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Firm Heterogeneity, Exporting and Foreign Direct Investment: A Survey

by

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Abstract

A new literature on firm heterogeneity and firm level globalisation strategies has developed rapidly over the last decade. New insights on why some firms export and others do not, why some firms fail to survive in export markets and why some choose to produce overseas rather than export have been generated. This paper provides a survey and evaluation of this literature. It reviews both new theories of the firm in an open economy context and the extensive microeconometric evidence base which has now developed. As well as highlighting the implications of this evidence base for policy, the evaluation also includes an assessment of how the research agenda may evolve in the future.

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Keywords: Firm Heterogeneity, Exporting and Foreign Direct Investment

Outline

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2. *New Theories of the Firm and International Trade*
3. *Evidence on Productivity, Export Market Entry and Survival*
4. *Exporting and Foreign Direct Investment*
5. *Future Research Issues and Policy Dimensions*
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Non-technical summary

Interest in a range of aspects of firm level adjustment to falling trade costs has exploded in recent years. This has been stimulated by two complementary developments. First, major theoretical breakthroughs associated have resulted in new ways of thinking about firm heterogeneity and participation in international markets, both by exporting and engaging in foreign direct investment. Second a growing availability of micro level datasets which has facilitated detailed analysis of aspects of firm level adjustments to globalisation.

One dimension which has received particular attention is the relationship between firm level productivity, entry to and survival in export markets. There is now an extensive body of empirical analyses on a large number of industrialised, transitional and developing countries. This addresses not only the characteristics of firms which enter export markets, but also those characteristics likely to be associated with survival. In addition, recent analysts have turned their attention to the issue of why firms choose to export rather than engage in direct production overseas. For both, productivity is key.

At the most basic level what this literature adds to our understanding of export behaviour is clear: a combination of sunk costs of entry and heterogeneity in the underlying characteristics of firms explains why not all firms export. We have moved from the 'new trade theory' world of the representative firm to one in which firms are heterogeneous. But the literature goes beyond this, for example to the recognition of a potential complementarity between exporting and foreign direct investment (FDI), which challenges the more traditional view that multinationals are different from other firms and that exporting and FDI are substitute strategies. New models stress proximity versus concentration, but differ from the older literature in that the export or FDI choice is predetermined for the firm by its productivity. As they show empirically, adding measures of dispersion improves the predictions of these models, which provides a basis for understanding globalisation in a broader context and therefore in understanding how changes to the costs of exporting or foreign direct investment change production patterns within industries and across countries.

Within this literature, the direction of causation between productivity and internationalisation has been a key issue. It has become something of a stylised fact that *ex-ante* productivity determines the choice of whether or not to enter export markets. In other words, firms have to become more productive before they export and causality therefore runs from productivity to exports. Causality in the opposite direction is more controversial. One can think of plausible reasons why being involved in export markets might raise productivity *after* entry, for instance due to exposure to best practise technology and learning, but the empirical evidence is mixed. More generally, when studying the determinants of entry and exit from markets most researchers include measures of international trade in the industry and at the firm level, with the notion that firm death is less likely if the firm is an exporter or in an industry in which exposure to imports is low. Entry and exit then leads to aggregate productivity changes as market shares change. These are important issues from a policy perspective. Export promotion policies are pervasive the world over and are often general rather than targeted. If not all firms have the appropriate attributes to export, some may simply self select into export subsidies. So the literature is sharpening the policy debate.

We begin our appraisal of this literature with a review of new theories of the firm and international trade. In Section III we then focus on productivity, entry and survival, taking in evidence on exchange rates, agglomeration and changes in the policy environment. Section IV

moves on to exporting and FDI. In addition to evaluating these as alternative strategies we also examine links between the decision to establish production facilities overseas and exporting. In Section V we discuss the emerging research agenda and policy context

I Introduction and Motivation

Interest in a range of aspects of firm level adjustment to falling trade costs has exploded in recent years. This has been stimulated by two complementary developments. First, major theoretical breakthroughs associated with Melitz (2003), Helpman, Yeaple and Melitz (2004) and Bernard, Jensen, Eaton and Kortum (2003) among others have resulted in new ways of thinking about firm heterogeneity and participation in international markets. Second the growing availability of micro level datasets has facilitated detailed analysis of aspects of firm level adjustments to globalisation.

One dimension which has received particular attention is the relationship between firm level productivity, entry to and survival in export markets. Following Bernard and Jensen (1995) there is now an extensive body of empirical analyses on a large number of industrialised, transitional and developing countries. This addresses not only the characteristics of firms which enter export markets, but also those markers likely to be associated with survival. In addition, recent analysts have turned their attention to the issue of why firms choose to export rather than engage in direct production overseas. For both, productivity is key.

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II: New Theories of the Firm and International Trade

The standard workhorse Heckscher–Ohlin model of international trade does not have firms. Economic activity takes place in sectors, the international competitiveness of which are fashioned by relative factor endowments. 'New trade theory', building on Dixit-Stiglitz monopolistic competition does explicitly have firms. However in that framework *all* firms export, because each produces a unique variety that consumers, who have 'love of variety' preference functions, want. In this setting any trade costs just absorb a proportion of a

firm's foreign revenue but do not stop it from exporting. Although new trade theory gave us new insights into the determinants of trade, a world where *all* firms export is manifestly at odds with what we observe in the real world, where some export and others in the same industry do not. The reason why this happens in the models of Krugman (1979) and others is that firms do not face fixed costs of exporting.

The business community would take it as axiomatic that there are fixed costs of entering export markets: market research has to be done; option appraisals completed; existing products have to be modified; new distribution networks set up and so on. Clerides, Lach and Tybout (1998) were one of the first to model this explicitly in a discrete choice framework. In their model, more productive firms with lower marginal costs earn higher gross profits from producing, but not all firms export. Only those with sufficiently high profits to cover the fixed (sunk) costs of entering export markets do so. This intuitively appealing result leads to the conclusion that self-selection is fundamental to exporting. The most productive firms self-select into export markets.[1] Its corollary is that firms have to raise their productivity *before* they enter. So the implication is that there is a direct connection between productivity and exporting but, if policymakers want to exploit that, they should target support at potential rather than actual exporters.

But this may not be the end of the story. Clerides, Lach and Tybout (1998) also raise the possibility of learning by exporting. In other words, once a firm has entered export markets, productivity growth may receive a further boost. They model this as an upward shift in the (stochastic) process that determines firms' productivity and it can be rationalised in various ways. For example, actual involvement in export markets could enhance the incentives to innovate by raising the return to innovation, a possibility modelled by Holmes and Schmitz (2001). A second possibility is that export markets are more competitive than domestic markets, forcing firms to reduce X-inefficiency. Here, learning results in business process re-engineering for example. The point is that if learning by exporting occurs, firm productivity may grow *after* entry as well as before. If this were the case, it provides a plausible mechanism underpinning export-led growth, though it also complicates the calculation that faces policymakers. Ultimately it is an empirical issue which we turn to in Section III..

[1] In a muliti-country setting between firm productivity differences can generate predictions of intra-industry trade in these models that do not rely on the assumptions of new trade theory.

Everything we have said so far refers to intra-firm productivity. At the macro-level we often associate productivity growth with inter-sectoral reallocation processes, classically the shift of resources from agriculture to manufacturing. Can we say anything in the current context about inter-firm reallocation and industry productivity growth? The pioneering paper here is Melitz (2003), which is set out schematically in Figure 1. He builds a dynamic industry model with heterogeneous firms operating in (Dixit-Stiglitz) monopolistically competitive industries. Firms incur a fixed cost to export. However, each has to make a productivity draw from an exogenous distribution and this determines whether they do actually produce and export and an endogenously determined productivity threshold determines who does and does not export.[2] The interaction of two effects raises *industry* productivity. First, there is a rationalisation effect. Exporting increases expected profit, which induces entry, pushes up the productivity threshold for survival and drives out the least efficient firms in a Schumpterian wave of 'creative destruction'. Clearly this raises average industry productivity. Second, exporting allows the most productive firms to expand and causes less productive firms to contract. The productivity distribution which results is set out in Figure 2. This reallocation effect again acts to raise average industry productivity. This model, despite its microeconomic structure, allows us to understand the correlation between exports and growth observed at the macro level.

Melitz (2003) is an important model linking heterogeneous firms and industry productivity, with exporting being a key factor in the process. It is not the only model to point to the potential for exporting to raise industry productivity. This is also a key output of Bernard, Eaton, Jensen and Kortum (2003). Their industrial organisation structure is different but they still derive a rationalisation and reallocation effect. In their model, however, the former is driven by import competition and the latter from exporters penetrating more markets. Jean (2002) also identifies import driven and export driven contributors to industry productivity growth, in a two country model with differences in relative efficiencies across countries.

The core Melitz (2003) model is now being extended in various ways. Helpman, Melitz and Yeaple (2004) extend it to consider the decision to set up an overseas affiliate. As in Melitz

[2] Ederington and McCalman (2004) develop a model of firm heterogeneity with the opposite outcome. Heterogeneity is a consequence of the decision of some firms to start to export.

(2003) increased globalisation is likely to lead to firm exit, where the probability is decreasing in whether the firm is an exporter or multinational. We return to this in Section IV.

A number of recent papers extend Melitz to consider asymmetries between countries. 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 lower (new entrants have a higher probability of failure). 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).

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. 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 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, domestic production of the differentiated product rises. The effect of falling trade costs 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 heterogeneous firms with Helpman and Krugman (1985) assumptions of imperfect competition and scale economies, and Heckscher-Ohlin differences in factor endowments. The model generates predictions about the reallocation of resources across industries by firms. Finally, Bernard, Redding and Schott (2003) develop a theoretical model to explain an alternative form of exit to death, namely 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 production of different products and heterogeneity in firm productivity. More productive firms endogenously choose to produce products with higher sunk costs. Although that paper does not identify a role for international competition in 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. For OECD countries this is more likely towards the use of technologies with higher costs, where this decision is dependent on firm productivity.

As we can see from this brief review of this theoretical literature, modelling exporting activity at the firm level throws up a range of possible channels through which exporting might be causally linked to firm and industry productivity. We now turn to the econometric analysis of these issues.

III Evidence on Productivity, Export Market Entry and Survival

As is apparent from Section II, theory suggests that the performance characteristics of exporters and non-exporters are different. But do these differences result from the decision to export or do only 'good' firms become exporters? This question of causality between exports and productivity, sparked in part by the debate over the relationship between openness and growth at the aggregate level[3] has, by some margin, received most attention within the micro literature on exports. Thus, we first consider determinants of export market entry and exit as well as the evidence that export market participation feeds back into firm performance. To provide some structure we begin with evidence relating to participation in export markets more generally.

According to Melitz (2003) and others, export participation decisions are determined completely by a combination of sunk-costs and firm productivity. Although in empirical counterparts to this, the set of firm characteristics has been extended to include other factors such as size, age, human capital, capital-intensity, ownership and so on, these predictions

[3] See for example Rodriguez and Rodrik (2000) and Greenaway, Morgan and Wright (2002) and see Lopes (2005) for an evaluation of micro and macro evidence.

are supported by the empirical evidence. While there are differences in the exact methodology employed (the choice over logit or probit models and attempts to correct for bias from the inclusion of the lagged export status of the firm) results are for the most part robust. Some if not all firm level variables are strongly correlated with export market entry. It follows that episodes of entry to and exit from export markets should be predicted by periods of change in these characteristics (and we discuss these in the sub-section on consequences of entry).

Of the explanatory variables, that relating to persistence (as measured by lagged export status) almost always explains most of the variation in the data. It's coefficient is usually interpreted as evidence of sunk-costs of export market entry. While the exact magnitude varies across studies, past participation in export markets increases the probability that a firm will continue to export by between 36 per cent in the US (Bernard and Jensen, 2004) and 90 per cent in Italy (Bugamelli and Infante, 2002). Entry is therefore likely to be determined by changes in sunk-costs. But what are these changes that produce waves of entry and exit? The three contributors most often discussed are exchange rates, policy innovation and agglomeration effects.

Exchange rates: Macroeconomic evidence on the effect on trade of exchange rate levels and volatility points to effects that are either significant but small in magnitude, or insignificant (Pozo, 1992; Chowdhury, 1993; and Parley and Wei, 1993).[4] This suggests that exchange rate movements play little or no role as a sunk-cost. The micro evidence suggests however that these results are a product of aggregation and that exchange rates *are* important. In the presence of sunk-costs the export responsiveness of exchange rate changes is likely to be higher amongst current exporters compared to non-exporters. That is, changes in exchange rates are more likely to lead to changes in the intensive rather than extensive margin. Bernard and Jensen (2004b) for example, study the export response of US manufacturing plants to dollar depreciation in the 1980's. They report that 87 per cent of the expansion of exports was from expansion of export intensity amongst current exporters and only 13 per cent from entry of new firms. A similarly strong correlation with exchange rates is reported by Bugammelli and Infante (2002) and Bernard and Jensen (2004a).

Whilst useful for future comparative work, this approach does not provide a complete explanation of the micro response to exchange rate movements for three reasons. First, Das, Roberts and Tybout (2004) find significant cross-industry variation in the effects of exchange rate movements. Simulating the effect of a 20 per cent devaluation for three Colombian industries they report that the magnitude of the industry response depends on previous export exposure, homogeneity of expected profit flows between firms and their proximity to the export market entry threshold. Ten years after the simulated devaluation the industry level effect varies between 14 and 107 per cent (although unfortunately they do not break this into that generated by new entrants and that from existing exporters).

Second, in some cases a devaluation can also lead to substantial exit. According to Blalock and Roy (2005) the 2 to 1 devaluation of the Indonesian rupiah against the US dollar between 1996 and 1998 did not lead to an export boom at the aggregate level. Deeper analysis showed that although there was both an expansion of export activity by established exporters and new entry by non-exporters, this new export activity was offset by cessation of exporting by previous exporters. Bernard and Jensen (2004b) also find some evidence of exit for the US. Blalock and Roy (2005) offer an explanation for this: firms that ceased

[4] This contrasts with the large estimated currency union effects of Rose and Stanley (2005).

exporting were no more likely to report liquidity constraints, or infrastructure problems compared to firms that continued to export and they were no less productive; they were however less likely to be foreign and less likely to have made R&D or training investments. These same variables predicted which firms would become new exporters. Finally, as we also note below, all of the detailed micro level analysis of exchange rate movements has been of episodes during which the domestic currency depreciated. It is not known whether the effect of appreciation is symmetric.

Policy Innovation Export decision are undoubtedly influenced by the policy environment in which the firm operates, where policy changes are likely to impact on both the intensive and extensive margins of exporting. For example, were policy innovation to lead to a within firm improvement in productivity perhaps because of increased competition or reduced costs of intermediate imports, this might make it more likely that non-exporters will enter export markets, but also make it easier for current exporters to increase export sales to existing or new markets. Unfortunately however we have little evidence as to what aspects of policy are actually important. In fact the evidence is concentrated in just five studies across two types of policy, trade liberalisation and export promotion, the results for which are summarised in Table 1.[5]

The evidence on trade liberalisation suggests an effect on both intensive and extensive margins. Blalock and Gertler (2004) find that trade liberalisation in Indonesia between 1990 to 1996 doubled the number of exporters, while in their study of the effects of NAFTA on Canadian firms, Baldwin and Gu (2004) report increases in both the number of exporters (the share of plants that export increases from 37 to 53 per cent between 1984 to 1990) and in export intensity (48 per cent of exporters increased export intensity). Using more sophisticated econometric techniques, they find the effect of policy on the export entry decision to be very large. The 4.5 per cent reduction in Canadian-US tariffs that occurred increased the probability of exporting by 63 per cent.

Export promotion is pervasive, not as pervasive as import protection, but pervasive nonetheless, and all governments provide some kind of support. The empirical evidence is again mixed, although this may be a result of both the question asked and the level of detail

[5] The table does not include the results from Blalock and Gertler (2004) because of a lack of formal econometric evidence in the paper.

available. Both Bernard and Jensen (2004a) and Alvarez (2004) find an insignificant effect from export promotion schemes, the former for exporters versus non-exporters; the latter for permanent versus sporadic exporters. Alvarez (2004) does however find differences in detail. Trade missions and trade shows do not increase the probability that a firm will become a permanent exporter whereas market studies and arranged meetings with clients, authorities and experts do, even when controlling for other firm and industry determinants of entry. Finally, it is worth noting the evidence of self-selection when evaluating export promotion schemes, a problem thus far not dealt with in the literature. Alvarez (2004) for example finds that established exporters are much more likely to have used public instruments for export promotion than sporadic exporters.

More detailed information on the payment of grants paid to firms is available for Ireland, as discussed by Görg *et al*. (2005). Using a matching approach to control for selection problems, the authors find only limited success from this intervention; large grants can induce existing exporters to further expand overseas sales but fail to encourage additional export market entry from those that did not previously export.

Agglomeration: Compared to the scrutiny of productivity spillovers (where some 40 studies are evaluated in Görg and Greenaway (2004),) the literature on export spillovers is limited. It is also concentrated on spillovers from the presence of other multinational firms within the same industry or region. As can be seen from the summary of results in Table 2 only Aitken *et al* (1997), Clerides, Lach and Tybout (1998) Bernard and Jensen (2004a) and Greenaway and Kneller (2003) depart from this to consider spillovers from other exporters and only Greenaway and Kneller (2003), Sjoholm (2003) and Kneller and Pisu (2005) allow for spillovers from outside the region or industry, where the latter are FDI spillovers.

In line with evidence of spillovers more generally, results are somewhat mixed. Some studies identify strong positive spillover effects (Aitken *et al*, 1997; Kokko *et al*, 1997; Greenaway *et al*, 2004; Greenaway and Kneller, 2003) others have either found none and in some cases negative impacts (Bernard and Jensen, 2004; Sjoholm, 2003; Barrios *et al*, 2003; Ruane and Sutherland, 2004). Kneller and Pisu (2005) and Swenson (2005) find mixed evidence, depending on the channel considered. Beyond country specific differences there appears to be no obvious pattern to these inconsistencies. This is best seen from a

comparison of Greenaway *et al*. (2004), Barrios *et al* (2003) and Ruane and Sutherland (2005) which all focus on European countries, measure foreign presence in the same way, and use a similar methodology.

Greenaway *et al.* (2004) measure foreign presence in the UK as the sum of employment or output in the industry and in an attempt to separate competition from information effects add exports from foreign multinationals as a proportion of total exports in the industry. They find that both the likelihood of exporting and export share are increasing in the industry-level foreign presence index, even controlling for firm and industry level characteristics. They report less clear results for the index measuring the export activities of foreign firms, this being positive and weakly significant for the export decision and positive and insignificant in the decision of how much to export. Barrios et al. (2003) for Spain by contrast, find no evidence of an effect on the export decision from MNEs or the export share.

As in Greenaway *et al* (2004), Ruane and Sutherland (2005) also use a Heckman selection model to account for inter-dependence between export participation and export share decisions, but with contrasting results. They find positive effects from foreign presence of multinationals and negative effects from their export share on both the export and export share decisions, with a suggestion the latter is due to the presence of US multinationals. They attribute this to the use of Ireland as an export platform to the rest of the EU. Export spillovers they argue are unlikely where the country is an export platform because competition with domestic firms in local product markets is limited.

The use of spillovers from other exporters does not appear to improve this situation. Aitken *et al*. (1997) and Bernard and Jensen (2004a) find no effect from such measures, whereas Greenaway and Kneller (2003) do.

While positive and insignificant effects are relatively easy to explain in this context, negative effects require more justification. Ruane and Sutherland (2005) explain theirs by Ireland being an export platform, and multinationals have less contact with indigenous

firms. It is not clear however why this makes Irish firms less likely to export. Perhaps more plausible is the congestion argument advanced by Swenson (2005). A number of different forms of congestion might be envisaged. Competition with multinationals may raises prices in product markets forcing domestic firms up their average cost curves for example. Or, perhaps higher costs result from the congestion of local infrastructure. Given the increased evidence of negative impacts from agglomeration, questions over their source may offer one useful avenue of future research.

Consequences of entry: Export market entry can be expected to have a number of different impacts on the firm and aggregate economy. Some have provoked less discussion than others. For example there is widespread evidence of an aggregate productivity effect through resource reallocation (Bernard and Jensen, 2004; Hannson and Lundin, 2004; Falvey *et al.*, 2004). The area given greatest attention however, is the direction of causality between exporting and within-firm changes in productivity. We focus on that, although other important effects might relate to survival probability of exporters (Bernard and Wagner, 1997; Bernard and Jensen, 1999).

At the simplest level this literature can be seen as a test between self-selection and learning, and indeed this was explicit in the earliest studies. The umbrella label 'learning' in fact contains three separate channels. First, interaction with foreign competitors and customers provides information about process and product reducing costs and raising quality, which can be interpreted as learning by exporting. Second exporting allows firms to increase the scale of production. Finally increased competition in foreign markets forces firms to become more efficient and increases innovation. However this fails to recognise how the hypothesis under test has evolved across time, to one of a bi-causal relationship. Self-selection into export markets is important, but leads also to endogenous changes in productivity either as a result of learning by exporting or learning to export.

In the earliest literature the hypothesis under test was most clearly one of self-selection versus learning, does productivity cause exports or exports cause productivity. The arguments in favour of self-selection are most powerfully put forward by Bernard and Jensen (1999, 2004). In their study of US plants they found that productivity growth of exporters was not significantly different from that of non-exporters, independent of whether

productivity was measured as labour productivity or TFP. This implies that the productivity distribution of firms in any given industry does not widen continuously over time, or put differently the growth effects from learning are not permanent. They also provided evidence that out of the pool of non-export firms, new exporters were already amongst the best and differed significantly from the average non-exporter.

This evidence has been replicated almost without fail across numerous countries.[6] In the first part of Table 3 we summarise the evidence. Whilst there is some country specific sensitivity in the magnitude of any difference in performance, a reasonable summary would be that the results of Bernard and Jensen (1999) for the US are replicated for most other countries. Export market entry is associated with significant changes in performance around the point at which export sales begin.

The argument for self-selection in Bernard and Jensen (1999) is therefore based on a comparison between established exporters and non-exporters. They find a difference in the performance of new export firms around the point of entry, but these are not permanent. Future entrants have many of the right characteristics that make them likely to export and faster productivity growth than non-exporters when they do. After a short period they then become indistinguishable from other exporters. Bernard and Jensen (2004b) argue however, that it is not clear whether these productivity changes are endogenous to the firm or not.

The strong conclusions reached by Bernard and Jensen (1999) in favour of self-selection led quickly to an adaptation of the hypothesis being tested to one of self-selection versus a bi-causal relationship. Recognising that new exporters appeared to already have many of the right characteristics to become exporters they test whether the surge in productivity associated with entry was explained by the decision to become an exporter, or whether the productivity surge led to the export decision. As a consequence of the change in focus, the choice of methodology also changed, with an attempt to control for self-selection using either instrumental variable or matching techniques (alone or in combination with difference in differences). As argued in Van Biesebroeck (2005) not controlling for self-selection will overstate the evidence of learning found in the data. The instrumental variable approaches have usually been estimated using GMM (see for example Van

[6] The evidence for Sweden (Hansson and Lundin, 2003; Greenaway et al. 2005) and Slovenia (Damijan et al., 2004) are exceptions.

Bieserbroeck, 2005; Baldwin and Gu, 2003). Whilst they have the advantage of being relatively easy to estimate one faces the perennial question of instrument validity. By contrast, matching attempts to reduce heterogeneity between new exporters and non-exporters by using observable firm characteristics. It has the disadvantage of removing observations from the data set and requiring specific assumptions about non-observable factors such as managerial ability. We leave arguments to which of these methodologies should be preferred to Blundell and Costa Dias (2000) and focus instead on results from each.

The impact of applying these techniques has been largely to confirm that self-selection is universally more important than learning. For example, comparisons of new exporters and non-exporters without controlling for selection in Germany (Bernard and Wagner, 1997) and the UK (Girma *at al*, 2004) shows significant pre-entry differences in firm performance, whereas such differences are not evident with methods controlling for selection. Yet whereas evidence of post-entry productivity changes are found for the UK (Girma *et al,* 2004) they are not for Germany (Wagner, 2002). Indeed whilst both GMM and matching are an improvement on simply comparing new exporters with all non-export firms, they are no guarantee that post-entry productivity changes will be observed. As Table 3 shows, there are seven studies claiming evidence for learning and four that fail to find such effects, although it is perhaps worth noting that these are all confined to studies that use matching.

So what explains this divergence? Two issues have been explored, heterogeneity and timing. Some studies have argued that learning is likely to be specific to some firms, such as those that are young (Delgado *et al*. 2002; Fernandes and Isgut, 2005), or those highly exposed to export markets (Kraay, 1999; Castellani, 2002; Girma *et al*, 2004; Damijan *et al*., 2004). Others have found that post-entry changes may depend on existing industry characteristics, productivity changes are lower in industries in which existing exposure to foreign firms (through both arms length trade and FDI) is high (Greenaway and Kneller, 2004). While it is difficult to conclude against such effects, heterogeneity should not be allowed to become an easy excuse for inconsistencies across studies. To establish heterogeneity will require consistent evidence that the same mechanisms (such as age or foreign market exposure) are important across countries.

The learning by exporting hypothesis attributes part of the change in productivity to the endogenous decision to start exporting. More recently Lopez (2004) and Alvarez and Lopez (2005) have questioned the timing issue, arguing that productivity changes occur following the decision to start exporting, that is they may pre-date the point at which export sales begin.[7] Firms make investments in new technologies leading to pre-entry changes in productivity: they learn to export rather than learn by exporting. A number of studies report anecdotal evidence to support this (Lopez 2004; Alvarez and Lopez, 2005; Van Biesebroeck, 2005; and Blalock and Gertler, 2004).

While this might be seen by some as an unfair shift of the goalposts, it is consistent with a test of exogenous versus endogenous changes in productivity associated with exporting. Owing to the unobservable nature of the time at which the decision to start to export is made, and the likelihood that this preparation time varies across firms, it also becomes more difficult to unequivocally identify such effects in the data. As Lopez (2004) notes however, without information on the timing of the decision, the time path of an endogenous change in productivity is likely to look similar to that of an exogenous change and it becomes harder to conclude that observed productivity changes are orthogonal to the export entry decision.

Using an econometric approach Lopez (2004) studies not the evolution of productivity, which shows significant increases pre- but not post-entry, but that of domestic sales and investment. He finds that investment rises in the pre-entry period but domestic sales are flat, domestic firms are increasing investment and productivity before entry but not domestic sales. He argues this is consistent with investment in technology for sales to foreign but not domestic markets.

Endogenous pre-entry changes in productivity offer an interesting possibility for future research, although the current analysis raises some questions. First, a simple growth accounting approach would suggest that if investment rises and output remains flat then productivity should fall. Simultaneous increases in investment and productivity would

[7] Alvarez and Lopez (2005) label pre-entry effects as 'learning to export' compared to 'learning by exporting' for post-entry effects. The common element between these is the effect of the decision to export on the firms productivity.

therefore seem an unlikely combination, unless of course there are reductions in other inputs. Here more detailed data on investment would be beneficial.

Second, how are we to interpret evidence of post-entry changes in productivity found in some studies? The most obvious explanation is an overlap between the benefits to new technology with the point at which sales start, perhaps due to lags in the effect of new technologies due to learning. An alternative might be a difference between firms that are passive and active in their export decision. There is also the issue of whether exporting is supply or demand driven. Discussions with those involved in export promotion in the UK suggest both occur frequently. For those firms that are passive, no pre-entry investments are made and productivity changes are likely to occur with the start of export sales.

Ultimately perhaps issues surrounding the timing of the decision and investment in new plant, equipment or personnel are difficult to answer with available micro level data. They simply fail to offer sufficient detail. While case studies offer one solution, perhaps a more interesting approach is that used by Baldwin and Gu (2004) who combine micro data with questionnaires about export behaviour. They find evidence consistent with changes in scale, increased efficiency through competition and learning. Canadian exporters used more foreign technologies, were more likely to have R&D collaboration with foreign firms and improved the flow of information about foreign technologies to Canadian firms. It also led to increased innovation and investments in absorptive capacity.

Determinants and Consequences of Exit: As with export market entry, the literature on exit splits into its determinants and its consequences. A reasonable expectation would be that exit should be symmetric to entry. To some extent this is the case, but not universally so, and the strength of any conclusions drawn remains tentative.

Exit from export markets is correlated with similar firm level variables as entry. It is less likely the larger, more productive and more human capital intensive the firm, and the lower the ratio of exports to domestic sales (see for example Greenaway and Kneller, 2004 and Blalock and Roy, 2005). Industry determinants have been less well researched. For example, research that focuses on the effect of exchange rate changes considers periods of domestic currency depreciation, when exports are likely to expand (Bernard and Jensen (2004b), Das, Roberts and Tybout (2004), Blalock and Roy, 2005). Thus far no one has

considered whether the effect of appreciation is symmetric, although the evidence of substantial export market exit in the presence of a depreciation of the Indonesia rupiah by Blalock and Roy (2005) suggests it is not.

The set of industry variables is extended by Greenaway and Kneller (2003) to include the effects of import penetration and intra-industry trade, as well as industry sunk costs. Conditional on firm level variables they find that exit is more likely in industries with low sunk-costs, perhaps because re-entry is easier, and industries characterised by high levels of intra-industry trade. No role for import penetration was found which is consistent with Melitz (2003) where self-selection is driven not by an increase in imports but by the pull of export markets.

The literature on the consequences of exit is somewhat larger. As with entry, self-selection appears to be important. Export quitters tend to have lower productivity compared to firms that continue (Aw *et al.* 2000; Baldwin and Gu, 2003; Girma *et al*, 2003) and no significant difference from or in some cases lower productivity (growth) than non-exporters (Bernard and Jensen, 1999, Hansson and Lundin, 2003; Hahn, 2004). It would appear therefore, firms self-select out of export markets just as they self-select into them. One caveat to this might be made from an often overlooked feature of the data, the comparison of new exporters with entrants. The evidence presented across studies comparing entrants and quitters suggests the latter have higher productivity than the former.

As with entry the effect of exit on productivity produces mixed results. Of those not conditioning for self-selection Hansson and Lundin (2003) and Hahn (2004) find no obvious post-exit productivity changes, whereas Girma *et al*. (2003) and Blalock and Gertler (2004) find similar results conditioning on self-selection. By contrast, for the US Bernard and Jensen (1999, 2004) report post-exit changes in productivity, not controlling for self-selection. On balance then it would seem that self-selection is important, weaker firms are likely to exit, but unlike entry there is little impact on productivity of this choice.

IV: Exporting and Foreign Direct Investment

Exports versus FDI: At the simplest level, exports and FDI are substitute channels for firms wishing to globalise.[8] The conditions for foreign production become more favourable relative to exporting as the size of the foreign market increases and the costs of exporting increase; and they become less favourable as the costs of setting up a foreign production facility grow. This is the proximity - concentration trade-off as explained by Brainard (1993). The contribution of Helpman Melitz and Yeaple (2004) to this issue is analogous to Meltiz (2003) contribution to the basic model of trade with representative firms. Adding heterogeneity in firm characteristics allows this proximity - concentration choice to differ across firms within the same industry and thus determines which firms export and which become multinational. The interesting properties of the model in this regard are generated through the assumptions of different costs (largely fixed costs) associated with serving the domestic market, and foreign markets (through FDI or exports), along with heterogeneity in productivity across firms.

A we have seen sunk-costs of exporting are typically thought to include fixed costs of research into product compliance, distribution networks, advertising and so on. Goods that are exported are also subject to transportation costs. The fixed costs of FDI are the duplication of costs in establishing domestic production facilities. They are assumed to be greater than those of exporting, such that FDI eliminates the variable transport costs of exporting, but involves higher fixed costs. Heterogeneous productivity levels then ensures self-selection into markets. Only the most productive firms become multinationals; firms whose productivity falls within an intermediate range export, whereas the least productive only sell domestically.

Helpman, Melitz and Yeaple (2004) assume that the decision to establish foreign production facilities is based purely on considerations of market access. All FDI is horizontally motivated. Head and Ries (2003a) demonstrate that when there are factor price and market size differentials across countries, firms invest abroad for vertical motives also: the ordering of the productivity distribution between multinationals and non-multinationals can even be reversed. If the foreign country is small and offers some cost advantage, for a certain range of the parameter of the model, the least productive firms

[8] We concentrate here on the evidence at the level of the firm. The issue of complementarity and substitution between exports and FDI has been studied at many other levels of aggregation, a summary of the evidence for which can be found in the Head and Ries (2004).

locate abroad whereas more productive ones produce at home. In this case, low productivity enterprises have a greater incentive to pay the FDI sunk costs because they use more intensively the production factor whose overseas price is low.

Empirical tests of the heterogeneous firm model have generally followed one of two lines. First, testing within industries for substitution between exports and FDI that is related to productivity differences. Second, testing the cross-industry/country predictions – the volume of exports relative to FDI we might expect. Whilst there is a large literature comparing productivity levels of multinationals against non-multinationals and exporters against non-exporters, there are only a small number of studies that compare exporters and multinationals. In part this is because this is a relatively new question, in part because for many countries information on which domestic firms export and which are multinational is not available. As can be seen from the summary of results in Table 4 two basic approaches to this question are evident. The first follows Head and Ries (2003) in comparing mean values (in some cases conditional on other firm and industry characteristics), see for example Castellani and Zanfei (2004) and Kimura and Kioyata (2004). The second follows Girma, Kneller and Pisu (2005a) in using Kolmogrov-Smirnov tests of stochastic dominance, see Girma, Gorg and Strobl (2004), Arnold and Hussinger (2005b) and Wagner (2005). This latter approach compares the cumulative distribution of productivity for these different types of firms and not just the mean.

Despite the difference in methodology, the prediction with regard to exports versus FDI would appear to have strong support (Head and Ries, 2003 being the exception), while ironically that between exporters and non-exporters less so. Whilst explaining differences across a small number of studies is never easy, several report a bias towards large firms, and therefore a bias against finding significant productivity differences, and there is a suggestion that this is most severe in Head and Ries (2003), who use information on publicly listed firms.

The second strand of the literature concerns itself with the proximity-concentration predictions, the relative level of exports to FDI. Helpman, Melitz and Yeaple (2004) predict that FDI will be more common relative to exports, the greater the dispersion of productivity levels within an industry. The data requirements of such a test are demanding however, particularly with regard to foreign sales by domestic multinationals and measures of

dispersion within an industry. They use data for the US and regress the ratio of exports to FDI (measured by sales of overseas affiliates) on traditional proximity-concentration variables, unit costs of international trade and plant fixed costs, as well as a new variable, a measure of within industry dispersion. They consistently find that dispersion has the expected effect on relative sales: industries in which firm size is highly dispersed are associated with relatively more FDI than exports.

Exports by MNEs: Whilst in the simple single product world exports and FDI are substitutes, even if this choice is determined exogenously by productivity levels, in practice multinationals also export. Indeed it has been noted in a number of papers that foreign multinationals contribute disproportionately to exports compared to employment or output shares (Baldwin and Gu, 2003; Kneller and Pisu, 2004). To some extent this should be expected, as we have already noted, a well-established result in the literature is the superior performance of foreign firms over domestic companies with respect to employment, wages and productivity, all of which are important determinants of exports. Should the export decision of multinationals firms be modelled as identical to that of domestic firms however? What little evidence there is suggests no. Kneller and Pisu (2004) find that even controlling for firm characteristics, foreign firms are more likely to export than indigenous ones, and when they do they export more intensively.

So what explains the export decisions of multinationals? Modelling this has developed along two lines: export platform FDI and complementarity, broadly distinguished by the number of product lines the firm is assumed to produce. Export platform FDI is typically defined as the establishment of production facilities in a foreign country and the use of part or all of the output from those facilities to serve a third country. It therefore refers to the export of a single product line, where these exports are not to the parent country. Complementarity refers instead to multi-product firms and to export and FDI flows from the home country to foreign countries: exports and FDI become positively correlated if there are horizontal or vertical complementarities across product lines.

Theories of export platform FDI have developed by adding more countries and stages of production into traditional theories of FDI and in more recent developments in cross-firm heterogeneity, FDI becomes complex. Vertical FDI occurs when the stages of production are located in more than one country; and horizontal FDI when the same stage is located in

more than one country. Vertical FDI is factor seeking; horizontal FDI market seeking. When there are more than two countries and more than two stages of production, multinationals are likely to undertake more complex FDI choices which involve intra-firm trade and export platform FDI. The effect of adding more countries is to allow for the possibility of a horizontal motive for export platform FDI, whereas adding more stages allows for a vertical motive.

Motta and Norman (1996), motivated by the observation that much FDI is between countries in regional trading blocks, consider the case of three identical countries and a single stage of production. Costs of production do not differ between countries but costs of trading do (because two either enter a free trade agreement or raise external barriers against the third). If we start from an equilibrium where each firm exports to the other two countries from its home country, raising external barriers or creating a free trade area will encourage the outside firm to set up production facilities inside the free trade area and export to the other country in the bloc. Where the outside country chooses to locate production in and export from is left undetermined. Again, because of identical costs neither of the inside countries choose export platform FDI as a strategy.

The conditions under which export platform FDI is likely to take place have been analysed by Ekholm *et al* (2003). In their model there are two identical countries in the North (A and B) and one in the South, and multiple stages of production. Each firm produces intermediates and a final good. Firms must provide headquarter services from their home northern country but can choose where to produce intermediates as well as assembling the final product. Two of the countries, one northern (A) and one southern are assumed to be members of a free trade area. The drivers of the model include assumptions about the size of the (marginal) cost advantage of southern firms and costs of trading between the different sets of countries. The free trade area between A and the Southern country means it is always optimal for the northern country to locate production in the South and export products home (owing to the cost advantage from doing so). Therefore, unlike Motta and Norman (1996), when there are no vertical motives for FDI, the country inside the free trade area always has a motive to undertake export platform FDI.

For the other northern country (B) the model predicts three outcomes. First, no FDI: firm B produces at home and exports to the free trade area; second, export-platform FDI: firm B

produces the good to be sold at home domestically, whereas the final product sold in the other northern country is produced in the South and exported; third, vertical FDI (hybrid MNE): firm B locates all production in the South and exports to both markets in the North. The last is a hybrid of FDI types because, toward the home country, the firm undertakes vertical FDI whereas, toward the other Northern country, it undertakes a pure form of export platform FDI.

Which strategy is adopted depends on the size of the (marginal) cost advantage to Southern firms, and the various trade costs. As the cost advantage of Southern relative to Northern firms increases we move from the first equilibrium to the second and when the cost advantage of locating production in the South becomes large enough all production moves there. Similarly as trade costs between the Southern and two Northern countries fall then the Northern firm outside the FTA finds it competitive to move from exporting to the FTA, to export platform FDI, to locating all production in the Southern country. This has similarities to Motta and Norman (1996).

The predictions of these models are driven primarily on cross-country differences in costs. Grossman, Helpman and Szeidl (2003), developing the complex FDI model of Yeaple (2003), show that firm characteristics may also be important. If firms within the same industry are heterogeneous in their productivity levels they may make different choices, even though the costs of exporting and FDI are the same. They assume three countries (two in the North and one in the South); firms must provide headquarter services, produce intermediates and assemble the final product. Their analysis allows for the coexistence in the same sector of a rich array of profitable FDI strategies. In brief, the general lesson is that least productive firms will not undertake FDI. More productive firms choose complex strategies that involve a mix of FDI and exports. In most situations these can be classified as neither purely horizontal nor purely vertical, but as complex and involve the export of intermediates and/or final products.

Models of export platform FDI simplify the analysis to a single product firm (albeit with multiple stages of production). An alternative set of models consistent with the idea that multinationals may also export their product comes from the literature on complementarity (for example Head and Ries, 2004). Again there are horizontal and vertical elements to this. In a multi-product firm exports and FDI become positively correlated if there are horizontal

or vertical complementarities across product lines. For example, in the case of horizontal complementarities increased demand for the good supplied by foreign production may lead to increased demand for all goods produced by that firm, some of which may be supplied through arms-length trade. For vertical complementarities the establishment of a plant in a foreign country to produce or assemble final goods will displace the exports of this product, but at the same time increase exports of intermediates from the home country. Net complementarity may arise if the displaced export of the final good is more than compensated by increased exports of intermediates.

Empirical evidence on the export decision of multinational firms has concentrated largely on the direction of correlation, whether positive or negative, rather than explanation. In all cases, at the level of the firm, this relationship has been found to be positive, for example Lipsey and Weiss (1984) for the US, Swedenborg (1985) for Sweden, and Lipsey et al. (2000) and Kiyota and Urata (2005) for Japan. Attempts at understanding the explanation for any correlation are limited to Head and Ries (2003), Kiyota and Urata (2005) and Girma *et al*. (2005a). Head and Reis (2001) and Kiyota and Utata (2005) both test for the effect of the vertical FDI on exports using export demand equations for the firm. Both for Japan they find similar results. Head and Ries (2001) find complementarity between exports and FDI for the most vertically integrated firms and substitution can be found for the least integrated firms, whereas Kiyota and Utata (2005) find that intra-firm exports grow faster than total exports. That is with increased FDI some of the inter-firm exports shift to intra-firm exports.

By contrast Girma *et al* (2005b) test for the effect of export platform FDI. For the UK they find foreign multinationals tend to acquire domestic firms that export – they cherry-pick the best firms. However there are differences in the post-acquisition export trajectories of acquired firms according to whether the firm is inside or outside the EU. For firms outside the export intensity of the firm rises, whereas it falls for firms inside the EU. This would appear to be consistent with export platform motives for FDI as discussed by Motta and Norman (1996).

V: Future Research Issues and Policy Dimensions

Future Research Issues: A simple trawl through the tables associated with this review and the references appended confirms that this is a literature which has grown rapidly. It also has generated genuinely new insights, particularly with regard to the determinants of exporting. However, it is also a progressive research agenda in the sense that there is both unfinished business and new research questions being raised.

As we have seen, some aspects of the export decision of firms have received more attention than others. For example, while much is known about the characteristics of exporters and non-exporters and what happens when a firm enters export markets for the first time, relatively little empirical work has been conducted around the question of the choices that firms make between exports and FDI. To a large degree this is data driven given the demanding requirements that exports versus FDI models impose. Since little may change with respect to data availability, or at least change only slowly, this suggests that future empirical work will continue along current lines, with some spread to questions where the data requirements are not so severe. Tests of the export-FDI models are also likely to remain specific to more data rich countries such as the US, Japan and Sweden. A new strand of empirical analysis does appear to be emerging from the predictions of the heterogeneous firm models that provides some insight about the export-FDI choice of firms however. That is the dynamic consequences of changes in the costs of exports and FDI. Perhaps the earliest example of this is by Pavcnik (2002), who studies the within firm and between firm productivity effects of trade liberalisation in Chile.

Although the evidence base points unambiguously to the crucial role played by sunk costs of export market entry, relatively little research has as yet focused on what exactly these are, and how agglomeration, exchange rates and policy changes affect them. Whilst many researchers go through the motions of commenting on (for example) changes in product design, setting up distribution channels and so on as possible sources of sunk costs, that is generally as far as it goes. Sharper insights are needed if we really are to understand firm heterogeneity. This will rely on merging datasets and / or firm and industry specific survey based enquiry. A recent example of the former, which investigates the role of access to credit is Greenaway, Guaraglia and Kneller (2005).

A fourth issue, which again depends on merging datasets is the role, if any, of the origin and destination of trade / FDI. As we saw in Sections II (extensions of the Melitz model to

incorporate country asymmetries) and Section IV (North – South FDI models) origin and destination are likely to affect outcomes. Moreover, they may be key to understanding some of the empirical findings reported in Section III. For example, it may be that the potential for learning from exporting is fashioned by the markets into which one exports.

Policy Dimensions: Intervention to promote exports is widespread- every WTO *Trade Policy Review* contains a chapter on 'Measures Directly Affecting Exports' and there are always measures to report. These range from intervention to improve market intelligence (for example public support for trade missions), to sector specific fiscal intervention (for example, tax concessions or duty drawbacks), to export processing zones (ie free zones).

A universal commitment to a specific policy agenda is unusual and the commitment to export promotion has historically been driven by the presumption that exporting and output growth are positively correlated. Although theoretical models linking openness to trade and economic growth are not unequivocal, there is a large empirical literature which points to a positive correlation, even if the direction of causality is controversial. Be that as it may, the key point is that intervention is motivated by macroeconometric evidence. Does the microeconometric evidence we have reviewed reinforce or undermine the case for export promotion? Lopez (2005) asks this very question. He concludes that the microeconometric evidence reinforces the macro evidence. He argues that even if self selection is the key driver of export market entry, it may nevertheless be 'conscious self selection', especially in developing countries. What he means by this is that firms consciously improve their productivity with the international market in mind, rather than the best firms just starting to export. Policy intervention could than stimulate more conscious self selection and deliver a productivity boost. Clearly if learning by exporting occurs, productivity gains are boosted further. Moreover, if these are spillovers, perhaps because non-exporting firms learn to export from other (domestic or multinational) exporting firms, the case is strengthened.

This is a plausible argument, though it underpins a case for general rather than targeted intervention. Lopez (2005) himself stresses the importance of reducing (overseas) barriers to exports, which clearly aligns with other (static) arguments for trade liberalisation. To this should be added internal barriers to export, chief among which is *domestic* import protection, since as the incidence of protection literature shows, import tariffs constitute taxes on exporting. If sunk costs are important, one can think of intervention to improve

aspects of infrastructure as relevant - improving information flows, promoting clustering and so on.

More targeted intervention would require much more information than we have access to at present. For example, are entry costs higher for small firms? is access to credit a barrier? and so on. In the absence of much more robust evidence, targeted intervention to support exporting firms is subject to the same risks as identifying so-called infant industries and the record on that front is not a good one.

VI Conclusions

This paper has reviewed and evaluated a new literature linking individual firms, international trade and cross-border investment. Its starting point is a well known feature of the real world, firms which export and others which do not co-exist in the same industries. Until recently, this simple fact was not well explained by core trade models, not even the so-called new trade theory. This has changed with the development of heterogeneous firm models, in which some firms export and others do not. Those that export are more productive and this, together with the reallocation of output which occurs as less productive firms contract or go out of business, points to a direct link between exporting and productivity. The framework has been extended to allow for the fact that some firms choose to produce overseas rather than export, in other words it can incorporate multinationals.

The empirical literature has grown fast and as we have seen extends across a large number of industrialised transitional and developing countries. Moreover this literature points to a number of regularities: exporting firms do tend to be larger and more productive than non-exporters; sunk costs appear to be important; multinational firms tend to be more productive than domestic firms. Other evidence is less conclusive however, such as that relating to learning by exporting.

We have learned a lot in a remarkably short space of time, but as we saw in the last section, a rich research agenda has been thrown-up and this is a literature which will continue to grow.

Table 1: Summary of Evidence on Policy Intervention and Firm Export Responses

Authors	*Sample*	*Policy intervention*	*Outcome*
Alvarez (2004)	Chile, 1990-96	Trade shows Trade missions Exporter committees	No effect on export market success No effect on export market success Positive effect on export market success
Baldwin and Gu (2004)	Canada, 1984-96	Canadian-US commodity tariff rates	4.5% reduction in Canadian tariffs increased the probability of exporting by 24% and export intensity by 46% percent
Bernard and Jensen (2004a)	US, 1984-92	State expenditures on export promotion	Insignificant effect on export market participation
Görg, Henry and Strobl (2005)	Ireland, 1983-98	Capital grants, training grants, rent subsidies, employment grants, feasibility study grants, technology acquisition grants, loan guarantees, research and development grants	In a matched sample large grants lead to additional exports. No evidence of additional entry. Withdrawal of grants does not lead to exit.

Table 2: Summary of Evidence on Agglomeration and Firm Export Responses

Agglomeration

Authors	*Sample*	*Measure of agglomeration*	*Export Participation*	*Export Share*
Aitken et al (1997)	Mexico, 1986-89	Foreign MNE share of exports by state & industry State industry share of national exports	+[1] -	
Barrios, Görg and Strobl, (2003)	Spain, 1990-98	Foreign MNE share of exports by industry Foreign MNE share of R&D by industry	0 0	0 +
Bernard and Jensen (2004a)	US, 1984-92	No. of exporters in region No. of exporters in industry No. of exporters in region & industry	0 - 0	
Clreides, Lach and Tybout (1998)	Colombia, Mexico and Morocco	Exporters per industry or region	+	
Greenaway & Kneller (2003)	UK, 1989-2002	No. of exporters in industry (SIC-3) & region New exporters in industry & region	+ +	
Greenaway, Sousa and Wakelin (2004)	UK, 1992-96	Foreign MNE share of employment by industry Foreign MNE share of exports by industry	+ +	+ +
Kneller and Pisu (2005)	UK, 1988-98	Horizontal-industry-region domestic sales Horizontal-industry-region export sales Horizontal industry domestic	+ + 0	+ 0 0

		sales Horizontal industry exports Forward vertical linkages Backward vertical linkages	 0 + 0	 + 0 +
Kokko, Tansin and Zejan (1997)	Uruguay, 1990	Foreign firms created post 1973	+	
Ruane and Sutherland (2005)	Ireland, 1991-98	Foreign MNE share of employment by industry Foreign MNE share of exports by industry	+ -	+ -
Sjoholm (2003)	Indonesia, 1980-91	Foreign MNE share of output by region	0	
Swenson (2005)[2]	China, 1997-2003	No. of multinational firms in city No. of multinational firms in city and industry Exports by multinational in a city Exports by multinationals in a city and industry Relative transaction density in a city		+ + + - +

Notes:

1. + the effect is positive and significant, - the effect is negative and significant, 0 the effect is insignificant and/or changes sign and/or significance through the paper.
2. These regressions relate to the 2-stage Probit regressions reported in Table5 and excluding natural resource intensive sectors.

Table 3: Summary of Evidence on Export Market Entry Effects and Firms

Authors	*Sample*	*Methodology*	*Pre-entry difference*	*Post-entry difference*
Self-Selection versus Learning				
Aw, Chung and Roberts (2000)	Korea, 1983-93 and Taiwan (China), 1981-91	New Exporters vs. non-exporters	5+% TFP Taiwan ? TFP Korea	6+% Δ TFP Taiwan ? Δ TFP Korea
Baldwin and Gu (2003)	Canada, 1974-96	New Exporters vs. non-exporters	3% ΔLP, 0% ΔTFP	6%ΔLP, 2%ΔTFP
Bernard and Jensen (1999)	US, 1984-92	New Exporters vs. non-exporters	6% TFP, 7-8% LP	3% ΔTFP, 3% ΔLP – short run 1% ΔTFP, 1-2% ΔLP – medium run 1% ΔTFP, 1-2% ΔLP – long run
Bernard and Jensen, (2004b)	US, 1983-92	New Exporters vs. non-exporters	3% TFP	6% TFP, 2% ΔTFP
Bernard and Wagner (1998)	Germany, 1978-92	New Exporters vs. non-exporters	5% LP, 0% ΔLP	5% ΔLP
Castellani (2002)	Italy, 1989-94	Exporters vs. non-exporters	+ TFP, 0 ΔTFP	
Damijan, Polanec and Prašnikar (2004)	Slovenia, 1994-2002	Exporters vs. non-exporters	0% TFP	0% TFP t_0 0% TFP when export to non-OECD countries t_1 11+% TFP when export to OECD countries t_1
Delgado, Farinas and Ruano, (2002)	Spain, 1991-96	New Exporters vs. non-exporters Stochastic dominance	+ TFP	0 ΔTFP
Greenaway and Yu (2004)	UK chemicals industry, 1990-2000	Dynamic panel		10% increase in exports = 1% TFP, 6% LP
Hahn (2004)	Korea, 1990-98	New Exporters vs. non-exporters	4% TFP	7% TFP
Hansson and Lundin (2004)	Sweden, 1990-99	New Exporters vs. non-exporters	0% ΔTFP, 0% ΔLP	0% ΔTFP, 5% ΔLP
Isgut (2001)	Colombia, 1981-91	New Exporters vs. non-exporters	20% LP, 4%ΔLP	5%ΔLP[1]
Kraay (1999)	China, 1988-92	Dynamic panel		1s.d. increase in exports = 2% TFP, 13% LP
Liu, Tsou and Hammitt (1999)	Taiwan, 1989-93	New Exporters vs. non-exporters	0% ΔLP, 6% ΔTFP	7% ΔLP, 0% ΔTFP
Self-Selection with Endogenous Productivity Change *Post-entry effects*				
Arnold and Hussinger (2005a)	Germany, 1992-00	Matched D-i-D	+ ΔTFP non-matched sample	0% ΔTFP matched sample
Baldwin and Gu (2003)	Canada, 1974-96	GMM	3.4% LP, 0% TFP non-matched sample	5.5%LP, 1.7%TFP non-matched sample 11%LP, 1%TFP GMM results
Bigsten et al.	4 African	Dynamic system		+ ΔTechnical efficiency

(2000)	countries 1992-95			
Blalock and Gertler (2004)	Indonesian firms, 1990-96	1.Fixed effects 2. IV – OP & LP 3. timing	3. 0% ΔTFP	1. 5% TFP 2. 2-5% TFP 3. 4% ΔTFP
Cleides, Lach and Tybout (1998)	Colombia 1981-91, Mexico, 1986-90 and Morocco 1984-91	GMM	Colombia + LP Mexico 0 LP Morocco + LP	Colombia +LP Mexico 0 LP Morocco + LP
De Loecker (2004)	Slovenia, 1994-2000	Matched D-i-D		22%TFP t_0
Girma, Greenaway and Kneller (2004)	UK, 1988-98	Matched D-i-D	0% ΔTFP, 0% ΔLP in matched sample 1% ΔTFP, 0% ΔLP in unmatched sample	ΔTFP:2% ΔLP:2% in matched sample ΔTFP:2% ΔLP:1% in unmatched sample
Greenaway & Kneller (2003)	UK, 1989-2002	Matched D-i-D	0% ΔTFP, 0% ΔLP in matched sample	ΔTFP:3% ΔLP:5.5% Effect stronger when interacted with export share
Greenaway, Gullstrand and Kneller (2005)	Sweden, 1980-97	Matched D-i-D	0% ΔLP 0% ΔTFP	0% ΔLP 0% ΔTFP
Van Biesebroeck (2005)	9 African countries, 1992-96	GMM		35%TFP
Wagner (2002)	Germany, 1978-89	matching	0% LP	0% ΔLP
Self-Selection with Endogenous Productivity Change *Pre-entry effects*				
Alvarez and Lopez (2005)	Chile, 1990-96	Matched D-i-D	+ ΔINV, + ΔSKILL + TFP, + LP non-matched results	0% ΔTFP, ?%ΔLP matched sample
Lopez (2004)	Chile, 1990-96	New Exporters vs. non-exporters	+ ΔINV, 0% ΔDOMSALE + ΔTFP	

Notes:

1. Where possible the results refer to a comparison of new exporters versus non-exporters.
2. TFP = total factor productivity, LP = labour productivity, Δ = growth
3. + the difference relative to the control group is positive and significant, - the difference relative to the control group is negative and significant, 0 the difference relative to the control group is insignificant, ? the difference relative to the control group changes sign and/or significance through the paper.
4. These results refer to firms that survive in export markets, as reported in Table 10 and for value added per worker.
5. Castellani (2002) compares exporters versus non-exporters

Table 4: Summary of Evidence on Relative Productivity of Exporters and Multinationals

Authors	*Sample*	*Methodology*	*Exporters vs. non-exporters*	*MNEs vs. exporters*
Arnold and Hussinger (2005b)	Germany, 1996-2002	K-S tests of stochastic dominance	+	+
Castellani and Zanfei (2004)	Italy, 1994-96	OLS	0	+
Girma, Gorg and Strobl (2004)	Ireland, 2000	K-S tests of stochastic dominance	0	+
Girma, Kneller and Pisu (2005a)	UK, 1990-95	K-S tests of stochastic dominance	+	+
Head and Ries (2003)[2]	Japan, 1989	OLS	0	0
Kimura and Kiyota (2004)	Japan, 1994-2000	OLS	+	+
Wagner (2005)	Germany , 1995	K-S tests of stochastic dominance	+	+

Notes:

1. + the effect is positive and significant, - the effect is negative and significant, 0 the effect is insignificant and/or changes sign and/or significance through the paper.
2. Head and Ries do find predictions in support of the model for size characteristics.

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