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# Internationalization and economic performance of 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: foreign direct investment, exporting and importing of capital goods. Our results point strongly at superior performance of foreign affiliates vs. domestic firms, exporters vs. non-exporters and importers vs. non-importers. There seem to be important learning effects associated with becoming a foreign affiliate or an exporter. We also find evidence for significant horizontal and backward productivity spillovers from all three types of international activity.

JEL classification: L25, F23, F15, O12

Keywords: internationalization, productivity, panel firm-level data

# 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 structure 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 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.

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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.

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; 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.[5] This helps us to discuss the relevance of some theoretical predictions 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 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 other 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 foreign affiliates, exporters and investment importers 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.

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

5 The choice of modes is determined by data availability. When we refer to exports, we mean any kind of exports of consumption, investment and intermediate goods or services, while the only information available on importing activity is the one concerning investment goods imports.

# 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 that 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 industry coverage is NACE 10 through 93. The average yearly total reported employment amounts to 3.7 million. In 2005, the total employment by firms covered by our dataset stood at 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.

Our dataset allows us to consider three modes of internationalization, which is foreign direct investment, exporting and investment goods importing. 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.[6] Table 3 shows the percentage of firms that are internationalized in all different combinations of the three modes. As can be seen, more than half of firms in our sample are classified as not being involved in any type of foreign activity, while only a small fraction (about 5%) is internationalized in all three dimensions (i.e. they are foreign affiliates, exporters and investment importers at the same time).[7] 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 show in particular 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 still significant share of foreign affiliates serving only domestic customers, the local market expansion motive seems to be important as well.

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

[7] Note, however, that due to unavailability of data, we are able to analyze only two modes of internationalization in the period of 1996-1999.

**Table 1. Data description by sectors (annual averages)**

| NACE | Revenues | Employment | Number of firms |
|---|---|---|---|
| 10 | 19 340 | 197 421 | 35 |
| 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 |
| 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 |

## 2.2 Relevance of internationalized firms for the economy

The relevance of foreign affiliates, exporters and importers for the domestic economy is summarized in Tables 4 to 6. As can be seen, the presence of foreign affiliates in Poland increased substantially between 1996 and 2005, with a marked acceleration following the EU accession. Their share is particularly high in manufacturing, but still remains below 50% in terms of output.

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.

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 4. Shares of output accounted for by exporters, importers and foreign affiliates (%)**

| Variable | 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 | 37.1 | 37.8 | 27.3 |
| 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 (%)**

| Variable | 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 | 22.2 | 24.6 | 15.9 |
| 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 (%)**

| Variable | 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 | 15.5 | 16.2 | 12.1 |
| 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, investment 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.

**Figure 1. Time spent as exporter**

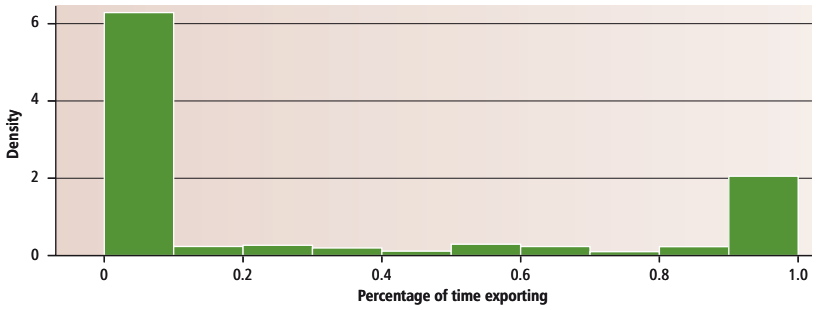


**Figure 2. Time spent as foreign affiliate**

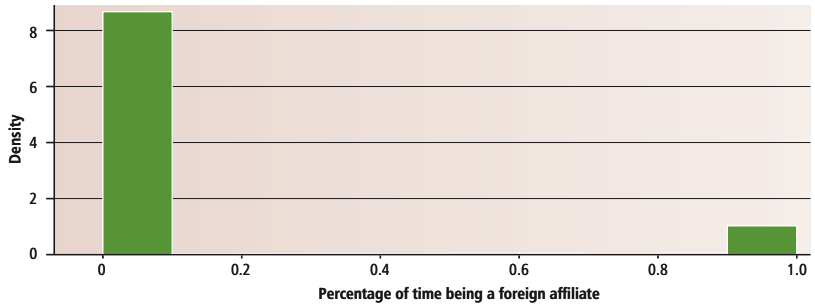
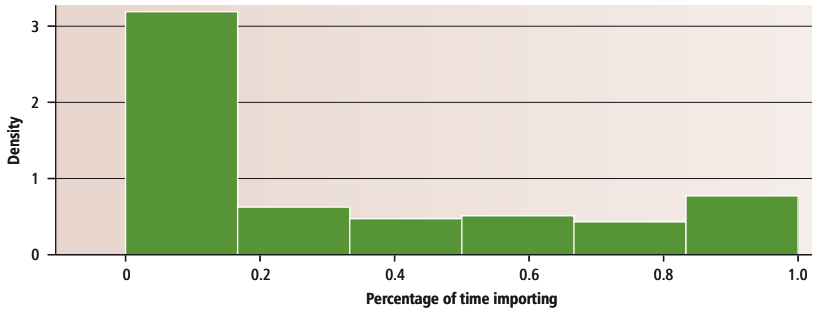



**Figure 3. Time spent as investment importer**




Both foreign affiliates and investment importers 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) shows 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.

# 3

# Internationalization and firm 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 firm characteristics

In order to examine formally how firms with international ties differ from their purely domestic 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 a constant ($\alpha$), an international status dummy ($Int$) corresponding to one of the three modes of internationalization and 3-digit industry fixed effects ($Industry_j$), according to the following specification:

$$\ln X_i = \alpha + \beta \cdot Int + \chi \cdot Industry_j + \varepsilon_i, \quad (1)$$

where the parameter of interest $\beta$ can be interpreted as a premium to internationalization, defined as an average percentage difference in performance between firms internationalized in a given mode and other firms. Following Bernard *et al.* (2007), we also perform an OLS estimation including log employment as an additional explanatory variable, which aims to control for the possible correlation between performance indicators and the firm size. We run our regressions year by year to be able to follow the premia behaviour over time and for the whole sample, with a full set of time dummies in the latter case.

We also estimate a panel variant of equation (1) with individual rather than industry fixed effects. This allows us to distinguish between cross-section effects of internationalization (when industry dummies are included) and dynamic effects associated with changes of the international status by individual firms (when firm dummies are included). Cross-section effects just show the average difference between internationalized and non-internationalized firms, while dynamic effects may be partially attributed to learning from going international.

The results of estimations are given in Tables 8 to 11. The coefficient estimates reported in these tables correspond to parameter $\beta$ in equation (1). We supress all other parameter estimates, since they are irrelevant to the analysis. Tables 8 and 9 contain the cross-section yearly parameter estimates, while Tables 10-11 report the results of panel estimations.

As Tables 8 to 11 reveal, the premia from foreign ownership are very significant in statistical terms. They also show a clear upward trend over the period covered by our

sample (Tables 8 and 9), except for the last year or two. If we do not control for firm size and individual fixed effects (Table 10), premia from foreign ownership average to around 100% for sales, 70% for the capital-labour ratio, 50% percent in the case of value-added per worker and 43% for wages. If we control for employment (Table 11), the premia 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% for wages, so they are slightly lower. When we include individual fixed effects, the premia are visibly smaller, but still significantly positive. The average premium for employment is negative (Table 10), 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, exporters are significantly bigger than non-exporters in terms of output and employment. They have also higher capital per worker and pay higher wages. Except for employment, there is a clear upward trend over time in all estimated premia, which seems to reverse or decelerate in the last years of our sample. The exporter premia are highly significant, in all cases at a 1% level. When we control for employment and industry-level effects (Table 11), they amount on average to roughly 30% for sales and the capital-labour ratio, 20% for value added per worker and 16% 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.



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

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

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

We follow a similar strategy to assess the premia from investment imports. They turn out positive and significant in all cases and they are of similar size as premia from exporting when regression estimates for individual periods are considered. We cannot, however, observe any clear trend in their size. When employment and industry fixed effects

are controlled for (Table 11), they amount to 20-25% for sales, capital-labour ratio and value added per worker and are somewhat smaller for wages (9%). When we control for individual fixed effects, premia become negative for sales and employment, while insignificant for the capital-labour ratio and value added per worker. The negative premium for employment suggests that a sizable share of investment sourced from imports might be of a labour-saving type. It is, however, difficult to interpret the small, but visibly negative premia on sales. Anyway, the visible difference between individual and fixed effects estimates indicates that there may be less learning effects from importing than from other internationalization modes.

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

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

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

**Table 10. Panel estimates of premia from internationalization**

| Fixed Effects | Dependent variable (log) | Foreign affiliates | Exporters | Investment importers |
|---|---|---|---|---|
| Industry | Sales | 0.970*** | 0.658*** | 0.535*** |
| Individual | Sales | 0.271*** | 0.161*** | -0.017*** |
| Industry | Employment | 0.255*** | 0.321*** | 0.285*** |
| Individual | Employment | -0.0601*** | 0.0429*** | -0.006** |
| Industry | Capital per worker | 0.716*** | 0.367*** | 0.320*** |
| Individual | Capital per worker | 0.312*** | 0.110*** | 0.005 |
| Industry | Value-added per worker | 0.508*** | 0.215*** | 0.228*** |
| Individual | Value-added per worker | 0.260*** | 0.0589*** | 0.000 |
| Industry | Wage | 0.432*** | 0.168*** | 0.110*** |
| Individual | Wage | 0.267*** | 0.0958*** | -0.002 |
| Industry | TFP | 0.347*** | 0.174*** | 0.200*** |
| Individual | TFP | 0.136*** | 0.0257*** | -0.001 |

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

**Table 11. Panel estimates of premia from internationalization (log employment included)**

| Fixed effects | Dependent variable (log) | Foreign affiliates | Exporters | Investment importers |
|---|---|---|---|---|
| Industry | Sales | 0.707*** | 0.325*** | 0.227*** |
| Individual | Sales | 0.313*** | 0.131*** | -0.011** |
| Industry | Capital per worker | 0.669*** | 0.306*** | 0.260*** |
| Individual | Capital per worker | 0.282*** | 0.130*** | 0.003 |
| Industry | Value-added per worker | 0.496*** | 0.199*** | 0.205*** |
| Individual | Value-added per worker | 0.245*** | 0.069*** | -0.001 |
| Industry | Wage | 0.425*** | 0.157*** | 0.090*** |
| Individual | Wage | 0.245*** | 0.112*** | -0.003 |
| Industry | TFP | 0.290*** | 0.102*** | 0.128*** |
| Individual | TFP | 0.144*** | 0.021*** | 0.000 |

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



Overall, it seems that foreign affiliates gain most from their internationalized status, both in static and dynamic terms. Investment importers and exporters, on average, enjoy a similar level of premia from internationalization, but learning effects seem to be important only in the case of the latter.

## 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 (TFP) 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,[8] we assume the following value-added based standard Cobb-Douglas production function:

$$\ln Y_{it} = \alpha_0 + \alpha_1 \cdot \ln L_{it} + \alpha_2 \cdot \ln K_{it} + \varepsilon_{it} \quad (2)$$

$Y_{it}$ 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 given by equation (2) may lead to biased estimates, if the factor choices are endogeneous 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

[8] Problems and possible solutions to estimating firm-level productivity are discussed e.g. by Altomonte and Besedina (2007).

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 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 quite pronounced: the distribution of productivity is shifted to the right. This is particularly true for the foreign-domestic breakdown.

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 foreign affiliate is significantly higher than that of its domestic counterpart. When we control for employment and industry-level effects (Table 11), the productivity premium from foreign ownership averages at nearly 30%. Substantially lower TFP premia, though highly significant, can be found for investment importers vs. non-importers (13%) and exporters vs. non-exporters (10%). Except for investment importing, our results also suggest statistically significant dynamic gains from going international (see Table 11 with individual effects), although they are much smaller in size compared to the cross-section premia.

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

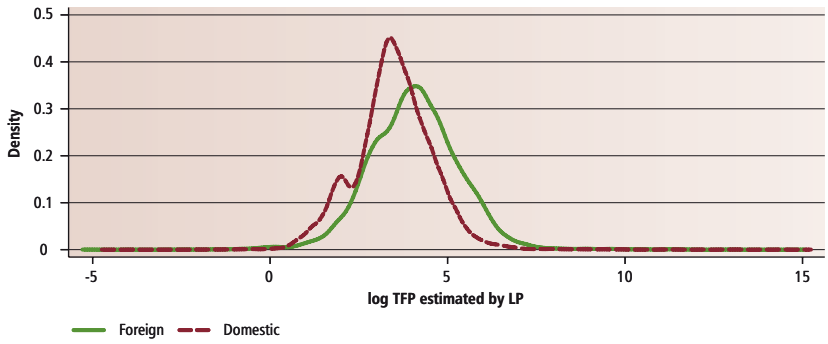



**Figure 5. TFP distribution: exporters vs. non-exporters**

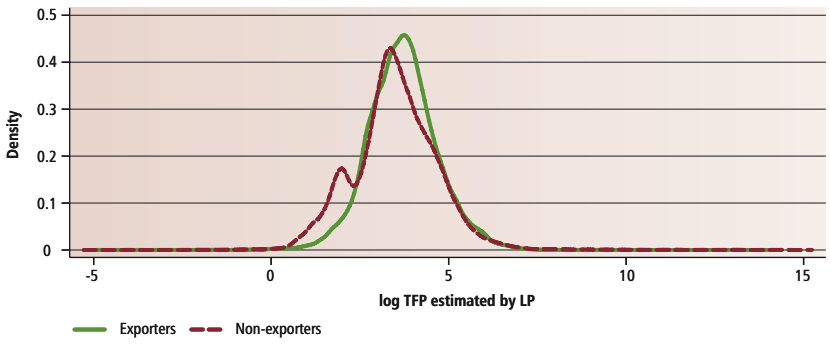
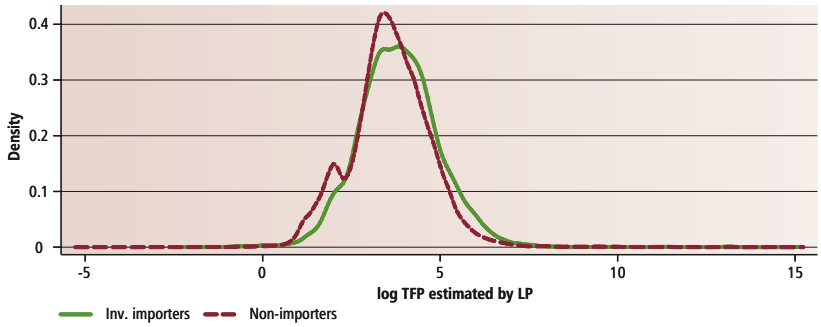


**Figure 6. TFP distribution: investment importers vs. non-importers**




Similarly to other indicators considered in the previous section, TFP premia show a clear upward trend for exporters and foreign affiliates (see Table 8 and 9). However, as we noted before, in many cases they do not rise as much at the end of our sample as in the previous years, or even show a drop in 2005. The theoretical literature may prove itself useful in explaining this phenomenon. Once Poland joined the EU, the barriers to entry to foreign markets have gone down. As predicted by the literature, the lower is the fixed cost to export, the lower is the required difference in productivity between exporting and non-exporting firms. At the same time, enlargement is a multilateral process and once the trade barriers go down with respect to many new member states, competition in the EU market tightens and the profits from entering them shrink. A similar explanation may be true for importers. Moreover, EU-entry means lower barriers to FDI inflow and, as more firms receive FDI, their premium becomes less significant with respect to the overall TFP level.

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.

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 that those of their non-internationalized counterparts, but they also recorded faster productivity gains, so that the discrepancies grew even larger. Interestingly, there was a marked acceleration in productivity in the years prior to Poland's EU-entry (particularly visible for exporters and importers), which might reflect necessary adjustments related to entering the common trade area.

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

**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 |

# 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 foreign affiliates, exporters and importers affects other enterprises operating in the economy. In particular, one might be interested whether superior productivity of internationalized firms spills over to other firms or rather comes at their expense.

## 4.1 Theoretical background



The existence of positive spillovers can be motivated in many ways.[9] 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 or 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 other 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 to facilitate the technology transfer or even get involved in a direct technological assistance (see 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 other local firms 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 chains locally, negative vertical spillovers may be observed. Productivity of non-internationalized companies may also be affected by erosion of human capital, since (as we have seen in section 3.1) international firms usually pay higher wages and so are able to attract the 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).

[9] 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.

## 4.2 Empirical model

In order to examine the existence of spillovers from foreign direct investment, exporting and importing, we estimate several variants of the following regression:

$$\Delta \ln TFP_{it} = \alpha_0 + \alpha_1 \cdot \Delta HZ_{it}^{m} + \alpha_2 \cdot \Delta BW_{it}^{m} + \alpha_3 \cdot \Delta FW_{it}^{m} + \alpha_t + \alpha_k + \varepsilon_{it}. \quad (3)$$

The estimated equation includes a full set of time and 3-digit industry dummies (denoted by $\alpha_t$ and $\alpha_k$, 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 foreign affiliates (defined in section 2.1) and is designed to capture horizontal (i.e. intra-industry) spillovers. $BW_{jt}^{F}$ serves as a proxy for backward linkages (i.e. from foreign affiliates to their domestic suppliers) and is defined as follows:

$$BW_{jt}^{F} = \sum_{l} a_{jl} HZ_{lt}^{F}, \text{ for } j \neq l \quad (4)$$

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 foreign firms to their domestic customers):

$$FW_{jt}^{F} = \sum_{l} b_{lj} HZ_{lt}^{F}, \text{ for } j \neq l \quad (5)$$

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 exporters and importers presented in section 2.1.

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 accounts for 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.

Overall, we find evidence for significantly positive horizontal and backward spillovers from foreign direct investment, but not for forward ones.[10] Backward spillovers seem to

[10] 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.

be most important, both in statistical and economic terms (measured as contribution to productivity growth).

**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*** | 0.200*** | 0.333*** | 0.260*** | 0.268*** | 0.132** |
| | [0.090] | [0.072] | [0.074] | [0.065] | [0.065] | [0.059] |
| Backward | 4.643*** | 4.423*** | 2.702*** | 2.501*** | 1.941*** | 1.747*** |
| | [0.35] | [0.26] | [0.38] | [0.33] | [0.33] | [0.31] |
| Forward | -0.243 | -0.247 | -0.046 | -0.047 | -0.092 | 0.029 |
| | [0.22] | [0.16] | [0.17] | [0.17] | [0.17] | [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.

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. Spillovers from exporting**

| | Coefficients [standard errors] | | | | | |
|---|---|---|---|---|---|---|
| | 1-year differences | | 2-year differences | | 3-year differences | |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Horizontal | 0.384*** | 0.320*** | 0.226*** | 0.177** | 0.154** | 0.159** |
| | [0.11] | [0.090] | [0.078] | [0.075] | [0.072] | [0.076] |
| Backward | 8.247*** | 8.312*** | 4.796*** | 4.695*** | 3.787*** | 3.422*** |
| | [0.67] | [0.52] | [0.64] | [0.58] | [0.58] | [0.58] |
| Forward | 0.782 | 0.702 | 0.14 | 0.352 | 0.286 | 0.627 |
| | [0.63] | [0.50] | [0.46] | [0.42] | [0.48] | [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.

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. Spillovers from importing

| | Coefficients [standard errors] | | | | | |
|---|---|---|---|---|---|---|
| | 1-year differences | | 2-year differences | | 3-year differences | |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Horizontal | 0.449*** | 0.402*** | 0.372*** | 0.324*** | 0.321*** | 0.233*** |
| | [0.087] | [0.076] | [0.086] | [0.095] | [0.081] | [0.087] |
| Backward | 6.007*** | 5.984*** | 3.372*** | 3.118*** | 3.149*** | 3.153*** |
| | [0.57] | [0.47] | [0.65] | [0.44] | [0.60] | [0.64] |
| Forward | -0.198 | -0.293 | 0.235 | 0.198 | 0.302 | 0.004 |
| | [0.30] | [0.25] | [0.29] | [0.35] | [0.30] | [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.

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### 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 | -0.044 | 0.250* | 0.16 | 0.045 | -0.135 |
| | | [0.16] | [0.14] | [0.13] | [0.11] | [0.17] | [0.19] |
| | Backward | 4.943*** | 4.881*** | 2.564*** | 2.074** | 0.980 | 1.431 |
| | | [0.99] | [0.81] | [0.97] | [0.84] | [0.84] | [0.99] |
| | Forward | -0.675** | -0.841*** | 0.111 | -0.245 | 0.120 | 0.005 |
| | | [0.31] | [0.27] | [0.34] | [0.31] | [0.39] | [0.34] |
| Exporting | Horizontal | 0.419** | 0.377*** | 0.104 | 0.079 | 0.140 | 0.326* |
| | | [0.17] | [0.14] | [0.11] | [0.11] | [0.13] | [0.18] |
| | Backward | -0.924 | -0.065 | -0.500 | 0.114 | -0.071 | 0.041 |
| | | [1.61] | [1.24] | [1.34] | [1.02] | [1.21] | [1.58] |
| | Forward | 1.202 | 0.902 | 0.076 | 0.294 | -0.807 | -1.342 |
| | | [0.91] | [0.74] | [0.70] | [0.58] | [1.01] | [1.19] |
| Importing | Horizontal | 0.373*** | 0.324*** | 0.357*** | 0.297*** | 0.334*** | 0.215* |
| | | [0.11] | [0.088] | [0.12] | [0.092] | [0.12] | [0.11] |
| | Backward | 1.579 | 0.971 | 1.190 | 1.280** | 2.344** | 2.040* |
| | | [1.03] | [0.82] | [0.79] | [0.61] | [1.15] | [1.19] |
| | Forward | -0.526 | -0.504 | -0.082 | -0.009 | 0.312 | 0.025 |
| | | [0.38] | [0.32] | [0.44] | [0.44] | [0.54] | [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 type of international activity. Standard errors are robust for heteroscedasticity and correlation across firms from the same industry. ***, ** and * denote significance at 1%, 5% and 10%, respectively.

As suggested by Table 3, 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 a given mode of internationalization. However, it is feasible to examine where most of spillovers come from for firms not involved in any type of 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.

In general, the results are mixed. However, bearing in mind that the regressions using longer differencing suffer from a relatively small size of the time dimension, 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: foreign direct investment, exporting and importing of capital goods. The Polish data on large and medium enterprises shows that firms often take part in at least one of the tree 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, stressing 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 non-internationalized firms benefit from the presence of companies involved in outward-oriented activities. These spillovers are mainly horizontal and backward in nature, i.e. they run from internationalized firms to their local competitors and suppliers.

Superiority of internationalized firms, together with significant spillovers to other firms, implies that the overall effect of opening to trade and FDI inflows on economic performance of enterprises is 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.

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