

the art of the state

IRPP

Volume VI

Redesigning Canadian
Trade Policies for
New Global Realities



Edited by Stephen Tapp, Ari Van Assche and Robert Wolfe

About this chapter

John Baldwin is director of Statistics Canada's Economic Analysis Division, which also hosts the Canadian Centre for Data Development and Economic Research. The research program makes use of business microdata to investigate issues such as firm turnover, the nature of industrial restructuring, productivity, the impact of trade liberalization, the performance of multinationals, innovation and technological change. He has a PhD from Harvard University and taught at Queen's University for many years. He has published extensively on firm demographics, industrial organization, innovation, the use of advanced technology, productivity and trade.

Beiling Yan is a senior research economist at Statistics Canada's Economic Analysis Division. She has published extensively in the areas of productivity, international trade, firm dynamics, exchange rates, labour markets and the income distribution, in academic journals that include the *Scandinavian Journal of Economics*, *Canadian Journal of Economics* and *Journal of Economics and Management Strategy*. She has an MBA and a PhD in economics.

Redesigning Canadian Trade Policies for New Global Realities, edited by Stephen Tapp, Ari Van Assche and Robert Wolfe, will be the sixth volume of *The Art of the State*. Thirty leading academics, government researchers, practitioners and stakeholders, from Canada and abroad, analyze how changes in global commerce, technology, and economic and geopolitical power are affecting Canada and its policy.

Chapter summary

Economic theory has long predicted a close relationship between trade and productivity. But what is the Canadian evidence of this and how does the relationship work in practice? To answer these questions, productivity experts John Baldwin and Beiling Yan (of Statistics Canada) present new empirical evidence and distil firm-level research from the past decade on the links between trade and productivity in Canada.

Their results suggest a link between trade intensity and aggregate productivity in Canada, and demonstrate that trade and trade-enhancing policies have improved the productivity performance of the manufacturing sector. This applies broadly to exporting and importing as well as to international and interprovincial trade. Exporters disproportionately contribute to economic activity: from 1974 to 2010, the 35 percent of manufacturing firms that were exporters accounted for more than 72 and 79 percent, respectively, of total manufacturing employment and shipments, and their labour productivity was 13 percent higher than that of nonexporters. As well, imports are an important and underappreciated source of productivity gains. For example, between 2000 and 2007, a remarkable two-thirds of Canada's effective productivity growth can be attributed to intermediate inputs produced abroad, largely in the United States.

While the productivity benefits that come from accessing new markets are impressive, they do not happen automatically: firm-specific factors matter. Businesses that succeed abroad tend to be adaptable and innovative, introducing new products and processes. Investment is also a key part of the story. When firms enter new markets, they often accumulate capital and invest in advanced technologies, research and development, and training – all activities that develop their capacity to learn from and adopt international best practices. Larger markets also raise productivity by allowing firms to specialize in their production, exploit economies of scale and increase their capacity utilization. Put simply, stronger international competition induces firms to become more efficient.

One of the most important ways that trade liberalization policies improve productivity is through industrial restructuring, which shifts production from less productive to more productive firms. Here, Baldwin and Yan show that tariff reductions have increased Canada's productivity. However, the authors find that the productivity effects associated with exchange rate movements were larger than those attributed to tariff cuts. In the 2000 to 2006 period, as the Canadian dollar appreciated and the Canada-US border "thickened" after 9/11, the productivity benefits typically enjoyed by new exporters were significantly reduced. Conversely, productivity benefits increased when the Canadian dollar depreciated. Overall, this chapter improves our understanding of the relationship between trade and productivity and provides a rich picture of the complex dynamics of the Canadian economy and its reliance on international trade.

Résumé de chapitre

Commerce et productivité sont étroitement liés selon la théorie économique. Mais au Canada quelles données confirment ces liens et comment fonctionnent-ils concrètement ? Pour le savoir, les experts en productivité John Baldwin et Beiling Yan (de Statistique Canada) ont conjugué l'analyse de nouvelles données empiriques et de données d'entreprise des 10 dernières années.

Leurs résultats indiquent qu'il y a effectivement un lien entre l'intensité des échanges et la productivité globale du pays, et ils démontrent que le volume d'échange et les politiques promouvant le commerce ont stimulé la productivité du secteur manufacturier. Une observation qui s'applique tant aux exportations et aux importations qu'aux échanges interprovinciaux et internationaux. Ainsi, les exportateurs contribuent énormément à l'activité économique : de 1974 à 2010, les 35 p. 100 d'entreprises manufacturières exportatrices totalisaient 72 p. 100 des emplois et 79 p. 100 des livraisons du secteur, la productivité de leur main-d'œuvre dépassant de 13 p. 100 celle des entreprises non exportatrices. Mais les importations sont également une source considérable, quoique sous-estimée, de gains de productivité. C'est ainsi que de 2000 à 2007, pas moins des deux tiers de la croissance effective de la productivité canadienne peuvent être attribués aux intrants intermédiaires produits à l'étranger (en grande partie aux États-Unis).

Certes impressionnants, les gains de productivité occasionnés par l'accès à de nouveaux marchés n'ont toutefois rien de systématique, car ils dépendent aussi des caractéristiques de chaque entreprise. Souvent plus flexibles et innovantes, celles qui réussissent à l'étranger créent des produits, lancent des processus et font des investissements. En pénétrant de nouveaux marchés, beaucoup d'entre elles accumulent du capital et investissent dans les technologies de pointe, la recherche-développement et la formation, renforçant ainsi leur aptitude à tirer profit des meilleures pratiques internationales. Les grands marchés stimulent aussi leur productivité en favorisant la spécialisation de leur production, les économies d'échelle et l'utilisation de leurs capacités. Bref, la concurrence internationale les incite à améliorer leur efficacité.

Les politiques de libéralisation du commerce stimulent la productivité principalement par les restructurations industrielles qu'elles entraînent, notamment les transferts de production vers les entreprises plus productives. Baldwin et Yan montrent ici que les réductions tarifaires ont fait croître la productivité canadienne, mais aussi que leur effet sur la productivité a été moindre que celui du mouvement des taux de change. Dans la période 2000-2006, qui a vu l'appréciation du dollar canadien et le « renforcement » de la frontière canado-américaine à la suite du 11 septembre, les gains de productivité généralement réalisés par les nouveaux exportateurs ont sensiblement diminué. Inversement, ils ont augmenté avec la dépréciation de notre dollar. En résumé, ce chapitre vient donc enrichir notre compréhension des liens entre commerce et productivité tout en décortiquant la dynamique complexe de l'économie canadienne et de son rapport avec les échanges internationaux.

Trade and Productivity: Insights from Canadian Firm-Level Data

John R. Baldwin and Beiling Yan

A REMARKABLE BUT UNDERAPPRECIATED FEATURE OF THE CANADIAN ECONOMY IS THAT its aggregate productivity performance has tracked its overall trade intensity relatively closely over the past three decades. As figure 1 shows, multifactor productivity (MFP) in the business sector and the trade share of the overall economy have largely risen and fallen together since 1981, with each decade exhibiting different dynamics.¹ Over the 1980s, there was little or no overall growth either in the trade share or in productivity. In the 1990s, when the trade environment became more favourable thanks to free trade agreements and the depreciation of the Canadian dollar, Canada's MFP performance improved substantially, growing at an average of 0.7 percent per year. After 2000, as the trading environment worsened due to the "thickening" of the Canada-US border after 9/11 (Brown, forthcoming; Globerman and Storer 2008; Moens and Gabler 2012) and the significant appreciation of the Canadian dollar against its US counterpart, Canada's MFP fell at an average annual rate of 0.3 percent.

On its own, the co-movement between aggregate trade and productivity is merely suggestive, but it hints at the deeper relationship predicted by trade theory — namely, that more intensive international trade and trade-enhancing policies are generally associated with better economic performance and productivity. Trade is thought to impact productivity in several ways, with effects both *within* a particular firm and *between* different firms. For instance, recent firm-level trade theory shows that more open trade policies can raise productivity by reallocating market share between firms in an industry — moving from less productive firms to more productive ones (see Lapham, in this volume). At the same time, theory also predicts that increased access to trade and participation in international markets can improve productivity within the firm by, for example, strengthening

Figure 1

Trade and productivity, 1981-2013

Source: Authors' calculations based on Statistics Canada, CANSIM database, tables 380-0064 and 383-0021.
 Note: Trade share equals exports plus imports relative to gross domestic product (GDP), all in current dollars.
 Multifactor productivity is the ratio of real GDP to combined labour and capital inputs (base year 2002 = 100).

incentives to invest and innovate and increasing the scale of production (Krugman 1979; Lileeva and Trefler 2010).

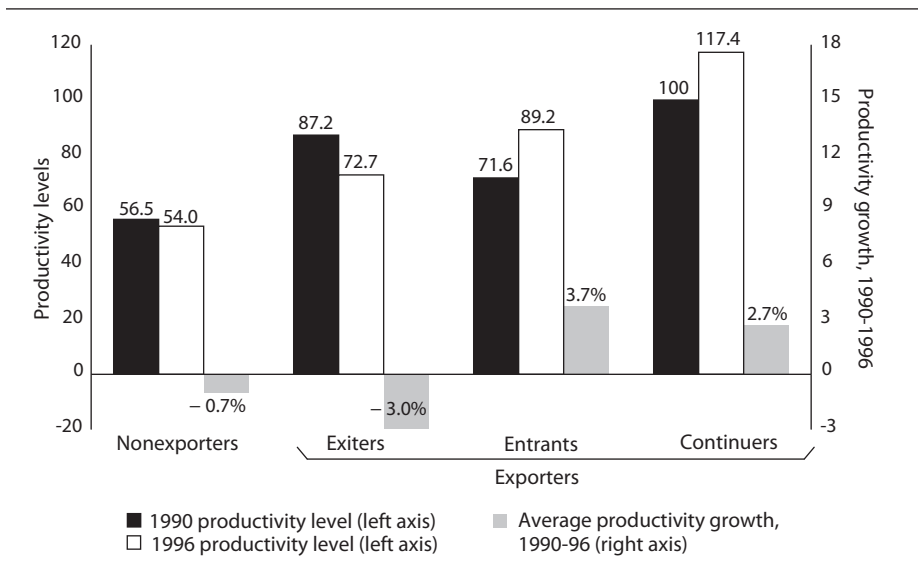
Because these complex productivity effects of trade can occur simultaneously both within and between firms, recent empirical trade research increasingly is adopting a firm-level approach to disentangle these factors and assess their relative importance.² Research using firm-level data in the Canadian context, in particular, provides a unique opportunity to study how firms in a smaller domestic market have responded to changes in the trading environment brought about by trade liberalization and significant currency fluctuations. Accordingly, this chapter is structured around two main sets of research questions. First, does trading improve productivity? How do changes in the overall trading environment affect aggregate productivity — specifically, what are the roles of tariff policies and exchange-rate fluctuations? Second, what are the mechanisms through which changes in the trade environment affect productivity? How does increased access to foreign markets change firm behaviour, and to what extent does industrial restructuring promote aggregate productivity growth? In the first section we review findings for the first set of questions; in the second section we review the

second set. The research that follows uses firm-level micro databases developed by Statistics Canada (in the Economic Analysis Division at the Canadian Centre for Data Development and Economic Research, CDER) as well as the Annual Survey of Manufacturers, the Survey of Innovation and Advanced Technologies, and the Workplace and Employee Survey. This research has generated new insights and improved our understanding of the trade and productivity nexus by providing a rich picture of the vast heterogeneity and complex dynamics of the Canadian economy.

Trade and Productivity in Canada's Manufacturing Sector³

ACCESS TO FOREIGN MARKETS HAS IMPROVED PRODUCTIVITY IN THE CANADIAN manufacturing sector. Baldwin and Gu (2003) found that Canadian manufacturing exporters were more productive than nonexporters over the

Figure 2
Labour productivity levels and growth of Canadian manufacturing firms, by export status, 1990-96



Source: Baldwin and Gu (2003, table 4).

Note: Average labour productivity is calculated as an unweighted average across plants, indexed to 100 for continuing exporters in 1990.

1990-96 period (figure 2). Moreover, new and continuing exporters had better productivity performance (both the level and the growth of productivity) than those that stopped exporting or did not export at all over the period. In addition, regression analysis that controlled for differences in firm characteristics estimated that the average annual labour productivity growth of new entrants to export markets was 4.9 percentage points higher and their MFP was 0.6 percentage points higher than those of nonentrants. This large gap between labour productivity and overall MFP growth suggests that investing is a key part of the exporting success story, and that plants that began to export accumulated more capital than did nonentrants. Baldwin and Gu also find that exporters accounted for the vast majority (three-quarters) of aggregate productivity growth in the Canadian manufacturing sector in the 1990s.

With the benefit of data over a longer period, economists now know that these basic patterns are not unique to the 1990s. In fact, it is now a well-accepted stylized fact for many countries — not only Canada — that exporters differ systematically from nonexporters in that they are generally more productive and larger.⁴ The experiences of Canadian manufacturing firms, averaged over the period from 1974 to 2010, show that the 35 percent that were exporters accounted for more than twice their share (over 70 percent) of total manufacturing employment and shipments, and their labour productivity was 13 percent higher than that of nonexporters (table 1). As well, export intensity — measured as the share of exports in the total value of shipments — generally increases with firm size. Over the 1974-2010 period, for small firms, an average of 33 percent of the total value of all shipments came from exports, compared with 37 percent for medium-sized firms and 43 percent for large firms (table 2).

But we must also look beyond exports and consider imports as an important source of Canada's productivity gains. For instance, Gu and Yan (2014) show that a significant part of Canada's effective MFP productivity growth originates from productivity gains from intermediate inputs produced abroad (table 3).⁵ Between 1995 and 2000, one-quarter of Canada's MFP growth came from productivity growth in foreign countries, the vast majority (22 percent) in the United States. And between 2000 and 2007, a remarkable two-thirds of Canada's MFP came from other countries (with half the total coming from the United States). The main reasons for this MFP growth were the relatively large share of intermediate inputs that Canada imports (23 percent, compared with only around

Table 1

Summary statistics for exporters, Canada, 1974-2010 (percent)

	Exporters' share in			Labour productivity ratio: exporters relative to nonexporters
	Number of firms	Employment	Shipments	
1974-79	24.2	60.3	67.6	102.1
1979-84	23.9	61.3	70.2	100.0
1984-90	28.7	63.7	73.9	144.4
1990-96	33.7	68.3	80.9	162.9
1996-2000	34.9	71.9	84.1	131.5
2000-05	39.0	77.3	81.7	110.2
2005-10	39.1	74.8	78.7	85.6
1974-2010	35.2	71.5	78.9	112.6

Source: Authors' calculations from Statistics Canada, Annual Survey of Manufacturers.

Note: To make the results consistent over time (to correct for changes in the sample frame and firm classification after 2000), we excluded firms with fewer than 10 employees. In calculating exporters' share of total employment, we adjusted post-2000 data to reflect population changes.

Table 2

Export intensity: Share of export value in total shipments, by firm size, Canada, 1974-2010 (percent)

	Firm size (number of employees)			
	All	Small (≥10 but <100)	Medium (100-250)	Large (>250)
1974-79	27.8	23.6	24.7	28.5
1979-84	31.7	28.3	27.1	32.6
1984-90	36.2	29.1	26.5	38.6
1990-96	42.0	29.6	33.1	45.3
1996-2000	46.1	32.4	38.3	49.3
2000-05	45.2	35.9	41.4	47.7
2005-10	41.2	37.4	41.4	42.0
1974-2010	41.4	33.1	37.0	43.4

Source: Authors' calculations from Statistics Canada, Annual Survey of Manufacturers.

Note: To make the results consistent over time (to correct for changes in the sample frame and firm classification after 2000), we excluded firms with fewer than 10 employees.

Table 3

Origins of effective multifactor productivity (EMFP) growth, 1995-2000 and 2000-07

Country	1995-2000		2000-07	
	Average annual EMFP growth	Relative contribution	Average annual EMFP growth	Relative contribution
	Percentage points	Percent	Percentage points	Percent
Total final demand products — Canada	0.86	100	0.23	100
Originating in:				
Canada	0.65	75	0.08	33
United States	0.19	22	0.12	50
Other foreign countries	0.03	3	0.04	17

Source: Gu and Yan (2014).

10 percent for many other advanced countries) and the marked increase in productivity growth among its main foreign suppliers between 1995 and 2007 — most notably, the United States. Productivity gains were strongest in machinery and equipment and export products.

Elsewhere in this volume we demonstrate that the productivity benefits for manufacturers that start to export occur for those firms that start simultaneously to export *and* import intermediate inputs. Comparing this group of global value chain (GVC) starters with firms that were otherwise similar but did not start exporting and importing inputs,⁶ we find that, in their first year, GVC starters experienced 5 percent faster productivity growth than comparable non-GVC firms, and that the performance premium grew to 9 percent after four years. Conversely, manufacturing firms that stopped importing inputs and exporting suffered a similar-sized productivity loss of 8 percent after four years.

Trade policy, the trading environment and links to aggregate productivity

Trading thus tends to improve productivity. It is no surprise, then, that Canada's adoption of trade-promoting policies had important beneficial economic effects. Trefler (2004), for example, estimates that tariff reductions under the Canada-US Free Trade Agreement (FTA) raised labour productivity by a compound average annual growth rate of 1.9 percent for the most affected import-competing manufacturing industries (such as brewery products and shipbuilding and repair), with at

least half of this coming from the closing or contraction of low-productivity plants. In the most affected export-oriented manufacturing industries (such as producers of sweaters and women's shirts), labour productivity at the plant level rose by 1.9 percent annually as a result of US tariff concessions.⁷ Overall, the FTA is estimated to have raised Canadian manufacturing productivity by 13.8 percent over the period from 1988 to 1996 (Trefler 2004; Lileeva and Trefler 2010; Melitz and Trefler 2012).

Exchange-rate movements also have had important effects on the magnitude of these productivity gains. A depreciation of the Canadian dollar relative to the US dollar — which is similar in effect to raising home tariffs and lowering foreign tariffs — generally increases exports by making Canadian exports cheaper in the United States (while raising the cost of imports). Conversely, an appreciation of the Canadian dollar tends to dampen Canadian exports by making them more expensive (while also beneficially reducing the cost of imported inputs).⁸ Elsewhere (Baldwin and Yan 2012a), we find that the productivity effects associated with exchange-rate movements are significantly larger than those attributed to tariff changes, and that the depreciation of the dollar served to reinforce the superior performance of Canadian export starters over the 1990-96 period (table 4). In contrast, the productivity benefits normally accompanying new exporters

Table 4

Contributions by tariffs and exchange rates to productivity growth gaps: Counterfactual exercises, Canada 1984-2006

	1984-90	1990-96	2000-06
	Change (percentage points)		
<i>Actual</i>			
Average annual change in average Canadian-US tariffs	-0.3	-0.6	0.0
Average annual change in real exchange rates	1.6	-1.9	5.5
Average annual mean difference in labour productivity growth, entrants less continuing nonexporters	2.0	5.3	0.1
<i>Estimated</i>			
Difference in labour productivity growth...	2.9	5.2	0.3
If no changes in tariffs and real exchange rates	4.1	4.1	4.1
Due to changes in tariff rates	-0.1	-0.2	0.0
Due to changes in real exchange rate	-1.1	1.3	-3.8

Source: Baldwin and Yan (2012a).

were much lower when the dollar appreciated during the 1984-90 and 2000-06 periods. In particular, the period after 2000 when the value of the dollar increased the most was accompanied by almost no productivity gains for new exporters.

Thus, better access to international markets — brought about by tariff cuts or currency depreciation — can boost productivity. Even more generally, entry into *new* markets, both domestic and foreign, is associated with improved productivity. We have found, for example, that Canadian firms that expanded across provincial borders enjoyed a spurt in productivity and performed as well as those that expanded across international borders (Baldwin and Yan 2012b). Moreover, the performance of firms that leave export markets in favour of domestic markets does not necessarily deteriorate. Between 2000 and 2006, a period characterized by new resource-led opportunities in expanding domestic markets, plants that exited export markets and began serving new domestic markets performed much better, contributing to more than half of aggregate labour productivity growth (53 percent) in the manufacturing sector (Baldwin, Gu and Yan 2013).

The Mechanisms of Trade-Induced Productivity Growth

FIRMS THAT ADAPT AND FIND NEW MARKETS GENERALLY HAVE SUPERIOR PRODUCTIVITY, and imported inputs are an important way to enhance productivity. But what exactly drives these productivity improvements? To better understand the link between changes in trading opportunities and productivity, we can use firm-level data to examine the “between-firm” and “within-firm” sources of trade-induced productivity gains.

Firm dynamics and the reallocation effect

Trade models with heterogeneous firms (see Bernard et al. 2003; Melitz 2003; Melitz and Ottaviano 2008) generally show that tariff reductions cause the least productive firms to exit and the more productive firms to expand. In the process, economic resources shift from less efficient to more efficient firms, thereby raising aggregate productivity. There is also empirical evidence that the reallocation effect is a key — perhaps the most important — source of productivity benefits from trade liberalization. As trade barriers fall, the more productive nonexporters expand to export markets and the more productive exporters increase their foreign sales. For example, the reallocation of output across plants was responsible

Table 5

Ways in which the Canada-US Free Trade Agreement increased manufacturing productivity, Canada, 1988-96

	Estimated impact	Relative contribution to total
	Percentage points	Percent
<i>Growth between plants (selection and reallocation)</i>	8.4	61
Growth of exporters	4.1	30
Contraction and exit of least productive plants	4.3	31
<i>Growth within plants</i>	5.4	39
New exporters invest in raising productivity	3.5	25
Existing exporters invest in raising productivity	1.4	10
Improved access to US intermediate inputs	0.5	4
Total increase	13.8	100

Source: Melitz and Trefler (2012).

for more than half of productivity growth in 13 of 22 manufacturing industries over the 1988-97 period (Baldwin and Gu 2004a). For a few industries, such as clothing and textile products, that experienced deep tariff cuts as a result of free trade, 90 to 100 percent of their productivity growth was due to the reallocation of output to more productive plants. For the Canadian manufacturing sector as a whole, changes in market share accounted for over half (53 percent) of the overall productivity growth in this period. Melitz and Trefler (2012) attribute almost two-thirds (61 percent) of the overall manufacturing sector's productivity gains, which they estimate at an impressive 13.8 percent over the 1988-96 period, to reallocation between plants (table 5).

Specialization and the scale effect

Perhaps the most obvious link between improved market access and productivity is the potential to exploit economies of scale that arise when serving larger markets. High trade barriers and limited domestic market size mean that plants that serve only the domestic market might be too small and have production runs that are too short and product lines that are too diverse. Trade liberalization and access to larger markets offer firms the chance to increase their size, plant scale or product specialization, which, in turn, can reduce average production costs and raise productivity.

Studies investigating whether trade promotes efficiency through increased scale have found, for example, that US tariff cuts under the Canada-US FTA generated a 9.8 percent increase in output per plant that was mostly offset by an 8.5 percent contraction caused by Canadian tariff reductions (Head and Ries 1999). There is also evidence that the primary influence of the FTA was longer production runs through increased plant specialization (Baldwin, Beckstead and Caves 2002; Baldwin, Caves and Gu 2005; Baldwin and Gu 2006). Plants were specializing in fewer commodities through the 1980s and 1990s in any case, but the pace of commodity specialization increased dramatically following the implementation of the FTA, accompanied by a substantial increase in the length of production runs.

The learning-by-doing effect

Trade liberalization also affects productivity through learning spillovers: one firm's investment in tangible assets, human capital and research and development (R&D) can generate broader, positive spillovers by increasing the stock of knowledge available to all firms (Arrow 1962; Lucas 1988; Romer 1986). Naturally, researchers have suggested that international trade facilitates the transfer of knowledge and ideas across countries (Coe and Helpman 1995; Grossman and Helpman 1991).

According to Baldwin and Gu, there are four pieces of evidence that trade liberalization has fostered the learning of Canadian exporters (2003, 2004b). First, productivity gains from entering export markets were greater for both domestically controlled plants and newer plants. The reason is that both types of plants are more likely to benefit from information gained as a result of exposure to foreign markets because their information acquisition systems are less developed than those of older or foreign-owned plants. This "advantage of backwardness" (Gerschenkron 1962) suggests that part of the efficiency gains from trade comes through learning-by-exporting. Second, new exporters were 37 percent more likely to use foreign technologies than were nonexporters following the implementation of the FTA, whereas previously there had been little difference between them. Third, following the FTA, there was an increase in R&D collaboration agreements between Canadian exporters and foreign buyers. This is key, since R&D is central to endogenous growth models and the innovation process; moreover, firms that export are more likely to be innovative. Finally, exporting improved the flow of information about foreign technologies to Canadian plants. Exporters were much

less likely to view the lack of information on foreign technologies as a significant impediment to their use, whereas prior to the FTA these same plants were as likely as nonexporters to view the lack of information as a significant impediment.

Innovation and technology adoption

Innovation, in the form of new and improved products, processes and markets, is a key driver of technological progress and productivity, and intellectual capital — a key source of technological progress — grows through innovation (see Aghion and Howitt 1992; Grossman and Helpman 1991; Romer 1990). Access to larger markets increases the incentive to innovate, but innovation entails fixed costs. Thus, the larger the market, the more profitable it is for firms to invest in innovation. For Canadian firms, trade liberalization increased their potential market, which encouraged them to export and simultaneously to invest and innovate, which, in turn, raised firm-level productivity growth (Baldwin and Gu 2004b; Lileeva and Trefler 2010).⁹

As well as increasing the intensity of technology use, exporting enhances firms' innovative capabilities as they invest in R&D and training to absorb foreign ideas and technologies. Baldwin and Gu (2004b) find that the likelihood that firms performed R&D on an ongoing basis was 10 percentage points higher among exporters than among nonexporters, whereas there was no such difference before plants entered the export market. Larger plants that became exporters also increased their emphasis on training as a general strategy. Further, in the period immediately after implementation of the Canada-US FTA (between 1989 and 1993), the new exporters that experienced labour productivity gains were those that adopted advanced technologies and engaged in product innovation more frequently than did nonexporters (Lileeva and Trefler 2010). In contrast, there was no difference, in terms of technology adoption and product innovation, between nonexporters and new exporters that did not experience labour productivity gains.

Competition

Trade also might improve efficiency because firms that export typically face a stronger, more competitive market environment. Penetrating external markets often increases the need to respond to nimble competitors. Where lack of competition engenders complacency and results in high levels of so-called x-inefficiency — large gaps between a firm's productivity and the production

“frontier” — trade liberalization has the beneficial effect of increasing competitive pressures. As Baldwin and Gu (2004b) find, Canadian firms that penetrated foreign markets indicated that they faced much more significant competition from abroad, while nonexporters did not rank competition from abroad as very meaningful.

Capacity utilization

Not all increases in foreign penetration are necessarily productivity enhancing. Increased market access can also affect productivity through changes in the use of production capacity. Costs associated with adjusting production inputs can lead to over- or underuse of production capacity and changes in productivity. Access to a foreign market where the demand differs from that of the domestic market offers diversification benefits from smoothing demand fluctuations. Unanticipated movements in exchange rates, however, might offset the advantages of serving large export markets and lead to extensive periods of overcapacity and reduced productivity.

For example, the Canadian manufacturing sector experienced significant adjustment costs due to a rapid and large appreciation of the Canadian dollar vis-à-vis its US counterpart after 2000 (Baldwin, Gu and Yan 2013). Aggregate labour productivity growth in manufacturing decelerated from 3.7 percent per year during the 1990-99 period to 1.7 percent per year in the 2000-06 period. The primary cause of this labour productivity slowdown — accounting for 1.6 percentage points of the decline — was excess capacity among Canadian exporters, particularly foreign-controlled plants and durable goods producers, that faced lower demand in the US export market.

Conclusions

A COMMON THEME THAT EMERGES FROM THIS BODY OF EMPIRICAL, FIRM-LEVEL RESEARCH IS that trading — both exporting and importing — is generally good for the economic performance of Canada’s manufacturing sector, and adapting to new larger markets has enhanced the sector’s productivity. Furthermore, new larger markets, whether domestic or foreign, are beneficial to productivity growth. But successfully expanding into new markets also depends on firms’ ability to adapt, invest and innovate.

Larger markets raise productivity by allowing firms to exploit economies of plant scale and product specialization, by forcing firms to become more efficient

in the face of more competitive pressure and by offering firms more incentives and possibilities to innovate and invest. Access to foreign markets provides the additional benefits of improved information flows and learning from foreign buyers that together allow exporters to benefit from the adoption of foreign technologies.

The benefits from access to larger markets are not automatic: to succeed, plants need to invest in advanced technologies, R&D and training to develop their absorptive capacity to learn from international best practices. The size of these benefits, moreover, might be attenuated by changes in international markets brought about by exchange-rate movements that affect exporters' competitiveness. Indeed, the Canadian manufacturing sector, which made heavy investments in the 1990s to serve new markets that were opened up by free trade with the United States, faced the challenge of declining opportunities in that market a decade later.

More generally, firm-level data reveal that aggregate demand shocks, such as those brought about by trade liberalization and exchange-rate movements, lead to firm-level supply responses. This suggests that the firm-level production function responds to demand shocks both by preparing for and adapting to such shocks. This is in contrast to the common approach in macroeconomics that models a static, exogenous production function that relates inputs to final output.

Research has generated new insights and improved economists' understanding of the trade and productivity nexus by providing a rich picture of the vast heterogeneity and complex dynamics of the Canadian economy. More research is needed, however, on the adjustments manufacturers made after 2000 and whether there were substantial differences between the adjustments of domestically owned and foreign-controlled firms, on how firms' entry into and exit from export markets responded to changes in competitiveness, and on how the innovation regime reacted to these changes. It would also be useful to examine trade and productivity beyond the manufacturing sector to see whether the findings reported in this chapter also apply to, say, the resource, commodities, agriculture and services sectors. Finally, more research is needed on the effects of freer trade not just on productivity, but also on other important economic dimensions such as the short- and long-run adjustment costs in the labour market associated with trade, where Canadian research is scarce.¹⁰ Such multidimensional research could provide valuable inputs to creating and implementing sound trade policies.

Notes

We thank participants in the IRPP symposium on “Adapting Canadian Trade and Commerce Policies to New Global Realities” in Ottawa, an anonymous reviewer, Wulong Gu, Beverly Lapham, John Ries, Stephen Tapp and the editors for helpful comments and suggestions.

1. Multifactor productivity is the ratio of gross domestic product (GDP) to combined labour and capital inputs. The trade share equals exports plus imports divided by GDP (expressed here in nominal terms). The contemporaneous correlation between the two series in figure 1 is 0.66.
2. Previous studies typically used more aggregated country- or industry-level approaches.
3. Plant-level productivity is derived by deflating plant-level nominal output with the available industry-level deflators. This approach is imperfect, but it is the best that can be done when firm-specific deflators are unavailable. In fact, using unique Danish manufacturing panel data, Smeets and Warzynski (2013) show that international trade premiums are significantly *larger* when output is deflated with firm-specific price indices, rather than using traditional industry-level price indices, as we have done in the research for this chapter.
4. Indeed, this has become an indispensable feature of trade models at the research frontier that feature firm heterogeneity (see Lapham, in this volume).
5. The standard MFP measure, used in the rest of this chapter, is the efficiency with which industries use inputs in their production. It does not capture the effect of productivity gains in upstream industries on productivity gains in downstream industries. It is constructed as the growth in gross output that is not accounted for by the growth in capital, labour and intermediate inputs in the industry. In contrast, *effective* MFP growth, which captures the effect of upstream industries, is the difference in the growth of gross output that is not accounted for by the growth of total capital and labour inputs used directly in the final industry sector and indirectly in upstream industries that supply intermediate inputs, both domestically and from abroad.
6. This approach controls for the positive self-selection effect of “better” firms that choose to export.
7. For a complete list of the most affected industries, see Treffer (2004, table A1).
8. Recall that previous results (for example, those in table 3) showed that imports can be a source of productivity gains. This implies that a stronger Canadian dollar also might have some positive effects — for instance, by making it cheaper for Canadian firms to import foreign capital, such as machinery and equipment, which can enhance productivity.
9. The complementarity between exporting and innovation is explored in theoretical models by Costantini and Melitz (2007), Grossman and Helpman (1991), Lileeva and Treffer (2010) and Yeaple (2005).
10. Some exceptions are Beaulieu (2000), Gaston and Treffer (1997) and Treffer (2004). The latter paper, for instance, found that the Canada-US FTA was associated with substantial employment losses: 12 percent for the most affected, import-competing group of industries and 5 percent for the manufacturing sector as a whole.

References

- Aghion, P., and P. Howitt. 1992. "A Model of Growth through Creative Destruction." *Econometrica* 60 (2): 323-51.
- Arrow, K.J. 1962. "The Economic Implications of Learning by Doing." *Review of Economic Studies* 29 (3): 155-73.
- Baldwin, J.R., D. Beckstead, and R. Caves. 2002. "Changes in the Diversification of Canadian Manufacturing Firms (1973-1997): A Move to Specialization." Analytical Studies Branch Research Paper 179. Ottawa: Statistics Canada.
- Baldwin, J.R., R. Caves, and W. Gu. 2005. "Responses to Trade Liberalization: Changes in Product Diversification in Foreign- and Domestic-Controlled Plants." In *Governance, Multinationals and Growth*, edited by L. Eden and W. Dobson. Cheltenham, UK: Edward Elgar Publishing.
- Baldwin, J.R., and W. Gu. 2003. "Export-Market Participation and Productivity Performance in Canadian Manufacturing." *Canadian Journal of Economics* 36 (3): 635-57.
- _____. 2004a. "Industrial Competition, Shifts in Market Share and Productivity Growth." Economic Analysis Research Paper Series 21. Ottawa: Statistics Canada.
- _____. 2004b. "Trade Liberalization: Export-Market Participation, Productivity Growth and Innovation." *Oxford Review of Economic Policy* 20 (3): 372-92.
- _____. 2006. "The Impact of Trade on Plant Scale, Production-Run Length and Diversification." Economic Analysis Research Paper Series 38. Ottawa: Statistics Canada.
- Baldwin, J.R., W. Gu, and B. Yan. 2013. "Export Growth, Capacity Utilization, and Productivity Growth: Evidence from the Canadian Manufacturing Plants." *Review of Income and Wealth* 59 (4): 665-88.
- Baldwin, J.R., and B. Yan. 2012a. "Export Market Dynamics and Plant-Level Productivity: Impact of Tariff Reductions and Exchange-Rate Cycles." *Scandinavian Journal of Economics* 114 (3): 831-55.
- _____. 2012b. "Market Expansion and Productivity Growth: Do New Domestic Markets Matter as Much as New International Markets?" *Journal of Economics and Management Strategy* 21 (2): 469-91.
- _____. 2014. "Global Value Chains and the Productivity of Canadian Manufacturing Firms." Economic Analysis Research Paper Series 90. Ottawa: Statistics Canada.
- Beaulieu, E. 2000. "The Canada-U.S. Free Trade Agreement and Labour Market Adjustment in Canada." *Canadian Journal of Economics* 33 (2): 540-63.
- Bernard, A.B., J. Eaton, J.B. Jensen, and S. Kortum. 2003. "Plants and Productivity in International Trade." *American Economic Review* 93 (4): 1268-90.
- Brown, M. Forthcoming. "How Much Thicker Is the Canada-US Border? The Cost of Crossing the Border by Truck in the Pre- and Post-9/11 Eras." Economic Analysis Research Paper Series. Ottawa: Statistics Canada.
- Coe, D., and E. Helpman. 1995. "International R&D spillovers." *European Economic Review* 39 (5): 859-87.
- Costantini, J., and M. Melitz. 2007. "The Dynamics of Firm-Level Adjustment to Trade Liberalization." In *The Organization of Firms in a Global Economy*, edited by E. Helpman, D. Marin, and T. Verdier. Cambridge, MA: Harvard University Press.
- Gaston, N., and D. Trefler. 1997. "The Labour Market Consequences of the Canada-U.S. Free Trade Agreement." *Canadian Journal of Economics* 30 (1): 18-41.

- Gerschenkron, A. 1962. *Economic Backwardness in Historical Perspective*. Cambridge, MA: Belknap Press of Harvard University Press.
- Globerman, S., and P. Storer. 2008. *The Impacts of 9/11 on Canada-U.S. Trade*. Toronto: University of Toronto Press.
- Grossman, G.M., and E. Helpman. 1991. *Innovation and Growth in the Global Economy*. Cambridge, MA: MIT Press.
- Gu, W., and B. Yan. 2014. "Productivity Growth and International Competitiveness." *Canadian Productivity Review* 37. Ottawa: Statistics Canada.
- Head, K., and J. Ries. 1999. "Rationalization Effects of Tariff Reduction." *Journal of International Economics* 47 (2): 295-320.
- Krugman, P.R. 1979. "Increasing Returns, Monopolistic Competition, and International Trade." *Journal of International Economics* 9 (4): 469-79.
- Lileeva, A., and D. Trefler. 2010. "Improved Access to Foreign Markets Raises Plant-Level Productivity... for Some Plants." *Quarterly Journal of Economics* 125 (3): 1051-99.
- Lucas, R.E. 1988. "On the Mechanics of Economic Development." *Journal of Monetary Economics* 22 (1): 3-42.
- Melitz, M.J. 2003. "The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity." *Econometrica* 71 (6): 1695-1725.
- Melitz, M.J., and G. Ottaviano. 2008. "Market Size, Trade and Productivity." *Review of Economic Studies* 75 (1): 295-316.
- Melitz, M.J., and D. Trefler. 2012. "Gains from Trade When Firms Matter." *Journal of Economic Perspectives* 26 (2): 91-118.
- Moens, A., and N. Gabler. 2012. *Measuring the Costs of the Canada-US Border*. Vancouver: Fraser Institute.
- Romer, P. 1986. "Increasing Returns and Long-Run Growth." *Journal of Political Economy* 94 (5): 1002-37.
- _____. 1990. "Endogenous Technological Change." *Journal of Political Economy* 98 (5): S71-S102.
- Smeets, V., and F. Warzynski. 2013. "Estimating Productivity with Multi-Product Firms, Pricing Heterogeneity and the Role of International Trade." *Journal of International Economics* 90 (2): 237-44.
- Trefler, D. 2004. "The Long and Short of the Canada-U.S. Free Trade Agreement." *American Economic Review* 94 (4): 870-95.
- Yeaple, S.R. 2005. "A Simple Model of Firm Heterogeneity, International Trade, and Wages." *Journal of International Economics* 65 (1): 1-20.