Vlerick Leuven Gent Management School
the Autonomous Management School of
Ghent University and Katholieke Universiteit Leuven

Vlerick Leuven Gent Working Paper Series 2007/13

OFFSHORING AS A SURVIVAL STRATEGY IN GLOBALIZING INDUSTRIES: NEW EVIDENCE FROM BELGIAN MANUFACTURING

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D/2007/6482/16

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The paper benefited from helpful comments by R .Belderbos, H.P. Bowen, B. A. Blonigen , E. Pennings .

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ABSTRACT

This paper analyzes the impact of globalization on the exit behavior of manufacturing firms in one of the world's most open economies: Belgium. We find that imports from low-wage countries exert a strong competitive effect that lowers a firm's chances of survival. This competitive effect is found to arise mainly in industries where intra-industry trade, an indicator of product differentiation, is relatively low. As an offensive strategy to cope with the rising competitive pressure from imports, we find that firms exploiting opportunities afforded by globalization, in particular the off-shoring of activities, are able to improve their chances of survival. Making a distinction between domestic firms and subsidiaries of multinational firms, we also find that domestic firms face a higher risk of exit when multinational firms compete in their relevant input and output markets. Finally, we show that subsidiaries of multinational firms are better adapted to cope with globalization forces, and we find them to be less sensitive to domestic market conditions in the host country.

Keywords:
Exit, Off-shoring, Sourcing, Globalization

JEL Code: F1, F23, L2

1.INTRODUCTION

The impact of globalization on the behavior of firms and industries in industrialized countries has received increasing interest in the literature. Recent theoretical and empirical models that examine the link between industry development and trade liberalization show that the competitive pressures of globalization is felt differently across heterogeneous firms in the industry (Head and Ries, 1999; Tybout, 2001; Pavcnik, 2002; De Backer and Sleuwaegen, 2003a; Bernard, Jensen and Schott, 2006b). As a result of the reallocation of resources, more productive firms expand while less productive firms contract or exit from the market. Summarizing recent theoretical models about falling trade costs and industry restructuring, Bernard, Jensen and Schott (2003, 2006b) point out that all the different models consistently predict that as trade costs fall and imports rise, less productive firms will exit the industry, while more productive firms will enter or increase their participation in export markets. Interestingly, these models also predict that even if exporting itself does not enhance productivity, exporting firms are less likely to exit. Blalock and Gertler (2004), De Loecker (2004) and Van Biesebroeck (2005) show that exporting to other countries may also involve an important learning process and yield substantial productivity gains that increase the chances of firm survival in globalizing industries.

Some observers have noted the growing complexity of global trade flows, reflecting the globalization of firms' value chains or supply chains that are organized into globally spread production networks (OECD, 2006). A rapidly increasing number of firms are reacting to growing global competitive pressures by sourcing intermediate inputs and activities internationally. Such international sourcing (off-shoring) can involve sourcing inputs through arms-length relationships between independent firms (out-sourcing) or within the own production network of the firm (in-sourcing). As a consequence of such developments, multinational firms have gained new competitive advantages from their flexibility to change the source of finished and intermediate goods and services across borders. However, the competitive advantages of multinational firms stretch far beyond their geographical flexibility. Their growing importance is linked to the possession and development of a range of knowledge assets, such as intellectual property, marketing and organizational skills, that allow them to exploit profitable opportunities in foreign markets by investing in new facilities abroad or by acquiring existing foreign companies.

This "multinationalization" process has been greatly facilitated by the removal of trade and investment barriers negotiated within the scope of the World Trade Organization (Bowen and Sleuwaegen, 2004).

The growing penetration of industries by multinational firms has several impacts on industry dynamics in host countries. In the short run, they create more competition for domestic firms not only in final product markets, but also in crowding out or more precisely, competing out, local firms in labor and other input markets (De Backer and Sleuwaegen, 2003b). In the longer run they create growth possibilities by bringing in capital and technology, linking up with domestic firms, and in generating technological spillovers to local firms.

The foregoing arguments imply that the impact of the globalization process on the development of industries in a particular country depends strongly on the organization and performance of indigenous firms. Importantly, they suggest that firms are not confined to being passive or defensive in the globalization process, but can offensively take advantage of the new opportunities offered by the emergence of global supply and knowledge networks. In this paper we follow this route in the development of an empirical model to explain the exit of firms in globalizing industries. The paper offers three main contributions. First, we present evidence of how international sourcing of firms positively affects their chances of survival. In doing so, we underscore the importance of firm-specific importing behavior when examining the impact of industry-wide import penetration on failure risk. Second, we show how the growing penetration by multinational firms in the relevant input and output markets of domestic firms raises competition and increases the likelihood of exit by domestic firms. Third, we show that subsidiaries of multinational firms are structurally better adapted to cope with globalization forces. As the relevant market for multinational firms typically stretches across national borders, we also find these firms to be less sensitive to domestic market conditions in the host country. The empirical evidence we present relates to Belgium, one of the most open economies of the world, characterized by strong inflows of foreign direct investment and trade openness.

The remainder of the paper is structured as follows. Section 2 introduces the main hypotheses. Section 3 presents the statistical model and data. Section 4 interprets the empirical results. Section 5 concludes.

2. HYPOTHESES

In a recent study Bernard, Jensen and Schott (2006a) find that plant survival and growth in U.S. manufacturing industries in the period from 1977 to 1997 were negatively associated with an industry's exposure to imports, especially imports originating from low-wage countries (LWC). They also show that surviving firms adjusted their product mix and reallocated manufacturing activities towards capital-intensive plants. The last strategy illustrates a possible offensive strategy at the individual firm level to deal with the rising competitive pressure from LWC imports. The change in activity mix, however, appears often to be part of a broader strategy by firms that involves moving labor-intensive production to low-wage countries and importing back those goods and services for further processing or distribution (OECD, 2006). Large multinational firms that have built up extensive worldwide networks are in a privileged position to benefit from such sourcing strategies, and to spread their global value chains in the most optimal way (Kogut and Kulatilaka, 1994).

Typically the least efficient or most costly stages of production are outsourced to third parties abroad. However, recent trends in off-shoring show that the process is not confined to the relocation of standardized labor-intensive activities, but involve the optimal spreading of all kinds of activities including various knowledge-intensive service activities within the development of global supply chains by firms (Yamawaki, 2004). A domestic firm facing high (sunk) costs to set up manufacturing plants abroad can benefit from the same international factor price differences through contracting or partnering with independent firms abroad. Firms that outsource not only benefit from lower input prices abroad, but can also benefit from better worker skills than they find at home (Bajpaj, Sachs, Arora and Khurana, 2004). Econometric studies focusing on productivity gains resulting from outsourcing activities show that the net effect of off-shoring on productivity depends very much on the specific context and stage of development of the firm (Olsen, 2006).

Evidence from a large set of industrialized countries shows that the in-sourcing and out-sourcing activities of firms have risen significantly over the last decade and have led to substantial cost savings and quality improvements of the supply process of off-shoring firms (OECD, 2006). Given the growing strategic importance of off-shoring and the competitive advantages it offers to participating firms, we therefore posit

H1 : International (out)sourcing lowers the probability of exit.

Most studies that examine for links between globalization and industry dynamics focus on the exit (or its mirror image, survival) of firms in relation to international trade. Less attention has been paid to the impact of foreign direct investment (FDI), the major component of the current globalization wave, on the exit behavior of domestic firms. In cases where multinational firms create or serve new markets they may offer (through vertical linkages) new growth possibilities for domestic firms. The transfer of superior technology to the host country by multinational firms may also generate beneficial effects for domestic firms if the technology from multinational firms spills over to domestic firms and improves their efficiency (Blomstrom and Kokko, 1998; Görg and Strobl, 2003b). However, since multinational enterprises (MNEs) are able to transfer better technologies to host countries and add capacity to the industry they also increase the competitive pressure on domestic firms. Competitive pressure can come via the labor market when MNEs pay higher wages and hence make it more difficult for domestic firms to attract workers and discourage domestic entrepreneurship (De Backer and Sleuwaegen, 2003b). Competitive pressure also comes via the product market where less efficient firms with inferior technologies are eventually pushed out of the market (Aitken and Harrison, 1999). The net effect from an increased participation by MNEs will therefore depend on the relative importance of positive spillover effects versus competitive displacement effects.

Görg and Strobl (2003b) demonstrate theoretically that positive spillover effects may outweigh the negative effects of crowding out on domestic firms if domestic firms have the capacity to absorb such spillover effects. In the model we separate spillover effects from competitive effects by explicitly controlling for productivity gains and market prospects for domestic firms and focus on the competitive effects, for which we posit

> **H2**: The competitive effect following an increase in the penetration of multinational firms in an industry raises the probability of exit by domestic firms.

The previous arguments and hypothesis suggest several distinguishing characteristics of subsidiaries of MNE in host countries. First, to compensate for the higher costs associated with the liability of being foreign in a host country, the subsidiaries of multinational firms should evidence higher productivity than domestic firms. A growing number of studies examining the performance of MNE subsidiaries in different host countries, support this expectation (Globerman et al, 1994; Doms and Jensen, 1998; Hallward-Driemeier et al, 2002; Kimura and Kiyoyta, 2007). Second, as multinational firms enter new host markets and spread their activities worldwide, subsidiaries of multinational firms should be more involved in exporting and international sourcing than domestic firms. This second characteristic can be expected to have also an impact on the pattern of exit behavior of domestic versus subsidiaries of multinational firms (see for instance, Mata and Portugal, 2002; Görg and Strobl, 2003a). Subsidiaries of multinational firms are typically less rooted in the local economy and, as a result, may be quicker to close down production plants (Alvarez and Görg, 2005). In most cases their scope of operations is also much wider than the national market while their production network includes operations in many developed and developing countries. Exit may thus result from strategic changes and efficiency-seeking motives within larger supply networks, rather than from simple profit and cost considerations solely based on market conditions in one country. For example, Belderbos and Zou (2006) found that divestment by Japanese multinational firms in the electronics industry were interlinked across countries.

Following this logic, we expect that subsidiaries of multinational firms will be less sensitive to local demand and competitive conditions and will be better adapted to relative cost conditions prevailing in the host country.

Similarly, multinational firms gain competitiveness from having operating flexibility with respect to global supply networks. This involves cost arbitrage across many countries, not just sourcing from low-wage countries (Kogut and Kulatilaka, 1994; Yamawaki, 2004) but also from other industrialized countries where they may benefit from scale or agglomeration economies. Indeed, Pennings and Sleuwaegen (2006) found that the majority of relocations by multinational firms out of Belgium involved shifting production to other EU countries so as to optimize production on an EU-wide basis. Hence,

> **H3**: Subsidiaries of multinational firms are strategically and structurally better adapted to industry globalization. They show a better fit with the comparative advantages of the host country and are less sensitive to local demand and competitive conditions.

3. EXIT MODEL AND DATA

Exit in Belgian manufacturing

Belgium is a particularly relevant country for studying the exit of firms in response to the competitive pressures arising from industry globalization. The export rate of Belgium, defined as total exports divided by gross domestic product, rose to 88.5 % in 2002 while the import rate rose to 78.6%. In 2002, the share represented by subsidiaries of multinational firms in manufacturing employment slightly exceeded 50% while their share of value added was estimated to equal 60%. The internationalization of the Belgian economy over the last thirty years went hand in hand with a strong process of de-industrialization, i.e. declining employment in manufacturing sectors. Over the period 1970-2002, Belgium experienced the strongest decline in manufacturing employment in Europe.

Total employment in Belgian manufacturing in 2002 decreased to almost one half[1] of its level in 1970 (index value 100 on the vertical axis in Figure 1).

Insert Figure 1 About Here

Interestingly, over the same period, Belgium attracted a strong inflow of foreign direct investments. Figure 1 shows that especially since the mid-1980s, the growth rate of foreign investment flows into Belgium has increased more rapidly than the growth rate of GDP. Imports also grew at a higher rate as shown by the rising import intensity (imports divided by total production) over the relevant period.

Underlying the de-industrialization process depicted in Figure 1 is the exit of many firms from the manufacturing sector. In this paper we focus on the exits of domestic firms and subsidiaries of multinational firms that happened in the manufacturing sector of Belgium over the period 1999-2001. Exits are measured as firms that stopped reporting activity and were removed from the registry of companies published by the National Bank of Belgium[2]. Removal from the registry of companies means that a firm no longer operates as a commercial unit. Operationally, this excludes all cases of merger and acquisition, which are most often recorded as a change of ownership without any change in the VAT registration number (see e.g. Sleuwaegen and Dehandschutter, 1991; Van de Gucht, Konings and Roodhooft, 2000 for an earlier use of this exit measure and discussion of its validity).

Between 1999 and 2001, 3577 domestic firms exited the market; this represents 25% of all domestic firms active in 1998. As a result of these exits, employment in domestic firms declined by 16% over the same period. Over the same time period, 152 subsidiaries of multinational firms exited, equal to 10% of all subsidiaries active in 1998, and these exits represented a loss of 6% of MNE employment in Belgian manufacturing. It is also important to stress here that the unit of observation is the firm and not a production plant.

[1] For most of the European countries the decrease in manufacturing employment was only one third over the same period.

[2] To be on the safe side in computing life-spans, we performed additional controls before classifying the absence of report as a firm exit. We required that a firm be absent from the file for at least 2 years in In order to be classified as an exit. For this reason, in our subsequent analysis we used data only until 2001, although our data files go up to the year 2002.

However, very few firms (less than 5%) operate several plants in the small economy of Belgium. This means that our results are therefore comparable to those studies in which the unit of observation is the production plant.

Modeling the decision to exit.

Similar to Bernard, Jensen and Schott (2006a), we model the likelihood that a firm will exit its industry using a Logit specification:

$$F(x_i'\beta) = P(y_i = 1) = \frac{\exp(x_i'\beta)}{1+\exp(x_i'\beta)}$$

In this expression, $y_i = 1$ if firm i exits, β is a vector of coefficients, x' is the vector of explanatory variables listed in Table 1. The dependent variable equals one if a firm active in 1998 exited the market by 2001. We use the discrete Logit model to model exit instead of using a continuous year to year hazard (survival) model for two reasons. First, the firm-level data before 1996 were not available so 1996[3] does not correspond to the year in which each firm first entered its industry. Second, the data only cover a period of 5 years and so a life-table that would reflect the distribution of survival times is rather limited, and would contain many censored observations. In addition, using year to year fluctuations is also likely to increase measurement error in the dependent variable while some independent variables may show insufficient variation over the short time period or have a delayed impact on the exit decision which would require the inclusion of various adjustment lags (Alvarez and Görg, 2005).

Insert Table 1 About Here

[3] Since most of the explanatory variables included in the model are lagged for the period preceding the exit period, exit is studied from 1998.

Our model of firm exit extends the basic specification of Bernard, Jensen and Schott (2006a) to incorporate the specific hypotheses formulated in Section 2. The model controls for industry wide effects as well as for firm-specific variables that may account for heterogeneous responses in exit behavior. Industries are defined at the (European industry classification) NACE 3-digit level (Eurostat, 2002) which corresponds to a level of disaggregation that lies between that of the ISIC 3-digit and ISIC 4-digit industry definitions. By reasonably assuming a lagged adjustment, all explanatory industry variables included in the model are measured for the period 1996-1998, the time period preceding the exit testing period. The descriptive statistics for industry variables are reported in Table 2.

Insert Table 2 About Here

Table 3 reports the firm level data, making a distinction between domestic firms and subsidiaries of multinational firms.

Insert Table 3 About Here

Tables A1, A2 and A3 in Appendix A present the correlations between the different variables. In the presentation of the variables below, we group the different variables according to their basic source of impact.

Import competition

Import competition (IMPGROW) is measured as the growth of import penetration in the three years prior to the decision to exit. The variable is measured as the percentage growth in the ratio of total imports to total sales in an industry. Similar to Bernard, Jensen and Schott (2006a), a distinction is made between growth in imports from low-wage countries (IMPGROW-L) versus growth in imports from other countries (IMPGROW-H). The descriptive statistics in Table 2 show that the growth of imports from low-wage countries in the period 1996-1998 was about 5 times higher than the growth of imports from other countries.

International sourcing

The importance of international sourcing is the central focus of our first hypothesis. International sourcing (SOURC) is measured by a dummy variable indicating if a firm imports goods and services from abroad. The available data did not permit us to make the same distinction between sourcing from low-wage versus high-wage countries as done for the import competition variable. However, for each firm we could differentiate whether it sourced from non-EU countries (SOURCEX). Clearly, if the distinction between sourcing from low-wage countries versus high-wage countries matters, we would expect the effect to show up for the more broadly defined non-EU sourcing variable.

Multinational penetration

The presence of multinational firms in the industry is the subject of our second and third hypothesis. Multinational enterprise penetration (MNEPEN) is measured as the percentage growth in sales of subsidiaries of multinational firms in an industry. In classifying firms as subsidiaries of multinational firms we followed the UN definition (United Nations World Investment Report, 2002) that a subsidiary should at least be 10% owned by a parent company that has manufacturing activities in at least two countries.

Productivity, Size, Export and Capital-intensity

The theoretical and empirical models of industry evolution consistently predict that under growing global competition less productive firms will exit, while productive firms will grow (for a recent review, see Bernard and Jensen, 2006). To account for difference in firm productivity we calculated the logarithm of a Total Factor Productivity index (TFP) for each individual firm following the method proposed by Caves, Christensen and Diewert (1982) and used in a comparative industry context by Aw, Chung and Roberts (2003). The method is described in Appendix B.

Most exit studies have found that large firms that enjoy scale economies, are characterized by important sunk costs and which benefit from a more varied set of experienced resources to be in a stronger position to face increased competition and resist bankruptcy (Siegfried and Evans, 1994) than are small firms. We measure firm size (SIZE) as the logarithm of a firm's reported number of employees.

Following recent work on firm heterogeneity and trade, we expect productive firms and large firms to export to other countries (Bernard, Jensen and Schott, 2006b). Despite the fact that we control for size and productivity, we also included an export variable to control for the possibility that exporting may offer extra advantages (e.g., learning) to the firm, helping it to survive. Exporting (EXP) is captured by a dummy variable that indicates if a firm exports.

Within the current wave of globalization, differences in factor conditions across countries continue to play an important role in determining the attractiveness of countries for locating technologically distinguished activities (Kogut, 1985). Belgium has established a comparative advantage in capital-intensive activities (Tharakan and Waelbroeck, 1988; De Backer and Sleuwaegen, 2001). Labor costs in Belgium are among the highest in the world (U.S. Bureau of Labor Statistics, 2006). We therefore expect capital-intensive firms in Belgium facing growing international competition to show a lower probability to exit. Capital-intensity (CAPINT) of the firm is measured by the logarithm of the ratio of (the value of) a firm's tangible fixed assets to it level of employment.

Firm History: Firm Age and Downsizing

It has been argued from an evolutionary perspective that old and large firms with routine business models are less likely than young and small firms to exit an industry. This is supported in many studies on new firm survival (Mitchell, 1994; Mata and Portugal, 1994; Dunne, Roberts and Samuelson, 1989). We control for this experience effect by including the age of the firm (AGE) and the squared value of age (AGE2). AGE is measured as the number of years the firm has been active in the industry. For subsidiaries of multinational firms this means the period since they were first established in Belgium.

In adopting the evolutionary approach we should, however, not overlook the fact that in some industries the economic context drastically changes over time and may render the business models of older firms obsolete. In reaction large firms in financial distress often try to become more cost efficient through downsizing and laying off employees (Coucke, Pennings and Sleuwaegen, 2005). However, if firms cannot successfully adapt their business model and are unable to become more cost efficient through downsizing, the decline in their employment is only a postponement of the exit decision, and it increases the probability of exit at a later time. Downsizing (DOWNS) in the model is modeled as the percentage decline in the number of employees in the three years preceding the exit period, reflecting a firm's recent history of downsizing.

Industry growth and recent Entry

An important industry characteristic that affects the survival of firms is the growth of the industry, reflecting the need for extra capacity. Several authors (Caves, 1998; Schmalensee, 1989) have also showed that profits are in general larger in growing than in declining industries. A positive and significant effect of industry growth on the survival of new firms is found in most of the empirical studies on exit, including Mata and Portugal (1994), Audretsch and Mahmood (1995) and Görg and Strobl (2003b). Industry growth (INDGROW) is measured by the relative growth in sales in a given NACE 3-digit industry over the period 1996-1998 (three years before the exit interval).

Controlling for industry growth prospects, other studies have also reported a strong correlation between the flows of entry and exit across markets (Dunne, Roberts and Samuelson, 1988; Siegfried and Evans, 1994; Mata and Portugal, 1994). A recent interpretation of this positive relation between entry and exit rates is provided by the carrying capacity model that includes replacement and displacement entry (Geroski, 1995; Carree and Thurik, 1999). If not just for replacing firms, new entry often introduces improved technologies or new products and displaces established firms from the industry. Hence, recent entry of new firms can be expected to increase the probability of exit of established firms. Industry entry (ENTRY) is measured by the ratio of new firms to the number of active firms in an industry averaged over the three years before the exit decision period.

4. RESULTS

Exit Behavior of Domestic Firms

Table 4 reports the estimation results including the marginal effects of the explanatory variables on the probability of exit of domestic firms for the observation period.

Insert Table 4 About Here

The positive and significant marginal effect of IMPGROW in the first column of Table 4 corroborates the results found for the U.S. (Bernard, Jensen and Schott, 2006a). In industries characterized by a strong import growth relative to sales, domestic firms experience fierce international competition and are more likely to exit. In splitting up imports according to the region of origin in column 2, we find this effect to originate exclusively from imports from low-wage countries.

The negative and significant coefficient of SOURC provides support for our first hypothesis. Domestic firms with international outsourcing activities have a lower probability to exit. If domestic firms can outsource abroad they can gain from differences in international factor prices, similar to the sourcing activities of multinational firms. However, during our sample period only 28 percent of the domestic firms engaged in international outsourcing (cf. Table 3). To the extent that import competition mainly originates from low-wage countries we would expect that outsourcing to firms located in non-EU would have a larger impact than sourcing from parties within the EU. Indeed, the results in column 2 where the distinction is made between sourcing from EU and non-EU countries[4] points to this effect.

[4] We are grateful to a referee for suggesting us to split up the sourcing variable following the region of origin.

In line with our second hypothesis, multinational penetration (MNEPEN) in the domestic market, measured as relative growth in sales of multinational firms in the industry, has a significant positive coefficient suggesting a strong competitive and displacement effect of multinational firms. In a set of related papers, Görg and Strobl (2002, 2003b) present evidence for the expanding manufacturing sector in Ireland, including many high-tech industries, where they make a similar distinction between domestic and foreign firms and find positive spillovers to be more important than displacement effects. However, in the mature and de-industrializing economy of Belgium we find a strong concentration of multinational firms in traditional industries. In a related study focusing on technology transfers among firms, Veugelers and Cassiman (2004) found no evidence of strong spillover effects running from multinational firms to domestic firms. Moreover by including the variables for Total Factor Productivity as well as recent industry growth, positive spillover effects in terms of efficiency and /or demand are implicitly taken in account in our model so that MNEPEN mainly proxies for competitive effects.

The coefficient on the productivity variable (TFP) is significant and negative as expected. Less productive firms are more likely to exit. The coefficient on SIZE suggests a strong negative impact, indicating that larger firms enjoying scale economies are less likely to exit. The negative and significant coefficient on CAPINT is consistent with the comparative advantage capital-intensive firms enjoy in Belgium. As a result of the high wage costs, Belgian firms are forced to substitute capital for labor in order to survive.

The results for AGE and AGE2 indicate that age has a negative dampening effect on the probability of exit, indicating that younger and less experienced domestic firms are more likely to exit. However, also for older and larger firms an employee lay-off in the recent history of the firm, measured by the variable DOWNS, has a positive and significant impact on the likelihood of exit. This result is in line with the finding that downsizing operations are difficult and risky operations that enhance the probability of exit in subsequent periods (Hannan and Carroll, 1992). Exit occurs when the restructuring fails to generate sufficient profits (Coucke, Pennings and Sleuwaegen, 2005).

The coefficient estimates for each of the industry characteristics have the expected signs: firms are less likely to exit the higher the industry's growth, INDGROW, and the lower recent entry into the industry, ENTRY, suggesting an important displacement effect by younger successful firms.

We do not find a negative effect for the export variable EXP. Only when we exclude the other globalization variables from the model (excluding MNEPEN, SOURC, SOURCEX, IMPGROW-L, IMPGROW-H: see column 4 of Table 4) the coefficient on EXP becomes negative and significant. Consistent with the findings of Bowen and Wiersema (2005), this finding suggests that exporting has an encompassing role for other globalization variables in the restricted model suggesting that firms react to rising global competitive pressure in such a way that surviving firms turn into exporting firms or enlarge their export markets. However, exporting itself does not appear to have a separate influence on the probability to exit. This result is also in line with the finding of Arnold and Hussinger (2005) who could not identify learning effects from exporting on productivity improvements of German manufacturing firms in the period 1992-2000.

In checking the robustness of some of our findings, we tested if the results were sensitive to the import measure used. One particular concern related to the nature of imports, is that not all imports necessarily exercise the same disciplinary effect. In cases where industry imports comprise important intra-firm trade arising from global sourcing, or that concerns trade in differentiated goods, we may expect the disciplinary effect to be substantially smaller. The combination of scale economies and product differentiation may lead to substantial intra-industry trade, i.e. cross-border trade in the same industry (Lancaster, 1980; Krugman, 1981; Helpman, 1987; Bergstrand, 1990). While also in this case, trade liberalization may reduce the number of varieties (Yeaple, 2005), the advantages of successfully differentiating one's products may reduce the risk of exit. Product differentiation in combination with scale economies can also be seen as an important barrier to exit as successful differentiation most often results from sunk investments in R&D or advertising, or specific capital equipment (Sutton, 1991; Geroski, 1995). We consequently tested if the pressure from low-wage country imports is different for firms that operate in differentiated industries characterized by a high level of intra-industry trade. A standard method to measure intra-industry trade (IIT) by industry is the Grubel-Lloyd index (1975).

The Grubel-Lloyd index measures the share of imports or exports (whichever is smallest) that is 'covered' by exports and imports of similar types of goods. The index ranges from zero to one where an index of one reflects 100% intra-industry trade. The Grubel-Lloyd index at a NACE-3 digit industry level (Marvel and Ray, 1987) is defined as follows:

$$IIT = 2\min (X_i , M_i)/(X_i + M_i)$$

where X_i equals total exports in industry i and Mi total imports in industry i averaged over the three years preceding the exit interval. The measure also picks up two-way intra-firm trade following international sourcing, if the trade covers goods in the same industry, but less so if the sourcing covers the exchange of goods in vertically distinguished industries. To test the impact of intra-industry trade, we estimated the possible differential impact of import growth from low-wage countries for two distinguished cases. IMPGROW-L-D tests the impact of import growth from low-wage countries for strongly differentiated industries, and where intra-industry trade represents more than 75% of total trade of the industry. Conversely, IMPGROW-L-U tests the impact of import growth from low-wage countries for the other less differentiated industries. Industries where product differentiation is important can offer firms various possibilities to reorganize value chains and focus in high-wage countries on the skill-intensive and capital-intensive parts of the supply chain. We believe that this effect could partly pick up the product mix effect found in Bernard, Jensen and Schott (2006a), where they find firms heavily exposed to low-wage country imports switch production to capital-intensive activities and industries.

The results presented in column 3 of Table 4 point indeed at the importance of distinguishing between the two types of industries. We find the competitive effect from low-wage country imports to be exclusively captured by the less differentiated industries.

Finally, in order to test for the robustness of our results across time periods, we performed extra tests and estimated the Logit model over two sub-periods (1998-2000) and (1999-2001). We could not discern significant differences using a Wald-test with respect to all model coefficients.

The Wald-test yielded a χ^2 value of 2.38 with fourteen degrees of freedom, indicating no significant difference at conventional levels between the two sub-periods. We also investigated the sensitivity of our results to changes of the productivity measure, as the exact measurement of total factor productivity continues to stir a lot of debate (see e.g. De Loeker, 2004). Using cross-section input elasticity estimates of a Cobb Douglas production function, the results did not significantly differ from the firm-specific input elasticity measures we have used.

Exit Behavior of MNE subsidiaries

Over the period 1999-2001 the exit rate of subsidiaries of multinational firms is much smaller than for domestic firms, respectively 10% of MNE subsidiaries in 1998 versus 25 % for all domestic firms operating in 1998. A basic explanation for this difference that also offers support for our third hypothesis, follows from the descriptive statistics in Table 3. The statistics reveal statistically significant differences in means between domestic firms and MNE subsidiaries, with the latter group of firms having a higher total factor productivity, a larger size, a higher percentage of off-shoring and exporting subsidiaries, and a substantially higher capital/labor ratio compared to domestic firms. Similar results were found for plants belonging to multi-plant and multinational companies in U.S. manufacturing (Bernard and Jensen, 2006).

As a further test of hypothesis 3, we estimated our Logit model for the exit behavior of subsidiaries of multinational firms, similar to the model used for domestic firms. Since the relevant markets and competitive arena for most multinational firms is typically larger than the market of a particular host country, we expected the competitive pressure from local entrants and the growth of the local industry to be less relevant for MNE subsidiaries. The results in Table 5 support this hypothesis.

Insert Table 5 About Here

The entry variable and the local industry growth variable have no significant impact on exit, different from the results obtained for domestic firms. Using a Wald-test for the differences between the coefficients on these two variables with respect to domestic versus multinational firms, resulted in a χ^2 value of 6.75 with one degree of freedom, suggesting a significant difference in the influence of these two domestic variables between the two groups of firms.

In the same context, it is interesting to find that subsidiaries of multinational firms show a different reaction with respect to sourcing. International sourcing activities of subsidiaries have a significant and strong negative impact on the probability to exit, irrespective of the country where the firm sources. This result suggests that multinational firms use their complete network to optimize a wider set of activities dispersed across high-wage and low-wage countries. Moreover, sourcing goods from affiliated plants located in high-wage countries may involve processed goods originally coming from low-wage countries. More importantly, the results continue to stress the importance of international sourcing as a strategy to survive. Subsidiaries that are not sourcing abroad are more vulnerable to possible exit. However, different from domestic firms, only 16% of the subsidiaries had no international sourcing activities. In some heavily regulated industries, international sourcing is made difficult and multinational firms cannot fully benefit from their operating flexibility. The fact that to survive, multinational firms have to co-ordinate their production activities in the most cost efficient way through global sourcing can also explain the increased importance of vertical FDI (versus horizontal FDI) during the last two decades (see e.g. Hanson, Mataloni and Slaughter, 2001).

Import growth has a strong positive impact on the probability to exit. We find a stronger reaction to imports from low-wage countries in less differentiated industries. The estimated marginal effect of other imports tends to remain important, but the estimated standard deviation of the effect is large. Different from domestic firms, the growing presence of multinational firms does not exert a competitive pressure on subsidiaries to exit. On the contrary, if anything, the (insignificant) negative effect rather suggests cluster advantages for those firms operating in the globalizing industries. Together with the differential impact of imports and sourcing, the last results appear to indicate a different regime of the model for MNE subsidiaries compared to domestic firms.

A Wald-test of the joint difference in globalization effects for subsidiaries of multinational firms versus domestic firms gives a χ^2 value of 18.69 with six degrees of freedom, rejecting the null hypothesis of no difference.

As for domestic firms, total factor productivity continues to be an important determinant of exit risk. Controlling for this effect as well as those stemming from imports and sourcing, exporting does again not play a role on itself. Unlike for domestic firms, the age variable does not show up as relevant for MNE subsidiaries, suggesting that subsidiaries of multinational firms are not subject to the same selection process as domestic firms. We would indeed expect the age of the parent company to be more relevant in this context. The insignificant result could also suggest that local experience, as measured by the time since the first establishment in the country, is less important or of a different nature for subsidiaries. There is a clear need for further research to uncover more of this process.

The insignificant effect for size is striking. In looking at the descriptive statistics of Table 3, however, we find MNE subsidiaries to operate on a larger scale than domestic firms with little variation in size across subsidiaries. This again suggests that MNE subsidiaries are exploiting scale economies better than domestic firms. Acknowledging the strategic importance of scale economies in globalizing industries, MNE subsidiaries are therefore better positioned than domestic firms in those industries. The same observations hold for the capital-intensity variable with subsidiaries operating in a more capital-intensive way then domestic firms. Parallel to the findings for domestic firms, we also find downsizing in the recent past to increase the probability of exit, reflecting the high risk of using such restructuring operations to redress a lack of profitability. In an important number of cases, the downsizing of MNE subsidiaries involved the relocation of some of the operations to other countries.

Finally, similar to the robustness checks for domestic firms, in splitting up our sample for different sub-periods or using an alternative measurement of total factor productivity, we found the results to remain robust across the different estimations of the model.

5. DISCUSSION AND CONCLUSIONS

The globalization of industries results from the interaction of diverse strategic actions and reactions of firms in response to new trade and investment opportunities across the world. Within this process, firms based in developed countries do not only face competition from newly industrializing countries, but increasingly seize profitable opportunities in spreading their supply chain across a wide set of countries through the off-shoring of activities. From these offshore plants firms source goods and services for further processing or distribution in the home country, or other countries where they established nodes of their supply network. In this paper we showed the importance of international sourcing as a competitive weapon to survive in a globalizing industry. It can be reconciled with the finding that sourcing cannot be held directly responsible for the losses of employment observed in many industrialized economies (see e.g. Mankiw and Swagel, 2005). On the contrary, where global competition grows and no off-shoring of activities or international outsourcing occurs, firms are more likely to exit and/or to substantially lay-off workers. Firms that are able to upgrade their domestic activities and benefit from global sourcing cannot only survive but can also be expected to create new jobs. Not only domestic firms, but also subsidiaries of multinational firms that do not source from abroad and do not use their operating flexibility to improve their cost efficiency, are more likely to cease operations. The finding that multinational firms have to specialize their production processes through increased sourcing of sideline or less cost efficient activities, reflects the increased importance of vertical foreign direct investment and international fragmentation of production in the last decade.

In this paper we emphasized the different sources of global competition which discipline the behavior of domestic firms. First, the results indicate a strong effect of imports originating from low-wage countries. This result corroborates the findings on firm exit from U.S. industries presented by Bernard, Jensen and Schott (2006a). However, we found the effect to be particularly strong for industries where there is less intra-industry trade, implying less product differentiation, or fewer possibilities to fragment the production chain in those industries. The result suggests the importance of upgrading of activities, using more skilled labor, in industries heavily exposed to trade pressure from low-wage countries. An interesting byproduct of our research is also the insignificance of the exporting variable in our estimation results.

The results suggest that firms subject to strong competitive discipline from global competition will have to become more efficient and as a result will become exporters, and not the other way around, as it has often been suggested in the literature.

Second, the results also indicate that the growing penetration of multinational firms exerts a strong competitive and displacement effect with respect to domestic firms in Belgian manufacturing. Subsidiaries of multinational firms do indeed show a superior competitive performance vis-à-vis domestic firms. This finding does not exclude the possibility that over time new growth opportunities and positive spillover effects from MNE subsidiaries to domestic firms could materialize. Görg and Strobl (2002, 2003b) found for the rapidly developing high-tech industries of Ireland that competitive displacement effects are overcompensated by positive technological spillovers. In view of this, it is important that domestic firms are continuously challenged and offered the right incentives to participate in global networks and possibly internalize such benefits. We also found subsidiaries of multinational firms not to be sensitive to local market demand and competitive conditions in Belgium. Observing that those subsidiaries operate on relevant markets that are much wider and most often encompass the European market, those firms are also less rooted in Belgium, and as a result take more flexible exit decisions comparing location conditions in different countries on a more continuous basis.

We believe that all those different results have some important implications for economic policies trying to cope with possible undesirable effects of globalization. First of all, growing global competition will continue to lead to strong restructuring within and across industries. Institutions assisting the functioning of input markets, especially labor markets, should therefore adapt themselves to ensure that the reallocation of resources to new activities can smoothly happen. Secondly, competitive effects from increasing presence of multinational firms should be mitigated or compensated by stimulating domestic firms to strongly invest in research and development and human capital formation to improve their technological capabilities, which may also help them to better compete and absorb technological spillovers originating from those multinational firms. Third, the best defense against the negative effects of globalization appears to lie in adopting offensive strategies and exploiting new possibilities in globalizing industries.

From a policy point of view, this implies that firms should not be regarded as national champions, but stimulated to better exploit the opportunities accruing from the globalization process in spreading their activities and/or source goods and services from different regions of the world. While most of the above recommendations may sound familiar to the better performing economies in the world, for many continental EU countries the implementation of such policies would still mean a radical change from traditional industrial policies.

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APPENDIX A

DATA SOURCES

TABLE 1

Definition of Explanatory Variables and data source

Variable	Definition
TFP	Total Factor Productivity (year=1998), calculated following the method described in appendix B. Cost shares of inputs, made available by the National Bank, are derived from their Company Data Base, "Centrale des Bilans"(CDB). The methodology for estimating user cost of capital is explained in Butzen, Fuzz and Vermeulen (2002).
SIZE	The logarithm of the reported number of employees (year =1998). Source: CDB
CAPINT	The logarithm of the ratio of physical fixed assets (measured in 1.000 euro) to employment (year=1998).Source: CDB
AGE	The number of years the firm has been active in the industry. Source CDB
DOWNS	The percentage decline in the number of employees in the period 1996-1998 Source: CDB
INDGROW	The relative growth in sales in the industry over the period 1996-1998. Source: NACE 3-digit industry data , VAT data, National Bank of Belgium
ENTRY	The ratio of new firms to the number of active firms, averaged over the period 1996-1998. Source CDB
EXP	Dummy variable indicating that the firm is exporting goods (year= 1998). Source: Statitics department of the National bank of Belgium, made available on special request.
SOURC	Dummy variable indicating that the firm is importing goods from abroad (year= 1998). Source: Statitics department of the National bank of Belgium, made available on special request.
SOURCEX	Dummy variable indicating that the firm is importing goods from countries outside the EU-15 (year=1998). Source: Statitics department of the National bank of Belgium, made available on special request.
MNEPEN	The percentage growth in total sales of affiliates of multinational firms over the period 1996-1998 per NACE 3-digit industry. Ownership data : Federal Planning Bureau . Sales data: CDB .
IMPGROW	The percentage growth in total imports to total sales ratio over the period 1996-1998 per NACE 3-digit industry. Source: Trade data, National Bank of Belgium
IMPGROW-L	The percentage growth in imports from low-wage countries to total sales ratio per NACE 3-digit industry over the period 1996-1998. Source: Trade data, National Bank of Belgium. The list of low-wage countries is based on Falk and Wolfmayr (2005). The list excludes all high-income countries classified as such by the World Bank Datastatistics (2006).
IMPGROW-H	The percentage growth in imports from high-wage countries to total sales ratio per NACE 3-digit industry over the period 1996-1998. Source: Trade data, National Bank of Belgium.
IMPGROW-L-D	The percentage growth in imports from low-wage countries to total sales ratio over the period 1996-1998 per NACE 3-digit highly differentiated industry where intra-industry trade represents more than 75% of total trade of the industry. Intra-industry trade is measured according to the Grubel and Lloyd-index (1975). The Grubel-Lloyd index measures the share of imports or exports (whichever is smallest) that is 'covered' by exports and imports of similar types of goods. Source: Trade data, National Bank of Belgium.
IMPGROW-L-U	The percentage growth in imports from low-wage countries to total sales ratio over the period 1996-1998 per NACE 3-digit less differentiated industry. Source: Trade data, National Bank of Belgium

TABLE 2

Industry Variables - Descriptive Statistics

Variable	Mean (St.Dev.)
INDGROW	0,24 (1,23)
ENTRY	0,04 (0,03)
MNEPEN	0,13 (0,52)
IMPGROW-L	0,56 (0,51)
IMPGROW-H	0,11 (0,39)

TABLE 3

Firm Variables - Descriptive Statistics

Variable	Domestic Firms Mean (St.Dev.)	Subsidiaries of Multinational Firms Mean (St.Dev.)	Significance level Differences in means Pr > |t|
TFP	5,38 (0,65)	5,73 (0,65)	<.01
SIZE	1,97 (1,14)	4,09 (1,58)	<.0001
CAPINT	3,13 (1,52)	3,31 (1,37)	<.01
AGE	2,61 (0,69)	2,87 (0,68)	<.01
DOWNS	0,07 (0,18)	0,05 (0,14)	<.01
EXP	0,28 (0,45)	0,77 (0,42)	<.0001
SOURC	0,28 (0,45)	0,84 (0,39)	<.0001

TABLE 4

Results from the Logit regression of Domestic Firms' exit

	(1)	(2)	(3)	(4)
INTERCEPT	3,81*** (17,41) *0,63*	3,80*** (17,35) *0,63*	3,88*** (17,46) *0,64*	3,94*** (19,97) *0,65*
TFP	-0,58*** (-16,9) *-0,09*	-0,58*** (-19,3) *-0,09*	-0,59*** (-17,1) *-0,09*	-0,59*** (-17,4) *-0,09*
SIZE	-0,63*** (-22,1) *-0,10*	-0,64*** (-22,5) *-0,10*	-0,63*** (-22,1) *-0,10*	-0,65*** (-24,7) *-0,10*
CAPINT	-0,21*** (-13,9) *-0,03*	-0,21*** (-13,9) *-0,03*	-0,21*** (-14,0) *-0,03*	-0,22*** (-14,7) *-0,03*
AGE	-0,02** (-2,28) *-0,003*	-0,02** (-2,20) *-0,003*	-0,02** (-2,16) *-0,003*	-0,02** (-2,21) *-0,003*
AGE2	0,0005* (1,93)	0,0004* (1,81)	0,0004* (1,81)	0,0005* (1,88)
DOWNS	1,24*** (10,6) *0,20*	1,22*** (11,1) *0,20*	1,23*** (10,6) *0,20*	1,22*** (10,5) *0,20*
INDGROW	- 0,77*** (-4,78) *-0,13*	- 0,91*** (-5,17) *-0,15*	- 0,93*** (-5,38) *-0,15*	- 0,96*** (-6,85) *-0,16*
ENTRY	0,59*** (4,46) *0,09*	0,61*** (4,63) *0,10*	0,55*** (3,75) *0,09*	0,58*** (4,51) *0,09*
EXP	0,007 (0,11) *0,001*	0,002 (0,04) *0,0003*	0,006 (0,13) *0,001*	-0,25** (-2,22) *-0,04*
MNEPEN	0,53*** (2,92) *0,08*	0,47** (2,53) *0,08*	0,38** (2,18) *0,06*	
SOURC	-0,16** (-2,41) *-0,02*	-0,07 (-1,01) *-0,01*	-0,07 (-0,91) *-0,01*	
SOURCEX		-0,41*** (-3,26) *-0,07*	-0,42*** (-3,31) *-0,07*	
IMPGROW	0,21** (2,02) *0,03*			
IMPGROW-L		0,48*** (2,81) *0,08*		
IMPGROW-H		0,002 (0,015) *0,0003*	-0,03 (-0,22) *-0,005*	
IMPGROW-L-D			-0,02 (-0,18) *-0,003*	
IMPGROW-L-U			0,71*** (3,51) *0,12*	
Log Lik	- 6336	- 6328	- 6323	- 6351

- t-values are between brackets,
- *significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level,
- mean marginal effects are in italics

TABLE 5

Results from the Logit regression of MNE subsidiaries' exit

	(1)	(2)	(3)
INTERCEPT	0,62 (0,74)	0,59 (0,71)	0,67 (0,81)
	0,05	*0,05*	*0,06*
TFP	-0,30** (-2,51)	-0,30** (-2,50)	-0,31** (-2,56)
	-0,02	*-0,02*	*-0,02*
SIZE	-0,05 (-0,76)	-0,05 (-0,75)	-0,05 (-0,78)
	-0,004	*-0,004*	*-0,004*
CAPINT	-0,03 (-0,53)	-0,03 (-0,48)	-0,03 (-0,52)
	-0,002	*-0,002*	*-0,002*
AGE	-0,007 (-0,16)	-0,007 (-0,15)	-0,007 (-0,16)
	-0,0005	*-0,0005*	*-0,0005*
AGE2	0,0002 (0,22)	0,0002 (0,21)	0,0002 (0,21)
DOWNS	1,31** (2,43)	1,30** (2,42)	1,33** (2,47)
	0,11	*0,11*	*0,11*
INDGROW	0,06 (0,05)	0,01 (0,01)	0,001 (0,01)
	0,005	*0,0008*	*0,00008*
ENTRY	-0,24 (-0,63)	-0,23 (-0,58)	-0,26 (-0,66)
	-0,02	*-0,02*	*-0,02*
EXP	-0,11 (-0,48)	-0,12 (-0,50)	-0,10 (-0,43)
	-0,01	*-0,01*	*-0,01*
MNEPEN	-0,91 (-1,17)	-1,01 (-1,26)	-1,08 (-1,31)
	-0,08	*-0,08*	*-0,09*
SOURC	-0,95*** (-3,61)	-0,94*** (-3,49)	-0,93*** (-3,44)
	-0,08	*-0,08*	*-0,08*
SOURCEX		-0,12 (-0,24)	-0,14 (-0,28)
		-0,01	*-0,01*
IMPGROW	0,71** (1,98)		
	0,06		
IMPGROW-L		0,98* (1,72)	
		0,08	
IMPGROW-H		0,56 (1,23)	0,57 (1,24)
		0,05	*0,05*
IMPGROW-L-D			0,55 (0,51)
			0,05
IMPGROW-L-U			1,16* (1,89)
			0,10
Log Lik	-478	-469	-462

- t-values are between brackets,
- *significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level,
- mean marginal effects are in italics

TABLE A1

Correlation Matrix of Industry variables

	INDGROW	ENTRY	MNEPEN	IMPGROW-L	IMPGROW-H	IMPGROW-L-D	IMPGROW-L-U
INDGROW	1						
ENTRY	-0,22	1					
MNEPEN	-0,05	-0,11	1				
IMPGROW-L	-0,08	-0,04	0,25	1			
IMPGROW-H	-0,55	-0,06	0,12	0,16	1		
IMPGROW-L-D	-0,07	-0,17	-0,03	0,50	0,03	1	
IMPGROW-L-U	-0,04	0,08	0,31	0,80	0,17	-0,10	1

TABLE A2

Correlation Matrix of Firm variables for Domestic Firms

	TFP	SIZE	CAPINT	AGE	DOWNS	EXP	SOURC	SOURCEX
TFP	1							
SIZE	-0,05	1						
CAPINT	0,07	-0,27	1					
AGE	0,005	0,27	-0,12	1				
DOWNS	0,17	-0,23	0,14	0,01	1			
EXP	0,11	0,37	0,004	0,15	-0,04	1		
SOURC	0,15	0,51	0,02	0,16	-0,07	0,54	1	
SOURCEX	0,04	0,09	0,01	0,04	-0,02	0,16	0,37	1

TABLE A3

Correlation Matrix of Firm variables for Subsidiaries of Multinational Firms

	TFP	SIZE	CAPINT	AGE	DOWNS	EXP	SOURC	SOURCEX
TFP	1							
SIZE	-0,07	1						
CAPINT	0,01	-0,07	1					
AGE	0,05	0,26	-0,09	1				
DOWNS	0,28	-0,25	0,15	0,03	1			
EXP	0,08	0,36	0,07	0,13	-0,05	1		
SOURC	0,06	0,36	0,04	0,10	-0,05	0,43	1	
SOURCEX	-0,008	-0,17	-0,01	-0,04	0,02	-0,06	0,24	1

APPENDIX B

Calculation of TFP

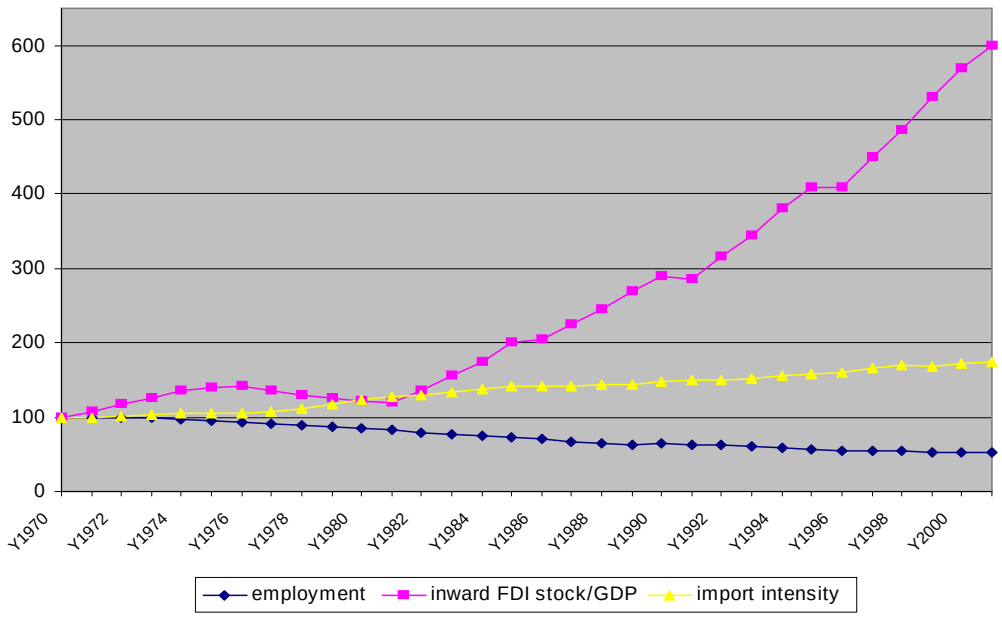
To analyze firm productivity, total factor productivity is calculated following the methodology developed by Caves et al. (1982) and used in Aw et al. (2003). The methodology consists of constructing an index of productivity, whereby for each firm i the logarithm of the levels of output *Y* and inputs *X* are compared to those of a hypothetical firm, the reference point, whose input and output values take the arithmetic mean values of log output, log input, and the respective input cost shares over all firms in the industry in a specific year. Hence, a non-parametrically calculated TFP index is obtained for each firm, which represents the relative productivity of the firm in its industry.

$$\ln TFP_i = (\ln Y_i - \overline{\ln Y}) - \left[\sum_j \frac{1}{2} \left(\alpha_{i,j} + \overline{\alpha_j} \right) \left(\ln X_{i,j} - \overline{\ln X_j} \right) \right]$$

with j=[1,n] for the n inputs.

FIGURE 1

Evolution of employment in Belgian manufacturing, import intensity and inward FDI stock as percentage of GDP (1970-2002; year 1970=100).



Source: Federal Planning Bureau, Eurostat, NBB