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Exporter Dynamics and Productivity

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Editor

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Foreword

This edition of *Trade Policy Research* takes up the general theme of exporter dynamics and productivity. To explore these issues, the Department of Foreign Affairs and International Trade (DFAIT) organized a conference on Exporter Dynamics and Productivity on March 27, 2009. This volume builds on the discussions at that conference.

Consistent with the recent focus in the international economics literature on firm-level or product-level analysis, many of the papers in this volume explore the microeconomic underpinnings of the linkage between international engagement—through trade or foreign direct investment—and productivity growth. They highlight the importance of international engagement to Canada's prosperity but also the obstacles that firms must surmount in order to successfully enter and sustain their presence in foreign markets, as well as the contribution that public sector program support can make in helping firms find their footing in foreign markets—including the first-ever econometric assessment of the impact on firm-level export performance of the export promotion services provided by DFAIT's Trade Commissioner Service.

This volume continues the practice of sharing with the wider research community and the interested public the results of trade-and investment-related policy research undertaken within, on behalf of, or in collaboration with Foreign Affairs and International Trade Canada. Launched in 2001 as part of the response to the Government of Canada's *Policy Research Initiative*, a government-wide effort to re-create and expand its research capacity, the *Trade Policy Research* series is now in its ninth edition.

Previous volumes have followed developments in trade and investment policy, addressed topical issues in international economics such as services trade liberalization and global value chains, and showcased research and analysis conducted within the Government of Canada on various aspects of trade policy

and economic globalization more generally, including a special edition on NAFTA @ 10 in 2005.

Through this volume, Foreign Affairs and International Trade Canada seeks to continue to contribute actively to the development and dissemination of knowledge concerning the role of international trade and investment in Canada's economy and in the global economy more generally, while at the same time stimulating the development of the Department's research capacity, and further developing links with professional and academic researchers in the field of international commerce.

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June, 2010

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Exporter Dynamics and Productivity: Editor's Overview

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The linkage between economic growth and openness to international trade and investment has long been subject to controversy.

Traditional trade theory promises efficiency gains to nations that partake in the international division of labour but not necessarily a higher rate of growth. The advent of endogenous growth theory provided theoretical models that do promise higher growth for more open economies (Romer, 1990). In these models, trade stimulates growth-enhancing technological change by increasing returns to innovation and/or by facilitating the absorption of technology developed abroad (e.g., through knowledge spillovers)[1], a particularly important consideration for smaller economies.

A number of studies sought to demonstrate the empirical validity of the connection between openness and growth on the basis of cross-country comparisons, including Sachs and Warner (1995), Edwards (1998), Frankel and Romer (1999), Dollar and Kraay (2002), and Wacziarg and Welch (2003). While influential, the claims made in these papers to have established a general link between greater openness and higher rates of growth were disputed on methodological grounds (Rodriguez and Rodrik, 2001; Easterly, 2005; and Rodriguez, 2007).

A more recent effort by Estevadeordal and Taylor (2008) to settle the controversy by explicitly addressing the various critiques reached the narrower conclusion that liberalizing

[1] Paul Romer's 1990 "Endogenous Technological Change" paper explicitly linked international integration to higher growth. Rivera-Batiz and Romer (1991) emphasized knowledge spillovers internationally through economic integration as a driving force.

tariffs on imported capital and intermediate goods did lead to faster GDP growth. However, policymakers in most countries did not wait for research to confirm this particular insight; pressure from business had long since led governments to lower tariffs on capital goods and industrial inputs. In Canada, Budget 2010 went the final step and simply eliminated them all.

However, that may not be all there is to this issue. In recent years, understanding of the role of trade and investment in economic growth has been significantly improved by new theoretical and empirical analysis based on explicit recognition of the heterogeneous nature of firms.

The theoretical framework for this body of research is provided by "new new trade theory" (Melitz, 2003). In this literature, firms of widely varying size and level of productivity co-exist in the same industry. Products of varying quality co-exist in the same markets. Firms face sunk costs of introducing their products into foreign markets in terms of obtaining market intelligence, identifying foreign partners, dealing with foreign regulatory requirements, setting up distribution and after-sales service networks and so forth. Entrants also face uncertainty about success in foreign markets. They have less knowledge than established firms about these markets and the local partners or agents they must engage (information asymmetries). International macroeconomic conditions, including business cycles and real exchange rates feature both volatility and protracted disequilibrium conditions that can affect a firm's profitability in foreign markets. Accordingly, not all firms engage in trade and foreign investment and, of those that do, many enter fewer markets than they might optimally serve. Indeed only relatively highly productive firms can absorb the costs of entering export markets and only the most productive of these can absorb the still higher costs of investing abroad while remaining profitable in those markets. As well, the flux of entry into and exit out of various foreign markets—or change at the "extensive margin"—is high. This constitutes an important factor in determining a country's overall trade growth, alongside changes in sales by existing exporters of established

products in established markets (which represents change at the "intensive margin").

At the same time, the increased availability of large, firm-level datasets has allowed researchers to shed light on the firm-level dynamics that are reflected in aggregate national trade and investment performance measures, on the quantitative significance of the channels through which trade and investment influence the productive capacity of a national economy, and on the effectiveness of public policies that affect firms' export engagement.

To explore these research developments, the Department of Foreign Affairs and International Trade organized a conference on Exporter Dynamics and Productivity, 27 March 2009. The present edition of *Trade Policy Research* is comprised of research presented at the conference and developed since.

This chapter provides a thematic overview of the findings of these papers. Following the structure of the book, it addresses in turn: exporter dynamics and productivity; the effectiveness of trade promotion programs; and Canadian trade and investment dynamics.

Exporter dynamics and productivity

John Baldwin and Beiling Yan, in their paper "Export Market Dynamics and Plant-level Productivity: Impact of Tariff Reductions and Exchange Rate Cycles," examine how trade liberalization and fluctuations in real exchange rates affect export-market entry/exit and plant-level productivity.

Inspection of the firm-level data quickly reveals that firms that export and those that do not differ markedly in measurable characteristics: exporters tend to be larger, more productive, and more innovative. The perennial question in the literature has been whether this superior performance is a consequence of exporting—i.e., as a result of "learning by exporting", or of access to economies of scale enabled by serving larger markets—or is exporting a consequence of superior performance? That is, do good firms "self-select" into export markets (and conversely do weak firms self-select out)?

In line with the emerging consensus, Baldwin and Yan find that self-selection is an important determinant of export activity at the firm level—that is, more efficient plants are more likely to enter and less likely to exit export markets. However, by tracking the comparative behaviour of firms post-export market entry and exit, they also lend support to the thesis that exporting boosts productivity. In particular, using both multivariate regressions and propensity score matching and the difference-in-differences technique, they are able to show that entrants to export markets improve their productivity performance relative to the population from which they originated by about 4 percentage points while plants that stay in export markets do better than comparable plants that exited by 5.7 percentage points in the multivariate analysis and by 7.1 percentage points in the propensity-score matching analysis.

The research design of their paper also allows Baldwin and Yan to assess whether market access conditions affect the likelihood of export market entry/exit and the extent of gains from exporting. They track the experience of Canadian manufacturing plants over three separate periods that featured different combinations of tariff rate changes and real exchange rate movements. In the first period, from 1984 to 1990, improvements in export profitability generated by tariffs cuts negotiated in the Tokyo Round were more than offset by the appreciation of the Canadian dollar from US$0.77 in 1984 to US$0.86 in 1990. In the second period, from 1990 to 1996, the still greater improvements in export opportunities due to the FTA and NAFTA tariff reductions were compounded by a depreciation of the Canadian dollar to US$0.73. In the third period, from 2000-2006, border costs stopped falling with completion of the tariff reductions under the Canada-U.S. free trade treaties and the creation of new trade costs due to post-9/11 border frictions. At the same time, export profitability was sharply reduced by the steep appreciation of the Canadian dollar from US$0.67 in 2000 to US$0.88 in 2006. These three periods also featured very different degrees of buoyancy in domestic markets, with the late 1980s and 2000s providing much stronger

domestic demand conditions for Canadian manufacturers than the early 1990s.

Using these periods as natural experiments, Baldwin and Yan find that a one percentage point decline in the Canadian dollar increases the probability that a non-exporter will start exporting by around one percentage point, while a similar increase in the real exchange rate increases the probability that an active exporter will exit from export markets. A one percentage point own-tariff reduction has the same impact on export market entry as a one percentage point depreciation of the dollar.

Importantly, they also show that the overall productivity advantage of exporters over non-exporters is affected by currency developments. The superior performance of Canadian export-market entrants and continuing exporters was reinforced in the 1990-1996 period when the Canadian dollar depreciated. The advantage, however, was reduced in the 1984-1990 when the Canadian dollar appreciated and almost completely eliminated in the 2000-2006 when the dollar appreciated even more steeply.

The Baldwin-Yan results suggest that that the export market entry/exit dynamic driven by real exchange rate fluctuations is an important factor in the Canadian productivity growth puzzle. As well, these results lend support to the Baldwin and Lyons (1996) argument that large misalignments of exchange rates over extended periods entail welfare costs due to hysteresis effects in trade, with entailed industrial dislocation and scrapping of sunk assets.

Exposure to international trade impacts on a firm's productivity in a variety of ways, including by influencing the scale and scope of its production, which in turn are important considerations in its technology decisions. Alla Lileeva and Johannes Van Biesebroeck, in their paper, "The Impact of Trade and Technology Adoption on Production Flexibility in Canadian Manufacturing," examine scale and scope economies in Canadian manufacturing plants, how these are affected by technology choices and how technology choices are, in turn, influenced by trade.

Manufacturing activity is usually assumed to be subject to positive scale economies, at least over an initial range, since

spreading fixed costs over a greater number of units produced reduces per unit costs. However, it is not clear on *a priori* grounds whether manufacturing activity is also subject to economies of scope. If there are joint products or if overhead costs can be spread over multiple product lines, there might be economies of scope; on the other hand, if a firm increases its productivity by specializing in fewer product lines, diseconomies of scope would be indicated. Complicating the story, there could be economies of scope at the *firm* level, notwithstanding diseconomies of scope at the *plant* level, if as Lileeva and Van Biesebroeck note, some of a firm's expenditures such as R&D costs can be spread over multiple plants. Importantly, firms can choose more or less flexible technologies that are optimal for, respectively, more or fewer product lines.

Lileeva and Van Biesebroeck find that Canadian plants generally face economies of scale but diseconomies of scope. While the scale-scope trade-off appears to be a pervasive phenomenon, it varies with the industrial context. In some cases, scale economies and the penalty for variety are large in absolute value; Lileeva and Van Biesebroeck identify these as involving mass production technologies. In other cases, scale economies and the penalty for variety are low; these they identify as involving flexible production systems. Examining cases where firms switch technologies, their results indicate that the "old" production technologies are more flexible and the newly adopted technology involves mass production. Thus, over time mass production technology has gained in importance.

The impact of trade liberalization differs for exporters versus non-exporters. The reduction of U.S. tariffs under the Canada-United States free trade agreements is associated with a decrease in available scale economies. Lileeva and Van Briesebroeck note that this might reflect investment by Canadian plants in the new technology needed to access these potential scale economies or—more plausibly, they suggest—simply an expansion of output, exploiting and exhausting the scale economies that their existing technologies provided. The reduction of Canadian import tariffs, on the other hand, had the

reverse effect on import-competing industries. Plants in industries where Canadian tariffs declined significantly saw their available scale economies grow—which could reflect an adjustment to more flexible production technologies to reduce the productivity penalty associated with a large product portfolio, or more plausibly in view of the finding that technology-switching firms typically switch to mass production techniques, a reduced scale of operations or a reduced product palette to bring the range of products produced into a range that the reduced-scale plants could handle.

The Lileeva-Van Biesebroeck results highlight the role of trade in influencing firms' *process* technology choices and re-focus attention on the role of economies of scale in productivity performance and the role of trade in prompting a switch to technology that offers greater scale economies, a somewhat neglected topic in the trade literature in recent years.

Pierre Therrien and Petr Hanel, in their paper "Innovation and Productivity in Canadian Manufacturing Establishments", shed light on the interaction of productivity and trade with both process and product innovation.

This paper is grounded in the literature that seeks to unpack the role of technological change in growth and to understand the determinants of innovation. The research questions that initially drove this literature were posed in the first instance by growth accounting studies that assigned an important contribution to growth in advanced industrial countries to a residual in the growth accounting formula that was associated with disembodied technological change (i.e., technological change that was not embodied in the form of new, more efficient capital equipment). The productivity growth slowdown of the 1970s and 1980s in the United States and other advanced industrial countries focussed rather urgent attention on the innovation process: was the productivity growth slowdown due to a slowdown in the pace of innovation? And, if so, was this due to lagging innovation inputs, such as R&D? The key objectives of the innovation literature thus became to accurately measure the links between innovation and productivity, and between innovation inputs and innovation outputs. In the firm-based

studies within this literature, engagement in trade is just one characteristic of firms that must be controlled for in order to obtain good estimates of the above linkages. For trade analysis, of course, the role of engagement in trade is the key feature.

This body or research is concerned with self-selection issues but in this case with self-selection into innovative activities. Therrien and Hanel apply an extension of an OECD model based on an approach developed by Crépon, Duguet and Mairesse (1998). This approach involves a system of three stages with four recursive equations: the first stage models the firm's decision to engage in R&D and, given self-selection into this activity, the resources committed to this activity. The second stage estimates the impact of R&D inputs on innovation, measured as sales of innovative products, and the third stage estimates the impact of innovation on the firm's productivity. The role of trade is captured in the first stage as a factor that influences the decision to innovate and the resources to commit to this activity.

Consistent with other findings in the literature, exporters are found to be more likely to be innovators than non-exporters but, unlike earlier results with the OECD version of this model, Therrien and Hanel find that it is exporting to non-U.S. markets that is associated with a greater likelihood of Canadian firms being innovators. They suggest that this may reflect the more demanding nature of selling to these markets compared to the familiar U.S. market. Moreover, exporting is associated with greater innovation intensity—in this case, regardless of the market to which the firm exports. Therrien and Hanel do not attempt to disentangle the complex relationship between exporting and innovation; they note, however, that causation is likely to run both ways. Exporting is likely to increase innovation by exposing firms to knowledge spillovers in foreign markets, providing added incentives to innovate by extending firms' potential market size, and providing new competitive stimuli. On the other hand, successful innovation may be the foundation for firms' entry into export markets.

Other important results of this study bear on the issue of Canada's record on innovation and productivity. Therrien and

Hanel find that greater resource commitment to innovative activity is associated with larger sales of innovative products and that firms with greater sales of innovative products are more productive. They note that, while a large proportion of Canadian firms describe themselves as innovators, the resource commitment to innovation is often quite small—they observe that a large percentage of firms reporting R&D activity and claiming R&D tax credits spend less than $100,000 per year, which is below the critical mass of human and complementary resources needed for successful commercialization of innovative products. Their overall results support the drawing of a causal link from Canada's lagging R&D performance to its lagging productivity performance.

The Effectiveness of Trade Promotion Programs

Given the complex inter-relationships between exporting, productivity and innovation, the importance of minimizing the hurdles that Canadian firms face in accessing foreign markets is made clear. Apart from trade negotiations aimed at reciprocal lowering of barriers to trade, the public policy tool bearing most directly on reducing barriers to exports is export promotion.

Since their introduction in 1919 in Finland, export promotion agencies have become a common part of the trade policy tool kit—a 2005 World Bank survey received responses from 88 such agencies (Lederman et al., 2010). In theory, public sector export promotion services address market failures arising from information spillovers and asymmetries and other market imperfections. If, for example, firms cannot fully capture the benefits of investments they make in acquiring knowledge of how to export a particular product to a given market because other firms costlessly follow their example, there will under-investment in acquiring such information and a resulting market failure in the form of under-exporting (Copeland, 2008). In this context, export promotion services would be welfare enhancing. However, over and above the question of whether or not public sector export promotion services improve welfare there is the question of whether or not they are effective. Two papers on

this topic in this volume are part of a growing body of literature investigating this latter question; they shed light on the impact that accessing trade promotion services has on export sales and which types of firms benefit most from such services.

Van Biesebroeck, Yu and Chen, in their paper, "The Impact of Trade Promotion Services on Canadian Exporter Performance," examine the impact of trade promotion on export sales using a unique set of microdata created by linking three datasets: Statistics Canada's Exporter and Business Registers, which respectively provide information on export activity and firm characteristics; and the Canadian Trade Commissioner Service (TCS) client management database maintained by Foreign Affairs and International Trade Canada. TCS services, delivered through 140 offices around the world and 12 regional offices across Canada, include information on market prospects, key contacts and local companies as well as assistance with visits, face-to-face briefings and trouble shooting. The combined dataset provides, for each identified exporting firm, information on the trade promotion services it received, identified by location and time, its export sales by export destination and year, and its economic characteristics, over the period from 1999 to 2006.

These data show that only about 5 percent of Canadian exporters sought out TCS services over the period. The propensity to seek TCS assistance increased steadily with the size of the firm, rising from 3 percent of micro exporters (1 to 10 employees) to almost 17 percent of larger exporters (more than 200 employees). However, because most Canadian exporters belong to the small and medium-sized categories, small and medium-sized exporters predominate within the TCS clientele, accounting for more than 80 percent of the total client population. Further, firms exporting to non-U.S. markets relied more frequently on TCS assistance than those exporting to the United States. Firms specialized in the production of differentiated products also had a higher propensity to seek TCS assistance.

Applying the treatment effects analytical framework, the authors find that exporters that received assistance, on average,