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Surviving Globalisation

by

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Abstract

This paper investigates the effects of international trade on firms' exit decision in Sweden, where exit can be by closedown, switching industry or being acquired. We find that higher levels of international competition increases the probability of exit by merger and closedown compared to no change. If trade is intra-industry in character the effect of import penetration on the probability of exit mitigates. The probability of exit by switching industry is higher in industries characterised by comparative disadvantage. Finally, we find the origin of international competition is significant; the effects are strongest when trade is with OECD countries.

JEL classification: D21, F10, L20, L6

Keywords: Industry dynamics, international trade, exit, closure, merger

Outline

Non-Technical Summary

Globalisation offers opportunities and threats to firms. Opportunities result from access to larger markets, potential scale economies and exposure to best practice management techniques and technologies; threats result from facing a more competitive environment. These opportunities and threats are not spread evenly amongst firms however. According to recent heterogeneous firm models the opportunities accrue to the best (most productive) firms within the industry, whereas the threats are felt disproportionately by the least productive.

Perhaps the most visible threat from globalisation, at least as judged by media coverage, is the closure of domestic firms and resulting loss of employment. This impacts greatest on domestic firms in import competing sectors. Yet, while firm death represents one possible response of firms to increased international competition it is not the only option. Some firms, rather than ceasing production altogether choose to switch production to a different industry or product; others choose to remain within their original industry but merge/acquire another firm. Globalisation does not always lead to the destruction of firm assets and employment but may also work by reorganising them into larger firm units or by forcing them to work in a new industry. In fact, in the case of Sweden, of these three options, it turns out that closure is the least likely choice to be made.

The reaction of firms in response to changes in the nature of international competition is an under-explored aspect of the globalisation process. Thus, in this paper we consider whether these choices depend on the level and structure of international competition, whether through foreign direct investment or arms length trade, and study which characteristics of firms make any one option more likely. Our focus is Swedish manufacturing firms from 1980 to 1996. Sweden, as a small open economy, has high levels of exposure to international markets and is therefore an interesting test case. Foreign owned firms account for on average 25 per cent of output over the sample period, while a very high proportion of domestic firms are engaged in exporting, on average around 85 per cent. This is much higher than one finds in larger OECD economies such as Germany, the UK and US.

From our analysis we find that while the view that globalisation leads to the closure of domestic plants and that foreign firms are ‘footloose’ has some truth, it is perhaps too simplistic a view. Increased import penetration does indeed significantly increase the probability of firm closure but it also increases the probability of firm exit by merger and acquisition, which may have a positive effect on a firm’s future performance. The behaviour of firms is also affected by the structure of trade as well as origin. If competition is more of intra-industry in character or is from a non-OECD country, the exit pressure on Swedish firms is moderated.

More generally the positive effect of increased import penetration on exit leads to greater merger and acquisition activity and more closedowns within the industry, but the effect on the probability of switching between industries is insignificant. We also find these result differ among firms with different characteristics.

I Introduction

Globalisation offers opportunities and threats to firms. Opportunities result from access to larger markets, potential scale economies and exposure to best practice management techniques and technologies; threats result from facing a more competitive environment. These opportunities and threats are not spread evenly amongst firms however. According to recent heterogeneous firm models (see for example Helpman, Melitz and Yeaple, 2004 or Bernard, Redding and Schott, 2004) the opportunities accrue to the best (most productive) firms within the industry, whereas the threats are felt disproportionately by the least productive.

Perhaps the most visible threat from globalisation, at least as judged by media coverage, is the closure of domestic firms and resulting loss of employment. This impacts greatest on domestic firms in import competing sectors. Yet, while firm death represents one possible response of firms to increased international competition it is not the only option. Some firms, rather than ceasing production altogether choose to switch production to a different industry or product; others choose to remain within their original industry but merge/acquire another firm. Schumpterian creative destruction occurs through the destruction of firm assets and employment and their reallocation both within and across industries. In fact, in the case of Sweden, of these three options, it turns out that closure is the least likely choice to be made.

The reaction of firms in response to changes in the nature of international competition is an under-explored aspect of the globalisation process. Thus, in this paper we consider whether these choices depend on the level and structure of international competition, whether through foreign direct investment or arms length trade, and study which characteristics of firms make any one option more likely.

Our focus is Swedish manufacturing firms from 1980 to 1996. Sweden, as a small open economy, has high levels of exposure to international markets and is therefore an interesting test case. Foreign owned firms account for on average 25 per cent of output over the sample period, while a very high proportion of domestic firms are engaged in exporting,

on average around 85 per cent. This is much higher than one finds in larger OECD economies such as Germany, the UK and US (see Wagner, 2002; Greenaway and Kneller, 2004; Bernard and Jensen, 1995, respectively).

The theoretical motivation for our analysis comes from the heterogeneous firm model (Melitz, 2003; Bernard, Eaton, Jensen and Kortum, 2004), as well as its recent extensions to allow for heterogeneity between countries (Meltiz and Ottaviano, 2003; Falvey, Greenaway and Yu, 2004; Bernard, Redding and Schott, 2003) and other forms of industry exit (Bernard, Redding and Schott, 2004).[1] Empirically the work builds on the determinants of industry exit at the firm level (see the review by Bartelsman and Doms, 2000). It has greatest similarity however to the work on firm closure and industry switching by Bernard and Jensen (2002) and Bernard, Jensen and Schott (2002) both for the US.[2] The latter estimates regressions of plant death controlling for a number of firm characteristics and industry characteristics, including trade variables. Controlling for industry fixed effects they find that the probability of death is higher in firms with low productivity and in firms that are non-exporters. Declines in trade costs are found to result in greater levels of firm death in industries characterised by high levels of intra-industry trade.

Bernard, Jensen and Schott (2002) consider both the decision to cease production and switch industries, although not in the same regression, following increased competition from low wage economies.[3] In the case of exit they find that the probability of survival is negatively correlated with low wage competition, and for a given level of wage competition it is firms with low capital and skill levels that are less likely to survive. While the determinants of switching are not considered in the same way there is evidence that industry switching occurs towards more capital-intensive and skill-intensive industries, exactly those industries with less competition from low-wage countries.

From our analysis we find that while the view that globalisation leads to the closure of domestic plants and that foreign firms are 'footloose' (Rodrik, 1997) has some truth, it is

[1] There is also a strong connection to an earlier literature that predicts the cross-industry patterns of exit (in a representative firm framework) such as that by Albequerque & Rebelo (2000).
[2] A related literature has considered trade variables as determinants of net entry and exit rates across industries (for example Criscuolo, Haskel and Martin, 2004).
[3] Dunne, Roberts and Samuelson (1988) and Dunne, Klimek and Roberts (2004) consider the same exit choices but do not model the effects of trade on this, while Bhatacharjee et al. (2002) compare differences in the determinants of firm bankruptcy relative to those of acquisition again without trade as a determinant.

perhaps too simplistic a view. Increased import penetration does indeed significantly increase the probability of firm closure but it also increases the probability of firm exit by merger and acquisition, which may have a positive effect on a firm's future performance (McGuckin and Nguyen, 1995). The behaviour of firms is also affected by the structure of trade as well as origin. If competition is more of intra-industry in character or is from a non-OECD country, the exit pressure on Swedish firms is moderated.

More generally the positive effect of increased import penetration on exit leads to greater merger and acquisition activity and more closedowns within the industry, but the effect on the probability of switching between industries is insignificant. We also find results that are, to some extent, consistent with the heterogeneous firm model since the probability of exit within industries differs among firms with different characteristics.

The remainder of the paper is organised as follows. In the next Section we briefly review the supporting theoretical literature. Section III discusses the data and methods used in identifying exit strategies, while Section IV reports our results of modelling their determinants. Finally, Section V concludes.

II Heterogeneous Firms and International Trade

The usual starting point for economists when thinking about the effect of increased globalisation on resource allocation is the Heckscher-Ohlin model. In a world characterised by different factor endowments, countries specialise in and trade products that use their relatively abundant factor intensively. Resources will therefore be reallocated towards industries in which the country has a comparative advantage.

However the H-O model is silent on how this reallocation takes place - firm exit, reductions in firm size or industry switching - because all firms are implicitly assumed to be identical. Recent heterogeneous firm models have started to make predictions about these options. This has meant that the literature on adjustment to globalisation has shifted away from the study of countries and industries to its impacts on plants and firms. The basic insight from

this literature is that when faced with identical opportunities firms make different choices, where these differences are explained by differences in the underlying characteristics of firms, typically their productivity. There is self-selection in the decisions of firms.

All the recent extensions of the heterogeneous firm models build on Hopenhayn (1992). Melitz (2003), which is the seminal paper along these lines, considers the export decision of firms in an industry with monopolistic competition and sunk-costs. The latter are incurred by the firm both to enter the industry and to enter export markets, where the sunk-costs of exporting are typically thought to include the fixed costs of research into product compliance, distribution networks, advertising and so on. Only firms with higher *ex ante* productivity can meet the sunk-costs associated with entry and there is therefore, self-selection into export markets. Firms with lower productivity produce only for the domestic market, while firms with the lowest productivity exit the market altogether.

Falling trade costs affect both the decisions about export market entry and industry exit. As expected, they allow firms that were previously serving just the domestic market to make non-negative profits from serving foreign markets also. In addition, these expanding profit opportunities encourage the entry of new firms. New entry has the effect of raising the minimum productivity level necessary to remain within the market. Greater opportunities for exporting in the industry therefore lead to the closure of some firms, and the least productive, non-exporting firms within an industry are most likely to be forced to quit. This has a positive effect on aggregate productivity in the industry because of the reallocation of resources– more productive (exporting) firms expand whilst less productive (non-exporting) firms contract or exit.

Bernard, Eaton, Jensen and Kortum (2003) generate similar insights using a static Ricardian model of exporting, while Helpman, Melitz and Yeaple (2004) extend Melitz (2003) to consider the decision to set up an overseas affiliate. As in the Melitz (2003) model increased globalisation is likely to lead to firm exit, where the probability is decreasing in whether the firm is an exporter or multinational.

A number of recent papers extend the Melitz model to consider asymmetries between countries yielding additional insights about the level and the structure of trade. Melitz and Ottaviano (2003) examine differences in the extent of competition between countries

(measured by differences in size) on equilibrium outcomes following trade liberalisation. They find that because competition is 'tougher' in the large country, product choice is greater, average productivity is higher, but firm survival is lower (new entrants have a higher probability that they will fail). Trade liberalisation increases competition in both countries thereby raising aggregate productivity, but these effects are felt disproportionately in the big country (because it attracts a disproportionate number of firms). The effect of competition from trade in Sweden may therefore, be weaker than that found in previous studies for the US.

In Falvey, Greenaway and Yu (2003) countries differ in the efficiency with which they use frontier technology. One interesting finding is that the degree of self-selection is stronger for industries in which the degree of substitution across products is higher. Therefore the probability of firm closure may be negatively correlated with the level of intra-industry trade in the industry. They also find that the higher the average efficiency of the country the more likely firms are to survive in the export market, but the less likely they are to survive in the more efficient country, which leads us to expect that the structure of trade is important. The pattern of trade is determined by the physical size of countries and size of the efficiency gap. For a given efficiency difference, as the size of the country falls, domestic production of the differentiated product falls. By contrast, for a given size difference, as the efficiency gap rises the greater is the domestic production of the differentiated product. The effect of trade liberalisation is to raise the minimum productivity needed to survive - it raises the self-selection cut-off point. This effect is strongest in the more efficient country.

The approach of Bernard, Redding and Schott (2004) is to combine the heterogeneous firm model of Meltiz, with Helpman and Krugman (1985) new trade theory assumptions of imperfect competition and scale economies, and Heckscher-Ohlin differences in factor endowments. The model therefore is able to generate predications about the reallocation of resources across industries by firms.

Finally, Bernard, Redding and Schott (2003) develop a theoretical model to explain a second form of exit considered in this paper, that of industry switching. Productivity levels are again shown to be important, albeit in the context of a closed-economy. Here product switching depends on the fixed costs associated with the production of different products

and heterogeneity in firm productivity. The more productive firms endogenously choose to produce products with higher sunk costs. Although that paper does not identify a role for international competition on firm choices, an effect from increased openness to trade is possible to envisage. Firms alter their output mix towards industries in which they have a comparative advantage and therefore avoid competition from countries in industries where they do not, perhaps because foreign countries are labour abundant. For OECD countries this is more likely towards the use of technologies with higher costs, where this decision is dependent on the productivity of the firm.

III Identifying Exit Strategies

Our underlying data source is based on Statistics Sweden and includes information for all firms in the Swedish manufacturing sector with at least 20 employees. To reduce the data collection burden on small firms (those with less than 50 employees) only large firms are required to provide complete information on the activities. For this reason we restrict our sample to firms with more than 50 employees, which amounts to 3,570 firms over the period 1980-1996, a total of 34,988 firm-year observations.

Industry exit takes three forms, which all lead to a transformation of the industry due to a realisation of resources, management control, and market-share.[4] In our data set a unique identifying code is given to each firm and a separate code to each of the plants that the firm operates. We define industry exit by closedown when both the firm identifier and *all* plant identifiers connected to that firm disappear. If the firm identifier disappears but one or more plant identifiers continue under a different firm then this is defined as an exit by merger or acquisition (M&A exit henceforth). Finally, firms may exit a particular industry by switching to another industry, which happens when the largest share of employees is found under a new 2-digit industry code. We focus on the decision to switch 2-digit industries to maximise the size of the jump made by firms. This has several advantages: first, it makes it more likely that switching is not due to a coding error in the data collection process. Second, we presume that the investment to switch 2-digit industries is greater than that necessary to switch 4-digit codes. (We consider the robustness of the results to industry switches at a more disaggregated level below).

[4] It is not clear the extent to which the existing literature conflates the three forms of exit considered here.

Around 8 per cent of our observations are of some kind of industry exit. Table 1 provides details on the patterns of exit by year, expressed as a percentage of the total number of observations each year, as well the characteristics of firms that make each of these forms of exit expressed relative to firms that do not exit. As can be seen there is a noticeable change in exit through industry switching over time and this peaks in the years 1988 and 1989, where they account for 5.4 and 13.8 per cent of total observations in those years respectively. The large number of switches in 1988 is explained by a revision of industry codes at the firm level - 13 per cent of all plants change industry codes between 1988 and 1989 while this share is as low as 1-2 per cent all other years. The increase in switching in 1989 reflects a break in the Swedish industry classification system used by Sweden Statistics from SNI69 to SNI92. Although we focus on industry switches at the 2-digit level, which should minimise these classification changes contaminating the sample, we choose instead to exclude 1988 and 1989 from the analysis.

Overall firm exit is relatively common; exit by one of the forms considered makes up 7 per cent of all observations in our reduced sample. As can be seen the least common form of exit is closure, at around 1.3 per cent of observations. There are over 30 per cent more firms that switch industries than close down, these make up 1.7 per cent of observations in our reduced sample, while there are about 3 times as many exits by merger and acquisition as closedown. In general there are few observable trends in the three forms of exit: there appear to be more exits through switching at the end of the period than the start; and as expected some cyclical patterns to exit through closure.

In the bottom half of Table 1 we compare mean firm level characteristics of firms that exit with those that continue within the industry in an unchanged form. A number of these differences are statistically significant. Table 1 would appear to confirm that firms that shut-down are about 9 per cent less productive than firms that do not, although this difference is not statistically significant. Firms that cease production are much less capital intensive (12 per cent), smaller (13 per cent), and less likely to export or conduct R&D.

Firms that exit by switching display some variation in their characteristics relative to continuing firms. On average firms that switch tend to be about 18 per cent less productive than continuing firms, but are more capital intensive, of a similar size and more likely to export or conduct R&D. We also investigate where these firms switch to by comparing the characteristics of the industry they leave and the destination industry. As in the US (Dunne, Roberts and Samuelson, 1991; Bernard, Jensen and Schott, 2002) we find that firms tend to switch towards more capital intensive (both physical and human), and more productive, in terms of labour productivity, industries. This indicates that this type of exit has real impact on the economy.

Around 90 per cent of all mergers and acquisitions are by firms from the same 2-digit industry. Much of the transfer of ownership is between domestically owned firms. Around 87 per cent of all acquired firms and 88 per cent of all acquiring firms are domestically owned. We find however, that foreign owners became more active in terms of merger and acquisition during the second half of the sample period. Around 18 per cent of acquiring firms are foreign owned in the 1990s, compared to 9 per cent in the 1980s. Of the characteristics of the acquired firms the bottom half of Table 1 suggests that on average they are the more productive domestically orientated firms within the industry. Acquired firms are 29 per cent more productive than continuing firms but less likely to export or conduct R&D.

The discussion in Section II highlights that resource allocation within and between industries through exit, industry switches or mergers and acquisitions occurs in part because of firm level characteristics, such as productivity levels, and in part because of industry characteristics, which might include international competition. We include measures of each. While the theoretical models emphasise the role played by differences in firm productivity in exit we consider heterogeneity across a number of dimensions. These are listed in Table 2 below along with their basic sample characteristics. These firm level variables include measures to capture differences in market diversification, ownership, size and age between firms. Size is measured by the (log) of employment; age as the (log) number of years in the sample; the capital labour ratio as the estimated (log) capital stock per employee; TFP is estimated using the methodology suggested by Olley and Pakes (1996) and Levinsohn and Petrin (2003) to control for any bias to the coefficient on capital; and whether the firm is an intermediate producer by the ratio of value added in total sales.

To capture the cumulative pressures facing firms we include measures of demand shocks (the ratio of stocks to total sales) and reductions in firm size (the change in employment). Finally we include dummy variable to measure whether the firm participates in export markets, is foreign owned or is a multiplant firm.

We also include a range of industry variables. To control for the fact that industry and exit rates are correlated with the sunk costs of entry and exit (Dunne, Roberts and Samuelson, 1988) we include a measure of sunk-costs due to Bernard and Jensen (2002). This is the minimum of industry entry and exit rates at the 4 digit level. Trade variables are more likely to determine net entry and exit rates, which is likely to depend also on the nature of competition. For example resource allocation due to international trade may stem from a higher volume of trade (higher import penetration or larger export market), but also from the type of trade (intra or inter-industry trade) as well as its origins. No study to our knowledge examines the effects of international trade on these decisions simultaneously. We measure the volume of trade using a measure of import penetration and the type of trade using the Grubel-Lloyd index. In addition we further sub-divide these measures according to whether trade is with other OECD countries or not. Finally we also include a dummy variable measure of whether the industry is one in which Sweden has a comparative advantage, measured by the ratio of the volume of exports to imports.

IV Modelling Determinants of Exit Strategies

Table 3 reports the main results from a multinomial logit regression based on the decision matrix facing each firm: continue its business as before, switch industry, merge or closedown. All of the reported coefficients are expressed relative to the firm making no change in its operating status. That is, the empirical model has the following form:

$$\text{Prob}(Y_{it} = j) = e^{\beta_j' x_{it}} \Big/ 1 + \sum_{k=1}^{3} e^{\beta_k' x_{it}},$$

where j equals 1 if firm i switch industry, 2 if it merge and 3 if it close. The vector x_{it} consist of a number of firm and industry level characteristics as well as time and industry dummies (see Table 2 for definitions and descriptive statistics).

Many of the results reported in Table 3 are consistent with the evidence presented using simple t-tests for differences in means in Table 1. Firms that exit by ceasing production have low TFP, are smaller and younger, though the latter not significantly so, compared to those that stay, and they are less likely to export. They are also more likely to be foreign owned and operate in industries with low sunk costs. A number of these results match those already reported in the literature, see for example Olley and Pakes (1996) and Dunne, Roberts and Samuleslon (1989) for the age of firms; Dunne, Roberts and Samuleslon (1989) for size and multiplant firms; Bernard, Redding and Schott (2002) for the export status.

Firms that exit by switching industries tend to be domestically owned and have a number of plants. Finally, acquired firms are more productive and non-exporting domestically owned firms. The higher productivity level of acquired firms is consistent with the operating efficiency theory for acquisitions, i.e. “cherry-picking” , see for example McGuckin and Nguyen (1995) and Harris and Robinson (2002).

At the industry level productivity growth is determined by productivity changes internal to the firm and through the reallocation of resources (the changing weight of firms in the aggregate index). The regressions estimated here provide information about the effect on aggregate productivity through reallocation of resources. One can infer from this set of results that the productivity effect from firm death is positive, in line with Schumpeter’s creative destruction This however is not only about births and deaths but also other forms of resourse reallocations that lead to within industry improvement. A transfer of resources through mergers and acquisitions may also lead to higher aggregate productivity since the high productivity level of the acquired firms suggests that synergy is the major motivation for merger (see McGuckin and Nguyen, 1995). The allocation of resources from one industry to another at firm level seems, however, to be neutral. Further evidence on the relationship between productivity and industry exit is revealed by the sunk-costs variable. Hopenhayn (1992) showed that barriers to entry moderate the probability of exit since incumbent firms face less competition through new entry. The results in Table 3 support this. Firms in industries with high sunk-costs are less likely to fail than other firms, and less likely to exit by switching.

To provide some interpretation of the estimated coefficients in Table 4 we calculate the marginal effects of the variables on the probability of exit by switching, M&A or closedown. The values are small in magnitude because the likelihood of exit by any form in any period is low. As can be seen the largest effect on the probability of exit is from the sunk-cost variables, an increase in sunk-costs decreases the probability of exit by closure by 0.25 and by switching by 0.16. This marginal effect is large compared to firm level variables such as TFP, size or the export dummy, where the effect on closure is 0.001, 0.007 and 0.005 respectively. We use these marginal effects, together with the mean of the independent variables and the probability of different exit strategies (see Table 4) at the mean, to calculate elasticities.

From Table 3 it would appear that international trade does not have a common impact on the three types of exit. Conditional on the underlying characteristics of the firm, exit by ceasing production is more likely relative to no change as import penetration increases. This is in line with the popular notion that greater import penetration leads to increased closure of domestic firms. It is also consistent with theoretical models such as Albequerque and Rebelo (2000) and Bernard, Eaton, Jensen and Kortum (2003), as well as the recent extensions if the heterogeneous firm model to incorporate differences across countries (Melitz and Ottaviano, 2003; Bernard, Redding and Schott, 2004). Increased competition increases the rate of selection amongst firms (Nickell, 1996).[5] Using the marginal effects calculated in Table 4 and the mean of import penetration, a one per cent change in this variable implies an increase in the probability of exit of 0.56 per cent.

Import penetration has a similar effect on firms merging or becoming acquired. Rather than cease production it appears that some firms react to increased foreign competition by becoming bigger, presumably because there are under-exploited economies of scale. The results imply, however, that the effect of import penetration on the probability of M&A exit is more moderate with an elasticity of around 0.26.

[5] Given the positive effect on aggregate productivity thorough the reallocation of resources already noted above this may provide an explanation of the strong correlation found between trade variables and productivity at the aggregate level (see for example Alcalá and Ciccone, 2004, or Baldwin and Winters, 2004, for an overview).

Firm closure and M&A activity also appears to be affected by the structure of trade in a similar manner. The negative effect of international competition on firm survival is, for example, moderated if the competition or trade is of an intra-industry form (i.e. the interaction term between intra-industry trade and import penetration is negative). This is in line with Falvey, Greenaway and Yu (2004) who allow for asymmetries across countries and find that self-selection is strongest when the degree of substitution across products is high. That is, the more homogeneous the goods being traded the higher the risk. On the other hand, the direct effect of the degree of intra-industry trade is positive, which indicates a higher probability of exit through either form. The impact of this variable is also significant with the elasticity of the probability of closure and M&A exit being 0.85 and 0.31 respectively.

The trade variables are less powerful predictors for industries in which firms exit by switching to a new industry, with the exception of comparative advantage, which shows that firms are more likely to switch from industries in which the balance of trade is negative. The probability of exit by switching is 0.004 per cent lower in these industries. One interpretation of this is that firms are more willing to incur the sunk-costs of breaking into a new industry when long-term growth prospects of the domestic market (indicated by a lack of comparative advantage relative to foreign firms) appear weak.

The coefficients in Table 3 show how changes in different variables affect the propensity of belonging to different exit groups compared to the set of firms that continue. In Table A1 we present the same regression as Table 3 but vary the omitted category, we also report the coefficients as the standardised changes in percentage of the odds ratio. So for example the propensity of belonging to the group of switchers decreases with import penetration and increases as this penetration is of an intra-industry form. The propensity to belong to the group of switching firms rather than closing down decreases by around 90 % as import penetration increases. That is, closedowns and M&A exits seem to react in much the same way to trade variables, and these are more likely in industries with a high degree of import penetration. The propensity to belong to the group of switching firms instead of continuing firms is not, however, affected by import penetration, but it is higher in industries characterised by comparative disadvantages.

Robustness: We evaluate robustness of our results to changes in specification, sample and measure of exit. Firstly, we check robustness after a redefinition of an industry switch to a change at the 4-digit level. The rate of industry switching at the 4-digit level is about 4 times that at the 2-digit level at an average of 7.1 per cent per year. As in Table 1 there is a clear upward trend in this, industry switching has become more prevalent over time (around 3-5 per cent per year in the 1980s and 10 per cent in the 1990s). Once again it is evident that there is a large increase in industry switching following the change in industry codes in 1989/1990 – switches occur in around 40 per cent of all observations for that year. For this reason we again exclude 1988 and 1989.

In Table A2 we report results on the industry variables, for brevity, from the multinomial logit regressions.[6] Import penetration now has a significant effect on the probability of switching industries, or products due to switching at a disaggregated level, and it seems that more competition lowers switching. That is, firms hold on to the products they know well as the competition increases, but this obstinacy tends to diminish when trade competition is more of an intra-industry form. Finally, switching at a more disaggregated level is less affected by sunk-costs and comparative disadvantage since these variables become insignificant. The other two exit forms are not affected by this change, except that the effect of the degree of intra-industry trade becomes insignificant for the probability of M&A exit.

To explore whether competition from trade captures the effect of domestic competition more generally we add a measure of industry concentration, the ratio of sales of the five largest firms to total sales. This is insignificant in all specifications, which may reflect the inclusion of a measure of sunk-costs already. In addition the trade variables are unaffected by the addition of the concentration index. There is something specific to overseas competition in determining firm exit in Sweden.

Of course, trade is not the only channel of globalisation that may affect firms' behaviour. Another is foreign direct investment, and we control for this by including a variable measuring the share of foreign owned firms at an industry level. This captures the degree of

[6] The coefficients of the firm-level variables are in line with the results in Table 3.

foreign multinationals within each industry, but it is insignificant for all three exit forms and does not affect the other variables.[7]

Finally, we consider whether the effect of trade on the choice of firms has altered over time by splitting the sample to pre and post 1990, and there are some differences across time. Although a division of the sample into two sub-samples means we lose information, the strong positive effects of import penetration appear to be explained by the effects of this variable in the 1990's rather than the 1980's, where although signs remain the same, on the whole the estimated coefficients are statistically insignificant (see Table A2).

Origin of Trade: In Table 5 we explore whether the origin of trade is important. In regression 2 we repeat the above analysis but allow the effect of imports to differ according to their source. That is we separate the import penetration variable into the part from other OECD countries and the part from non-OECD countries.[8] Comparing regression 1 with regression 2 we find that the origin of trade is important. Where previously import penetration was not found to be a good predictor of the likelihood a firm would switch industries, import penetration from the rest of the world is found to make this less likely.

Interestingly the effect of import penetration on firm closure does not appear to differ according to the source of foreign competition. Import penetration from non-OECD countries has a quantitatively similar impact on closedown as import penetration more generally. In contrast the positive effect of import penetration on M&A activity appears driven solely by competition from other OECD countries.

According to the results, import penetration from OECD countries does not affect the likelihood of industry switching while import penetration from non-OECD countries seems to decrease this likelihood and the effect is moderated when import penetration is more of an intra-industry form. That is, trade from low and middle-income countries does not tend to force firms to switch industry, but the probability of switching is still larger in industries characterised by comparative disadvantages.

[7] The two regressions including the concentration index and the share of foreign owned firms at industry level respectively are not reported but they are available upon request.
[8] Our OECD is composed of the 24 riches members (defined by the World Bank).

Firm and Trade Interactions: Our results demonstrate that industry exit is in part determined by firm characteristics such as productivity and size, and in part by industry variables such as exposure to foreign competition. This allows us to make certain predictions about which firms will exit. For example, exit by closure is more likely in industries where import penetration is high, and conditional on this, exit is more likely by firms with low productivity. In the rest of the paper we explore whether our trade variables bring any additional pressures to firms with certain characteristics, such as low productivity, or whether their effects are common across industries. We do so by interacting trade variables with firm level characteristics in the same way as Bernard, Jensen and Schott (2002). These interaction terms might be thought to better capture the predictions of the heterogeneous firm models.

In Table 6, regression 3-8, we report results from a multinomial logit model in which we add interaction terms between different firm characteristics and our trade variables. These include, import penetration, intra-industry trade and our measure of comparative advantage and firm level characteristics, TFP, export indicator, R&D indicator, firm size, export intensity and labour productivity.

From this we find that a number of the interaction terms are statistically significant, although this appears to have little to do with the overall volume of trade or TFP.[9] There is little evidence that the effect of import penetration on the probability of exit varies across firms with different characteristics. The only significant result, albeit at the 10 per cent level, is that firms that tend to have export activities are more likely to fail. The results for the direct effect of trade variables remain unchanged. It appears that while firms with weak underlying characteristics in high import penetration industries are more likely to fail, these pressures are not felt disproportionately by firms in high import penetration industries. This contrasts with results in Bernard and Jensen (2002).

Similarly none of the interactions of the trade variables with TFP are statistically significant; which might lead us to conclude that firms with low TFP face the same

[9] One effect of import penetration not explored in this paper is the effect on TFP through technology transfer from abroad. Coe and Helpman (1995), Coe et al. (1997) and others have suggested that countries benefit from the R&D investments of foreign firms embodied in imported capital goods. Import penetration may therefore increase the set of available inputs to the firm (Either, 1982) raising TFP and therefore the survival chances of the firm.

pressures for survival irrespective of the extent of foreign competition. This might be a strong conclusion however, given the significance of a number of firm level indicators known to be highly correlated with TFP, such as export and R&D indicators (see for example Greenaway et al., 2002; Griffith et al. 2004). This might suggest instead that a threshold model rather than a linear interaction term best captures the interaction between TFP and trade. The insignificance of TFP combined with the significance of the labour productivity interaction term suggests that capital intensity of the firm is important however.

The exit choice of firms appears instead to be influenced more by the structure of trade and its non-TFP characteristics, although this appears to be largely for exit by M&A. The results in Table 3 indicated that firm turnover is more likely in industries characterised by a high degree of intra-industry trade. In regression 5 (Table 6) we show that all forms of exit are increasing in intra-industry trade for firms that do not undertake R&D, suggesting that the structure of trade becomes increasingly important as firms move away from the technical frontier. This interaction is the only one that is significant for firm closure, while interestingly for firms that switch the interaction of IIT and size is significant while neither of the direct effects of these variables are.[10] Exit by switching is decreasing in firm size and IIT. For M&A activity the results in Table 3 appear to hold less strongly in high IIT industries, firms are less likely to be acquired when they are non-exporting or R&D and have lower export intensity and labour productivity.

Finally some of the relationships found before also appear to be stronger/weaker depending on whether the firm operates in an industry in which the balance of trade is positive or negative. Exit by M&A is more likely for R&D firms in comparative advantage industries, while similarly the effect of firm size on switching industries operates more strongly. In contrast, the effect of export intensity and labour productivity hold more strongly on switching and M&A in industries with a comparative disadvantage. Thus, it is still type of trade and firm characteristics that is the most significant interaction. The results from the interaction of import penetration with different firm characteristics do not reveal whether the effect on the decision to closedown is strongest for OECD trade or non-OECD trade.

[10] The insignificance of the interaction between size and import penetration means we can make no comment about the effect of import penetration on the size distribution of firms (see for example Tybout, de Melo and Curbo, 1991; Tybout and Westbrook, 1995; Tybout, 2000).

V Conclusions

This paper has investigated the effects of international trade on firms' choice of exit strategy as between closure, switching industry or being acquired. We have used a rich dataset of Swedish firms that extends over two decades to track the industry choice of each firm with the help of plant and firm level information. With this dataset we were able to test whether choices depend on the level, structure and origin of international competition. All three dimensions were important.

We found that as the level of international competition increased, it was more likely that firms exited by merger and closedown compared to no change at all. We did not, however, find a similar correlation regarding the probability of switching industries, but found this probability to be higher in industries characterised by comparative disadvantages. We also found results consistent with the heterogeneous firm model of export behaviour since different firm characteristics influence how firms react to trade variables.

The results suggest that the structure of international competition matters indirectly as well as directly. A greater share of intra-industry trade increases the probability of firm turnover (in the form of merger and acquisition and closedown) while it moderates the effect of import penetration. The importance of the origin of international competition turned out to be significant in the sense that we found that many of the effects of trade on the exit decision of firms was strongest when trade was from OECD countries.

Tables

Table 1: *Industry exits by year and difference in means.*

Year	Switches	Mergers/acquires % of total observations	Closedowns
1982	1.2	4.7	1.6
1983	1.7	2.5	1.3
1984	1.5	2.9	1.2
1985	0.9	4.5	0.8
1986	1.1	3.7	1.7
1987	0.4	5.3	1.4
1988	5.4	3.8	1.3
1989	13.8	4.4	2.0
1990	2.9	1.6	1.2
1991	1.9	5.4	2.2
1992	2.5	6.0	2.9
1993	1.8	3.6	0.6
1994	1.5	2.8	0.4
1995	2.6	3.5	0.7
Full sample	2.9	3.9	1.4
Sample excluding 1988/89	1.7	3.9	1.3
Percentage difference in mean [a] (compared to continuing firms)	%	%	%
Total factor productivity	-18*	29*	-9
Capital per labour	4*	-3	-12*
Size	-1	-2	-13*
Export dummy	6*	-14*	-17*
R&D dummy [b]	11*	-14*	-47*

Notes: [a] A differences of means test between a group of exiting firms (switches, M&A or closedowns) and continuing firms for the whole period. Each figure represents, expressed in percentage, how the mean of an exit group differs from the mean of continuing firms, and * indicates if the means are significantly unequal at, at least, a 10 % level. [b] Based on firm-level information after 1984 due to a large number of missing values 1980-1984.

Table 2: *Definitions and descriptive statistics* [a]

Variables	**Mean**	**Standard deviation**
Firm Level Variables		
Size (lg[# employees])	2.12	0.40
Age (lg[# years in sample])	.79	0.25
TFP (total factor productivity) [b]	-0.28	2.73
Capital per employee (lg[capital stock/#employees])	-0.04	0.49
Export dummy (one if the firm is exporting)	0.77	0.42
Multiplant dummy (one if the firm has more than one plant)	0.25	0.43
Foreign owner dummy (one if the firm is owned by a foreign company)	0.17	0.38
Demand shock (stock as a share of total sales)	0.19	0.15
Changes in labour force (lg(# employed in t)- lg(# employed in t-1))	0.001	0.07
Intermediate producer (value added as share of total sales)	0.37	0.13
Industry Level Variables		
Sunk costs (-minimum of industry entry and exit rates) [c d]	-0.004	0.008
Import penetration (import/(domestic production - export + import))	0.52	1.58
Gruble-Lloyd index ([1-(|export-import|/(export+import))]*100) [d]	70.19	25.11
Comparative advantage dummy (one if export >import) [d]	0.53	0.50

Notes: [a] All variables originates from Statistics Sweden and nominal values are deflated with industry specific producer price indices (SNI92 2-digit level). [b] As in Olley and Pakes (1996) and in Levinsohn and Petrin (2003), we control for unobservables (using investments) when calculating firm level TFP (note that around 93% of the firm-year observations have non-zero investment). [c] See Bernard and Bradford Jensen (2002). [d] Industry and trade variables are calculated at a SNI69 5-digit level before 1995, and at a SNI92 4-digit level after 1994. The reason for this is that the key used to transform SNI69 to SNI92 becomes less reliable at a disaggregated level.

Table 3: *Regression 1, excluding 1988-1989 (continuing firm as base).* [a]

Variables	**Switch**	**Merged or Acquired**	**Closedown**
Proportion of total sample	*1.7%*	*3.9%*	*1.3%*
Firm Level Variables			
Size	-.16 (*.35*)	.06 (*.63*)	**-1.00** (*.00*)
Age	.17 (*.56*)	.23 (*.28*)	-.51 (*.13*)
TFP	-.09 (*.79*)	**.24** (*.04*)	**-.07** (*.10*)
Capital per employee	.08 (*.58*)	**-.15** (*.04*)	**-.35** (*.00*)
Export dummy	-.24 (*.13*)	**-.61** (*.00*)	**-.71** (*.00*)
Multiplant dummy	**.61** (*.00*)	-.06 (*.55*)	-.25 (*.20*)
Foreign owner dummy	**-.43** (*.01*)	**-.32** (*.00*)	**.40** (*.03*)
Intermediate producer	-.08 (*.87*)	-.48 (*.16*)	**-2.52** (*.00*)
Demand shock	.34 (*.36*)	**-.95** (*.00*)	.25 (*.48*)
Changes in labour force	-.39 (*.62*)	**-2.85** (*.00*)	**-4.26** (*.00*)
Industry Level Determinants			
Sunk costs	**-12.86** (*.05*)	6.82 (*.28*)	**-31.89** (*.00*)
Import penetration (IMPEN)	-.35 (*.20*)	**.52** (*.04*)	**1.09** (*.02*)
Gruble-Lloyd index (GL)	-.001 (*.84*)	**.004** (*.06*)	**.01** (*.00*)
IMPEN_GL	.005 (*.20*)	**-.006** (*.05*)	**-.01** (*.02*)
Comparative advantage dummy	**-.36** (*.02*)	.07 (*.55*)	-.04 (*.83*)
Percent correctly predicted: 93%			
McFadden's pseudo R^2: 0.10			
Number of observations: 17,136			

Notes: [a] Variable definitions are found in Table 5. Year and 2-digit industry dummies are included in the regression. Figures between parentheses are p-values, and bold coefficients are significant at least at a 10 % level. The constant is not reported.

Table 4: *Marginal effects on probability to exit.* [a]

Variables	**Probability to switch**	**Probability to M&A exit**	**Probability to closedown**
Size	-.002 (*.36*)	.002 (*.55*)	**-.007** (*.00*)
Age	.002 (*.57*)	.007 (*.27*)	-.004 (*.13*)
TFP	-.0001 (*.78*)	**.001** (*.03*)	**-.001** (*.10*)
Capital per employee	.001 (*.55*)	**-.005** (*.05*)	**-.003** (*.00*)
Export dummy	-.002 (*.17*)	**-.019** (*.00*)	**-.005** (*.00*)

Multiplant dummy	**.007** (*.00*)	-.002 (*.52*)	-.002 (*.19*)
Foreign owner dummy	**-.005** (*.01*)	**-.010** (*.01*)	**.003** (*.03*)
Intermediate producer	-.0006 (*.93*)	-.015 (*.17*)	**-.019** (*.00*)
Demand shock	.004 (*.32*)	**-.031** (*.00*)	.002 (*.44*)
Changes in labour force	-.003 (*.74*)	**-.092** (*.00*)	**-.032** (*.06*)
Sunk costs	**-.156** (*.05*)	.238 (*.25*)	**-.247** (*.00*)
Import penetration (IMPEN)	-.004 (*.17*)	**.017** (*.04*)	**.008** (*.02*)
Gruble-Lloyd index (GL)	-.0001 (*.78*)	**.0001** (*.07*)	**.0001** (*.03*)
IMPEN_GL	.0006 (*.17*)	**-.0002** (*.06*)	**-.0001** (*.02*)
Comparative advantage dummy	**-.004** (*.02*)	.002 (*.52*)	.0003 (*.84*)

Notes: [a] Based on the results from Table 3, and they are computed at the means of each variable. We have excluded marginal effects on the probability of continue. Probabilities at the mean x-vector are: 0.012 for switching industries, 0.034 for M&A exit, and 0.0008 for closure.

Table 5: *Regression 2-, excluding 1988-89 (continuing firm as base).* [a]

	2		
IMPEN OECD		IMPEN RoW	
Switch	-.33 (.28)	Switch	**-1.14** (.03)
M&A	**.58** (.02)	M&A	.45 (.17)
Closedown	**.95** (.04)	Closedown	**.99** (.07)
GL		CA	
Switch	-.003 (.48)	Switch	**-.34** (.03)
M&A	**.005** (.03)	M&A	.05 (.60)
Closedown	**.01** (.00)	Closedown	-.04 (.81)
GL IMPEN OECD		GL IMPEN RoW	
Switch	.004 (.31)	Switch	**.02** (.04)
M&A	**-.006** (.04)	M&A	-.007 (.16)
Closedown	**-.01** (.03)	Closedown	-.01 (.22)

Notes: [a] See Table 3. All other variables are excluded from the table for brevity.

Table 6: *Regression 3-8, excluding 1988-89, (continuing firm as base).* [a]

	3	**4**	**5**	**6**	**7**	**8**
	X=TFP	X=Export	X=R&D	X=size	X=Export	X=Labour

		dum	dummy [b]		intensity [c]	productiv. [d]
X_IMPEN						
Switch	-18.9 (.52)	-49.5 (.67)	-22.8 (.72)	-.2 (.97)	-120.0 (.46)	-20.5 (.76)
M&A	6.6 (.72)	-34.7 (.65)	-74.4 (.12)	-2.2 (.43)	35.7 (.62)	-13.8 (.65)
Closedown	-12.52 (.79)	**323.8** (.06)	38.9 (.72)	-0.9 (.87)	-105.7 (.60)	83.7 (.11)
X_GL						
Switch	-.6 (.57)	-7.6 (.27)	**-4.2** (.07)	**-.39** (.10)	-.001 (.20)	-3.1 (.29)
M&A	.8 (.20)	**-5.9** (.10)	**-6.9** (.00)	-.05 (.68)	**-.011** (.00)	**-5.1** (.00)
Closedown	-.5 (.74)	-8.8 (.12)	**-10.8** (.00)	.30 (.14)	-.007 (.23)	-4.0 (.48)
X_CA						
Switch	-.07 (.30)	-.17 (.56)	-.06 (.78)	**.26** (.03)	**-.78** (.06)	**-.44** (.03)
M&A	.01 (.80)	.23 (.65)	**.36** (.03)	-.04 (.65)	-.36 (.22)	**-.33** (.01)
Closedown	-.11 (.28)	-.32 (.42)	-.31 (.34)	-.09 (.58)	-.24 (.63)	-.31 (.33)

Notes: [a] See Table 3. All other variables are excluded from the table for brevity. [b] Excluding years before 1985 due to missing values. [c] We exclude the export dummy while we include export intensity (defined by the ratio between exports and sales), and the results are similar to those in Table 2. [d] We exchange TFP for labour productivity (defined as real value-added per employee), and the direct effect of this variable is similar to that of TFP in Table 2.

Table 7: *Firm and trade interactions.* [a]

	9	**10**	**11**
	X=TFP	X=Export dummy	X=R&D dummy [b]
IMPEN OECD			
Switch	-.32 (.27)	-.22 (.51)	-.31 (.31)
M&A	**.60** (.02)	**.61** (.02)	**.61** (.02)
Closedown	**.94** (.04)	**.84** (.06)	**1.1** (.02)
IMPEN RoW			
Switch	**-.99** (.09)	-.29 (.66)	**-1.4** (.02)
M&A	.49 (.12)	.52 (.23)	.49 (.18)
Closedown	**.98** (.07)	.54 (.53)	**1.2** (.03)
GL			
Switch	-.003 (.38)	-.004 (.60)	-.002 (.64)
M&A	**.006** (.02)	**.01**(.00)	**.009** (.01)
Closedown	**.01** (.04)	**.02** (.00)	**.01** (.00)
GL IMPEN OECD			
Switch	.004 (.29)	.003 (.49)	.004 (.33)
M&A	**-.007** (.03)	**-.007** (.03)	**-.007** (.03)
Closedown	**-.01** (.00)	**-.01** (.01)	**-.01** (.02)
GL IMPEN RoW			
Switch	**.02** (.08)	**.02** (.04)	**.02** (.06)
M&A	-.007 (.17)	-.007 (.19)	-.007 (.17)
Closedown	-.01 (.22)	-.01 (.13)	-.01 (.19)
CA			
Switch	**-.34** (.03)	**-.35** (.02)	**-.34** (.03)
M&A	.06 (.60)	.06 (.61)	.06 (.55)
Closedown	-.04 (.81)	-.07 (.71)	-.02 (.93)
X IMPEN OECD			
Switch	-1.7 (.60)	-1.2 (.89)	.32 (.96)
M&A	-.08 (.97)	-2.4 (.66)	-7.11 (.17)
Closedown	-.02 (.99)	-27.9 (.12)	13.5 (.26)
X IMPEN RoW			
Switch	4.5 (.66)	-83.5 (.19)	51.4 (.32)
M&A	4.6 (.52)	-7.8 (.84)	-9.9 (.75)
Closedown	-3.8 (.86)	67.6 (.40)	-47.3 (.50)

X GL			
Switch	-.99 (.39)	-6.9 (.32)	-1.2 (.83)
M&A	.83 (.19)	**-6.1** (.09)	**-11.6** (.00)
Closedown	.15 (.92)	-8.8 (.12)	3.9 (.62)

Notes: [a] See Table 3. All other variables are excluded from the table for brevity.

Appendix

Table A1: Logit effect coefficients (standardised changes in percentage). [a]

Variables	**Industry switch vs continue**	**M&A exit vs continue**	**Closedown vs continue**	**Industry switch *vs* Closedown**	**M&A exit *vs* Closedown**
Size	-6.9 (*.29*)	2.4 (*.63*)	**-33.0** (*.00*)	**-39.0** (*.00*)	**52.9** (*.00*)
Age	8.2 (*.35*)	6.3 (*.28*)	**-12.8** (*.13*)	**24.0** (*.06*)	**21.7** (*.04*)
TFP	-2.4 (*.56*)	**6.8** (*.04*)	**-18.3** (*.10*)	19.4 (*.24*)	**30.7** (*.04*)
Capital per employee	5.7 (*.79*)	**-6.9** (*.04*)	**-16.2** (*.00*)	**26.1** (*.01*)	**11.0** (*.06*)
Export dummy	-9.2 (*.58*)	**-22.7** (*.00*)	**-26.2** (*.00*)	**23.1** (*.02*)	4.7 (*.54*)
Multiplant dummy	**29.9** (*.00*)	-2.6 (*.55*)	-10.7 (*.20*)	**45.5** (*.00*)	9.0 (*.37*)
Foreign owner dummy	**-13.9** (*.01*)	**-11.3** (*.00*)	**16.1** (*.03*)	**-25.8** (*.00*)	**-23.7** (*.00*)
Intermediate producer	-1.9 (*.87*)	-6.3 (*.16*)	**-28.2** (*.00*)	**36.6** (*.00*)	**30.6** (*.00*)
Demand shock	3.6 (*.36*)	**-13.3** (*.01*)	4.1 (*.48*)	-.5 (*.95*)	**-16.7** (*.02*)
Changes in labour force	-1.2 (*.84*)	**-19.0** (*.00*)	**27.1** (*.00*)	**35.5** (*.00*)	**11.2** (*.06*)
Sunk costs	**-8.6** (*.05*)	5.3 (*.28*)	**-29.9** (*.00*)	**21.90 (***.00*)	**38.70** (*.00*)
Import penetration (IMPEN)	-45.7 (*.20*)	**140.5** (*.04*)	**462.3** (*.02*)	**-90.4** (*.00*)	-57.2 (*.30*)
Gruble-Lloyd index (GL)	-5.9 (*.84*)	**14.5** (*.06*)	**38.0** (*.00*)	**-31.8** (*.00*)	-17.0 (*.11*)
IMPEN_GL	87.9 (*.20*)	**-56.2** (*.05*)	**-83.4** (*.02*)	**1031** (*.00*)	163.9 (*.23*)
Comparative advantage dummy	**-15.7** (*.02*)	3.3 (*.55*)	-2.4 (*.83*)	-.29 (*.24*)	.11 (*.61*)

Notes: [a] Based on the results from Table 3.

Table A2: *Regressions excluding 1988-1989 (continuing firm as base).* [a]

Variables	**Switch**	**Merged or Aquired**	**Closedown**
Proportion of total sample	*9.4%*	*3.9%*	*1.3%*
	Switching industries at a 4-digit level.		
Sunk costs	-3.83 (*.28*)	4.77 (*.45*)	**-32.97** (*.00*)
5-firm concentration measure	.41 (*.93*)	-1.38 (*.80*)	9.90 (*.17*)
Import penetration (IMPEN)	**-.48** (*.00*)	**.47** (*.07*)	**0.87** (*.05*)
Gruble-Lloyd index (GL)	-.001 (*.27*)	.003 (*.16*)	**.01** (*.00*)
IMPEN_GL	**.005** (*.00*)	**-.006** (*.09*)	**-.01** (*.04*)
Comparative advantage dummy	-.06 (*.47*)	.09 (*.43*)	-.09 (*.65*)

Results from the 1980s (2-digit switching)			
Sunk costs	-3.39 (*.79*)	**19.54** (*.05*)	**-38.84** (*.00*)
Import penetration (IMPEN)	**-.78** (*.08*)	.14 (*.67*)	0.54 (*.36*)
Gruble-Lloyd index (GL)	-003 (*.67*)	.003 (*.42*)	.003 (*.68*)
IMPEN_GL	**.01** (*.09*)	-.002 (*.67*)	-.007 (*.33*)
Comparative advantage dummy	-.33 (*.22*)	.19 (*.23*)	-.11 (*.72*)
Results from the 1990s (2-digit switching)			
Sunk costs	-14.93 (*.05*)	5.54 (*.49*)	**-33.10** (*.00*)
Import penetration (IMPEN)	-.08 (*.86*)	**.95** (*.00*)	1.08 (*.13*)
Gruble-Lloyd index (GL)	-.0002 (*.97*)	**.006** (*.06*)	**.01** (*.03*)
IMPEN_GL	.001 (*.84*)	**-.01** (*.01*)	**-.01** (*.09*)
Comparative advantage dummy	-.26 (*.17*)	-.006 (*.96*)	-.03 (*.92*)

Notes: [a] See Table 3. All other variables are excluded from the table for brevity.

References

Albequerque, and Rebelo (2000) 'On the dynamics of trade reform', *Journal of International Economics* 51:21-47.

Alcalá, F. and A. Ciccone (2004) 'Trade and Productivity', *Quarterly Journal of Economics* 119:613-646.

Baldwin, R.E. and Winters, A. (2004) 'Openness and Growth: What's the Empirical Relationship?', in Baldwin and Winters, eds., *Challenges to Globalization Analyzing the Economics*, University of Chicago Press, Chicago.

Bartelsman, E.J., and M. Doms (2000) 'Understanding Productivity: Lessons from Longitudinal Microdata', *Journal of Economic Literature*, 38:569-594.

Bhattacharjee, A. Higson, C. Holly, S. and Kattuman P. (2002). 'Macro economic instability and business exit: determinants of failures and acquisitions of large UK firms', University of Cambridge Working Paper CWPE0206.

Bernard, A.B., Eaton, J., Jensen, J.B., and Kortum, S. (2004) 'Plants and productivity in international trade', *American Economic Review* 93_1268-1290.

Bernard, A. and Jensen, J.B. (1995), Exporters, jobs and wages in US manufacturing: 1976-1987, *Brookings Papers on Economic Activity*, Microeconomics 1995, pp.67-119.

Bernard, A.B. and J.B. Jensen (2002) 'The Deaths of Manufacturing Plants', *NBER Working Paper* 9026.

Bernard A.B., and J.B. Jensen (2000). 'Who Dies? International trade, Market Structure and Industrial Restructuring', *NBER Working Paper* 8327.

Bernard, A.B., J.B. Jensen, and P. Schott. (2002). 'Survival of the Best Fit: Exposure to Low Wage Countries and the (Uneven) Growth of US Manufacturing Plants', *NBER Working Paper* 9170.

Bernard, A.B., S. Redding, and P. Schott (2003) 'Product Choice and Product Switching', *NBER Working Paper* 9789.

Bernard, A.B., S. Redding, and P. Schott (2004) 'Comparative Advantage and Heterogeneous Firms', *NBER Working Paper* 10668.

Coe, D., and Helpman, E. (1995) 'International R&D Spillovers', *European Economic Review*, 39, 859-887.

Coe, D., Helpman, E., & Hoffmaister, A. (1997) 'North-South R&D Spillovers', *Economic Journal*, 107, 134-149.

Criscuolo, C. Haskel, J. and Martin, R. (2004), 'Import competition, productivity, and restructuring in UK manufacturing', *Oxford Review of Economic Policy*, Vol. 20(3), pp. 393-408.

Curbo, V. de Melo, J. and Tybout, J. (1991) 'The effects of trade policy and scale and technical efficiency: New evidence from Chile' *Journal of International Economics*, 31, 321-250.

Dunne, T., Klimek, S., and Roberts, M.J. (forthcoming), 'Exit from regional manufacturing markets the role of entrant experience' Journal of Industrial Organisation

Dunne, T. Samuelson, L and Roberts, M.J. (1988), 'Patterns of firm entry and exit in US manufacturing industries' *Rand Journal of Economics* 19, 495-515

Dunne, T. Samuelson, L and Roberts, M.J. (1989), 'The growth and failure of US manufacturing plants', *Quarterly Journal of Economics*, 104, 671-698.

Either, W.J. (1982). 'National and international returns to scale in the modern theory of international trade', *American Economic Review*, 72, 389-405.

Falvey. R., D. Greenaway, and Z. Yu (2004) 'Intra-Industry Trade Between Asymmetric Countries with Heterogeneous Firms', *GEP Research Paper* 04/05.

Greenaway, D., Gullstrand, J., and Kneller, R. (2003), Exporting May Not Always Boost Firm Level Productivity, *GEP Research Paper 03/26*, Leverhulme Centre for Research on Globalisation and Economic Policy, University of Nottingham.

Greenaway, D. and Kneller, R. (2004), 'Exporting and productivity in the UK', *Oxford Review of Economic Policy*, Vol. 20(3), pp. 358-371.

Griffith, R. Redding S., and Simpson, H. (2004), 'Foreign ownership and productivity: new evidence from the service sector and the R&D lab', *Oxford Review of Economic Policy*, 20(3), 440-456.

Harris, R. and C. Robinson (2002) 'The effect of foreign acquisitions on total factor productivity: plant-level evidence from U.K. manufacturing, 1987-1992', *Review of Economics and Statistics* 84:562-568.

Helpman, E., and Krugman, P. (1985). *Market structure and foreign trade*, MIT Press, Cambridge, USA.

Helpman, E., Melitz, M. and Yeaple, S. (2004). Export versus FDI with heterogeneous firms. *American Economic Review* 94(1): 300-316.

Hopenhayn, H.A. (1992) 'Entry, Exit and firm Dynamics in Long Run Equilibrium', *Econometrica* 60:1127-1150.

Levinsohn, J. and A. Petrin (2003) 'Estimating production functions using inputs to control for unobservables', *Review of Economic Studies* 70:317-341.

McGuckin, R.H. and S.V. Nguyen (1995) 'On Productivity and Plant Ownership Change: New Evidence form the Longitudinal Research Database', *Rand Journals of Economics*, 26:257-276.

Melitz, M.J. (2003) 'The impact of trade on intra-industry reallocations and aggregate industry productivity', *Econometrica* 71:1695-1725.

Melitz, M. and G. Ottaviano (2003). 'Market size, trade and productivity', *mimeo*, Harvard University.

Nickell, S. (1996), 'Competition and corporate performance' *Journal of Political Economy*, 74, 132-157.

Olley, S. and A. Pakes (1996) 'The Dynamics of Productivity in the Telecommunications Equipment Industry', *Econometrica* 64:1263-1298.

Rodrik (1997) 'Globalization and growth – looking in the wrong places', *Journal of Policy Modeling* 26:513-517.

Tybout, J.R. (2000) "Manufacturing firms in developing countries: How well do they do, and why?', *Journal of Economic Literature* 38:11-44.

Tybout, J.R and Westbrook, M.D. (1995). 'Trade liberalisation and dimensions of efficiency change in Mexican manufacturing industries', *Journal of International Economics,* 39, 53-78.

Wagner, J (2002). 'The causal effects of exports on firm size and labor productivity: first evidence from a matching approach' *Economics Letters,* Vol.77, pp.287-292.