We verify that our results hold and are qualitatively the same whether the foreign export activities are measured in t or in $t-1$.

All our findings are also confirmed when we restrict our sample to durable starts, defined as export starts followed by positive export values for at least two consecutive years. [17]

[17] Results are available from the authors upon request.

Table 6: Robustness checks and further results

	Explained variable:	Domestic ordinary new export link in t+1						
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
			China's share		No	No		
		benchmark	<45%	<85%	top 3 provinces	Textile Clothing	Additional controls	
Ordinary trade Foreign Spillovers	ODT same prod/country for. export	0.016^a	0.018^a	0.016^a	0.016^a	0.014^a	0.006^a	0.018^a
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.001)	(0.005)
	0/1 ODT same prod/country for. export	0.066^b	0.048^c	0.059^b	0.065^b	0.079^b	0.013^c	0.109^b
		(0.030)	(0.028)	(0.029)	(0.028)	(0.034)	(0.001)	(0.047)
	ODT same prod. other country for. export	0.021^a	0.022^a	0.022^a	0.014^a	0.023^a	0.003^a	0.020^a
		(0.005)	(0.005)	(0.005)	(0.004)	(0.006)	(0.001)	(0.005)
	0/1 ODT same prod. other country for. export	-0.144^a	-0.155^a	-0.149^a	-0.075^c	-0.155^a	-0.027^a	-0.125^a
		(0.047)	(0.048)	(0.047)	(0.039)	(0.049)	(0.010)	(0.048)
	ODT other prod. same country for. export	0.021^b	0.022^b	0.021^b	0.011	0.019^b	0.004^b	0.018^b
		(0.009)	(0.009)	(0.009)	(0.008)	(0.009)	(0.002)	(0.009)
	0/1 ODT other prod. same country for. export	-0.192^b	-0.182^c	-0.193^b	-0.080	-0.156^c	-0.053^a	-0.175^c
		(0.092)	(0.095)	(0.093)	(0.081)	(0.093)	(0.018)	(0.094)
	ODT other prod/country for. export	0.031	0.042	0.037	0.041	-0.005	0.016	0.037
		(0.101)	(0.097)	(0.100)	(0.095)	(0.098)	(0.018)	(0.097)
	Lag ODT same prod/country for. export							-0.006
								(0.005)
	Lag 0/1 ODT same prod/country for. export							0.220^a
								(0.042)
	Lag ODT same prod. other country for. export							0.009^b
								(0.004)
	Lag 0/1 ODT same prod. other country for. export							-0.062
								(0.038)
	Lag ODT same country other prod for. export							0.010
								(0.007)
	Lag 0/1 ODT same country other prod. for. export							-0.085
								(0.073)
	lag ODT Other prod/country for. export							-0.026
								(0.062)
Domestic presence	Other product same country	0.152^a	0.170^a	0.160^a	0.134^a	0.150^a	0.001	0.161^a
		(0.044)	(0.049)	(0.045)	(0.028)	(0.048)	(0.006)	(0.049)
	0/1 Other prod./same country	-1.297^a	-1.462^a	-1.396^a	-1.072^a	-1.232^a	-0.177^b	-1.381^a
		(0.473)	(0.539)	(0.475)	(0.303)	(0.464)	(0.069)	(0.506)
	Same product other country	0.177^a	0.180^a	0.177^a	0.164^a	0.182^a	0.018^a	0.196^a
		(0.008)	(0.008)	(0.008)	(0.007)	(0.008)	(0.001)	(0.009)
	0/1 Same prod./other country	-1.436^a	-1.460^a	-1.436^a	-1.297^a	-1.444^a	-0.182^a	-1.567^a
		(0.091)	(0.103)	(0.096)	(0.091)	(0.094)	(0.015)	(0.102)
	Other country/product	0.702	0.689	0.696	0.935^b	0.628	0.079	0.889
		(0.466)	(0.450)	(0.465)	(0.391)	(0.449)	(0.054)	(0.551)
	Control for imports and GDPs	yes	yes	yes	yes	yes	yes	yes
	Control for Macro export	yes	yes	yes	yes	yes	yes	yes
	Control for Macro export lags	yes	yes	yes	yes	yes	yes	yes
	SH2-year Fixed effects	non	no	no	no	no	yes	no
	Fixed effects	by province-product (HS4)-country triad & by year						
	Observations	3425094	2568573	3239186	2689057	2782764	4387492	2860539
	R-squared	0.123	0.125	0.126	0.113	0.131	0.019	0.178

Heteroskedasticity-robust standard errors are reported in parentheses. Standard errors are clustered at the province level. ^{a}, ^{b} and ^{c} indicate significance at the 1%, 5% and 10% confidence level. Column 6 is a linear probability estimation.

Table 7: Heterogeneity impact of foreign export spillovers depending on product sophistication

	Explained variable:	Domestic ordinary trade new export link in t+1							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Product HS-4 sophistication)							
		$\geq$ 13775	$<$ 13775	$\geq$ 13775	$<$ 13775	$\geq$ 11000	$<$ 11000	$\geq$ 11000	$<$ 11000
Foreign ODT spillovers	ODT same prod/country for. export	0.012^{b}	0.025^{a}	0.009^{c}	0.024^{a}	0.015^{a}	0.024^{a}	0.013^{a}	0.023^{a}
		(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.008)	(0.004)	(0.008)
	0/1 ODT same prod/country for. export	0.095^{b}	0.016	0.100^{b}	0.015	0.070^{b}	0.024	0.074^{b}	0.021
		(0.040)	(0.044)	(0.040)	(0.044)	(0.030)	(0.071)	(0.030)	(0.071)
	ODT other prod. same country for. export			0.020^{b}	0.022^{b}			0.019^{b}	0.024^{b}
				(0.010)	(0.009)			(0.010)	(0.010)
	0/1 ODT other prod. same country for. export			-0.181^{c}	-0.191^{b}			-0.173^{c}	-0.208^{b}
				(0.097)	(0.095)			(0.097)	(0.100)
	ODT same prod. other country for. export			0.026^{a}	0.016^{a}			0.023^{a}	0.018^{a}
				(0.006)	(0.006)			(0.006)	(0.005)
	0/1 ODT same prod. other country for. export			-0.186^{a}	-0.091^{c}			-0.151^{a}	-0.120^{b}
				(0.052)	(0.048)			(0.050)	(0.049)
	ODT other prod./country for. export			0.023	0.034			0.017	0.047
				(0.108)	(0.099)			(0.110)	(0.091)
	All product-country Foreign export	0.042	0.059			0.037	0.074		
		(0.110)	(0.101)			(0.112)	(0.093)		
Domestic presence	Other product same country dom. export	0.129^{b}	0.127^{a}	0.151^{a}	0.153^{a}	0.139^{a}	0.107^{a}	0.160^{a}	0.136^{a}
		(0.051)	(0.037)	(0.053)	(0.039)	(0.045)	(0.039)	(0.047)	(0.042)
	0/1 Other prod./same country dom. export	-0.929^{c}	-1.192^{a}	-1.121^{b}	-1.422^{a}	-1.126^{b}	-0.987^{b}	-1.313^{a}	-1.240^{b}
		(0.501)	(0.434)	(0.521)	(0.447)	(0.451)	(0.494)	(0.468)	(0.508)
	Same prod. other country dom. export	0.164^{a}	0.161^{a}	0.180^{a}	0.175^{a}	0.160^{a}	0.162^{a}	0.176^{a}	0.178^{a}
		(0.010)	(0.009)	(0.011)	(0.010)	(0.008)	(0.010)	(0.009)	(0.011)
	0/1 Same prod./other country dom. export	-1.302^{a}	-1.352^{a}	-1.430^{a}	-1.461^{a}	-1.295^{a}	-1.361^{a}	-1.416^{a}	-1.486^{a}
		(0.127)	(0.106)	(0.135)	(0.108)	(0.108)	(0.113)	(0.114)	(0.117)
	Other prod./country Domestic export	0.726	0.696	0.737	0.674	0.754	0.641	0.757	0.614
		(0.525)	(0.450)	(0.515)	(0.442)	(0.503)	(0.443)	(0.492)	(0.435)
	Control for imports and GDPs	yes	yes	yes	yes	yes	yes	yes	yes
	Control for Macro export	yes	yes	yes	yes	yes	yes	yes	yes
	Control for Macro export lags	yes	yes	yes	yes	yes	yes	yes	yes
	Share of domestic starts	0.234	0.236	0.234	0.236	0.234	0.237	0.234	0.237
	Observations	1712219	1710931	1712219	1710931	2352760	1070390	2352760	1070390
	R-squared	0.147	0.101	0.147	0.101	0.143	0.084	0.143	0.084
	Fixed effects	by province-product (HS4)-country triad & by year							

Heteroskedasticity-robust standard errors are reported in parentheses. Standard errors are clustered at the province level. ^{a}, ^{b} and ^{c} indicate significance at the 1%, 5% and 10% confidence level.

4.2 Foreign export spillovers and product sophistication

One argument often advanced by policy-makers to justify policies aiming at attracting FDI is that foreign firms may help domestic ones to improve their processes, to adopt technology and then to increase their productivity and upgrade the quality of their products. Jarreau and Poncet (2009) show that the export sophistication of domestic exports is favorable to provincial growth, but not the sophistication of foreign exports. However, if the export spillovers generated by foreign firms are stronger for more sophisticated products, this would be consistent with an indirect impact of foreign firms' export activities on local income growth. In Table 7, we thus check whether the magnitude of foreign export spillovers depends on the product sophistication level. As in the previous section, we focus on domestic starts and foreign exports in ordinary trade. We follow Hausmann, Hwang and Rodrik (2007) and assume that each good k that a country can potentially produce and export has an intrinsic level of sophistication[18] associated to it, $PRODY_k$, which is the weighted average of the income levels of this good k's exporters, where the weights correspond to the revealed comparative advantage of each country j in good k:[19]

$$PRODY_k = \frac{1}{C_k} \sum_j \frac{x_{jk}}{X_j} \times Y_j, \tag{3}$$

where x_{jk} is the value of exports of good k by country j, X_j is the total value of country j's exports and Y_j is the per capita level of income of country j, measured as the real GDP per capita, in 2000 PPP dollars. C_k is a normalization term used to have the coefficients sum to 1. The bigger share a given good k weighs in the exports of rich countries, the higher its $PRODY$, the more sophisticated it is.

We compute the product(HS4)-level sophistication level for the year 1997, the initial year of our sample. The average sophistication value of goods exported by China across the 1213 exported HS4-products in 1997 is 12813\$ with a minimum of 971 and a maximum of 32000\$.[20]

In Table 7, we use two alternative cut-offs. Columns 1 to 4 rely on the value of 13775\$ which ensures a split in almost two equal subsamples. Columns 5 to 8 use a lower value, equal to 11000\$. Both cut-offs provide a similar message: export spillovers are systematically

[18]While Hausmann, Hwang and Rodrik (2007) use the word "productivity" to describe sophistication at the good level, we prefer terms like sophistication, high quality or technological advancement.

[19]The numerator of the weight, x_{jk}/X_j, is the value-share of the commodity in the country j's overall export basket while the denominator of the weight, $C_k = \sum_j (x_{jk}/X_j)$, aggregates the value-shares across all countries exporting the good.

[20]The statistical distribution of sophistication value is reproduced in Figure 1 in the Appendix. Values are in constant 2000 PPP dollars. For example sophistication values of 5000\$ correspond to cotton fabrics and fresh fish, sophistication values of 10000\$ correspond to woven fabrics in synthetic staple fibers and stranded wires in aluminium. At values of 15000\$, one finds children printed books and sewing machines.

stronger for higher product sophistication levels. When we consider results obtained in columns 3 and 4, the sole presence of foreign exporters increases the probability that domestic firms start exporting sophisticated product k to country j in year $t+1$ by 10.5% with respect to the average productivity to start exporting, i.e. by 2.5 percentage point. Foreign presence has no impact *per se* for less sophisticated products. As reported in Table 10, the difference in the marginal impact of foreign exports value between both samples is negligible (0.02 for sophisticated products and 0.05 for less sophisticated ones). The effect of the presence *per se* of foreign exporters is equal to 1.8 percentage point when the sophistication threshold is set at 11000$ (in this case, the marginal impact of foreign exports value is equal to 0.03 percentage point for sophisticated products and 0.05 for the others).

This result is suggestive that foreign export spillovers can be beneficial to the upgrading of Chinese domestic exports. At least, the positive impact of foreign exporters is not restricted to products of low sophistication level, which could have resulted in a "low-sophistication" trap for domestic exporters.

4.3 Foreign export spillovers and sophistication gap

We now investigate another source of heterogeneity of foreign export spillovers. In order to benefit from the experience of foreign firms, the activity of domestic firms might need to be quite similar to the one of foreign firms. It is indeed likely that large technological distance reduces the capacity for domestic firms to benefit from export spillovers, due to limited absorption capacity. Consistently with the theoretical model of Rodriguez-Clare (1996), Havranek and Irsova (2010) find in a meta-analysis on technology spillovers from FDI that the positive impact of foreign firms presence on domestic firms' productivity is greater when generated by investors that have a slight technological advantage over local firms.

One way to measure the distance between the goods produced by foreign and domestic firms is to compare their degree of sophistication. In Table 8, we thus investigate the potential heterogeneous impact of foreign export spillovers depending on the sophistication gap between foreign and domestic exporters. We compute the average difference in sophistication level at the province-HS2 level for the year 1997. This average difference is computed as the ratio between the weighted average sophistication of HS4-products exported by foreign firms of province i within a given HS2 category, and this weighted average for domestic firms. The median value of this sophistication gap over the 1715 province-HS2 pairs was 1.008 in 1997.[21] To verify that

[21]The statistical distribution of sophistication gap across the province-HS2 pairs is reported in Figure 2 in

Table 8: Heterogeneity impact of foreign export spillovers depending on sophistication gap

Explained variable:	Domestic ODT new export link in t+1					
	(1)	(2)	(3)	(4)	(5)	(6)
	Ratio Foreign/Domestic ordinary sophistication (sh2-province 1997)					
	< 1	≥ 1	≥ 1 & < 1.07	≥ 1 & < 1.09	≥ 1.07	≥ 1.09
ODT same prod/country for. export	0.015^{b}	0.017^{a}	0.013^{c}	0.013^{b}	0.021^{a}	0.021^{a}
	(0.006)	(0.003)	(0.007)	(0.007)	(0.004)	(0.005)
0/1 ODT same prod/country for. export	0.082	0.053^{b}	0.092^{c}	0.086^{c}	0.010	0.010
	(0.053)	(0.026)	(0.048)	(0.049)	(0.042)	(0.048)
ODT same prod. other country for. export	0.018^{a}	0.024^{a}	0.036^{a}	0.035^{a}	0.014^{b}	0.012^{b}
	(0.005)	(0.006)	(0.007)	(0.007)	(0.006)	(0.006)
ODT other prod. same country for. export	0.023^{b}	0.020^{b}	0.027^{a}	0.029^{a}	0.013	0.010
	(0.011)	(0.009)	(0.009)	(0.009)	(0.010)	(0.011)
ODT other prod./country for. export	-0.135	0.074	0.298	0.191	-0.035	-0.005
	(0.230)	(0.123)	(0.223)	(0.251)	(0.095)	(0.097)
0/1 ODT other prod. same country for. export	-0.184^{c}	-0.192^{b}	-0.278^{a}	-0.291^{a}	-0.119	-0.090
	(0.111)	(0.090)	(0.095)	(0.090)	(0.096)	(0.098)
0/1 ODT same prod. other country for. export	-0.105^{b}	-0.169^{a}	-0.266^{a}	-0.254^{a}	-0.089	-0.081
	(0.047)	(0.057)	(0.068)	(0.065)	(0.057)	(0.058)
Control for imports and GDPs	yes	yes	yes	yes	yes	yes
Control for Macro export	yes	yes	yes	yes	yes	yes
Control for Macro export lags	yes	yes	yes	yes	yes	yes
Share of domestic starts	0.233	0.230	0.235	0.234	0.227	0.2265
Observations	1427612	1995538	870664	983733	1124874	1011805
R-sq	0.1289	0.1200	0.1329	0.1313	0.1107	0.1097
Fixed effects	by province-product (HS4)-country triad & by year					

Heteroskedasticity-robust standard errors are reported in parentheses. Standard errors are clustered at the province level. ^{a}, ^{b} and ^{c} indicate significance at the 1%, 5% and 10% confidence level.

export spillovers are not restricted to cases where foreign exporters display no technological advantages over local firms, we split our sample depending on whether the ratio of sophistication level between foreign and domestic entities is lower (column 1) or higher (column 2) than one.

We find that spillovers are stronger when the HS4-products exported by foreign firms of the province are on average as sophisticated or more sophisticated than the products exported by domestic firms (column 2 compared to column 1). In this case, the presence of foreign exporters increases the average probability that domestic firms start exporting a given product k to country j by 5.4% (i.e. 1.25 percentage point). The presence of foreign firms *per se* has no effect when domestic firms of the province export products that are more sophisticated than foreign firms' exported products. In columns 3 to 6, we further split the sample of column 2 depending on the level of the sophistication advance of foreign firms. We use two alternative values for the sophistication ratio, 1.07 and 1.09. Interestingly, we find that the export spillovers effect is much higher when foreign exporters have a slight technological advantage over domestic firms (in columns 3 and 4).

Overall, our results suggest that the magnitude of foreign export spillovers is greatest when the average difference in sophistication between foreign and domestic firms is positive but lower than 10%. In this case, the presence of foreign exporters in the province increases the probability that domestic firms start exporting product k to country j by around 9% (i.e. 2.26 percentage

the Appendix.

point). The presence of foreign exporters *per se* has no impact when the technological advance of foreign firms is too big. Regarding the marginal impact of the foreign exports value, the difference between both samples is again negligible (0.03 percentage point when sophistication gap is small (columns 3 and 4) versus 0.05 when it is big (columns 5 and 6)). Our results are in line with theoretical and empirical evidence on technology spillovers from FDI (Rodriguez-Clare (1996), Havranek and Irsova (2010)) suggesting that the positive impact from foreign firms presence on domestic firms' productivity is greatest when the technological advantage of foreign investors over local firms is moderate. This last finding suggests that the optimistic result obtained previously about the magnification effect of export spillovers with product level sophistication should be qualified. While proximity to foreign exporters can help domestic exporters to create new export linkages, especially for sophisticated products, this is restricted to instances where the technological advantage of foreign firms is not too high.

5 Conclusion

We investigate how the creation of new export linkages (extensive margin of trade) by domestic firms in China is influenced by their proximity to multinational exporters. Using panel data from Chinese customs for the period 1997-2007, we show that domestic firms' capacity to start exporting new varieties to new markets positively responds to the export activity of neighboring foreign firms for that same product-country pair. Weak or no foreign export spillovers are detected when other dimensions of export activities of foreign firms are considered (other destination countries, other products). This is coherent with preceding results obtained by Koenig et al. (2010) for France and indicates that externalities in terms of exports operate at a very detailed level of activities. We also find that foreign export spillovers are limited to ordinary trade activities. No foreign export spillovers are found for processing trade. More, export spillovers are stronger for sophisticated products indicating that proximity to foreign exporters may help domestic exporters to upgrade their exports. However we observe that foreign export spillovers are weaker when the technology gap between foreign and domestic firms is large, suggesting that upgrading may not occur when foreign firms have already a strong edge.

6 References

Aitken B., G. Hanson and A. Harrison, 1997, "Spillovers, Foreign Investment, and Export Behavior" *Journal of International Economics* 43, 103-132.

Amiti M. and C. Freund, 2010, "An anatomy of China's export growth", in Robert Feenstra and Shang-Jin Wei (Eds.), China's Growing Role in World Trade. : University of Chicago Press.

Barrios, S., H. Gorg and E. Strobl, 2003, "Explaining Firms' Export Behaviour: R&D, Spillovers and the Destination Market", *Oxford Bulletin of Economics and Statistics*, 65(4), 475-96.

Blomström, M. and Kokko, A., 1998, "Multinational corporations and spillovers", *Journal of Economic Surveys*, 12(3), 247-278.

Bloningen, B. and Ma A., 2010, "Please Pass the Catch-up: The Relative Performance of Chinese and Foreign Firms in Chinese Exports", in Robert Feenstra and Shang-Jin Wei (Eds.), China's Growing Role in World Trade. : University of Chicago Press.

Caves, R., 1974, "Multinational firms, competition and productivity in host-country markets", *Economica*, 41, 176-193.

Chen H. and D. Swenson, 2009, "Multinational Exposure and the Quality of New Chinese Exports", mimeo.

Cheung K.-Y. and P. Lin , 2004, "Spillover effects of FDI on innovation in China: Evidence from the provincial data", *China Economic Review*,15, 25- 44.

China Statistical yearbook, 2008, China Statistics Press.

Crespo N. and M. P. Fontoura, 2006, "Determinants factors of FDI spillovers, what do we really know", *World Development*, 35(3), 410-425.

Görg H. and D. Greenaway, 2004, "Much ado about nothing? Do domestic firms really benefit from Foreign Direct Investment?", *The World Bank Research Observer*, 19 (2), 171-197.

Gaulier G. and S. Zignago, 2010. "BACI: A World Database of International Trade at the Product level, The 1994-2007 Version" , CEPII working paper 2010-23.

Hale G. and C. Long, 2010, "Are There Productivity Spillovers from Foreign Direct Investment in China?", *Pacific Economic Review*, forthcoming.

Harding T. and B. Smarzynska Javorcik, 2010, "A Touch of Sophistication: FDI and Unit values of exports", mimeo.

Hausmann R., J. Hwang and D. Rodrik, 2007, 'What You Export Matters', *Journal of Economic Growth*, 12, 1-25.

Havranek T. and Z. Irsova, 2010, "Which Foreigners are worth wooing? A Meta-Analysis of vertical spillovers from FDI?", mimeo.

Hu, A., and Jefferson, G., 2002, "FDI impact of spillover: Evidence from China's electronic and textile industries", *The World Economy*, 25(8), 1063-1076.

Jaffe, A.B., Trajtenberg, M., Henderson, R., 1993, "Geographic localization of knowledge spillovers as evidenced by patent citations", *Quarterly Journal of Economics*, 108, 577-598.

Jarreau, J. and S. Poncet, 2009, "Export Sophistication and Economic Performance: evidence from China", CEPII working paper 2009-34, forthcoming *Journal of Development Economics*.

Kemme D., D. Mukherjee and A. Nikolsko-Rzhevskyy , 2009, "Foreign Direct Investment and Export Performance in Emerging Economies: Evidence from Indian IT Firms", mimeo.

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

Kokko A., M. Zejean and R. Tansini, 2001, "Trade regimes and spillover effects of FDI: Evidence from Uruguay", *Weltwirschaftliches Archiv*, 137 (1), 124-149.

Koenig P., F. Mayneris and S. Poncet, 2010, "Local export spillovers in France", *European Economic Review*, 54, 622-641.

Li, X., X. Liu, and D. Parker, 2001, "Foreign direct investment and productivity spillovers in the Chinese manufacturing sector", *Economic Systems*, 25(4), 305-321.

Liu, Z., 2001, "Foreign direct investment and technology spillover: evidence from China', ' *Journal of Comparative Economics*, 30(3), 579-602.

Ma, Alyson, 2006, "Export Spillovers to Chinese Firms: Evidence from Provincial Data", *Journal of Chinese Economic and Business Studies*, 4(2), 127-149.

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

Rodriguez-Clare A., 1996, "Multinationals, linkages, and Economic Development", *American Economic Review*, 86 (4), 852-73.

Ruane F. and J. Sutherland, 2005, "Foreign Direct Investment and Export Spillovers: How do export platforms fare?", IIIS discussion paper 58.

Swenson D., 2008, "Multinationals and the creation of Chinese trade linkages", *Canadian Journal of Economics*, 41(2), 596-618.

Xu B. and J. Lu, 2009, "Foreign Direct Investment, processing trade, and the sophistication of China's exports", *China Economic Review*, 20, 425-439.

Wang Z. And Wei S-J, 2010, What Accounts for the Rising Sophistication of China's Exports? , in Robert Feenstra and Shang-Jin Wei (Eds.), China's Growing Role in World Trade. : University of Chicago Press.

7 Appendix

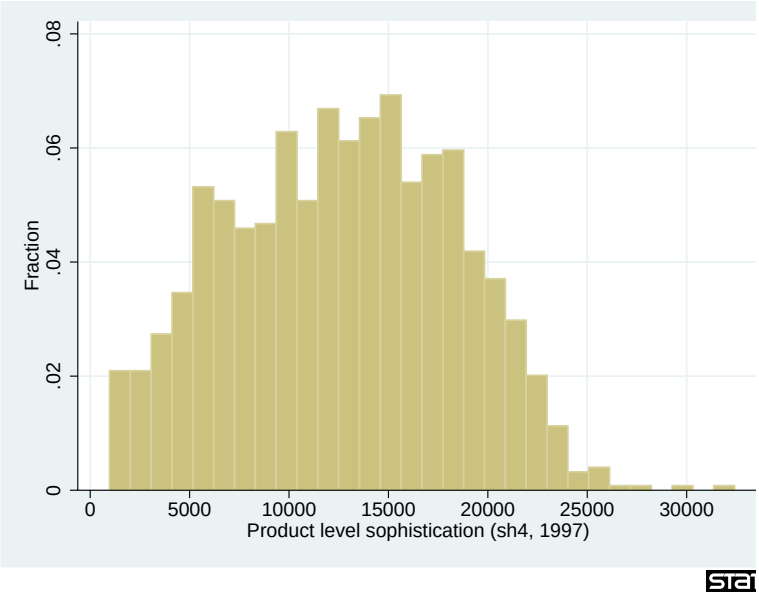

Figure 1: Density of product-level export sophistication, 1997. Source: Authors' computations based on Chinese customs, BACI and WDI.

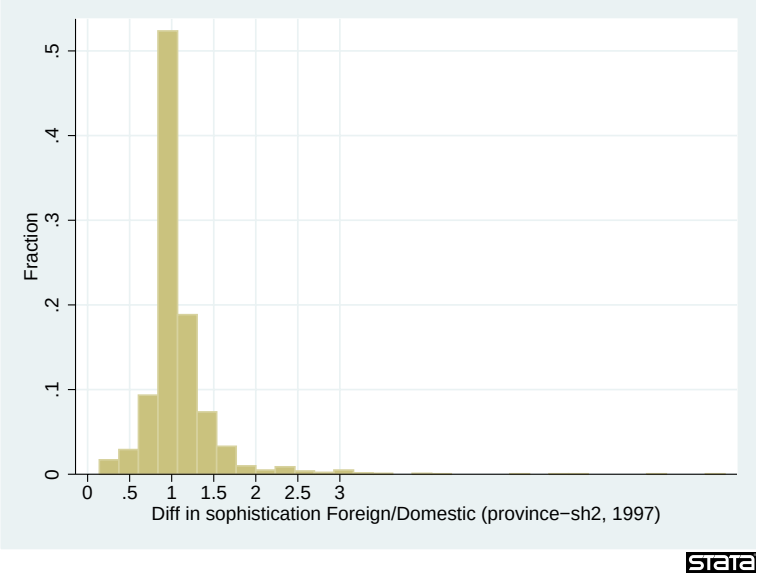

Figure 2: Density of Foreign-Domestic ODT export sophistication, 1997. Source: Authors' computations based on Chinese customs, BACI and WDI.

Table 9: Summary statistics on domestic starts and foreign presence nature

Year	Domestic Start=1					Domestic start=0				
	Total	Foreign Exports>0				Total	Foreign Exports=0			
		Same product		Other product			Same product		Other product	
		Same country	Other country	Same country	Other country		Same country	Other country	Same country	Other country
1997	83818	5688	55047	71753	83818	776830	17230	444238	581812	776830
2006	159318	13001	118686	146838	159318	395054	31580	250577	358320	395054
Total	1268768	94690	885055	1123626	1268768	6060088	226741	3674106	4956347	6060088
Share (%)		7.5	69.8	88.6	100		3.7	60.6	81.8	100

Table 10: Marginal impact in percentage point-Summary

	All sample	ODT	PCS	Soph.	Not soph.	Low soph. gap	High soph.gap
	Tab. 4 Col. 8	Tab. 5 Col. 4	Tab. 5 Col. 6	Tab. 7 Col. 4	Tab. 7 Col. 5	Tab. 8 Col. 3	Tab. 8 Col. 5
Foreign presence *per se*	1.6	1.53	n.s.	2.5	n.s.	2.26	n.s.
Foreign exp. val	0.04	0.04	n.s.	0.02	0.05	0.03	0.05

Figures correspond to the increase in the average probability that domestic firms start exporting in a product/country pair when foreign firms' exports are positive for this product/country pair (first row) and when foreign firms' exports rise by 10% (second row).

Recent titles

CORE Discussion Papers

2010/55. Jan JOHANNES, Sébastien VAN BELLEGEM and Anne VANHEMS. Iterative regularization in nonparametric instrumental regression.
2010/56. Thierry BRECHET, Pierre-André JOUVET and Gilles ROTILLON. Tradable pollution permits in dynamic general equilibrium: can optimality and acceptability be reconciled?
2010/57. Thomas BAUDIN. The optimal trade-off between quality and quantity with uncertain child survival.
2010/58. Thomas BAUDIN. Family policies: what does the standard endogenous fertility model tell us?
2010/59. Nicolas GILLIS and François GLINEUR. Nonnegative factorization and the maximum edge biclique problem.
2010/60. Paul BELLEFLAMME and Martin PEITZ. Digital piracy: theory.
2010/61. Axel GAUTIER and Xavier WAUTHY. Competitively neutral universal service obligations.
2010/62. Thierry BRECHET, Julien THENIE, Thibaut ZEIMES and Stéphane ZUBER. The benefits of cooperation under uncertainty: the case of climate change.
2010/63. Marco DI SUMMA and Laurence A. WOLSEY. Mixing sets linked by bidirected paths.
2010/64. Kaz MIYAGIWA, Huasheng SONG and Hylke VANDENBUSSCHE. Innovation, antidumping and retaliation.
2010/65. Thierry BRECHET, Natali HRITONENKO and Yuri YATSENKO. Adaptation and mitigation in long-term climate policies.
2010/66. Marc FLEURBAEY, Marie-Louise LEROUX and Gregory PONTHIERE. Compensating the dead? Yes we can!
2010/67. Philippe CHEVALIER, Jean-Christophe VAN DEN SCHRIECK and Ying WEI. Measuring the variability in supply chains with the peakedness.
2010/68. Mathieu VAN VYVE. Fixed-charge transportation on a path: optimization, LP formulations and separation.
2010/69. Roland Iwan LUTTENS. Lower bounds rule!
2010/70. Fred SCHROYEN and Adekola OYENUGA. Optimal pricing and capacity choice for a public service under risk of interruption.
2010/71. Carlotta BALESTRA, Thierry BRECHET and Stéphane LAMBRECHT. Property rights with biological spillovers: when Hardin meets Meade.
2010/72. Olivier GERGAUD and Victor GINSBURGH. Success: talent, intelligence or beauty?
2010/73. Jean GABSZEWICZ, Victor GINSBURGH, Didier LAUSSEL and Shlomo WEBER. Foreign languages' acquisition: self learning and linguistic schools.
2010/74. Cédric CEULEMANS, Victor GINSBURGH and Patrick LEGROS. Rock and roll bands, (in)complete contracts and creativity.
2010/75. Nicolas GILLIS and François GLINEUR. Low-rank matrix approximation with weights or missing data is NP-hard.
2010/76. Ana MAULEON, Vincent VANNETELBOSCH and Cecilia VERGARI. Unions' relative concerns and strikes in wage bargaining.
2010/77. Ana MAULEON, Vincent VANNETELBOSCH and Cecilia VERGARI. Bargaining and delay in patent licensing.
2010/78. Jean J. GABSZEWICZ and Ornella TAROLA. Product innovation and market acquisition of firms.
2010/79. Michel LE BRETON, Juan D. MORENO-TERNERO, Alexei SAVVATEEV and Shlomo WEBER. Stability and fairness in models with a multiple membership.
2010/80. Juan D. MORENO-TERNERO. Voting over piece-wise linear tax methods.
2010/81. Jean HINDRIKS, Marijn VERSCHELDE, Glenn RAYP and Koen SCHOORS. School tracking, social segregation and educational opportunity: evidence from Belgium.
2010/82. Jean HINDRIKS, Marijn VERSCHELDE, Glenn RAYP and Koen SCHOORS. School autonomy and educational performance: within-country evidence.
2010/83. Dunia LOPEZ-PINTADO. Influence networks.
2010/84. Per AGRELL and Axel GAUTIER. A theory of soft capture.

Recent titles

CORE Discussion Papers - continued

2010/85. Per AGRELL and Roman KASPERZEC. Dynamic joint investments in supply chains under information asymmetry.
2010/86. Thierry BRECHET and Pierre M. PICARD. The economics of airport noise: how to manage markets for noise licenses.
2010/87. Eve RAMAEKERS. Fair allocation of indivisible goods among two agents.
2011/1. Yu. NESTEROV. Random gradient-free minimization of convex functions.
2011/2. Olivier DEVOLDER, François GLINEUR and Yu. NESTEROV. First-order methods of smooth convex optimization with inexact oracle.
2011/3. Luc BAUWENS, Gary KOOP, Dimitris KOROBILIS and Jeroen V.K. ROMBOUTS. A comparison of forecasting procedures for macroeconomic series: the contribution of structural break models.
2011/4. Taoufik BOUEZMARNI and Sébastien VAN BELLEGEM. Nonparametric Beta kernel estimator for long memory time series.
2011/5. Filippo L. CALCIANO. The complementarity foundations of industrial organization.
2011/6. Vincent BODART, Bertrand CANDELON and Jean-François CARPANTIER. Real exchanges rates in commodity producing countries: a reappraisal.
2011/7. Georg KIRCHSTEIGER, Marco MANTOVANI, Ana MAULEON and Vincent VANNETELBOSCH. Myopic or farsighted? An experiment on network formation.
2011/8. Florian MAYNERIS and Sandra PONCET. Export performance of Chinese domestic firms: the role of foreign export spillovers.

Books

J. GABSZEWICZ (ed.) (2006), La différenciation des produits. Paris, La découverte.
L. BAUWENS, W. POHLMEIER and D. VEREDAS (eds.) (2008), *High frequency financial econometrics: recent developments*. Heidelberg, Physica-Verlag.
P. VAN HENTENRYCKE and L. WOLSEY (eds.) (2007), *Integration of AI and OR techniques in constraint programming for combinatorial optimization problems*. Berlin, Springer.
P-P. COMBES, Th. MAYER and J-F. THISSE (eds.) (2008), *Economic geography: the integration of regions and nations*. Princeton, Princeton University Press.
J. HINDRIKS (ed.) (2008), *Au-delà de Copernic: de la confusion au consensus* ? Brussels, Academic and Scientific Publishers.
J-M. HURIOT and J-F. THISSE (eds) (2009), *Economics of cities.* Cambridge, Cambridge University Press.
P. BELLEFLAMME and M. PEITZ (eds) (2010), *Industrial organization: markets and strategies*. Cambridge University Press.
M. JUNGER, Th. LIEBLING, D. NADDEF, G. NEMHAUSER, W. PULLEYBLANK, G. REINELT, G. RINALDI and L. WOLSEY (eds) (2010), *50 years of integer programming, 1958-2008: from the early years to the state-of-the-art*. Berlin Springer.

CORE Lecture Series

C. GOURIÉROUX and A. MONFORT (1995), Simulation Based Econometric Methods.
A. RUBINSTEIN (1996), Lectures on Modeling Bounded Rationality.
J. RENEGAR (1999), A Mathematical View of Interior-Point Methods in Convex Optimization.
B.D. BERNHEIM and M.D. WHINSTON (1999), Anticompetitive Exclusion and Foreclosure Through Vertical Agreements.
D. BIENSTOCK (2001), Potential function methods for approximately solving linear programming problems: theory and practice.
R. AMIR (2002), Supermodularity and complementarity in economics.
R. WEISMANTEL (2006), Lectures on mixed nonlinear programming.