

Internationalization and performance of Polish enterprises: evidence from firm-level data

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Abstract

This paper provides evidence on the relative performance of internationalized firms using Polish firm-level data spanning over the period of 1996-2005. We distinguish between three modes of internationalization: exporting, importing of capital goods and foreign direct investment. Our results point strongly at superior performance of exporters vs. non-exporters importers vs. non-importers and foreign affiliates vs. domestic firms. We also find evidence for significant horizontal and backward productivity spillovers from all three types of international activity.

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The views presented here are those of the authors and not necessarily of the institution they represent.

1. Introduction

Until quite recently, the international trade literature was dominated by a representative firm setup. Since the seminal contribution by Krugman (1980),¹ textbook models of trade incorporated imperfect competition and increasing returns to scale, but they still assumed that firms operating in the same sector share the same level of productivity, fixed costs etc. One of the consequences of this assumption was a uniform export status. Within a given country-sector, either all firms were exporters or none of them was involved in this type of activity.

This model prediction was clearly at odds with empirical observations. At least since Bernard and Jensen (1995) it is well documented that firms with significantly different characteristics do coexist even in narrowly defined industries and only some of them export. Interest in firm heterogeneity was further supported by an outbreak of theoretical contributions. The major breakthrough can be attributed to Melitz (2003), who augmented the Krugman-like model with firm heterogeneity and demonstrated how its interaction with sunk costs associated with entering foreign markets determines the distribution of the export status within industries.² Building on this framework, Helpman et al. (2004) showed how it can be extended to capture firm decisions to set up a foreign subsidiary serving the local market.³ Antras and Helpman (2004) develop a model in which differences in productivity levels lead to different organizational forms, including ownership structures and suppliers locations. Melitz and Ottaviano (2005) explore the link between the tightness of competition and market prices, which allows them to incorporate pro-competitive effects from trade liberalization. Among other most recent contributions one can also mention Constantini and Melitz (2007), who link firm heterogeneity with decisions to innovate in the process of adjustment to trade liberalization.

The expanding body of theoretical developments was matched by a growing number of empirical works using firm-level data. Our paper adds to this literature by focusing on the relationship between internationalization and the economic performance of firms. We distinguish between three modes of internationalization: exporting, importing of capital goods and foreign direct investment. The aim of our paper is not only to present evidence on how

¹ See also Helpman and Krugman (1985).

² The relationship between productivity and exporting is also explored by Bernard et al. (2003) (and subsequently by Bernard et al., 2006), who introduce the stochastic framework in the Ricardian model of comparative advantage.

³ An important predecessor is Markusen (1995), who derives the rationale for the existence of multinational enterprises from the concept of knowledge capital.

performance of firms is related to their international status (direct effects), but also to examine how presence of exporters, importers and foreign affiliates affects other enterprises operating in the economy (spillovers). Our analysis relies on Polish firm-level data spanning over the period of 1996-2005.

Our work is related to a number of studies trying to tackle similar empirical questions using micro-data. Firm heterogeneity with respect to an international status was examined using standard methods e.g. by Kimura and Kiyota (2006) or Castellani and Zanfei (2007), while Delgado et al. (2002) and Girma et al. (2004) addressed the same issue by applying nonparametric tests to firm productivity distributions. Overall, the main finding of this literature is superior performance of internationalized firms compared to those operating only on the domestic market.

The existence of spillovers from foreign direct investment was examined by a quite large number of studies, the early wave of which is summarized in Görg and Greenaway (2004). Given the somewhat mixed evidence, more recent contributions tried to show how the size of spillovers depends on such factors as age, size and absorptive capacity of domestic firms, ownership structure of foreign affiliates or competitive pressure (see e.g. Gorodnichenko et al., 2007 or Kolasa, 2008).

The literature on spillovers from exporting is far more limited and concentrates mainly on export rather than productivity spillovers. The overview provided in Greenaway and Kneller (2007) fails to find any consistent relationship nor any clear pattern for discrepancies across the studies.

While imports of capital goods are considered as one of the major channels for technology transfer,⁴ there are hardly any firm-level studies examining the potential spillovers from importers to other firms. A rare exception is Keller and Yeaple (2003) who find positive externalities from importing.

Our main contribution to the existing literature can be summarized in three points. First, our dataset allows us to simultaneously consider three different modes of internationalization: exporting, importing of capital goods and foreign investment. This helps us to discuss the relevance of some theoretical implications in a more comprehensive way. Second, given the impressive size and coverage of our data, we can explore the cross-industry heterogeneity of some of our main findings. Third, we do not restrict our attention to how the international status is related to the firm performance, but also examine how presence of

⁴ A classical macrostudy on international R&D spillovers is Coe and Helpman (1995). Keller (1998) provides its critical evaluation.

exporters, importers and foreign affiliates affects other enterprises operating in the economy. This allows us to gain a broader picture of the macroeconomic consequences of internationalization, e.g. by assessing whether superior productivity of internationalized firms spills over to domestic firms or rather comes at their expense.

The rest of this paper is organized as follows. Section two describes the dataset and demonstrates the relevance of exporters, investment importers and foreign affiliates for the Polish economy. Section three shows how internationalization affects firm-level performance. Evidence for spillovers from internationalization to other firms is discussed in section four. Section five concludes.

2. Descriptive statistics

2.1. Dataset and definitions

The dataset under study is provided by the Polish Central Statistical Office (CSO). It covers all medium and large size enterprises (employing at least 50 people) in the Polish economy over the period of 1996-2005. The dataset is based on two sources: the financial (profit-and-loss) statement survey, F-01, and the balance sheet survey, F-02. Besides financial data, our combined dataset also includes information on the number of employees, form of ownership (foreign vs. domestic, private vs. state-owned) and on the geographical location of firm registration. F-01 data has a threshold of 50 employed persons while F-02 of 9 employed persons. In order to obtain the information on the number of employees (available only in F-01), these two datasets are merged and purged of all datapoints below the 50 employee threshold.

The dataset covers on average almost 15 thousand firms each year (see Table 1 and 2 for a detailed sectoral breakdown of employment, output and number of firms). The dataset covers NACE 10 through 93 industries. The average yearly reported employment is 3.7 million. In 2005, the total employment by firms covered by our dataset amounted to roughly 29% of total working population in the national economy (including self-employed) and 42% of all persons employed on a contract basis. The average total revenue during the period under consideration is 861 billion PLN per year.

[Table 1 and Table 2 about here]

Our dataset allows us to consider three modes of internationalization, which is exporting, investment goods importing and foreign direct investment. We define a firm as foreign affiliate if more than half of its equity is owned by non-residents. We define a firm as exporter if it exports at least 5% of its turnover and does it for at least two years covered by our sample. By analogy, we define a firm as investment good importer if its investment imports constitute at least 5% of total investment for at least two years.⁵ Applying these definitions to our sample of firms reveals that more than half of them are classified as not being involved in any type of foreign activity (see Table 3), while only a small fraction (about 5%) is internationalized in all three dimensions. There are significant interdependencies across the modes of internationalization. For instance, foreign affiliates have a much higher propensity to export and import than domestic firms, exporters much more often than non-exporters use imported investment goods for expanding or upgrading their capital stock etc.

The cross shares reported in Table 3 also show that most of foreign firms are also exporters, which points at cost reduction or (less likely) export platform as primary motives for FDI inflow to Poland. However, given the significant share of foreign affiliates serving only domestic customers, the local market expansion motive seems to be important as well.

[Table 3 about here]

2.2. Relevance of internationalized firms for the economy

The relevance of exporters, importers and foreign affiliates for the domestic economy is summarized in Tables 4 to 6. As can be seen, exporters account for large shares of output, employment and number of firms in manufacturing, having a relatively smaller share in services and construction. The proportion of output produced by exporters remained relatively stable over the period 1996-2002 (except for the drop in 1998 related to the Russian crisis) and accelerated in 2003 (the year prior to Poland's EU accession), driven by a rapid expansion in manufacturing. In 2005 the share of exporters in manufacturing output amounted to 65%.

Investment importers supply about 36-38% of output in our sample of firms. Their share is the highest in manufacturing and it amounts to roughly 60%. The shares of investment importers in the total output, employment and the number of firms are relatively stable over the period for which the data are available.

⁵ Our dataset allows us to distinguish between domestic and foreign sources of firm capital expenditures only as from 2000.

The relevance of foreign affiliates for the Polish economy increased substantially between 1996 and 2005, with a marked acceleration following the EU accession. The share of foreign affiliates is particularly high in manufacturing, but still remains below 50% in terms of output.

[Tables 4-6 about here]

Exporting activity is highly concentrated, with more than half of exports accounted by top 5% of exporters (see Table 7). The level of concentration remained relatively stable over the period of 1996-2005. When looking at the distribution of time spent as exporter (Figure 1), we can see that the most firms either do not export at all or export during the whole analyzed period. This pattern is consistent with the existence of sunk costs associated with entering foreign markets.

[Table 7 about here]

[Figure 1 about here]

Both investment importers and foreign affiliates are also highly concentrated. Top 5% of firms belonging to the respective group account for nearly half of output, while top 10% supply almost two thirds. The distribution of time spent as investment importer or as foreign affiliate (Figure 2 and 3) show a similar pattern as in the case of exporting, with far more pronounced “fat tail” features for the ownership status and relatively less so for importing. This suggests that, compared to exporting, setting up a foreign affiliate involves higher sunk costs, while the opposite holds true for starting to import capital goods.

[Figure 2 and 3 about here]

3. Internationalization and firms' heterogeneity

As we demonstrated in the introduction, the major channel that the theoretical literature seems to focus on when discussing heterogeneity of firms with respect to their international status is productivity. Bernard and Jensen (1999) and many other contributions find that exporting firms are on average more productive, larger and pay higher wages. The

empirical literature also explores a reverse channel of causation, namely learning by exporting. However, most studies (see e.g. Bernard and Jensen, 1999, Aw et al., 2001 or Clerides et al., 1998) do not arrive at any robust conclusions.

In this section we look at the characteristics of firms that choose one or more of the three modes of internationalization defined above. We claim that all of them are costly (especially in terms of fixed costs of establishing trading partners, distribution channels etc.) but can also be associated with larger market share and better performance, either through self-selection mechanisms or by learning processes. The aim of this section is to test for the existence and size of this kind of effects related to internationalization.

3.1. International status and firms' characteristics

In order to examine formally how exporting firms differ from their non-exporting counterparts (we abstract from the analysis of causal relationships), we follow Bernard and Jensen (1999) and regress a number of firm-specific indicators (X_i) against an exporting dummy (*Export*) and 3-digit industry fixed effects (*Industry_j*) according to the following specification:

$$\ln X_i = \alpha + \beta \cdot \text{Export} + \chi \cdot \text{Industry}_j + \varepsilon_i,$$

where the parameter of interest β can be interpreted as an export premium, defined as an average percentage difference in performance between exporters and non-exporters. Following Bernard et al. (2007), we also perform an OLS estimation additionally controlling for the firm size. We run our regressions year by year and for the whole sample, with a full set of time dummies in the latter case.

The results reported in Tables 8-11 show that exporters are significantly bigger than non-exporters in terms of output and employment. They have also higher capital per worker, labour productivity and pay higher wages. There is a clear upward trend over time in all estimated premia, except for employment. The exporter premia are highly significant, in most cases at a 1% level. When we control for employment and industry-level effects, they amount on average to 30% for sales and capital-labour ratio, 20% for value added per worker and 15% for wages. The premia remain significant when we control for employment and firm-level rather than industry-level effects. This means that firms starting to serve foreign markets gain in size and improve their performance, which can be seen as evidence for either learning to export or learning by exporting.

We follow a similar strategy to assess the premia from investment imports. They turn out positive and significant in all analyzed cases. This time, however, we cannot observe any clear trend in their size. Except for employment, premia from importing seem to be somewhat higher than those related to exporting. When employment and industry fixed effects are controlled for, they amount on average to 40-50% except for wages, where the premium is equal to 15%. When we control for individual fixed effects premia remain significant. Interestingly, in this case the premium for employment turns out negative, which suggests that a sizable share of investment sourced from imports might be of a labour-saving type.

[Table 8-11 about here]

Similar pattern emerges if we do a similar exercise for foreign affiliates and domestic firms. As tables 8 to 11 reveal, the premia from foreign ownership are the highest among the three different internationalization modes. When we include industry fixed effects and control for employment, they amount on average to around 70% for sales and the capital-labour ratio, 50 percent in the case of value added per worker and 40 percent for wages. When we include individual fixed effects, these premia are still significant and close to those reported for investment importers. Again, the premium for employment is negative, which suggests that some of the efficiency gains associated with a domestic firm being taken over by a foreign company are achieved via shedding least productive staff. Similarly to exporting, the premia from foreign ownership show a clear upward trend over the period covered by our sample.

Overall, it seems that foreign affiliates gain most from their internationalized status. Except for size (sales and employment), investment importers enjoy higher premia than exporters.

3.2. Internationalization and total factor productivity

We supplement our discussion of the relation between firms characteristics and their international status with a total factor productivity analysis. As mentioned before, this dimension of firm heterogeneity seems to be most important in view of most recent theoretical advances.

In order to estimate total factor productivity at the firm level,⁶ we assume the following value-added based Cobb-Douglas production function (lower case letters denote natural logarithms):

$$y_{it} = \alpha_0 + \alpha_1 \cdot l_{it} + \alpha_2 \cdot k_{it} + \varepsilon_{it}.$$

Y_{it} is value-added for firm i at time t , deflated by the price index for the relevant two, three or four-digit industry (depending on data availability). Labour input, L_{it} , is measured as the number of workers. Capital input, K_{it} , is calculated as the average book value of fixed assets (assuming linear change in the stock during the year), deflated by the capital goods deflator for the appropriate two-digit sector.

It is well acknowledged that ordinary least squares estimation of the production function may lead to biased estimates, since the factor choices may be endogenous to the realisation of productivity shocks (firms may adjust the factor mix once the shock is observed). Among many ways to circumvent that problem, two seem to be most popular: the algorithms proposed by Olley and Pakes (1996) and Levinsohn and Petrin (2003). Both papers develop similar semi-parametric estimation procedures to overcome the endogeneity problem using, respectively, investment and material costs as instruments for unobservable productivity shocks.

We estimate the production function with the algorithm developed by Levinsohn and Petrin (2003), using intermediate inputs as a proxy variable. Intermediate inputs are defined as a sum of the use of materials and outsourced services, deflated by price indexes constructed for each two-digit sector using the input-output table (available only at a two-digit level for the year 2000) and the relevant two-digit gross output and import deflators. We chose the Levinsohn-Petrin procedure since otherwise (i.e. if using the Olley-Pakes algorithm) our sample would have to be cleared of many datapoints with zero or negative investment.

In view of insufficient number of observations for a few two-digit industries, we merge the following: 10 with 11, 13 with 14, 15 with 16, 23 with 24, 30 with 31, 60 and 61 with 62. The Levinsohn-Petrin algorithm is run separately for each of thus defined industries.

Additionally, before applying the estimation procedure we purge the dataset of outliers. An observation is defined as an outlier if the growth rate of either its value added, capital input or labour input belongs to the bottom (below 0.5%) or upper (above 99.5%) tail

⁶ Problems and possible solutions to estimating productivity at a firm-level are discussed e.g. by Altomonte and Besedina (2007).

of the relevant distribution. This procedure flags as outliers around 4% of observations in our dataset.

Having estimated the production function, firm-level productivity estimates are calculated as residuals. TFP distributions for foreign affiliates vs. domestic firms, exporters vs. non-exporters and investment importers vs. non-importers are sketched on Figure 4, 5 and 6, respectively. The superior performance of firms involved in international activity is clearly visible, particularly for the foreign-domestic breakdown.

[Figure 4 to 6 about here]

TFP differences between respective categories of firms can also be tested quantitatively using the method described in the previous subsection. As can be seen from Tables 8 to 11, the productivity level of an average exporter is significantly higher than that of its non-exporting counterpart. Even higher premium can be found for investment importers vs. non-importers and the highest for foreign affiliates vs. domestic firms. Similarly to other indicators considered in the previous section, TFP premia show a clear upward trend for exporters and foreign affiliates.

Finally, we report the evolution over time of a productivity index by industry for all firms and each category of firms separately (i.e. foreign affiliates, domestic firms, exporters, non-exporters, investment importers, non-importers). For a given firm category and a two-digit industry, we calculate the log productivity index as an average log TFP level across all relevant firms and normalize it by the average TFP level in 1996 of the relevant industry. For groups of industries (construction, manufacturing, mining, services, utilities and the whole sample), productivity indexes are defined as weighted averages of productivity indexes for relevant two-digit industries, where the weights are given by value-added shares. The results are reported in Table 12.

[Table 12 about here]

As can be seen, over the period of 1996-2005 Poland recorded a sizable and broad-based productivity improvement. Not only the initial levels of productivity of exporters, importers and foreign affiliates were on average significantly higher than those of their non-internationalized counterparts, but they also recorded faster productivity gains, so that the discrepancies grew even larger.

Taken together, all our results point strongly at significant superiority of internationalized firms.

4. Externalities from internationalization

In section 3 we presented evidence on how performance of firms is related to their involvement in various modes of internationalization. However, in order to gain insight on the overall macroeconomic impact of increasing international activity, it is important to examine how presence of exporters, importers and foreign affiliates affects other enterprises operating in the economy. In particular, one might be interested whether superior productivity of internationalized firms spills over to domestic firms or rather comes at their expense.

4.1. Theoretical background

The existence of positive spillovers can be motivated in many ways.⁷ First of all, one may refer to the partially public nature of knowledge and knowledge-based assets (i.e., in the language of Romer (1990), they are nonrival and only partially excludable). This means that it may be hard for high-performance firms to prevent leakages of their superior technologies, organizational and marketing practices to other enterprises. In this respect, two typical transmission mechanisms alluded to in the theoretical literature are imitation, like reverse engineering (see e.g. Wang and Blomström, 1992) or imitating export penetration practices (Aitken et al., 1997), and employment turnover (see e.g. Fosfuri et al., 2001). Another important channel through which spillovers might operate is increased competition, forcing direct competitors of internationalized firms to reduce inefficiencies and adopt better technologies (see e.g. Blomström and Kokko, 1998).

The mechanisms described so far typically refer to interactions between internationalized enterprises and firms operating in the same industry (horizontal spillovers). A recent strand of literature emphasizes the importance of vertical linkages, i.e. those occurring between internationalized firms and their suppliers (backward spillovers) or customers (forward spillovers). An important difference between horizontal and vertical spillovers is that in the case of the latter internationalized firms may have incentives not to prevent technology transfer or even get involved into a direct technological assistance (see

⁷ While most of the mechanisms described below are taken from the studies on spillovers from FDI, they can be easily extended to other modes of internationalization, like exporting or importing activities.

e.g. Blalock and Gertler, 2005). This may be motivated by their willingness to ensure better quality of inputs (backward spillovers) or increase demand for their products (forward spillovers).

It has to be mentioned that spillovers do not have to be positive. Negative horizontal spillovers may occur if competition from internationalized firms forces the domestic ones to reduce their production below the efficient level (see Aitken and Harrison, 1999). Similarly, if internationalized firms are more likely to source intermediate inputs from abroad rather than to build their supply chain locally, negative vertical spillovers may be observed. Productivity of domestic companies may also be affected by erosion of human capital, since it is the international firms that pay higher wages and hence are able to attract most qualified workers.

Finally, it might be that the positive spillover potential fails to materialize because domestic companies lack sufficient absorptive capacity (see e.g. Cohen and Levinthal, 1989) or operate in completely different market or production segments (Kokko, 1994).

4.2. Empirical model

In order to examine the existence of spillovers from exporting, importing or foreign direct investment, we estimate several variants of the following regression (lower case letters denote natural logarithms):

$$\Delta \ln TFP_{it} = \alpha_0 + \alpha_1 \Delta HZ_{jt}^m + \alpha_2 \Delta BW_{jt}^m + \alpha_3 \Delta FW_{jt}^m + \alpha_t + \alpha_k + \varepsilon_{it}.$$

The estimated equation includes a full set of time and 3-digit industry dummies (denoted by α_t and α_k , respectively). TFP_{it} is total factor productivity, estimated as in section 3. For each two-digit industry j , HZ_{jt}^m , BW_{jt}^m and FW_{jt}^m measure the intensity of internationalization of type m in the same industry, upstream sectors and downstream sectors, respectively.

Focusing first on spillovers from foreign direct investment ($m = F$), HZ_{jt}^F is defined as the share of an industry's output produced by exporters (defined in section 2) and is designed to capture horizontal (i.e. intra-industry) spillovers. BW_{jt}^F serves as a proxy for backward linkages (i.e. from exporters to their domestic suppliers) and is defined as follows:

$$BW_{jt}^F = \sum_l a_{jl} HZ_{lt}^F, \text{ for } j \neq l$$

where a_{jl} is the proportion of sector j output supplied to sector l , taken from the input-output matrix for 2000 (the most recent available for Poland). By analogy, FW_{jt}^F is designed to capture forward spillovers (i.e. from exporters to their domestic customers):

$$FW_{jt}^F = \sum_l b_{lj} HZ_{lt}^F, \text{ for } j \neq l$$

where b_{lj} is the input-output coefficient defined as the share of sector j inputs purchased from sector l .

Variables measuring horizontal, backward and forward linkages for the two remaining modes of internationalization, i.e. exporting ($m = E$) and importing ($m = I$), are defined in an analogous way, using definitions of importers and foreign affiliates presented in section 2.

Following Smarzynska-Javorcik (2004), our estimated regression is written in differences, which is aimed at removing any firm or region specific fixed factors that may be correlated with both firm productivity and foreign presence. This strategy has its costs: it can introduce biases by aggravating measurement errors in the regressors. Therefore, additionally to the baseline specification using one-year differences, we report results for two- and three-year differences. This not only makes potential measurement errors problems less severe (see Griliches and Hausman, 1986), but also takes into account the fact that spillovers may take time to materialize.

4.3. Results

The results of FDI spillovers regressions are reported in Table 13. Estimates from column 1 correspond to our baseline specification, based on one-year differences and 3-digit industry dummies. In column 2 industry dummies are replaced with firm dummies. The next two pairs of columns show the results obtained from similar regressions using two-year and three-year differences, respectively. All regressions are run on a subsample of domestic firms. Standard errors reported in the brackets are corrected for heteroscedasticity and correlation between observations for the same industry (defined at a 2-digit level) in a given year.

[Table 13 about here]

Overall, we find evidence for significantly positive horizontal and backward spillovers from foreign direct investment, but not for forward ones.⁸ Backward spillovers seem to be most important, both in statistical and economic terms (measured as contribution to productivity growth).

We follow a similar strategy to examine the existence of spillovers from exporting, restricting our sample to non-exporting firms. The results are reported in Table 14.

[Table 14 about here]

The main findings turn out to be similar to those obtained for externalities from foreign investment. They point at significantly positive horizontal and backward spillovers from exporting, with the impact of the latter being relatively stronger.

Finally, we rerun our regressions including import-based proxies for internationalization on a subsample of non-importing firms (see Table 15). One has to bear in mind that we can distinguish between importers and non-importers only in the last 6 years of our sample, which means that the results obtained for two- or three-year differences might be relatively less robust. Nevertheless, the main findings do not differ in qualitative terms from those obtained for spillovers from foreign investment and exporting.

[Table 15 about here]

As suggested by Table 3 and 4, outward orientation of firms usually involves more than one mode of international activity. For instance, most of foreign affiliates are either exporters or importers. Therefore, it is not possible to say from the results reported above which type of international activity generates highest externalities for firms not involved in this very mode of internationalization. However, it is feasible to examine where most of spillovers come from for firms not involved in any type of an outward-oriented activity.

To this effect, we reestimate our spillover regressions using all proxies for international intensity on a subsample of domestic firms which are neither exporters nor importers. The results are reported in Table 16.

[Table 16 about here]

⁸ This conclusion does not depend on whether we use industry or firm dummies, despite the fact that the latter specification is clearly favoured by the Hausman test.

In general, the results are mixed. However, bearing in mind that the regressions using longer differencing suffer from a relatively small sample size, one can conclude that spillovers from international trade are rather of a horizontal nature, while FDI spillovers operate mainly via backward linkages.

5. Conclusions

The aim of this paper was to study the effects of internationalization on the economic performance of firms. We distinguished between three modes of outward orientation: exporting, importing of capital goods and foreign direct investment. The Polish data on large and medium enterprises shows that firms often take part in at least one of the three modes and that internationalized firms contribute to a large part of the overall output and exports of the economy.

Our results point clearly at superiority of internationalized firms with respect to the analyzed criteria: they are significantly larger, more productive, have higher capital intensity and pay higher wages. These findings are perfectly consistent with most recent theoretical advances in the international trade theory, that stress the role of sunk costs associated with entering foreign markets and differences in productivity across firms as the key determinants of their international status. Moreover, our results suggest that superior performance of internationally active firms is not only due to the self-selection mechanism, but there are also some learning effects related to going international. We also find that internationalized firms were not only more productive as compared to their non-internationalized counterparts, but also the overall pace of growth of productivity among the former was faster than elsewhere.

Importantly, we find significant externalities from internationalization, which means that domestic firms benefit from the presence of companies involved in outward-oriented activities. These spillovers are mainly horizontal and backward (i.e. from internationalized firms to their domestic suppliers) in nature.

Superiority of internationalized firms together with significant spillover effects to domestic firms implies that overall macroeconomic effects from globalization are positive, at least in the case of Poland. Therefore, the clear policy implication of our findings is to support firm strategies aimed at increasing their international trade relations and to provide appropriate incentives for FDI inflow.

References

- Aitken, B., Hanson, G.H., Harrison, A.E., 1997, Spillovers, foreign investment, and export behavior, *Journal of International Economics* 43: 103-132.
- Aitken, B.J., Harrison, A.E., 1999, Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela, *American Economic Review* 89(3): 605-618.
- Altomonte, C., Besedina, E., 2007, Exploring International Trade from Below: A Survey of Firm Heterogeneity and Productivity Dynamics, MICRO-DYN Working Paper No. 01/07.
- Antras, P., Helpman, E., 2004, Global sourcing, *Journal of Political Economy* 112: 552–580.
- Aw, B. Y., Chen, X. and Roberts, M. J., 2001, Firm-level Evidence on Productivity Differentials, Turnover, and Exports in Taiwanese Manufacturing, *Journal of Development Economics* 66: 51-86.
- Bernard, A., Eaton, J., Jensen, J.B., Kortum, S., 2003, Plants and productivity in international trade, *American Economic Review* 93: 1268–1290.
- Bernard, A.B., Jensen, J.B., 1995, Exporters, jobs and wages in US manufacturing: 1976–1987, *Brookings Papers on Economic Activity, Microeconomics*: 67–119.
- Bernard, A.B., Jensen, J.B., 1999, Exceptional exporter performance: cause, effect, or both? *Journal of International Economics* 47: 1-25.
- Bernard, A.B., Jensen, J.B., Redding, S.J., Schott, P.K., 2006, Firms in International Trade, NBER Working Paper No. 13054.
- Blalock, G., Gertler, P.J., 2005, Welfare Gains from Foreign Direct Investment through Technology Transfer to Local Suppliers, mimeo.
- Blomström, M., Kokko, A., 1998, Multinational Corporations and Spillovers, *Journal of Economic Surveys* 12(2): 247-277.
- Castellani, D., Zanfei, A., 2007, Internationalisation, Innovation and Productivity: How Do Firms Differ in Italy?, *The World Economy* 30(1): 156-176.
- Clerides, S.K., Lach, S., Tybout, J., 1998, Is learning by exporting important? Micro-dynamic evidence from Colombia, Mexico and Morocco, *Quarterly Journal of Economics* 113: 903-948.
- Coe, D.T., Helpman, E., 1995, International R&D spillovers, *European Economic Review* 39(5): 859-887.
- Cohen, W., Levinthal, D., 1989, Innovation and Learning: The two Faces of R&D, *Economic Journal* 397: 569-596.
- Constantini, J.A., Melitz, M.J., 2007, The Dynamics of Firm-Level Adjustment to Trade Liberalization, mimeo.
- Delgado, M., Farinas, J., Ruano, S., 2002, Firm Productivity and Export Markets: A Non-Parametric Approach, *Journal of International Economics* 57: 397-422.
- Fosfuri, A., Motta, M., Rønde, T., 2001, Foreign Direct Investment and Spillovers Through Workers' Mobility, *Journal of International Economics* 53: 205-222.
- Girma, S., Görg, H., Strobl, E., 2004, Exports, international investment, and plant performance: evidence from a non-parametric test, *Economics Letters* 83: 317–24.

- Gorodnichenko, Y., Svejnar, J., Terrell, K., 2007. When Does FDI Have Positive Spillovers? Evidence from 17 Emerging Market Economies, CEPR Discussion Paper No. 6546.
- Görg, H., Greenaway, D., 2004, Much Ado about Nothing? Do Domestic Firms Really Benefit from Foreign Direct Investment?, *World Bank Research Observer* 19(2): 171-197.
- Greenaway, D., Kneller, R., 2007, Firm heterogeneity, exporting and foreign direct investment, *Economic Journal* 117: F134-F161.
- Griliches, Z., Hausman, J.A., 1986, Errors in Variables in Panel Data, *Journal of Econometrics* 31: 93-118.
- Helpman, E., Krugman, P.R., 1985, *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*, MIT Press, Cambridge, MA.
- Helpman, E., Melitz, M., Yeaple, S., 2004, Export versus FDI, *American Economic Review* 94: 300-316.
- Keller, W., 1998, Are international R&D spillovers trade-related?: Analyzing spillovers among randomly matched trade partners, *European Economic Review* 42(8): 1469-1481.
- Keller, W., Yeaple, S.R., 2003, *Multinational Enterprises, International Trade, and Productivity Growth: Firm-Level Evidence from the United States*, NBER Working Paper No. 9504.
- Kimura, F., Kiyota, K., 2006, Exports, FDI, and Productivity: Dynamic Evidence from Japanese Firms, *Review of World Economics* 127(4): 695-719.
- Kokko, A., 1994, Technology, Market Characteristics, and Spillovers, *Journal of Development Economics* 43: 279-293.
- Kolasa, M., 2008, How does FDI inflow affect productivity of domestic firms? The role of horizontal and vertical spillovers, absorptive capacity and competition, *Journal of International Trade and Economic Development* 17(1): 155-173.
- Krugman, P.R., 1980, Scale Economies, Product Differentiation, and the Pattern of Trade, *American Economic Review* 70: 950-959.
- Levinsohn, J., Petrin, A., 2003, Estimating Production Functions Using Inputs to Control for Unobservables, *Review of Economic Studies* 70(2): 317-341.
- Markusen, J.R., 1995, The Boundaries of Multinational Enterprises and The Theory of International Trade, *Journal of Economic Perspectives* 9: 169-189.
- Melitz, M., 2003, The impact of trade on intra-industry reallocations and aggregate industry productivity, *Econometrica* 71: 1695-725.
- Melitz, M.J., Ottaviano, G.I.P., 2005, *Market Size, Trade, and Productivity*, NBER Working Paper No. 11393.
- Olley, S., Pakes, A., 1996, The Dynamics of Productivity in the Telecommunications Equipment Industry, *Econometrica* 64: 1263-1297.
- Romer, P., 1990, Endogenous Technological Change, *Journal of Political Economy* 98(5): 71-102.

Smarzynska-Javorcik, B., 2004, Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages, *American Economic Review* 94(3): 605-627.

Wang, J., Blomström, M., 1992, Foreign Investment and Technology Transfer: A Simple Model, *European Economic Review* 36: 137-155.

Figure 1. Time spent as exporter

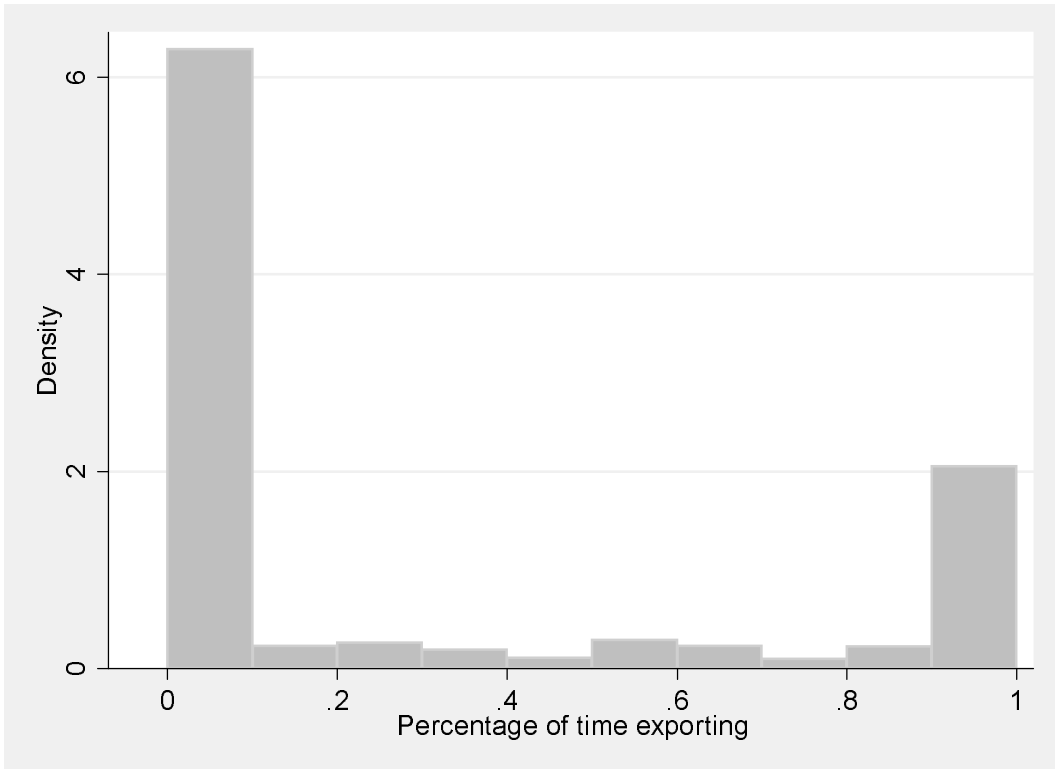


Figure 2. Time spent as foreign affiliate

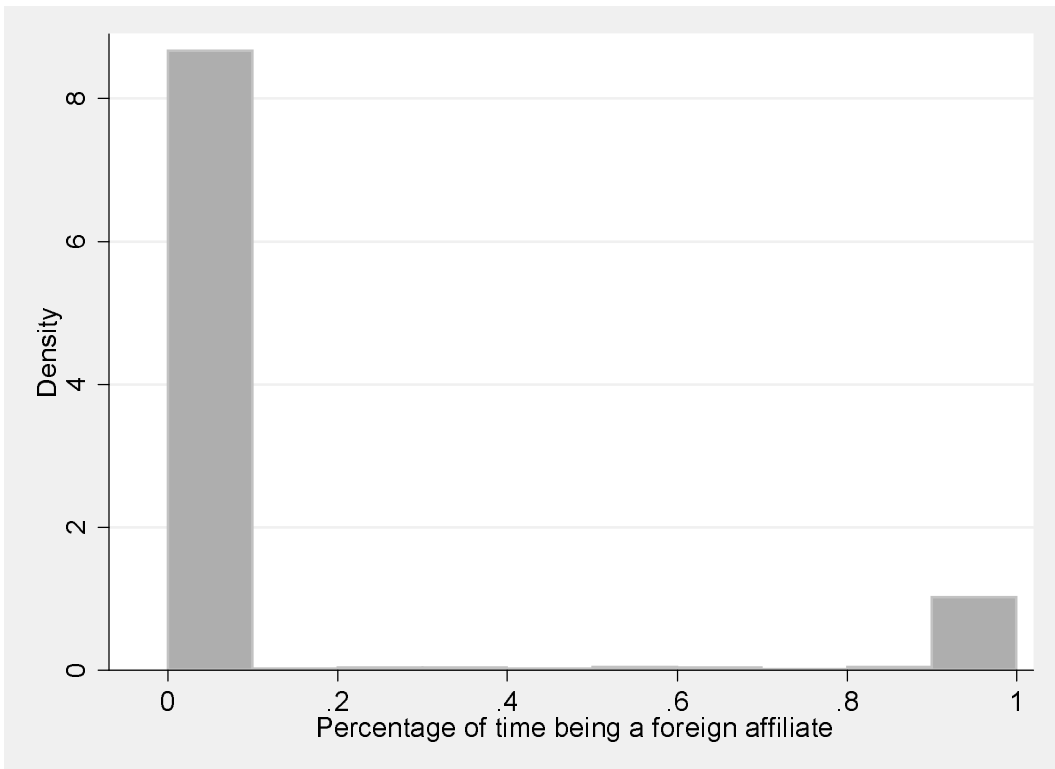


Figure 3. Time spent as investment importer

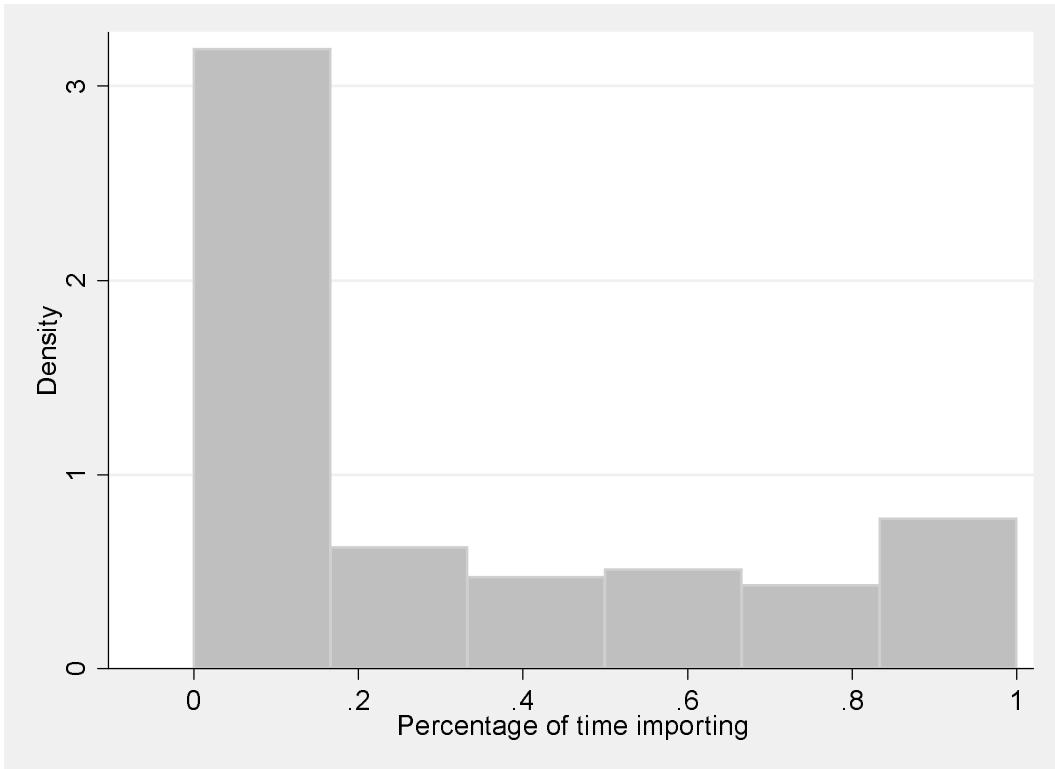


Figure 4. TFP distribution: foreign affiliates vs. domestic firms

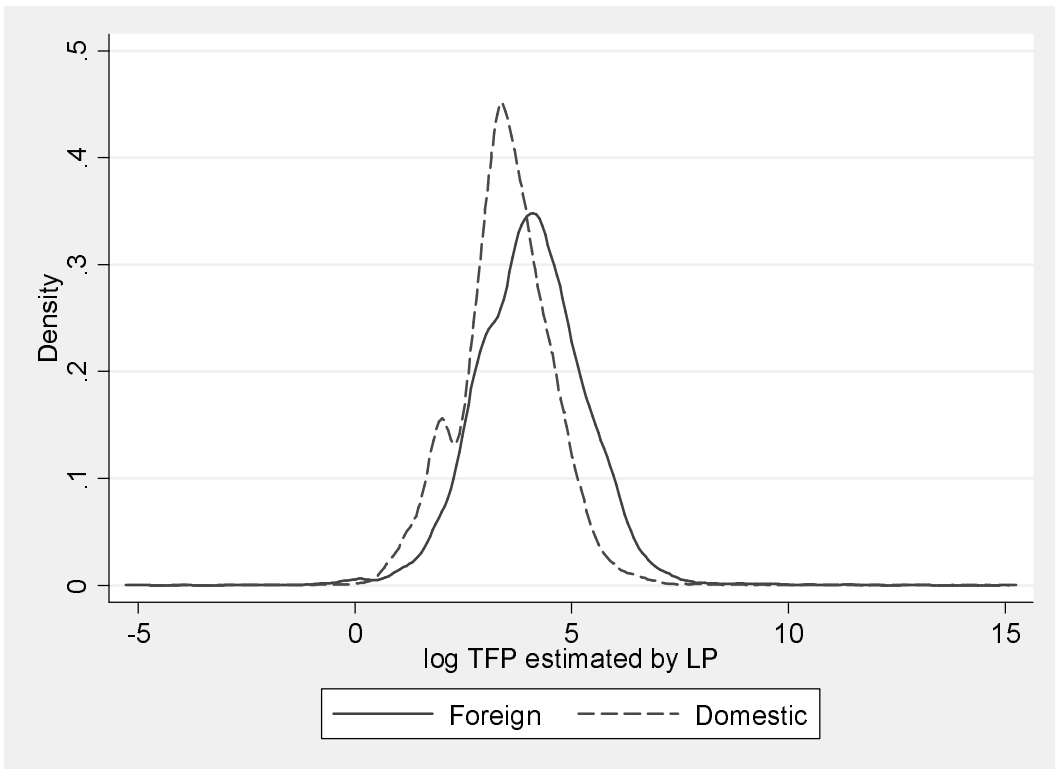


Figure 5. TFP distribution: exporters vs. non-exporters

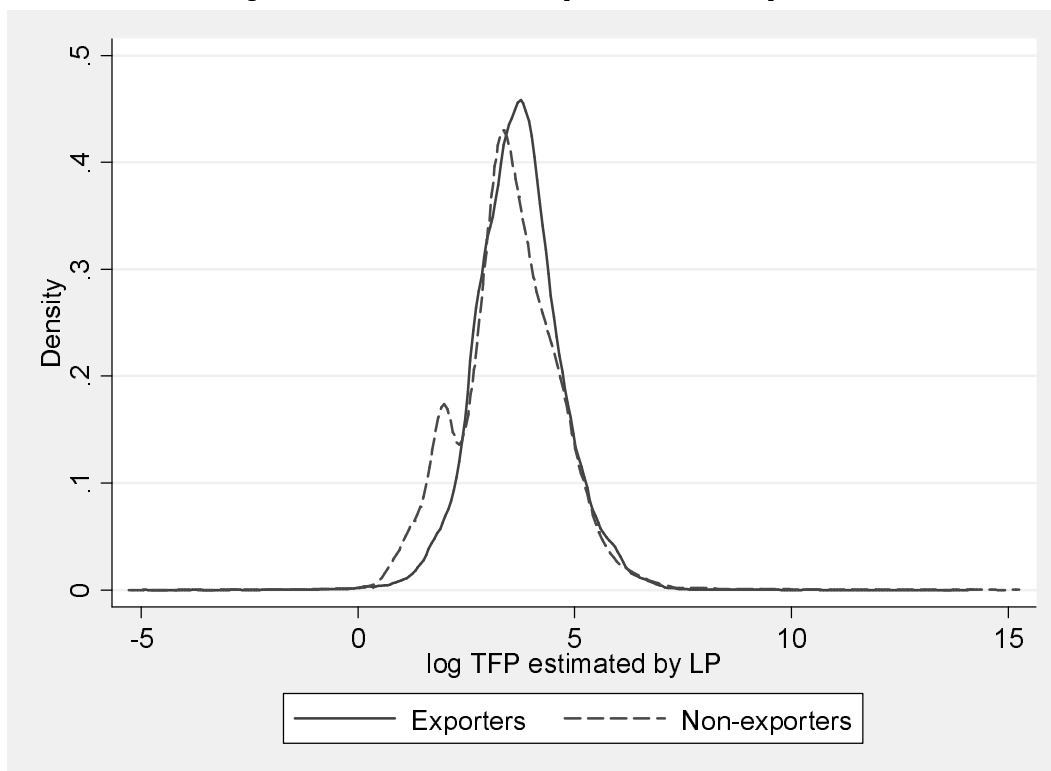


Figure 6. TFP distribution: investment importers vs. non-importers

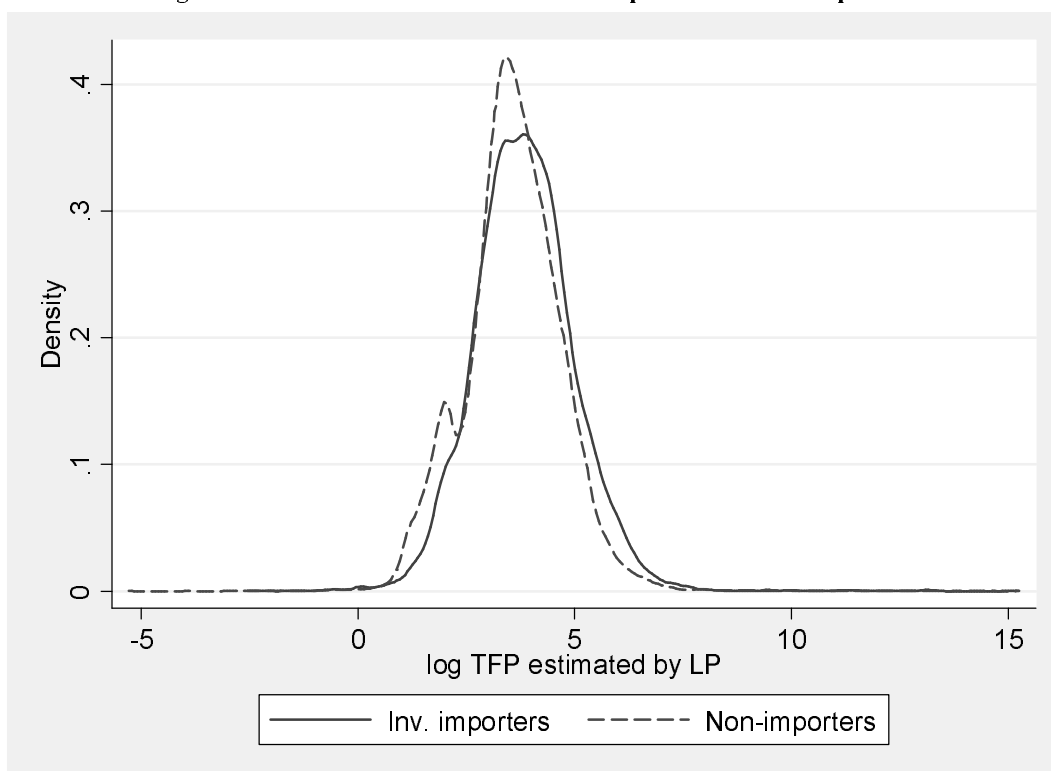


Table 1. Data description by sectors (annual averages)

NACE	Revenues	Employment	Number of firms
10	19 340	197 421	35
11	248	876	3
13	4 628	17 705	2
14	2 129	20 672	97
15	80 810	302 127	1 374
16	10 813	9 095	10
17	7 545	78 411	292
18	4 810	106 217	551
19	2 119	29 659	149
20	9 294	60 673	298
21	8 976	28 081	140
22	8 079	39 145	213
23	35 580	19 224	18
24	30 880	98 840	253
25	14 371	68 922	391
26	16 569	100 347	396
27	22 010	90 830	146
28	16 393	112 840	628
29	21 010	173 955	694
30	1 262	3 577	13
31	13 366	76 171	251
32	8 900	26 771	82
33	3 127	26 269	115
34	33 880	84 024	197
35	8 718	72 528	119
36	13 421	107 136	446
37	1 581	3 840	28
40	76 580	181 059	334
41	4 327	41 626	204
45	42 680	281 004	1 755
50	26 251	37 997	319
51	158 960	202 247	1 271
52	46 110	209 451	1 112
55	3 443	41 574	158
60	19 318	211 837	492
61	1 599	4 102	12
62	2 642	4 616	4
63	8 011	42 409	177
64	29 210	172 899	41
70	12 427	72 409	507
71	1 148	2 599	16
72	5 301	16 878	111
73	1 330	21 146	94
74	14 105	168 942	623
90	1 996	24 478	187
92	7 224	24 707	101
93	352	14 719	56
Construction	42 680	281 004	1 755
Manufacturing	373 500	1 718 679	6 804
Mining	26 330	236 673	136
Services	338 800	1 268 318	5 261
Utilities	80 890	222 685	538
Total	861 600	3 727 359	14 494

Table 2. Data description by year (sums)

Year	Revenues	Employment	Number of firms
1996	450 000	4 031 683	13 752
1997	566 000	3 975 632	14 109
1998	661 000	3 896 248	14 815
1999	742 000	3 939 000	14 738
2000	866 000	3 830 860	14 988
2001	866 000	3 503 531	13 864
2002	925 000	3 476 214	14 429
2003	1 040 000	3 469 025	14 468
2004	1 210 000	3 525 307	14 732
2005	1 290 000	3 626 085	15 044

Table 3. Cross-shares of exporters, importers and foreign affiliates in the number of firms [%]

Foreign affiliate	Exporter	Investment importer	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average 2000-2005
Yes	Yes	Yes	4.1	4.8	5.4	5.9	3.5	4.3	4.6	5.1	5.2	4.9	4.6
Yes	Yes	No					3.0	3.4	3.7	3.9	4.3	4.1	3.7
Yes	No	Yes	3.6	3.6	4.1	4.5	1.4	1.7	1.6	1.7	1.6	1.7	1.6
Yes	No	No					3.5	3.7	4.0	4.1	4.5	5.6	4.2
No	Yes	Yes	18.4	20.6	19.6	19.2	5.0	5.5	5.6	6.3	6.3	5.5	5.7
No	Yes	No					14.3	14.7	14.2	14.9	15.6	13.9	14.6
No	No	Yes	73.9	70.9	70.9	70.4	8.3	9.2	9.2	9.2	8.7	7.6	8.7
No	No	No					60.9	57.6	57.1	54.8	53.9	56.7	56.9

Table 4. Shares of output accounted for by exporters, importers and foreign affiliates [%]

Group	Sector	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average
Foreign affiliates	Construction	3.9	3.6	3.8	6.9	10.0	14.9	15.6	21.6	22.2	25.0	12.7
	Manufacturing	20.7	26.3	30.1	32.4	35.1	38.1	40.7	44.3	48.0	47.7	36.3
	Mining	0.3	0.5	0.9	1.6	1.8	1.7	1.6	2.0	1.8	1.4	1.4
	Services	13.4	18.5	23.1	26.3	26.8	28.4	29.7	32.5	34.1	36.5	26.9
	Utilities	0.2	0.1	0.6	0.7	0.8	3.0	5.2	7.8	11.8	11.1	4.1
	Total	14.4	18.4	21.9	24.4	26.3	28.5	30.4	33.8	45.3	45.6	28.9
Exporters	Construction	18.0	19.1	20.0	16.0	15.3	16.4	11.8	13.6	15.3	13.6	15.9
	Manufacturing	49.5	53.3	53.3	53.1	55.5	56.7	57.7	63.7	67.7	64.8	57.5
	Mining	4.0	39.2	29.5	29.2	31.4	18.7	38.9	33.4	22.6	26.6	27.3
	Services	22.0	24.4	16.4	21.2	16.6	16.4	15.9	15.8	16.4	13.4	17.8
	Utilities	0.0	0.0	0.0	0.0	0.1	17.6	16.5	15.1	13.8	12.0	7.5
	Total	31.6	35.4	31.7	32.9	32.2	33.6	33.7	36.2	39.1	35.9	34.2
Investment importers	Construction					20.6	16.4	22.8	17.1	19.7	16.6	18.9
	Manufacturing					57.9	58.1	52.5	57.7	61.4	60.7	58.0
	Mining					31.1	34.2	28.3	31.9	27.7	30.5	30.6
	Services					22.5	23.6	23.2	23.7	18.5	20.0	21.9
	Utilities					28.9	26.2	25.3	7.4	23.9	7.9	19.9
	Total					38.5	38.3	35.7	36.3	38.4	36.7	37.3

Table 5. Shares of employment accounted for exporters, importers and foreign affiliates [%]

Group	Sector	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average
Foreign affiliates	Construction	2.5	2.6	2.3	2.4	4.0	5.1	5.3	7.2	8.6	10.1	5.0
	Manufacturing	11.9	15.4	17.4	19.3	22.0	24.2	26.5	28.0	30.9	32.3	22.8
	Mining	0.4	0.5	0.7	0.9	1.0	1.0	0.9	0.9	0.9	0.6	0.8
	Services	4.9	8.1	10.4	11.6	12.8	14.6	16.3	17.8	19.4	23.2	13.9
	Utilities	0.3	0.3	0.7	0.7	0.8	3.5	4.2	5.8	6.8	7.1	3.0
	Total	7.6	10.1	11.8	13.0	14.7	16.6	18.4	20.0	35.0	35.6	18.3
Exporters	Construction	16.8	15.1	14.4	12.9	11.7	15.0	11.8	13.6	15.4	14.5	14.1
	Manufacturing	53.5	58.2	58.7	57.1	57.9	60.4	60.7	64.0	67.0	63.9	60.1
	Mining	3.7	30.3	20.3	21.0	21.9	11.7	34.0	25.3	12.6	12.7	19.3
	Services	18.0	19.1	11.3	27.4	20.8	13.0	12.5	12.6	11.7	7.6	15.4
	Utilities	0.0	0.1	0.1	0.1	0.2	0.4	0.2	0.3	0.1	0.1	0.2
	Total	33.6	38.0	34.7	37.7	35.2	33.0	34.1	35.3	36.1	32.9	35.1
Investment importers	Construction					15.1	15.7	17.2	15.9	18.7	18.3	16.8
	Manufacturing					41.4	42.7	42.5	45.4	44.8	43.0	43.3
	Mining					22.7	29.3	20.3	19.6	17.0	16.6	20.9
	Services					24.4	25.3	23.7	24.7	20.3	21.7	23.4
	Utilities					10.6	8.6	9.7	7.5	6.8	2.9	7.7
	Total					30.2	31.4	30.5	32.0	30.2	29.8	30.7

Table 6. Shares of number of firms accounted for exporters, importers and foreign affiliates [%]

Group	Sector	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average
Foreign affiliates	Construction	1.9	1.8	2.1	2.3	2.6	3.1	3.3	3.3	4.6	5.1	3.0
	Manufacturing	12.3	12.9	13.9	15.0	16.3	17.8	19.0	19.7	20.4	21.3	16.8
	Mining	5.2	6.4	7.6	8.2	9.7	9.3	8.9	11.1	12.4	10.3	8.9
	Services	5.3	6.4	7.9	8.6	9.9	11.3	11.6	12.6	13.0	13.5	10.0
	Utilities	0.4	0.4	0.6	0.7	0.7	2.0	3.3	4.1	5.0	6.0	2.3
	Total	7.7	8.5	9.5	10.4	11.5	13.0	13.9	14.8	28.1	28.8	14.6
Exporters	Construction	8.9	9.0	9.1	8.3	7.6	9.0	7.8	9.4	8.5	7.9	8.5
	Manufacturing	38.8	43.1	42.5	42.2	44.3	46.9	47.6	50.4	53.3	49.1	45.8
	Mining	19.3	25.5	19.4	18.4	20.0	19.3	23.0	20.6	19.8	18.1	20.3
	Services	10.7	12.2	11.8	11.7	11.3	12.0	11.6	12.5	11.7	9.8	11.5
	Utilities	0.0	0.2	0.2	0.2	0.2	0.4	0.2	0.4	0.4	0.2	0.2
	Total	22.5	25.5	25.0	25.1	25.8	27.8	28.1	30.2	31.4	28.4	27.0
Investment importers	Construction					12.4	15.0	16.0	16.5	18.9	16.3	15.8
	Manufacturing					26.8	29.1	29.7	31.4	29.6	27.0	28.9
	Mining					20.7	20.7	20.0	23.8	19.8	19.8	20.8
	Services					10.4	12.8	12.7	13.5	13.9	12.3	12.6
	Utilities					6.4	6.2	7.1	6.8	6.5	5.0	6.3
	Total					18.3	20.6	21.0	22.3	21.8	19.6	20.6

Table 7. Distribution of exporters, importers and foreign affiliates [%]

Group	Percentile	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Foreign affiliates	Top 1%	22.3	22.5	26.1	22.9	22.1	21.9	22.6	21.8	23.5	25.7
	Top 5%	47.3	49.0	50.4	49.5	49.6	49.0	50.5	49.9	51.9	53.1
	Top 10%	62.3	63.7	64.2	64.1	64.5	63.6	64.8	64.6	66.1	66.7
Exporters	Top 1%	35.6	39.5	37.3	37.4	40.3	37.1	35.4	34.0	35.2	36.1
	Top 5%	56.8	58.5	58.0	57.2	60.7	59.3	57.6	57.4	61.0	60.7
	Top 10%	66.4	68.3	68.0	67.7	70.6	69.5	69.7	69.3	71.3	70.7
Investment importers	Top 1%					36.0	36.1	31.5	28.2	33.0	34.3
	Top 5%					60.7	61.7	58.2	56.2	59.2	60.0
	Top 10%					72.7	73.2	71.2	69.7	71.7	71.8

Notes: The distribution characteristics rely on total output shares for foreign affiliates and investment importers, while the share of total exports is used in the case of exporters.

Table 8. Premia from internationalization by year (industry effects included)

Group	Dependent variable	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Foreign affiliates	Log capital per worker	0.47***	0.59***	0.67***	0.70***	0.72***	0.73***	0.68***	0.65***	0.63***	0.60***
	Log employment	0.07**	0.20***	0.23***	0.25***	0.27***	0.29***	0.30***	0.32***	0.35***	0.36***
	Log sales	0.62***	0.77***	0.84***	0.89***	0.90***	0.95***	0.95***	1.03***	1.03***	1.02***
	Log TFP	0.25***	0.23***	0.27***	0.27***	0.31***	0.33***	0.34***	0.36***	0.45***	0.39***
	Log VA per worker	0.35***	0.34***	0.40***	0.41***	0.45***	0.47***	0.46***	0.48***	0.55***	0.48***
	Log wage	0.32***	0.30***	0.33***	0.34***	0.36***	0.38***	0.39***	0.41***	0.4***	0.41***
Exporters	Log capital per worker	0.27***	0.31***	0.33***	0.29***	0.35***	0.35***	0.31***	0.35***	0.39***	0.44***
	Log employment	0.40***	0.36***	0.35***	0.33***	0.32***	0.31***	0.31***	0.31***	0.35***	0.40***
	Log sales	0.59***	0.58***	0.58***	0.60***	0.61***	0.62***	0.64***	0.69***	0.75***	0.76***
	Log TFP	0.13***	0.13***	0.11***	0.10***	0.14***	0.13***	0.17***	0.23***	0.26***	0.22***
	Log VA per worker	0.13***	0.14***	0.13***	0.12***	0.18***	0.17***	0.2***	0.27***	0.29***	0.26***
	Log wage	0.10***	0.12***	0.12***	0.13***	0.13***	0.13***	0.13***	0.16***	0.18***	0.19***
Investment importers	Log capital per worker					0.36***	0.30***	0.28***	0.3***	0.33***	0.36***
	Log employment					0.36***	0.26***	0.26***	0.27***	0.28***	0.34***
	Log sales					0.63***	0.48***	0.49***	0.50***	0.54***	0.60***
	Log TFP					0.23***	0.19***	0.20***	0.19***	0.22***	0.21***
	Log VA per worker					0.26***	0.22***	0.22***	0.21***	0.24***	0.23***
	Log wage					0.11***	0.10***	0.11***	0.11***	0.12***	0.14***

Notes: *, ** and *** denote significance at 1%, 5% and 10%, respectively.

Table 9. Premia from internationalization by year (log employment and industry effects included)

Group	Dependent variable	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Foreign affiliates	Log capital per worker	0.45***	0.54***	0.62***	0.65***	0.66***	0.68***	0.62***	0.59***	0.57***	0.53***
	Log sales	0.56***	0.56***	0.60***	0.63***	0.62***	0.65***	0.63***	0.70***	0.66***	0.64***
	Log TFP	0.24***	0.19***	0.22***	0.22***	0.24***	0.26***	0.26***	0.28***	0.36***	0.3***
	Log VA per worker	0.35***	0.32***	0.38***	0.39***	0.43***	0.46***	0.44***	0.45***	0.52***	0.45***
	Log wage	0.32***	0.29***	0.31***	0.32***	0.35***	0.37***	0.37***	0.39***	0.38***	0.39***
Exporters	Log capital per worker	0.17***	0.22***	0.24***	0.22***	0.28***	0.29***	0.25***	0.29***	0.32***	0.36***
	Log sales	0.18***	0.21***	0.21***	0.25***	0.28***	0.30***	0.31***	0.37***	0.39***	0.33***
	Log TFP	0.04**	0.05***	0.03**	0.03**	0.07***	0.06***	0.09***	0.15***	0.17***	0.12***
	Log VA per worker	0.10***	0.12***	0.10***	0.10***	0.15***	0.15***	0.17***	0.24***	0.26***	0.22***
	Log wage	0.08***	0.10***	0.10***	0.10***	0.11***	0.11***	0.11***	0.14***	0.15***	0.17***
Investment importers	Log capital per worker					0.28***	0.24***	0.22***	0.25***	0.28***	0.29***
	Log sales					0.25***	0.20***	0.21***	0.21***	0.24***	0.24***
	Log TFP					0.15***	0.13***	0.13***	0.12***	0.14***	0.12***
	Log VA per worker					0.23***	0.20***	0.19***	0.18***	0.22***	0.20***
	Log wage					0.08***	0.09***	0.09***	0.09***	0.10***	0.11***

Notes: *, ** and *** denote significance at 1%, 5% and 10%, respectively.

Table 10. Premia from internationalization in total sample

Dependent Variable	Fixed effects	Foreign affiliates	Exporters	Investment importers
Log sales	Industry	0.970***	0.658***	0.666***
	Individual	0.271***	0.161***	0.225***
Log employment	Industry	0.255***	0.321***	0.188***
	Individual	-0.060***	0.043***	-0.044***
Log capital per worker	Industry	0.716***	0.367***	0.539***
	Individual	0.312***	0.110***	0.317***
Log VA per worker	Industry	0.508***	0.215***	0.417***
	Individual	0.260***	0.059***	0.241***
Log wage	Industry	0.432***	0.168***	0.347***
	Individual	0.267***	0.096***	0.319***
Log TFP	Industry	0.347***	0.174***	0.247***
	Individual	0.136***	0.026***	0.073***

Note: All regressions run with a full set of time dummies. *, ** and *** denote significance at 1%, 5% and 10%, respectively.

Table 11. Premia to exporters, importers and foreign affiliates in the total sample (log employment included)

Dependent Variable	Fixed effects	Foreign affiliates	Exporters	Investment importers
Log sales	Industry	0.707***	0.325***	0.469***
	Individual	0.313***	0.131***	0.256***
Log capital per worker	Industry	0.669***	0.306***	0.501***
	Individual	0.282***	0.130***	0.296***
Log VA per worker	Industry	0.496***	0.199***	0.407***
	Individual	0.245***	0.069***	0.231***
Log wage	Industry	0.425***	0.157***	0.341***
	Individual	0.245***	0.112***	0.303***
Log TFP	Industry	0.290***	0.102***	0.204***
	Individual	0.144***	0.021***	0.080***

Note: All regressions run with a full set of time dummies. *, ** and *** denote significance at 1%, 5% and 10%, respectively.

Table 12. Evolution of productivity indexes

Section	International status	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Construction	foreign	1.05	1.28	1.49	1.51	1.60	1.43	1.63	1.55	1.76	1.86
	domestic	1.00	1.13	1.15	1.10	1.05	0.99	0.93	1.01	1.09	1.12
	exporter	1.14	1.31	1.37	1.32	1.29	1.19	1.31	1.46	1.52	1.51
	non-exporter	0.97	1.10	1.11	1.08	1.05	1.01	0.95	0.99	1.08	1.17
	importer	--	--	--	--	1.20	1.06	1.04	1.07	1.19	1.21
	non-importer	--	--	--	--	1.07	1.05	0.99	1.08	1.16	1.23
	total	1.00	1.14	1.16	1.12	1.09	1.05	1.00	1.08	1.16	1.23
Manufacturing	foreign	1.25	1.27	1.33	1.33	1.35	1.38	1.50	1.62	1.73	1.64
	domestic	0.96	1.07	1.16	1.10	1.09	1.11	1.06	1.09	1.16	1.08
	exporter	1.05	1.18	1.19	1.15	1.19	1.25	1.31	1.45	1.58	1.51
	non-exporter	0.96	1.05	1.21	1.18	1.16	1.16	1.16	1.14	1.20	1.13
	importer	--	--	--	--	1.24	1.28	1.42	1.49	1.54	1.40
	non-importer	--	--	--	--	1.06	1.07	1.03	1.07	1.22	1.24
	total	1.00	1.11	1.20	1.16	1.17	1.20	1.23	1.31	1.42	1.34
Mining	foreign	0.60	0.98	1.09	1.00	1.05	1.08	1.07	1.24	1.42	1.44
	domestic	1.00	1.35	1.11	1.30	1.63	1.61	1.58	1.64	1.58	1.76
	exporter	0.88	1.48	1.39	1.45	1.71	1.13	1.41	1.64	2.37	2.81
	non-exporter	1.00	1.28	1.01	1.24	1.59	1.68	1.68	1.63	1.39	1.37
	importer	--	--	--	--	1.75	1.39	1.56	1.83	2.23	2.56
	non-importer	--	--	--	--	1.57	1.70	1.58	1.56	1.36	1.38
	total	1.00	1.35	1.11	1.30	1.63	1.61	1.57	1.64	1.58	1.76
Services	foreign	1.54	1.62	1.59	1.71	1.68	1.84	1.57	1.62	1.93	2.22
	domestic	0.96	0.89	1.00	1.12	1.18	1.33	1.45	1.47	1.62	1.37
	exporter	1.22	0.91	1.29	0.79	1.22	1.25	1.24	1.32	1.52	1.65
	non-exporter	0.91	1.00	1.05	1.41	1.26	1.47	1.52	1.54	1.73	1.65
	importer	--	--	--	--	1.58	2.05	2.22	2.30	3.03	2.63
	non-importer	--	--	--	--	1.06	1.10	1.08	1.10	1.36	1.27
	total	1.00	0.97	1.08	1.19	1.26	1.42	1.47	1.50	1.69	1.65
Utilities	foreign	2.43	2.66	2.32	2.05	2.17	1.97	1.97	2.38	2.78	2.52
	domestic	1.00	1.01	1.08	1.12	1.11	1.08	1.11	1.05	0.99	1.09
	exporter	--	1.81	2.02	1.48	1.36	3.57	14.31	3.18	5.30	18.56
	non-exporter	1.00	1.01	1.09	1.13	1.12	1.09	0.77	1.10	1.04	0.44
	importer	--	--	--	--	1.73	1.74	1.87	1.32	2.14	1.67
	non-importer	--	--	--	--	1.00	1.06	1.05	1.16	1.07	1.26
	total	1.00	1.01	1.09	1.13	1.12	1.13	1.17	1.17	1.23	1.27
Total	foreign	1.30	1.34	1.39	1.43	1.44	1.51	1.53	1.65	1.82	1.86
	domestic	0.97	1.06	1.10	1.12	1.17	1.22	1.24	1.27	1.34	1.25
	exporter	1.09	1.16	1.22	1.06	1.23	1.26	1.43	1.46	1.64	1.83
	non-exporter	0.96	1.06	1.12	1.24	1.22	1.30	1.26	1.32	1.41	1.27
	importer	--	--	--	--	1.37	1.48	1.66	1.71	1.82	1.72
	non-importer	--	--	--	--	1.09	1.14	1.09	1.14	1.27	1.27
	total	1.00	1.09	1.15	1.17	1.22	1.29	1.31	1.37	1.49	1.46

Table 13. Spillovers from foreign direct investment

	Coefficients [standard errors]					
	1-year differences		2-year differences		3-year differences	
	1	2	3	4	5	6
Horizontal	0.243*** [0.090]	0.200*** [0.072]	0.333*** [0.074]	0.260*** [0.065]	0.268*** [0.065]	0.132** [0.059]
Backward	4.643*** [0.35]	4.423*** [0.26]	2.702*** [0.38]	2.501*** [0.33]	1.941*** [0.33]	1.747*** [0.31]
Forward	-0.243 [0.22]	-0.247 [0.16]	-0.046 [0.17]	-0.047 [0.17]	-0.092 [0.17]	0.029 [0.16]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	No	Yes	No	Yes	No
Firm dummies	No	Yes	No	Yes	No	Yes
Observations	98 369	98 369	77 308	77 308	60 073	60 073
R-squared	0.04	0.24	0.03	0.22	0.03	0.23

Notes: The dependent variable is the log change in productivity. All regressions are run on a subsample of domestic firms. Standard errors are robust for heteroscedasticity and correlation across firms from the same industry. *, ** and *** denote significance at 1%, 5% and 10%, respectively.

Table 14. Spillovers from exporting

	Coefficients [standard errors]					
	1-year differences		2-year differences		3-year differences	
	1	2	3	4	5	6
Horizontal	0.384*** [0.11]	0.320*** [0.090]	0.226*** [0.078]	0.177** [0.075]	0.154** [0.072]	0.159** [0.076]
Backward	8.247*** [0.67]	8.312*** [0.52]	4.796*** [0.64]	4.695*** [0.58]	3.787*** [0.58]	3.422*** [0.58]
Forward	0.782 [0.63]	0.702 [0.50]	0.14 [0.46]	0.352 [0.42]	0.286 [0.48]	0.627 [0.48]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	No	Yes	No	Yes	No
Firm dummies	No	Yes	No	Yes	No	Yes
Observations	79 934	79 934	62 550	62 550	48 430	48 430
R-squared	0.04	0.28	0.03	0.26	0.03	0.27

Notes: The dependent variable is the log change in productivity. All regressions are run on a subsample of non-exporting firms. Standard errors are robust for heteroscedasticity and correlation across firms from the same industry. *, ** and *** denote significance at 1%, 5% and 10%, respectively.

Table 15. Spillovers from importing

	Coefficients [standard errors]					
	1-year differences		2-year differences		3-year differences	
	1	2	3	4	5	6
Horizontal	0.449*** [0.087]	0.402*** [0.076]	0.372*** [0.086]	0.324*** [0.095]	0.321*** [0.081]	0.233*** [0.087]
Backward	6.007*** [0.57]	5.984*** [0.47]	3.372*** [0.65]	3.118*** [0.44]	3.149*** [0.60]	3.153*** [0.64]
Forward	-0.198 [0.30]	-0.293 [0.25]	0.235 [0.29]	0.198 [0.35]	0.302 [0.30]	0.004 [0.30]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	No	Yes	No	Yes	No
Firm dummies	No	Yes	No	Yes	No	Yes
Observations	48 834	48 834	34 653	34 653	23 280	23 280
R-squared	0.05	0.35	0.04	0.33	0.04	0.38

Notes: The dependent variable is the log change in productivity. All regressions are run on a subsample of non-importing firms. Standard errors are robust for heteroscedasticity and correlation across firms from the same industry. *, ** and *** denote significance at 1%, 5% and 10%, respectively.

Table 16. Spillovers from internationalization – all modes

		Coefficients [standard errors]					
		1-year differences		2-year differences		3-year differences	
		1	2	3	4	5	6
Foreign investment	Horizontal	0.022 [0.16]	-0.044 [0.14]	0.250* [0.13]	0.16 [0.11]	0.045 [0.17]	-0.135 [0.19]
	Backward	4.943*** [0.99]	4.881*** [0.81]	2.564*** [0.97]	2.074** [0.84]	0.980 [0.84]	1.431 [0.99]
	Forward	-0.675** [0.31]	-0.841*** [0.27]	0.111 [0.34]	-0.245 [0.31]	0.120 [0.39]	0.005 [0.34]
Exporting	Horizontal	0.419** [0.17]	0.377*** [0.14]	0.104 [0.11]	0.079 [0.11]	0.140 [0.13]	0.326* [0.18]
	Backward	-0.924 [1.61]	-0.065 [1.24]	-0.500 [1.34]	0.114 [1.02]	-0.071 [1.21]	0.041 [1.58]
	Forward	1.202 [0.91]	0.902 [0.74]	0.076 [0.70]	0.294 [0.58]	-0.807 [1.01]	-1.342 [1.19]
Importing	Horizontal	0.373*** [0.11]	0.324*** [0.088]	0.357*** [0.12]	0.297*** [0.092]	0.334*** [0.12]	0.215* [0.11]
	Backward	1.579 [1.03]	0.971 [0.82]	1.190 [0.79]	1.280** [0.61]	2.344** [1.15]	2.040* [1.19]
	Forward	-0.526 [0.38]	-0.504 [0.32]	-0.082 [0.44]	-0.009 [0.44]	0.312 [0.54]	0.025 [0.53]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	
Industry dummies	Yes	No	Yes	No	Yes	No	
Firm dummies	No	Yes	No	Yes	No	Yes	
Observations	34 489	34 489	24 393	24 393	16 351	16 351	
R-squared	0.07	0.41	0.06	0.38	0.05	0.42	

Notes: The dependent variable is the log change in productivity. All regressions are run on a subsample of firms not involved in any mode of internationalization. Standard errors are robust for heteroscedasticity and correlation across firms from the same industry. *, ** and *** denote significance at 1%, 5% and 10%, respectively.