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Article abstract

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Globally Trading Firms in Canada: Productivity and Global Value Chains

by

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Using firm-level data in Canada from 2002 to 2008, I compare the economic performance of three types of firms: those that both export and import (called globally trading firms—GTFs), exporters-only, and importers-only. The results show that GTFs are more productive, larger, more capital intensive, pay higher wages, trade more goods, and trade with more countries than both types of one-way traders. These premia for GTFs were found even before they turned into GTFs (self-selection). Moreover, even after turning into GTFs, the productivity growth of a subset of them was faster than that of one-way traders. The higher the involvement in global value chains (GVCs), the higher was the performance of the "learning-by-turning GTFs". The GTFs with higher productivity growth were the ones that imported from multiple countries, not those that imported only from China. By another measure, they were both-in-both GTFs—those that traded both final and intermediate goods, and in both directions (exports and imports). Even though they employed only 10% of Canada's business sector workforce, they contributed 60% of its labour productivity growth.

1. Introduction

There has been substantial research on exporters but very little knowledge on the importing activities of these exporting firms. It is likely that most trade is contributed by firms that both export and import, making them globally trading firms (GTFs). We can think of at least two reasons why firms intend to be two-way rather than one-way traders. First, firms can spread country-specific fixed costs by being engaged both in exports and imports in the same market, thereby reducing per dollar trade transaction costs. Second, as firms engage in global value chains (GVCs) or offshoring, where a finished product includes tasks performed in different countries requiring back and forth border-crossing, they may prefer to handle both exports and imports by themselves, within their own firm boundaries. Whatever the motivation for turning GFTs into one-way traders (exporters-only or importers-only), it is expected that the performance of GTFs will be superior to that of one-way traders.

There is growing discussion of the fixed costs of trading (especially exporting) and the benefits of GVCs in the literature, but the most likely candidates to potentially exercise these two approaches—the GVCs—are not the focus of the research. So far, there are only two papers that deal with exporters and importers (Bernard et al., 2009, & Amiti et al., 2014) with US data. The focus of these two papers has been to profile GTFs in terms of trade, firm size, numbers of product, and country traded in (Bernard et al., op. cit.) and to study price pass-through differences between them and one-way traders (Amiti et al., op. cit.). Many interesting and important issues can be addressed using firm-specific export and import data. For example, trade data on GTFs allow us to compute the firm-specific share of imports in exports and the firm-specific share of intermediate inputs in exports and imports, which can be considered as measures of GVCs or offshoring. Indeed, firm-specific intermediate inputs in their exports and imports are likely the best measure of GVCs so far available (for different concepts of GVCs, see Antras & Chor, 2018).

Amidst these research gaps, this paper examines several issues related to GTFs using Canadian data (for a profile of all Canadian traders, see Acharya, 2016). Trade (both export and import) plays a much larger role in Canada compared to many developed countries. Thus, a study linking all exporters and importers in Canada is fitting to understand the role of GTFs in global trade dynamics. Some of the issues that the paper deals with are as follows: How different are firms that both export and import—GTFs—from

one-way traders, which either only export (exporters-only) or only import (importers-only)? Is there self-selection such that more productive one-way trading firms turn into GTFs? Do one-way traders become more productive after they turn into GTFs? Or do we see both outcomes? What factors cause firms to turn from one-way into two-way traders? What is the impact of GVCs (offshoring) on labour productivity and total factor productivity (TFP)? Is this impact heterogeneous across GTFs, depending on which countries they source their imports from and what types of goods (intermediate, final, or both) they export and import?

For the purpose of the paper, I combine and exploit a range of different Canadian datasets. First, I link the Canadian Exporter Register and Importer Register databases. Then these data are linked with the Longitudinal Employment Analysis Program, General Index of Financial Information, and Business Registry. The unit of analysis in the paper is the firm (enterprise). By combining these datasets, I compile data on exports by product-country, imports by product-country, sales, employment, wages, payroll, capital stock, and country of control for seven years, from 2002 to 2008. Even though there are a couple of years of firm-level trade data available after 2008, I have to end the sample in 2008 because the data from subsequent years is not linkable to the previous years due to definitional changes adopted by the statistical agency.

Some of the findings of the paper are as follows. GTFs are larger, more capital intensive, pay higher wages, trade more goods, and trade with a larger number of countries than one-way traders.[1] Both labour productivity and TFP are higher for GTFs than for one-way traders. GTFs have 11% higher labour productivity and 8% higher TFP than one-way traders. GTFs are more productive even before they turn from one-way traders into GTFs than those that remain one-way traders. These results establish the fact that there is self-selection: more productive one-way traders become GTFs. But do GTFs perform better after they turn into GTFs, compared to one-way traders? In many respects, yes. Compared to one-way traders, their employment levels, export value, import value, number of exported products, and number of imported products rises faster than those of one-way traders. As a group, however, their labour productivity does not grow faster than that of one-way traders. That raises two questions. First, since GTFs are probably the ones that are engaged in GVCs, does this result imply that there is no relationship between productivity and GVCs? Second, does this result apply to all GTFs?

To answer the first question, we need data on GVCs and to link it directly with productivity growth. The difficulty is that in this age of globalization, even though GVCs are an important and integral part of firms' trade, statistical agencies worldwide are far from providing this data. So, I compute GVCs in the paper. To answer the second question, I introduce two types of heterogeneity among GTFs using the computed GVCs measure. First, depending on which country the GTFs import from (the source-country heterogeneity) I construct a firm-country-specific ratio of total imports to exports as a measure of GVCs. The second GTF heterogeneity is based on what combination of products (intermediate inputs, final goods, or both) they trade (traded-product heterogeneity). Here I construct the firm-product-specific measure of GVCs as the ratio of intermediate inputs to imports.

The results show that a select group of GTFs experience the learning-by-turning GTF advantages of faster labour productivity and TFP growth compared to one-way traders after they turn into GTFs. Using the first method of heterogeneity, I find that a 1% increase in the firm-specific import to export ratio leads to 0.04% labour productivity growth and 0.03% TFP growth for those GTFs that import from four markets: China, the US, other OECD countries, and other developing countries. For other GTFs, however, the association between changes in import to export ratio and productivity was either negative or negligibly positive with an upmost value of 0.005%.[2] So these four-market GTFs had a productivity growth 8 times higher than that of other GTFs and by extension than that of one-way traders as the last two groups had a similar performance.

Using the second measure of heterogeneity, I find that the GTFs that have contributed tremendously are those that traded both final and intermediate goods in both exports and imports. The annual labour productivity growth of these GTFs was 4.32% faster than that of other GTFs, which in turn had very similar productivity growth as one-way traders. Even though these GTFs employed only 10% of the labour force of the Canadian business sector, they contributed 60% of Canada's business sector labour productivity growth during the sample period (2002–2008). They contributed about two-thirds of all trade by GTFs.

Both sets of GTFs that were formed using two very different methods of grouping—heterogeneity criterion—led to very similar results that there is a positive nexus between an increase in GVCs and productivity growth. So, no matter which way the subset is formed, the result that some GTFs have faster productivity growth compared to other GTFs and in turn one-way traders is robust.

The rest of the paper is organized as follows. In Section 2, I discuss the data. In Section 3, I provide a ranking of GTFs and examine how different they are from one-way traders in terms of size, employment, trade contribution, etc. In Section 4, I evaluate whether there is a self-selection process for GTFs. In Section 5, I evaluate the performance of newly turned GTFs vis-à-vis one-way traders (the post-GTFs effects). In Section 6, I examine the impact of global value chains or offshoring on productivity. Section 7 concludes the paper.

2. Data

This paper exploits data from several micro databases. First, it links two databases that report plant (establishment) level export and import transactions of trading firms in Canada (whether Canadian or foreign-controlled). They are: (1) the Exporter Register database, which covers merchandise exports by a Harmonized System (HS) 8-digit product code and countries of destination, and (2) the Importer Register database, which covers merchandise imports by a HS 10-digit code and countries of origin. The export database covers more than 95% of exports, and the coverage of import files is even higher.[3] By linking these two databases, I have data by establishment (plant) on the value of exports and value of imports (by product and by destination/origin countries). I also have information on the enterprise (firm) and the 3-digit North American Industrial Classification System (NAICS) industry that a particular establishment falls into.[4] Even though the Export Register starts in 1996, since the Import Register starts only in 2002, the paper uses data from 2002 to 2008. Linking these two datasets allows me to identify the firms that only export (exporters-only), only import (importers-only) and both export and import (global trading firms—GTFs). The way the statistical agency has assembled these trade data after 2008, they are not linkable across years to enable a meaningful longitudinal econometric study. However, I do not expect that the results would be drastically different with more recent data.

As trading decisions are most likely made at the firm (enterprise) level, not at the plant level, and also as all other datasets that I use in the paper are available only at the firm level, I roll up the plant level trade data at the firm level and create data with four dimensions: firm-product-country-year. Some firms have more than one plant and in some cases the plants within a firm fall into more than a single industry (at the level of the NAICS 3-digit code). In that case, one cannot assign a particular firm to a single industry uniquely. For some parts of the study (especially at the econometric parts) when uniqueness was required in assigning a firm into an industry, I use the maximum value approach. I assign a multi-industry firm to a single industry in which it has the highest value of exports (in the case of exporters) and imports (in the case of importers). A summary table of exporters and importers—numbers of firms, product counts, and trading-country counts along with trade value—is presented in the Appendix (A1).

I link this Exporter Register and Importer Register data with the T2-Longitudinal Employment Analysis Program (T2-LEAP) and use data on employment and payroll for all enterprises in Canada that

hire employees. Employment is measured by average labour unit which is calculated as the ratio of the total payroll of a firm to the average annual wages of the workers. The latter is calculated as the average of the industry, size class, and province.

The next database that is linked is the General Index of Financial Information (GIFI), which contains information on incorporated enterprises' (irrespective of whether they hire employees) financial statements, including balance sheets and income statements. From this database, I take data on sales and tangible capital. The sales figure contains both domestic and foreign revenues, whereas trade data from the Exporter and Importer Registries are only foreign sales. Deducting depreciation from tangible capital assets, I generate net tangible assets, which after deflating, is used as capital stock for productivity analysis. One of the major drawbacks of firm-level studies in Canada is that there is no investment data available at the firm level. Hence, the lack of capital stock data has been a daunting limitation, especially for studies that deal with productivity. By linking this database, I was able to fill the data gap on capital stock by firms.

As trading firms can be both incorporated and unincorporated and as T2-LEAP and GIFI exclude unincorporated businesses, traders that are unincorporated cannot be linked with T2-LEAP and GIFI. However, unincorporated traders were small in trade value. By total count, 82% of traders (the percentage is the same for exporters and importers) were linked with T2-LEAP and GIFI datasets and in value they covered 86% of exports and 99% of imports. As some of the firms have negative and zero sales and some have zero employment, by removing them I was left with 75% coverage by count (for both exporters and importers), 84% coverage of export value, and 94% coverage of import value. And the coverage in both counts and value was even larger for GTFs than for one-way traders. Appendix Table A2 provides a summary of this link by year. In the analysis, whenever I do not need variables from T2-LEAP and GIFI, I use the data that link only the Exporter Register and Importer Register (covering 86% export and 99% import value). But whenever I need to link traders with their sales, capital, and employment variables, I use the final link file (with nonzero sales and employment) that covers 84% of exports and 94% of imports.

Finally, I use the Business Registry to link all these datasets and also identify firms that are Canadian-controlled and foreign-controlled using this database. The current price data on sales are deflated using industry-level gross output deflators; the wage bill is deflated using industry-level GDP deflators, and tangible capital is deflated using industry-level capital services deflators.

3. Ranking of Exporters and Importers

In Canada, the firms that both export and import—referred to as "global trading firms (GTFs)"—have a predominant role in goods trade. As reported in Table 1, in 2008, out of 48 699 exporters 28 470 (58%) also imported (GTFs) and 18% of 158 644 importers also exported (GTFs). Although compared to 2002 the total count of exporters declined in 2008, the number of GTFs increased by 4.3%. In terms of value, GTFs are predominant; in 2008, they contributed 80% of total exports and 82% of total imports.[5]

Table 1. Counts and Value of Global Trading Firms

	Firm counts			**Value (in billions)**			
				Exports		Imports	
	All exporters	All importers	Of which GTFs	All	GTFs	All	GTFs
2002	50 346	136 068	27 290	352.4	268.1	321.9	239.4
2008	48 699	158 644	28 470	414.6	331.5	379.9	313.3
Change	-1647	22 576	1180	62.1	63.5	58.0	73.9

For these firms, I start by examining how different GTFs are from one-way traders—exporters-only and importers-only—by estimating the following equation:[6]

$$\ln y_{jt} = \beta_0 + \beta_1 D_{jt}^{GTF} + \gamma \ln size_{jt} + \delta_{It} + u_{jt} \quad (1)$$

where *j* indexes the firm; *t* indexes the year, and *I* indexes the industry; $\ln y_{jt}$ denotes the logarithm of firm characteristics: number of employees, sales, export value, import value, wage rate, capital per worker, labour productivity, total factor productivity (TFP), number of products traded, and number of trading partner countries. The firm-level explanatory dummy variable on the right-hand side, D_{jt}^{GTF}, is a dummy with a value of unity for firms that are GTFs and zero if they are either exporters-only or importers-only.

The data is for the period between 2002 and 2008, and results are presented in Table 2. Panel A includes all exporters (GTFs plus exporters-only) in the sample, and Panel B includes all importers (GTFs plus importers-only). All results are from OLS regressions of the firm characteristics in the first column on the dummy variable. In each panel, each row (cell) is a separate regression. The number of observations and R-square for each regression are reported in columns next to the coefficient. The last column lists the variables that are used as additional controls. For the first four set of regressions (in both panels) I control only for the interaction of the full set of NAICS 3-digit industries and the full set of year fixed effect.[7] For all other regressions I also use control of size which is proxied by the log number of employment. The regression on TFP also controls for the log capital-labour ratio. The error term u_{jt} is Huber-White heteroskedasticity-robust standard errors but the results were not qualitatively different to alternative levels of clustering such as by industry, year, and industry-year.

Since the dependent variables are measured in logarithms, the coefficients can be interpreted as percentages.[8] In other words, within an industry, measured by employment, the GTFs are 105% larger than exporters-only in any given period, and when measured by sales they are 208% larger.[9] These premia for these firms do not vanish even after controlling for size measured by employment (all regressions except the first four). Compared to exporters-only, the GTFs pay 1% higher wages and have 11% higher labour productivity and 8% higher TFP levels. They export 16% more goods and to 10% more destination markets.[10]

Interestingly, GTFs are not different from exporters-only in capital intensity but are 21% more capital intensive than importers-only. Except for sales, the premia for GTFs over importers-only (Panel B) are even stronger than those for exporters-only. This implies that the exporters-only have premia over importers-only. This is the case because in both panels, the GTF dummy applies for the same set of firms (that are both exporters and importers) and what differs is the reference groups (exporters-only in panel A and importers-only in panel B). The exporters-only pay 3% higher wages and are 18% higher in both labour productivity and TFP and have 20% higher capital intensity compared to importers-only.

Table 2. Premia of Global Trading (Both Exporting and Importing) Firms

	Panel A: Exporters			**Panel B: Importers**			
	GTF Dummy	**# obs.**	**R^2**	**GTF Dummy**	**# obs.**	**R^2**	**Additional controls**
Log employment	0.720** (0.008)	258 023	0.12	1.048** (0.005)	739 465	0.15	Industry-year
Log sale	1.128** (0.009)	288 134	0.14	0.292** (0.003)	728 828	0.71	Industry-year
Log export	0.546** (0.008)	356 655	0.27	-	-	-	Industry-year
Log import	-	-	-	1.237** (0.007)	1 053 337	0.32	Industry-year
Log wage rate	0.010** (0.002)	258 023		0.046** (0.001)	739 465	0.46	Industry-year, log emp.
Log capital per worker	-0.004 (0.007)	242 489	0.15	0.207** (0.005)	691 832	0.18	Industry-year, log emp.
Log labour productivity	0.113** (0.005)	254 256	0.19	0.292** (0.003)	728 828	0.25	Industry-year, log emp.
Log TFP	0.082** (0.005)	241 937	0.28	0.255** (0.003)	690 203	0.33	Industry-year, log emp., log K/L
Log # of products traded	0.149** (0.004)	258 023	0.20	0.579** (0.004)	739 465	0.29	Industry-year, log emp.
Log # of trading partners	0.102** (0.003)	258 023	0.15	0.389** (0.002)	739 465	0.28	Industry-year, log emp.

The data are for the period between 2002 and 2008. All regressions use robust standard errors. An asterisk denotes significance level (**: p<1%, and *: p<5%*). The coefficients on annual data were similar to these panel regressions ones.

4. Self-Selection in Trading Behaviour

The finding that GTFs are more productive than one-way traders raises the question of the direction of causality: does high productivity induce firms to self-select into two-way traders or does participation in two-way trade cause productivity growth much more than participating in a single trade pattern (either export or import). Or is learning-by-trading more pronounced for GTFs than for one-way traders? So far, these issues of self-selection and learning-by-trading are confined to exporting vis-à-vis non-exporting activities.[11] In this section, I examine these self-selection and learning-by-trading issues for GTFs compared to one-way traders, that is, learning-by-turning into GTFs.

First, I compare ex-ante firm characteristics of *would be* GTFs while they were either exporters-only or importers-only with those that are still one-way traders. For this, I form a subsample by selecting only those firms that were one-way traders in any of the years between 2002 and 2007, inclusive. In the estimation, I use the subsample, using dummy of unity for firms that turned into GTFs (from one-way traders) beginning in 2008. The reference group consists of firms that were one-way traders throughout 2002 to 2008. This exercise would allow us to compare how these would-be GTFs were performing as long as five years prior to turning into GTFs. I compare differences in the pre-GTFs levels of firm characteristics by conducting the following regression:

$$\ln y_{jt} = \beta_0 + \beta_1 D_{jT}^{GTF} + \gamma \ln size_{j0} + \delta_{It} + u_{jt} \quad (2)$$

where y_{jt} is the firm *j*'s characteristics in year *t; t = 1, 2,..., T-1* (= 2002, 2003,..., 2007); D_{jT}^{G} is the GTF dummy for those that turn into GTFs in year T = 2008; $size_{j0}$ is employment for initial year (denoted by the 0 subscript) that the firm shows up in the database. There were a total of 3721 firms that turned into GTFs in 2008; the dummy of unity is assigned to them.[12] The coefficient on 2008 GTFs, β_1, measures the premium for these future GTFs prior to turning into GTFs. I include the interaction of the NAICS 3-digit industry code and a full set of year fixed effects to control for different industry (unobserved) shocks, both in the production process and output markets. The variables are deflated using industry-level deflators.[13]

The results are presented in Table 3, where Panel A includes both types of traders (exporters-only and importers-only), and Panels B and C report the results by breaking this sample into two groups: exporters-only and importers-only. All coefficients are significant at the 1% level, indicating that the differences between those that remained one-way traders and those that turned into GTFs in 2008 are substantial (even prior to 2008). Firms that became GTFs in 2008 are 101% higher in employment, pay 3% higher wages, have an 11% higher capital-labour ratio, 18% higher labour productivity, and 13% higher TFP than those that remained one-way traders in 2008.

Table 3. Ex-ante Advantage in Levels for Future GTFs

	Panel A: Both traders			**Panel B: Exporters**		**Panel C: Importers**	
	Coef.	**# obs.**	**R^2**	**Coef.**	**# obs.**	**Coef.**	**# obs.**
Log employment	0.706**	354 612	0.09	1.070**	41 442	0.505**	313 170
Log export				0.275**	46 379		
Log import						1.134**	322 360
Log wage rate	0.033**	354 188	0.49	0.041**	41 380	0.026**	312 808
Log capital per worker	0.107**	326 229	0.22	0.166**	37 318	0.035**	288 911
Log labour productivity	0.170**	346 543	0.21	0.215**	40 175	0.122**	306 368
Log TFP	0.129**	325 248	0.31	0.146**	37 178	0.093**	288 070
Log # of traded products	-	-	-	0.216**	46 382	0.566**	322 360
Log # of trading partners	-	-	-	0.196**	46 382	0.294**	322 360
# obs. 182 869	182 869	178 692	167 163	24 194	24 194	175 681	175 681

The sample excludes observations for the year 2008 and firms that are GTFs between 2002 and 2007. All regressions use robust standard errors, which are WH robust. An asterisk denotes significance level (**: p<1%, and *: p<5%). Except for the regression on the first row (for employment) other rows also control the initial level of log employment. The regressions on TFP also control for capital-labour ratio.

Most of the attributes found in GTFs against non-GTFs (reported in Table 2) are also found in those firms 1 to 5 years before they become GTFs.

The regressions above are in *level*; below I evaluate how the performances of would-be GTFs *change* in the run up to being GTFs by estimating the following regression:

$$\ln y_{jt} - \ln y_{jt-1} = \beta_0 + \beta_1 D_{jT}^{GTF} + \gamma \ln size_{j0} + \delta_{It} + u_{jt} \qquad (3)$$

The regression setup is the same as in equation (2) except that the left-hand side is year-to-year growth rate (first log difference) and the results are presented in Table 4. The sample is the same as the one used for Table 3. Each column is a separate regression; columns (1–4) include all firms; columns (5) and (6) are for exporters, and columns (7) and (8) are for importers. From 2002–2007, firms that turned into GTFs in 2008 grew 9% per year faster in employment and increased their export destination countries and import source countries by 5% per year compared to those that remained one-way traders in 2008. They also increased the number of products exported and number of products imported by about 8% and 10% more per year, respectively. However, the firms that turned into GTFs in 2008 were not different from the reference group in terms of growth in productivity and wages. So, the would-be GTFs have higher levels of productivity but did not become more efficient leading up to becoming GTFs compared to one-way traders.

Table 4. Ex-ante Growth Advantage for Future GTFs

	Both traders				**Exporters**		**Importers**	
	Δlog employ. (1)	Δlog wage (2)	Δlog LP (3)	Δlog TFP (4)	Δlog # of exported products (5)	Δlog # of destin. countries (6)	Δlog # of imported products (7)	Δlog # of source countries (8)
GTF	0.092**	-0.004	-0.013	-0.005	0.083**	0.050*	0.095**	0.052**
	(0.007)	(0.003)	(0.008)	(0.007)	(0.017)	(0.012)	(0.012)	(0.008)
Ind.-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log emp.	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# obs.	182 869	182 869	178 692	167 163	24 194	24 194	175 681	175 681

The sample includes one-way traders in the period between 2002 and 2007. All regressions use robust standard errors and are reported in the parentheses. The log employment for the initial year is also controlled for some regressions. An asterisk denotes significance level (**: p<1%, and *: p<5%).

These findings, while not establishing the causal relationship between being better performers and becoming GTFs, provide important evidence that future GTFs already have many of the desirable performance characteristics found in cross-section comparisons. In addition, employment growth, and numbers of product exported and imported are higher for these firms in the years just before they turn into GTFs. To test the relationship between turning into GTFs and firm characteristics, I estimate a model of the decision to be GTFs by estimating the following equation:

$$D_{jt}^{GTF} = \beta_0 + \sum_i \beta_i \Delta \ln(Firm\ characteristics)_{\text{it-1}} + \delta_{It} + u_{jt} \quad (4)$$

The dummy that takes the value of unity on the left-hand side is for those firms that turned into GTFs in 2003 and after. The reference group consists of the firms that did not turn into GTFs throughout the sample period. The data is from 2002 to 2008 but firms that were GTFs in 2002 were dropped from the sample. Under firm characteristics on the right-hand side, I include size measured by employment, capital-labour ratio, labour productivity, wage rate, number of products traded, number of trading partner countries, and whether the plant is a single-plant or multi-plant firm. Table 5 reports the results for exporters (first three specs) and importers (last three specs) and each column is a separate regression. For each group, I provide estimates for all firms and also decompose the sample firms into Canadian-controlled (domestic) and foreign-controlled (foreign). All regressors are lagged by one year to reduce possible simultaneity. Since our sample consists of only those firms that survive as traders, the estimated coefficients capture whether or not firms' decisions to turn into GTFs is conditional on firm survival. Since combinations of

full sets of the NAICS 3-digit industry code and the full set of year fixed effects are used in the estimation, a firm's decision of whether or not to be a GTF, that is, the coefficients βs, should be identified by the variation in the firm's characteristics.

The results show that both exporters-only and importers-only are more likely to turn into GTFs if, in the past, they were growing in employment, had positive productivity growth, a growing capital-labour ratio, and were increasing the number of products exported and number of destination countries (specs 1 and 4). A 10% increase in employment increases the probability of an exporter-only turning into a GTF by 1.4% and of an importer-only by 0.4%. A 10% increase in labour productivity increases the chances of becoming a GTF by 0.6% for an exporter-only and by 0.2% for an importer-only. Being a multi-plant firm reduces the probability of turning into a GTF for exporters-only but increases probability for importers-only. Comparing the coefficients for domestic and foreign firms, it is clear that the results for all firms are driven by domestic firms, which is not a surprise given their large sample size.[14] What is interesting though is that only very few factors in the model determine the decision to become a GTF in the case of foreign-controlled firms. In the case of exporters, it is only the number of trading partners that affects the decision to become GTFs positively and for importers, employment growth and the increased number of traded products affect the decision positively.

Table 5. The Decision to be GTFs

	Panel A: Exporters-only			**Panel B: Importers-only**		
	All	Domestic	Foreign	All	Domestic	Foreign
	(1)	(2)	(3)	(4)	(5)	(6)
Δlog employment	0.144**	0.156**	0.037	0.044**	0.044**	0.048**
	(0.010)	(0.010)	(0.028)	(0.003)	(0.003)	(0.014)
Δlog labour productivity	0.062**	0.068**	0.012	0.021**	0.022**	-0.007
	(0.007)	(0.007)	(0.027)	(0.002)	(0.002)	(0.012)
Δlog KL ratio	0.012*	0.014**	-0.005	0.005**	0.006**	0.007
	(0.005)	(0.005)	(0.016)	(0.002)	(0.002)	(0.007)
Δlog wage	0.065**	0.066**	0.016	0.012*	0.012*	0.037
	(0.014)	(0.014)	(0.061)	(0.005)	(0.005)	(0.029)
Δlog # of traded products	0.025**	0.026**	-0.019	0.005**	0.005**	0.022*
	(0.004)	(0.005)	(0.018)	(0.001)	(0.001)	(0.009)
Δlog # of trading partners	0.028**	0.025**	0.064*	0.008**	0.008**	-0.002
	(0.007)	(0.007)	(0.022)	(0.002)	(0.002)	(0.012)
Multi-plant dummy	-0.029*	-0.017	-0.010	0.132**	0.132	0117*
	(0.014)	(0.017)	(0.027)	(0.014)	(0.015)	(0.050)
Industry-year FE	Yes	Yes	Yes	Yes	Yes	Yes
R Square	0.13	0.13	0.26	0.09	0.09	0.13
# observations	29 437	27 494	1763	160 778	155 847	4029

Data are from 2002 to 2008 but firms that were GTFs in 2002 are dropped from the sample. All regressions use robust standard errors as reported in the parentheses. An asterisk denotes significance level (**: p<1%, and *: p<5%*).

What we have established so far is that several years prior to becoming GTFs, the firms were larger, more productive, paid higher wages, and traded more goods with more countries. Compounding their advantages, their growth was faster in the years leading up to becoming GTFs in many of these performance measures (except productivity and wages). Also, faster growth in productivity and other performance measures were found to be contributing factors to turning into GTFs. These findings confirm that past success leads to turning one-way traders into GTFs.

5. Learning Advantage: Two-way Over One-way Trading Markets

The results from the previous section confirm that firms self-select into GTFs. In this section, I evaluate another important aspect, that is, whether firms become more productive at the post-GTF period vis-a-vis their one-way trading counterparts. I do this by excluding firms that were in operation as GTFs in 2002 (the sample is the same as used in Table 5). The 2002-GTFs have to be excluded because I have no way of knowing their history (2002 being the first year of the sample): neither do we know when these 2002-GTFs turned into GTFs nor do we have information on them prior to 2002. With the remaining sample, I estimate the following equation:

$$\ln y_{jt} - \ln y_{jt-1} = \beta_0 + \beta_1 D_{jt}^{GTF} + \gamma \ln size_{j0} + \delta_{It} + u_{jt} \quad (5)$$

where D^{GTF} is a dummy for GTFs (with unity) that were turned into or born as GTFs in 2003 and after. In each year, there were new GTFs ranging from 3500 to almost 5700.[15] The reference group consists of one-way traders. The sample is the same as is the case for the results in Table 5. The estimation results are presented in Table 6, where each cell is a separate regression.

Table 6. Performance of GTFs and Non-GTFs (Annual Growth Rates)

	Δlog employ. (1)	Δlog exports (2)	Δlog imports (3)	Δlog LP (4)	Δlog # of product exported (5)	Δlog # of product imported (6)	Δlog # of export partners (7)
GTF Dummy	0.115**	0.192**	0.152**	0.002	0.058*	0.076*	0.045**
	(0.007)	(0.028)	(0.022)	(0.008)	(0.012)	(0.011)	(0.007)
Ind.-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log emp.	No	Yes	Yes	Yes	Yes	Yes	Yes
# obs.	91 597	16 077	83 937	89 666	16 079	83 937	16 079

Data are for the period between 2002 and 2008, but those that were GTFs in 2002 are excluded. All regressions use robust standard errors. An asterisk denotes significance level (**: p<1%, and *: p<5%).

For all regressions, I control for initial year of employment, and the interaction of the full set of NAICS 3-digit industry codes and full years' fixed effects. Results show that over the annual horizon, the GTFs show significantly faster growth in employment (12%), exports, imports, number of products traded, and number of exporting partners compared to (their reference group) one-way traders. The GTFs have either similar (labour productivity) or superior (2% faster TFP growth) performance in terms of productivity compared to one-way new traders.

So far, we have looked at the annual growth differences of GTFs and one-way traders without restricting the comparison for a similar span of time in foreign markets. In this sub-section, I do that by estimating the following equation for each interval of length *s* period but also by confining the estimation to labour productivity only (results for TFP were very similar).

$$\frac{\ln \pi_{jt} - \ln \pi_{jt-s}}{s} = \beta_0 + \beta_s D_{jt}^{GTF} + \gamma \ln size_{j0} + \delta_I + u_{jt} \quad (6)$$

where *s = 0, 1, ..., S* denotes the time periods after the firm shows up in the trade database (either as an exporter-only or an importer-only or a GTF). For each firm, the year that it shows up in the database is

denoted by 0 and subsequent years are indexed accordingly as 1, 2, 3, 4, 5, and 6 (at the maximum). For firms, the value of *S* could vary anywhere from 0 to 6, depending on when the firm shows up in the database and how long it remains in the database.[16] I get the estimators for every *s* by estimating equations for each of *s = 1, 2, 3, 4, 5,* and *6* and the coefficients are annualized by dividing the growth in the dependent variable by the interval of length *s*. I estimate this regression for data from 2002 to 2008 by excluding firms that were GTFs in 2002. In other words, the sample is the same as for the results in Tables 5 and 6. The coefficient on the GTF dummy measures whether firms as GTFs for *s* period of time are different from one-way traders with the same *s* period of trading history. All regressions control for initial log employment and NAICS 3-digit industry code fixed effects.

The distribution of new GTFs, both before and after they turn into GTFs, based on windows of year of operation (the span, s) is given in Appendix Table A3. The year that the firm turned into GTFs is labelled as Span = 0 in the middle of the table and the numbers of new GTFs in the corresponding year are also listed together. The number of years of operation after becoming GTFs are labelled as *s + t* and the number of years of operation prior to becoming GTFs are labelled as *s - t.* The entries on each column on the right-hand side (of Span = 0) are the number of GTFs that were in operation within a given span of time at the top. For example, for a one-year span, there were a total of 8711 GTFs and for a two-year span there were a total of 6309 GTFs and so on.[17]

There are three sets of results as given in Table 7. In Panel A, I look at the labour productivity (π) *level*; in Panel B, I examine labour productivity *growth* year to year for each time period, $\pi_s - \pi_{s-1}$, and in Panel C, I examine the *cumulative* labour productivity growth, where $\beta_S = \sum_{s=1}^{S} \beta_s$. The GFTs have a higher level of labour productivity (Panel A) but this productivity premium falls as firms spend more years as GTFs for the next four periods and then recovers slightly. For example, the GTFs had a 27% higher productivity level in the year that they turned into GTFs, but GTFs with a 5-years span had only 17% higher productivity (compared to one-way traders). This implies and clearly shows in Panel B that the productivity of GTFs did not grow faster after they turned into GTFs. The cumulative estimation (in Panel C) also shows that there is no productivity growth advantage for GTFs.[18] These results do not suggest that being a GTF leads to faster productivity growth.

Table 7. Performance of New GTFs vs. New One-way Traders in a Given Timeframe

S	0	1	2	3	4	5
Panel A: Labour productivity level						
GTF Dummy	0.239**	0.204**	0.126**	0.114**	0.116*	0.165**
	(0.013)	(0.023)	(0.027)	(0.041)	(0.053)	(0.057)
# observations obs.	108 225	39 295	27 213	18 833	11 689	5947
Panel B: Labour productivity growth: year to year						
GTF Dummy		-0.019	-0.010	0.029	0.031	0.053
		(0.016)	(0.018)	(0.020)	(0.026)	(0.035)
# observations		36 192	19 418	13 602	8675	4270
Panel C: Labour productivity growth: cumulative						
GTF Dummy		-0.019	-0.045*	-0.040	0.036	0.026
		(0.016)	(0.022)	(0.038)	(0.055)	(0.057)
# observations		36 192	24 296	16 648	10 562	5434

Data are for the period between 2002 to 2008, but GTFs in 2002 are excluded. All regressions use robust standard errors. An asterisk denotes significance level (**: p<1%, and *: p<5%).

6. Global Value Chain and Firms' Performance

If a firm participates in global value chains (or offshoring), it is most likely the case that it both exports and imports; that is, it is a GTF. So, does this result—that the productivity performance of GTFs after turning into GTFs is not different from those that continue to be one-way traders—imply that there is no positive relationship between GVCs and productivity? Prior to answering this question, there are two aspects that require a different treatment from what I have done. First, I have treated all GTFs as homogenous, which may not be the case. Second, I have not done a direct test of GVCs and productivity nexus. This section addresses both issues by introducing GTFs heterogeneity in two ways and conducting a direct test of GVCs and productivity. The first type of heterogeneity is introduced by source-country of imports and the second type of heterogeneity is introduced by types of goods the GTFs trade (intermediate inputs, final goods, or both). From now on I will be using only GTFs in the sample (one-way traders are excluded).

In source-country heterogeneity, I allow a differential impact of Canada's major import supplier countries or regions because not all trade partners are equally viable for GVCs. Accordingly, I organize Canada's import suppliers into four groups: (1) the US, (2) other OECD countries (all OECD countries except the US and Mexico) (3) China and (4) all other countries, including Mexico. I call them respectively, the US, OECD, China, and other markets. In 2008, 51% of Canada's goods imports were supplied by the US, followed by the second largest share by China at 10%. I divide GTFs into 15 mutually exclusive groups, depending on which combination of these four countries/regions they import from: (i) any single market (four groups), (ii) combinations of any two markets out of those four (six groups), (iii) combinations of any three markets (four groups) and (iv) all four markets (one group).[19]

As these GTFs do both exporting and importing, it is reasonable to expect that firm-specific import to export ratios measure the global value chain (offshoring). In the sample, the share of imports in exports increased from 79% in 2002 to 83% in 2008. In what follows I examine whether growth in imports (M) to exports (X) ratio (as a proxy for GVCs) is associated with higher productivity growth by estimating the following equation:

$$\Delta \ln \pi_{jt} = \beta_0 + \beta_1 \Delta \ln\left(\text{Import}/\text{Export}\right)_{jt} + \beta_2 \Delta \ln\left(Emp\right) + \beta_3 \Delta \ln\left(K/L\right) + \sum_{i=1}^{14} \delta_i D_{it}^{MARKET} + \sum_{i=1}^{14} \gamma_i \left[\Delta \ln\left(\text{Import}/\text{Export}\right)_{jt} \times D_{it}^{MARKET}\right] + \delta_{It} + u_{jt} \quad (7)$$

where π_{jt} is labour productivity for firm *j* in year *t*; D^{MARKET} includes 14 dummies for the 14 types of GTFs as mentioned above (depending on their import source countries), with GTFs importing from the US only as a reference group. Besides introducing them directly I also incorporate these dummies as interactions with the M/X ratio. Data are for the period 2002 to 2008. The results are presented in Table 8. All four regressions use labour productivity growth as the dependent variable, but the last two specifications also control for capital-labour ratio, making them TFP regressions. The first and third specs use only M/X as an explanatory variable, whereas specs (2) and (4) introduce 14 dummies and their interactions with the M/X ratio. In all regressions, I control for employment growth and interactions of a full set of NAICS 3-digit industry codes and year fixed effects.

The results in spec 1 show that a 1% increase in import to export ratio leads to 0.003% growth in labour productivity, a small but statistically significant impact. With the introduction of dummies, the coefficient on M/X for the reference group rises to 0.005%, indicating that labour productivity growth is stronger for GTFs that import from the US-only than for other GTFs. Labour productivity and M/X growth are negatively and significantly related for GTFs that import from OECD-other countries and from OECD-

Other-US. The only GTFs for which there is a positive relationship between labour productivity growth and M/X growth are those that import from all four markets. For them, the coefficient is almost eight times larger than the reference group: a 1% increase in the M/X ratio leads to 0.04% (=0.005 + 0.034) labour productivity growth for them compared to 0.005% for GTFs that import only from the US. For these GTFs there is a positive relationship between M/X and TFP growth as well (spec 4) but the magnitude of the relationship is smaller at 0.03% (=0.001 + 0.028) than for labour productivity.

Table 8. Impact of Growth in Import to Export Ratio on Productivity Growth

	Dependent variable: Δlog (Labour productivity)			
	(1)	(2)	(3)	(4)
Δlog (M/X)	0.003* (0.001)	0.005* (0.002)	-0.001 (0.001)	0.001 (0.002)
Single-market importers				
Δlog (M/X) × only OECD		-0.009 (0.005)		-0.006 (0.005)
Δlog (M/X) × only China		0.008 (0.012)		0.004 (0.012)
Δlog (M/X) × OECD-other		-0.031* (0.015)		-0.006 (0.005)
Two-markets importers				
Δlog (M/X) × US-OECD		-0.002 (0.004)		0.002 (0.003)
Δlog (M/X) × US-China		0.009 (0.009)		0.006 (0.007)
Δlog (M/X) × US-other		-0.003 (0.005)		-0.003 (0.003)
Δlog (M/X) × OECD-China		-0.033 (0.023)		-0.034 (0.027)
Δlog (M/X) × OECD-other		-0.015 (0.017)		-0.016 (0.012)
Δlog (M/X) × China-other		0.001 (0.012)		-0.007 (0.011)
Three-markets importers				
Δlog (M/X) × US-OECD-China		-0.011 (0.009)		-0.010 (0.009)
Δlog (M/X) × US-OECD-other		-0.009* (0.004)		-0.007* (0.004)
Δlog (M/X) × US-China-other		-0.015 (0.009)		-0.013 (0.007)
Δlog (M/X) × OECD-China-other		0.001 (0.020)		-0.014 (0.015)
Four-markets importers				
Δlog (M/X) × Four markets		0.034** (0.005)		0.028** (0.004)
Capital-labour ratio			0.026** (0.010)	0.206** (0.010)
R-square	0.24	0.24	0.39	0.39
# observations	86 660	86 660	82 860	82 860

Data are for the period between 2002 and 2008 and only for GTFs; one-way traders are excluded. In estimation I also introduced 14 dummies directly, but their results are not reported. The reference group consists of firms that import from the US only. All regressions use robust standard errors. An asterisk denotes significance level (**: p<1%, and *: p<5%).

From Section V, we knew that the GTFs as a group (after they turn into GTFs) are not different from one-way traders in terms of productivity growth. However, we find that a subset of GTFs had stronger productivity growth than other GTFs and hence stronger than one-way traders.[20] Raw data shows that this subset of GTFs represents 27% of all GTFs and on average, they are the firms with high trade value; they export to more countries and export a larger number of goods (compared to other GTFs and much more so

compared to one-way traders). The results in Table 8 also show that the smaller firms and those that are importing only from China or other developing countries have not been able to take advantage of GVCs.[21] It might be the case that by importing from those four countries/regions, not only do these GTFs have better opportunities to search for cheaper sources of GVCs, but also the chance to reduce their fixed cost of country entry and product entry, which the literature suggests might fall with the number of trading partners and the number of goods traded, respectively.

In the analysis above, GVCs are measured by total import to export ratio, but arguably, a better measure could be import of intermediate inputs, not the total imports. But there is no easy way of identifying the intermediate inputs in imports. Nevertheless, I do it here. I perform this task using two concordances based on the work by the UN. First, using concordance between the Harmonized System (HS) and Broad Economic Categories (BEC), export (HS 8-digit, about 5500 goods) and import (HS 10-digit, about 1800 goods) goods are converted into 19 (out of seven headings) BEC categories.[22] Second, using concordance between BEC and SNA (as listed in Appendix Table A4), 19 BEC categories are converted into three basic classes of goods in SNA: intermediate inputs (ii) consumption goods and (iii) capital goods. The sum of the last two is a measure of final goods.

In 2008, 69% of exported goods and 57% of imported goods were intermediate inputs for GTFs.[23] Next I divide the GTFs into three mutually exclusive sub-groups, those that trade (i) intermediate goods only, (ii) final goods only, and (iii) both intermediate and final goods. Since GTFs are the ones that both export and import, among the nine possibilities, they may fall in two different categories (among these three): one of exported goods and the other for imported goods.[24]

First, take the export side. As reported in column 1 (Table 9), in 2008, 32.1% of GTFs exported only intermediate inputs, 27.7% only final goods, and the remaining 40% both intermediate and final goods. Similarly, the GTFs distribution by nature of imported goods is listed in column 2. Looking at the third column, among those that exported intermediate goods only (32.1%) and imported intermediate goods only (16.4%), a subset (8.8%) of GTFs *both* exported and imported intermediate goods only. Looking at the second to last row, among the 40.1% of GTFs that *exported* both goods (column 1) and 75% of GTFs that *imported* both goods (column 2), a subset of them (34.1% in column 3) *both* exported and imported *both* intermediate and final goods. In value terms, these "both goods" (intermediate and final) traders in both trade patterns (export and import)–call them both-in-both (BIB) GTFs—contributed 65% of exports and 68% of imports (both in bold entries in columns 6 and 7). Comparing their shares in counts and value, it is clear that they have higher trade value.

Table 9. Share of GTFs' Counts and Value by Combination of Goods Traded in 2008 (%)

	Counts			**Value**			
						Both-way	
SNA class of goods	Export side (1)	Import side (2)	Both-way (3)	Export side (4)	Import side (5)	Exports (6)	Imports (7)
Intermediate only	32.1	16.4	8.8	24.1	1.6	3.7	0.4
Final only	27.7	8.9	4.8	2.1	1.2	0.1	0.1
Both (int. *plus* final)	40.1	74.8	34.1	73.9	97.2	**64.7**	**68.0**
TOTAL	100	100	47.7	100	100	68.5	68.5

Note: The GTFs are the same on both the export side and import side. They are evaluated by their exported products in column 1, their imported products in column 2, and their both exported and imported products in column 3.

Obviously, if GTFs were participating in GVCs, they should be exporting either final goods only or both intermediate and final goods. But the contribution of the former type of GTFs (in export value) is small (2.1%, column 4), leaving the latter, which contribute 73.9% of exports, as the candidates for GVCs. Similarly, if GTFs were participating in GVCs, they should be involved in importing either intermediate goods only or both intermediate and final goods. As the GTFs that import both goods contribute 97% of imports, they are the candidates for GVCs. As an overwhelming majority of these BIB GTFs are contributing two-thirds of both-ways trade, my focus of the analysis would be these BIB firms. I estimate the following equation, linking productivity and the share of imported intermediate inputs (measure of GVCs), to evaluate whether this association differs for BIB:

$$\Delta \ln \pi_{jt} = \beta_0 + \beta_1 \Delta \ln\left(\frac{\text{Imported inputs}}{\text{Exports}}\right)_{jt} + \beta_2 \Delta \ln(Emp) + \beta_3 \Delta \ln(K/L) + D_{it}^{BIB} + \gamma\left[\Delta \ln\left(\frac{\text{Imported inputs}}{\text{Exports}}\right)_{jt} \times D_{it}^{BIB}\right] + \delta_{It} + u_{jt} \quad (8)$$

where π_{jt} is labour productivity for firm *j* in year *t*; BIB is a dummy taking the value of one for BIB (47.7%, last column) GTFs and zero for the remaining 53.3% of GTFs. The results for this growth equation are presented in Table 10. The sample in this estimation is the same as was used for Table 8, all GTFs from the year 2002 to 2008. In all regressions, I control for log employment and a full set of interactions of NAICS 3-digit industry and year fixed effects.

Table 10. Impact of Imported Intermediate Inputs on Productivity Growth

	Dependent variable: Δlog (labour productivity)			
	(1)	(2)	(3)	(4)
Imported inputs to exports ratio (I/X)	0.004**	0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Both-in-both dummy (D)	-	0.043**	0.031**	0.011**
		(0.012)	(0.003)	(0.003)
Interaction (I/X) × D	-	0.024**	0.002	0.002
		(0.001)	(0.002)	(0.003)
Capital per worker	-	-	0.205**	0.175**
			(0.010)	(0.011)
R-squared	0.253	0.398	0.399	0.430
# observations	78 684	76 678	75 287	55 159

Data are for the period between 2002 and 2008 and only GTFs, one-way traders are excluded. All regressions use robust standard errors. An asterisk denotes significance level (**: p<1%, and *: p<5%).

Spec 1, which uses only imported intermediate inputs to export (I/X) ratio as an explanatory variable, shows that firms that use a larger ratio of I/X have higher labour productivity levels: a 10% increase in I/X ratio is associated with 0.04% higher labour productivity growth.[25] In the next regression we introduce the BIB dummy and its interaction with the I/X ratio. The results are revealing. The coefficient on the dummy implies that the labour productivity of BIB GTFs increased 4.3% faster than that of other GTFs. Also, the labour productivity growth of BIB GTFs was positively related with an increase in the GVCs measure. According to the coefficient of the interaction dummy, doubling the GVCs is associated with an increase in productivity growth of 2.6% (= 0.001 + 0.025) for a BIB GTF but only a 0.1% increase (this is also not significant statistically) for other GTFs. Even after controlling for capital labour ratio in

spec 3, the productivity (TFP) growth of BIB is 3% higher than that of other GTFs. However, once we control for capital intensity, not only the coefficient on the dummy falls but also the significance of the interaction term vanishes, implying that on average BIB GTFs are more capital intensive. Spec 4 is the same as spec 3 (which includes all goods trading GTFs) but only for manufacturing GTFs. Comparing specs 3 and 4, we see that the faster productivity growth for the BIB GTFs came mainly from the non-manufacturing sector (agriculture, mining, and some services), as productivity growth for BIB GTFs in the overall economy (spec. 3) is 3%, whereas that for the manufacturing BIB-GTFs is only 1% (spec. 4).

Quantification: The results in column 2 of Table 10 show that the I/X coefficient of BIB GTFs with respect to labour productivity growth is 2.4% faster than that of other GTFs. During the sample period (2002–2008), the share of imported inputs in exports increased by 3 percentage points, from 55% to 58% (an increase of 0.9% annually). This implies a faster labour productivity growth of BIB GTFs by about 0.022% per year (= 0.009 × 2.4%) because of their participation in GVCs, compared to other GTFs. If we want to know the contribution of BIB in Canada's labour productivity growth, we need to combine its direct and interaction coefficients. By adding these two coefficients, the labour productivity of BIB GTFs increased by 4.322% (= 4.3 + 0.022) faster per year than that of other GTFs, whose productivity growth was not different from that of one-way traders.

What was the role of these BIBs in Canada's overall labour productivity growth? To answer this question, we make a reasonable assumption that during the sample period (2002 – 2008) the labour productivity of all other firms in the economy that were not trading grew at the same rate as that of the one-way traders. Then we have only two types of firms in the economy, BIB and non-BIB (labelled as NBIB). The BIB firms were employing about 10% of Canada's total business sector labour force.[26] We also know that Canada's business sector labour productivity during the sample period increased by 0.7% annually. By indicating the productivity growth of NBIB firms by g_{NBIB} and that of BIB byg_{BIB}, the aggregate productivity growth equation for Canada's business sector can be written as $0.7 = 0.9(g_{NBIB}) + 0.1(g_{BIB})$. Since g_{BIB} = (g_{NBIB} + 4.32), we have $0.7 = 0.9(g_{NBIB}) + 0.1(g_{NBIB} + 4.32)$. Solving it, g_{NBIB} = 0.27. This means that non-BIB firms contributed 0.27% of 0.7% growth and BIB firms contributed 0.43% of 0.7% of growth. Even though BIB GTFs employed only 10% of the labour force of the business sector, they contributed 60% (= 0.43/0.7) of the labour productivity growth that Canada achieved during 2002 to 2008.

Basically, both sets of GTFs, following two different methods of introducing heterogeneity, lead us to very similar results. This indicates that no matter which way we form the subset, the result that some GTFs have faster productivity growth compared to other GTFs and in turn one-way traders is robust.

7. Conclusions

The paper links five large micro databases to study the behaviour of Canadian goods exporting and importing firms. Data on exports and imports by a detailed Harmonized System product code, destination (export), and source (import) countries are taken from the Exporter Register and Importer Register. Firm-level revenue and tangible capital are taken from the General Index of Financial Information database. The T2-Longitudinal Employment Analysis Program database is used for payroll and employment, and the Business Register is used to determine the foreign-control and Canadian-control status of the firms. The data on revenue, employment, and intangible capital allows me to compute not only labour productivity but also the total factor productivity for trading firms. The study covers seven years, from 2002 to 2008.

I examine characteristics of firms that both export and import (called globally trading firms or GTFs) vis-a-vis firms that either only export or only import. The results show that the GTFs are larger, more capital intensive, pay higher wages, trade more goods, and trade with a larger number of countries

than one-way traders. These performance advantage for GTFs were there even several years prior to their becoming GTFs. Compounding their advantages, their growth was faster in the years leading up to becoming GTFs in many of these performance measures (except productivity and wage). Faster growth in productivity and other performance measures was found to be a contributing factor to turning into a GTF. All these findings confirm that past success leads to one-way traders turning into GTFs.

This indicates that there is self-selection since more productive firms turn into GTFs. Then the paper examines whether there are "learning-by-turning-GTFs". Even though as a group the GTFs, compared to one-way traders, did not have faster productivity growth after they turned into GTFs, a subset of them did. I identify the subset of such GTFs by computing firm-specific imported inputs in its exports—the measure of the firm's global value chains (GVCs)—one of the novelties of the paper, and link this with the firm's productivity growth. I introduce GTFs' heterogeneity in two ways depending on first, where they imported from (source-country heterogeneity) and second, what types of products they traded (traded-product heterogeneity).

Based first on heterogeneity, only GTFs that imported from all four major trading partners (China, other developing countries, the US, and other OECD countries), which constituted 28% of GTFs and 45% of trade, had a positive association between use of GVCs and productivity growth. For these firms, a 1% increase in import to export ratio led to 0.04% labour productivity growth compared to those that imported only from the US or any other combination of countries and regions.

Alternatively, using a more refined measure of GVCs—the ratio of imported intermediate inputs to exports—I introduced a second type of heterogeneity. In this case, the GTFs that were engaged in both exporting and importing and both final and intermediate goods increased their productivity by 4.32% faster per year than that of other GTFs, whose productivity growth was not different from that of one-way traders.

Endnotes

[1] Although in Canada only 58% of exporters and 18% of importers are GTFs, they contribute 80% of exports and 82% of imports. One-way traders contribute less than one-fifth of two-way goods trade.

[2] 27% of GTFs imported from these four countries/regions and they contributed close to 70% of all trade by GTFs. So they were very large traders.

[3] The remaining share not covered can be attributed to very small exporter (and importer) establishments, many of which are unincorporated businesses, individuals, or institutions whose trade patterns are irregular and difficult to monitor. Exports and imports reported in Chapter 99 of the HS System, which are most likely for non-business use, are not included. For exports, transactions valued at less than $2000 to countries other than the US are not required to report to the Canada Border Services Agency, and therefore are not reported in the database.

[4] There is a total of 107 NAICS 3-digit industries (14 in primary industries, 32 in manufacturing, and 61 in services).

[5] Exporting and importing is a rare activity. For some perspective, in the business sector in Canada there were about million firms in 2008, and out of that only 48 699 (about 5%) were exporters, and 158 644 (16%) were importers.

[6] Since the focus of the paper is to evaluate the productivity behavior of the firms that have production plants, firms that were engaged only in wholesale activities (with no production plant) have been excluded from the sample. They contributed about 12% of two-way trade.

[7] With 107 NAICS 3-digit industries and 7 years of data, there are more than 700 fixed effects. I do not use firm fixed effects because the data vary by firm and year only and using firm effects will leave the

data no choice but to define the coefficients only by time variation. As the objective is to understand how the outcomes differ by firm characteristics (being a GTF), I would like to maintain the firm variations in the estimation.

[8] As the differences between one-way traders and GTFs are often large, the log approximation can underestimate considerably the size of these differences. The right way to calculate the difference would be [exp (β1) – 1]*100. For example, in the case of employment it would be 105%, not 72%, because [exp (0.72) -1] = 105.

[9] As the coefficient on employment is higher than the coefficient on exports, had we run a regression for export per employment, the coefficient on the dummy would have been -17 (the difference between coefficients on export and employment), indicating lower export per employee by GTFs, compared to the reference group. So, exports increased with employment but not in the same proportion. But once we controlled for size, per employee exports were larger for GTFs compared to exporters-only.

[10] In the raw data, the average number of exported products per firm was 4.6 (at the HS 8-digit level), with 3.5 for exporters-only and 5.6 for GTFs. With size control, GTFs exported 15% more products (about one more product) than exporters-only. Similarly, as per firm export destination countries were 2.3 (2.7 for GTFs and 1.8 for exporters-only), the similarly sized GTFs went into slightly more countries than exporters-only. In a given year in the sample period, a firm imported about 16 (HS-10 digit) products and sourced them from about four countries.

[11] Roberts and Tybout (1997) find that only the most productive firms find it profitable to incur the extra cost to be exporters, compared to non-exporters. Using data for Mexico, Columbia, and Morocco, Clerides et al (1998) and Bernard and Jensen (1999) using US data, find evidence of self-section but no evidence of differences in productivity growth between exporters and non-exporters. However, Van Biesebroeck (2005) and de Loecker (2007) find evidence of productivity improvement after a firm starts exporting. An excellent discussion of these studies is in Greenaway and Kneller (2007).

[12] Among them, 1325 were in operation in 2002; 1446 in 2003; 1648 in 2004; 1885 in 2005; 2240 in 2006; 2787 in 2007, and 3721 in 2008 (the numbers are cumulative over years, and they turned into GTFs in 2008).

[13] Industry-level price deflators may not be enough to control for the fact that output and factor prices might be different and/or evolve differently over time across firms within an industry. Particularly, it might be different for GTFs and firms that are engaged in one-way trading. However, since price data at the firm-level are not available, there is no way to improve in this measure.

[14] The numbers of observations fall substantially for several reasons. There are about 80 000 firms in the sample period (2002–2008). By excluding firms that were GTFs in 2002, the sample falls to about 60 000. The first difference and one year lag left us with 35 000. As the data are missing for different explanatory variables, at the end, we are left with only 29 000 observations. Similarly, for importers, there are a total of 500 000 firms and by taking away GTFs in 2002, we have 480 000; the growth and one year lag reduces this to 161 000.

[15] But some of them disappeared in subsequent years as they either turned into one-way traders or stopped trading altogether. As a result, the number of dummies in each year grew slower than the number of new entries as GTFs in each year. For example, in 2003, the number of GTF dummies was 5656; in 2004, it was 6955; in 2005, it was 7676; in 2006, it was 7830; in 2007, it was 9621, and finally in 2008, it was 10 406.

[16] If a firm starts at 2002 (S = 0) and continues till 2008 (6), then S = 6. For a firm that starts in 2003 and continues till 2008, S = 5 and for a firm that starts in 2003 and stops at 2005, S = 2 and so on.

[17] Looking at the left, out of 3721 GTFSs in 2008, 1325 were in operation even six years ago (left-most column) and within the sample period, there were a total of 18 903 firms with one year of history as one-way traders.

[18] The cumulative estimator is not exactly equal to the sum of the pure time estimator due to the unbalanced data, as N varies with s.

[19] In 2008, 29% of GTFs sourced their imports from only one market (of these, 78% did so from the US; 9% from the OECD, 6% from China, and the remaining 7% from other countries). In that year 22% each sourced their imports from two and three markets and the remaining 27% sourced from all four markets. For all the GTFs, whether they imported from one, two, three, or four markets, the US was the main source. For example, out of all GTFs, 91% of them imported from the US, either as a single source, or as part of two, three, or four source countries/regions.

[20] I also conducted similar regressions by using one-way traders rather than those that import only from the US as the reference group (in this table). The results were very similar qualitatively, implying that these results can be read vis-à-vis one-way traders. That should not be a surprise given the fact that the labour productivity growth of all GTFs (when taken as a group) was not different from that of one-way traders as shown in Tables 6 and 7.

[21] I also estimated this equation replacing the import-export ratio by an import-sales ratio, as firms use imported inputs not just for goods that are exported but also for goods that are used for domestic consumption. The import-export ratio will not be able to capture the second component whereas the import-sales ratio does. The results did not change in any significant way. Alternatively, I also estimated this equation by introducing dummies by country/region. For example, I evaluated whether firms that are importing from China (either only from China or China and other countries) are growing faster in productivity. I could not reject the null that these firms are not different from those that imported only from the US.

[22] Import data on the HS 10-digit were first aggregated into HS 6-digit and then using the HS 6-digit concordance—between HS2007 and broad economic category (BEC) they were converted to 19 BEC categories. I was able to convert all imports in 2008, 98% of imports in 2007, and about 92% of imports for the years 2002 to 2006 into BEC groupings. The reason for not being able to capture all imports for 2002–2007 was that some HS codes in the trade data-file were different from those in the concordance file, HS2007. This occurred because the UN has adopted three different versions of HS codes (1996, 2002, and 2007) over time and so does the data file. Hence, for the remaining data, I ran concordance HS2002-BEC, which enabled me to capture another 5–6% of imports into BEC. Therefore, at the end, almost the entire import value was captured in the concordances. Since export data were already on the HS 6-digit, I ran the concordances for imports and was able to capture almost all value.

[23] The pattern was very similar even when a similar table was prepared by source country/region, especially for the US, other OECD, China, and other developing countries. There were no substantial differences in the share changes of intermediate inputs across these countries/regions.

[24] For example, a GTF that exports intermediate-only could be engaged in any one of three on the import side (only intermediate, or only final or both intermediate and final). Similarly, a GTF that exports final goods only could be engaged in any of the three activities on imports. The same applies for a GTF that exports both types of goods.

[25] Note that the coefficient of total import to export ratio (in Table 8) was 0.003 compared to 0.004 (in spec 1) here. So, the association of imported intermediate inputs to export ratio and labour productivity is slightly stronger than that of total imports to exports ratio and labour productivity.

[26] GTFs contributed about 69% of both exports and imports and BIB contributed about 67% of GTF's trade, meaning that BIB contributed 46% of both exports and imports. As some of these firms were also involved in service industries (though doing goods trade), they were employing about 10% of the labour force.

Appendix

Table A1. Counts of Trading Firms, Traded Goods, and Trading Partner Countries

	Exports				Imports				
	Firm count	Goods count (HS 8)	Country count	Value in $billion	Firm count	Goods count (HS 10)	Goods count (HS 8)	Country count	Value in $billion
2002	50 346	5442	227	352.3	136 068	18 300	8328	233	321.9
2003	51 489	5518	230	338.1	142 211	18 248	8310	234	308.3
2004	52 906	5553	231	367.8	141 516	18 235	8314	235	327.1
2005	52 495	5562	234	388.2	147 013	18 810	8650	235	347.8
2006	51 002	5535	232	387.8	161 280	18 288	8382	236	359.9
2007	49 726	5494	230	394.7	166 605	18 152	8203	220	371.2
2008	48 699	5506	235	414.6	158 644	18 171	8180	220	379.9

Table A2. Share of Trading Firms that are Linked with GIFI and LEAP Variables

	Exports					Imports				
	Counts			Value		Count			Value	
		Linked & positive		Linked	Of which positive		Linked & positive			Linked & positive
	Linked %	Percent	Number		%	Linked %	Percent	Number	Linked %	%
2002	81.1	74.6	37 572	87.8	86.4	82.4	74.5	101 313	96.8	95.5
2003	81.0	74.2	38 223	88.0	86.8	82.0	73.8	105 000	95.9	94.5
2004	81.2	74.2	39 262	87.5	85.9	82.6	74.7	105 662	95.4	93.4
2005	80.7	74.0	38 827	83.7	82.6	81.3	74.0	108 746	95.4	94.2
2006	82.5	75.6	38 567	83.9	81.9	81.2	73.6	118 713	94.9	93.5
2007	83.0	76.3	37 925	83.8	82.3	81.6	74.8	124 581	95.4	93.7
2008	83.9	77.1	37 554	85.3	83.0	83.9	77.9	123 530	97.1	95.0
Avg.	81.9	75.1	38 276	85.7	84.1	82.1	74.7	123 603	95.9	94.3

The column “linked” provides the share of trading firms that were able to be linked with GIFI and LEAP variables and the column “linked with positive value” measures the share of trading firms that are linked and have positive value on sales and employment. For GIFI variables, our link variable is sales. There were no enterprises that had either missing or zero sales value but had information on employment and payroll.

Table A3. New GTFs by Window of Operation Years

-6	-5	-4	-3	-2	-1	Span = 0	1	2	3	4	5
					4638	2003 - 5656	2680	2277	2171	1982	1779
				2924	3382	2004 - 4275	1732	1566	1432	1251	
			2063	2362	2844	2005 - 3667	1601	1342	1145		
		1594	1796	2129	2606	2006 - 3392	1312	1124			
	1382	1569	1792	2164	2646	2007 - 3553	1386				
1325	1446	1648	1885	2240	2787	2008 - 3721					
1325	**2828**	**4811**	**7536**	**11 819**	**18 903**	**24 264**	**8711**	**6309**	**4748**	**3233**	**1779**

This table reports the distribution of GTFs, both before and after they turn into GTFs, based on the window of years of operation (the span, s). The year that the firm turned into GTFs is labelled as span = 0 (in the middle), listing the number of new GTFs in the corresponding years. The numbers of years of operation prior to becoming GTFs are labelled as *s*-*t* and those after becoming GTFS are labelled as *s*+*t*. The entries on each column on the right-hand side are the number of GTFs that were in operation with the span of year given at the top. For example, there were 8711 GTFs under span = 1, the sum of GTFs with a one-year duration (turned into GTFs anytime between 2003 and 2007). Among the 5655 GTFs that started in 2003, 2680 remained in 2004; among those that started in 2004, 1732 remained in 2005, and so on. The entries on the left-hand side under each column show how many GTFs were in operation as one-way traders before they turned into GTFs. For example, among the firms that turned into GTFs in 2003, the majority of them (4638) were in operation in 2002. Only the remaining 1018 (5656 minus 4638) were born as GTFs. Of course, they would only have one year of history (year 2002) as our data starts in 2002. But the firms that turned into GTFs in 2008 could have potentially 6 years of non-GTF history (starting from 2002) reported under -1 to -6 in the table. In this table, the GTFs in 2002 are not included as we have no way of knowing how many of them were new in 2002 and hence we do not know where exactly they fall in the time-span.

Table A4: Current BEC and SNA classes of goods

Classification by Broad Economic Categories	Basic Classes of Goods in SNA
1 - Food and beverages	
11 - Primary	
111 - *Mainly* for industry	Intermediate
112 - *Mainly* for household consumption	Consumption
12 - Processed	
121 - *Mainly* for industry	Intermediate
122 - *Mainly* for household consumption	Consumption
2 - Industrial supplies not elsewhere specified	
21 - Primary	Intermediate
22 - Processed	Intermediate
3 - Fuels and lubricants	
31 - Primary	Intermediate
32 - Processed	
321 - Motor spirit	*Not classified*
322 - Other	Intermediate
4 - Capital goods (except transport equipment), and parts and accessories thereof	
41 - Capital goods (except transport equipment)	Capital
42 - Parts and accessories	Intermediate
5 - Transport equipment and parts and accessories thereof	
51 - Passenger motor cars	*Not classified*
52 - Other	
521 - Industrial	Capital
522 - Non-industrial	Consumption
53 - Parts and accessories	Intermediate
6 - Consumer goods not elsewhere specified	
61 - Durable	Consumption
62 - Semi-durable	Consumption
63 - Non-durable	Consumption
7 - Goods not elsewhere specified	*Not classified*

Source: http://unstats.un.org/unsd/class/intercop/expertgroup/2011/AC234-25.PDF

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