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A Time to Sow, a Time to Reap: The FTA and its Impact on Productivity and Employment

COMPETING CONTENTIONS – IS THERE NOW A VERDICT?

THE CANADA-U.S. FREE TRADE AGREEMENT (FTA) remains one of the most contentious pieces of economic legislation ever enacted in Canada. Remarkably, the FTA is far from being viewed as a success by either end of the political spectrum. The Canadian Labour Congress fingers the Agreement as the cause of job losses that tragically racked manufacturing in the early 1990s (Jackson, 1996). And even the business community complains about the ultimate FTA failure: *lagging* productivity growth (Rubin, 1997) — in apparent contradiction to the forecasted improvements in productivity that have always been at the heart of the proclaimed benefits.

While the nay-sayers dominate public discussion, the arguments, pro and con, have often been devoid of hard facts, despite efforts made by the research community to provide evidence and thoughtful analysis on the matter (e.g., Gaston and Trefler, 1994, 1997; Trefler, 1997; Head and Ries, 1997, 1999a,b; Feinberg and Keane, 1998; Feinberg, Keane and Bognanno, 1998; and Beaulieu, 2000). Clearly, the court of public opinion is not easily convinced. The jury remains out on whether the FTA productivity benefits live up to their promise and whether these benefits compensate sufficiently for any employment and business losses. Consequently, two questions still beckon: Is it possible to summon clear, convincing evidence of the FTA's impact? Is it possible to separate out the *real* from the *perceived*, and facts from appearance?

Trefler (2001) takes us a long way towards providing an answer. In particular, he calculates that the FTA reduced manufacturing employment by 5 percent between 1988 and 1996, and by 15 percent in the manufacturing industries that experienced the deepest tariff cuts. On the other hand, he estimates

that the FTA raised manufacturing labour productivity by 5 percent, and by a remarkable 17 percent in the manufacturing industries hardest hit by the FTA tariff cuts.

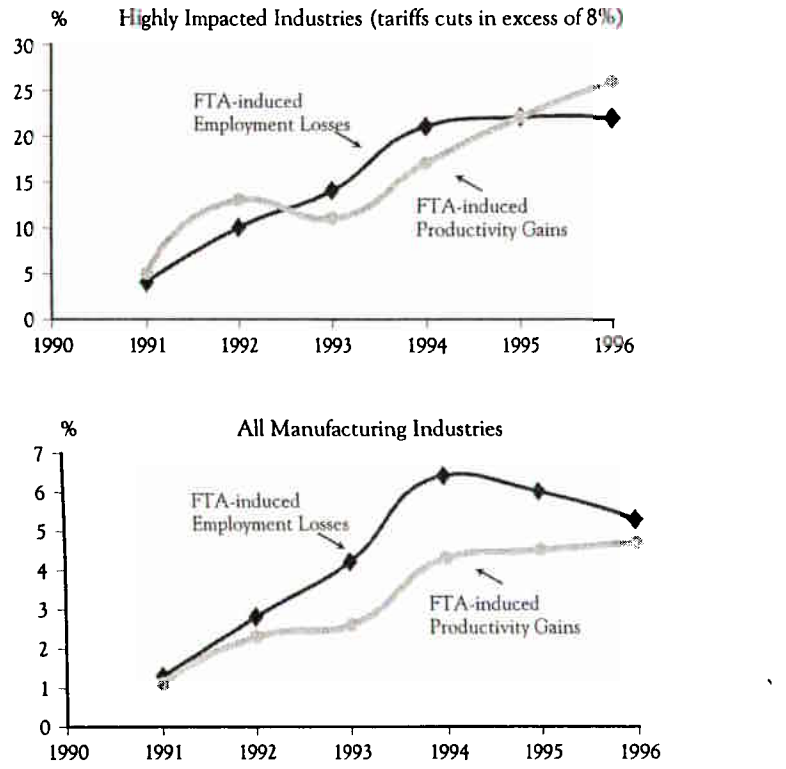
There remains, however, two unanswered questions stemming from Trefler's (2001) research. First, he asserts rather than establishes that the employment losses were a short-run and, by implication, temporary phenomenon. Second, he leaves open the question of whether there were net benefits accruing from the FTA. In particular, timing matters. For example, suppose that the employment losses were permanent and came immediately after implementation of the FTA, whereas the bulk of productivity gains came only in 1996. Then, for a policy maker with a high discount rate, employment losses could outweigh any productivity gains and the FTA could be deemed a failure.

In this chapter, we will confront the two issues left unanswered by Trefler's (2001) analysis. First, we will provide evidence that the employment losses did not significantly predate the productivity gains. The argument is illustrated in Figure 1, which plots our estimates of the FTA impact on employment and labour productivity. (We emphasize that these plots are the output of a complex estimation procedure.) Recall that the FTA was implemented on January 1, 1989. Figure 1 tracks FTA effects starting in 1991. The top panel plots the FTA impacts on those industries that, by 1996, had experienced FTA-mandated tariff cuts in excess of 8 percent. As can be seen, the employment losses arrived early and plateaued by 1994. However, the productivity gains also arrived early and, unlike the employment losses, continued accruing throughout the period. Even for all of manufacturing, illustrated in the bottom part of Figure 1, the employment losses did not arrive much earlier than the productivity gains.[1] There is thus no sense in which the employment costs were front-ended relative to the productivity gains. It follows that even our fictitious high-discount-rate policy maker should not worry about the timing of the FTA costs and benefits. Since the FTA-induced employment costs and productivity benefits accrued at roughly the same rate, any assessment of the FTA must be independent of the discount rate used.

Second, we will provide evidence that while the industries that experienced the deepest tariff cuts saw their employment level fall, the remaining industries experienced an increase in their employment level. Part of the evidence for this stems from the fact that, over the 1988-2000 period, Canadian manufacturing employment rose by 0.7 percent. In contrast, manufacturing employment declined in almost all of the most industrialized nations (for example, it fell by 4.4 percent in the United States). This implies that the FTA did not induce any permanent job losses in manufacturing. The observation of no net employment losses is entirely consistent with standard Ricardian trade theory, which predicts that free trade will shift employment out of low-end,

FIGURE 1

TIMING OF EMPLOYMENT LOSSES AND PRODUCTIVITY GAINS



Source: Authors' calculations from Tables 7 and 9.

protected industries and into high-end, unprotected industries. Re-framing our facts in the context of this theory, the permanent effect of the FTA on employment was not a reduction in employment, but a reallocation of workers toward more productive activities.

Figure 1 also provides an interesting way of looking at Trefler's (2001) results on employment and productivity. Trefler was only interested in the 1996 results. In the top panel of Figure 1, which deals with the highly impacted industries, we can see that the FTA reduced employment by an unimaginable

22 percent and raised productivity by a remarkable 26 percent. These numbers represent both the huge costs and huge benefits of the FTA.[2]

The chapter is organized as follows. The next section, entitled *What Do Simple Time-series Comparisons Show?*, provides a broad overview of Canada's key manufacturing performance indicators since the implementation of the FTA. The third, entitled *Isolating the FTA Effect – Method of Analysis and Data*, develops a modification of Trefler's (2001) methodology for assessing the impacts of the FTA. This modification allows us to look at the timing issues that are at the heart of this study. The fourth section, entitled *Findings – Productivity Growth and Employment Losses*, presents the results that underlie Figure 1. The fifth section, entitled *General Equilibrium Considerations*, critiques our approach by observing that it ignores the effect of the FTA in reallocating workers from high-tariff to zero-tariff industries. It then provides evidence on the magnitude of this effect. Our conclusions are presented in the last section.

WHAT DO SIMPLE TIME-SERIES COMPARISONS SHOW?

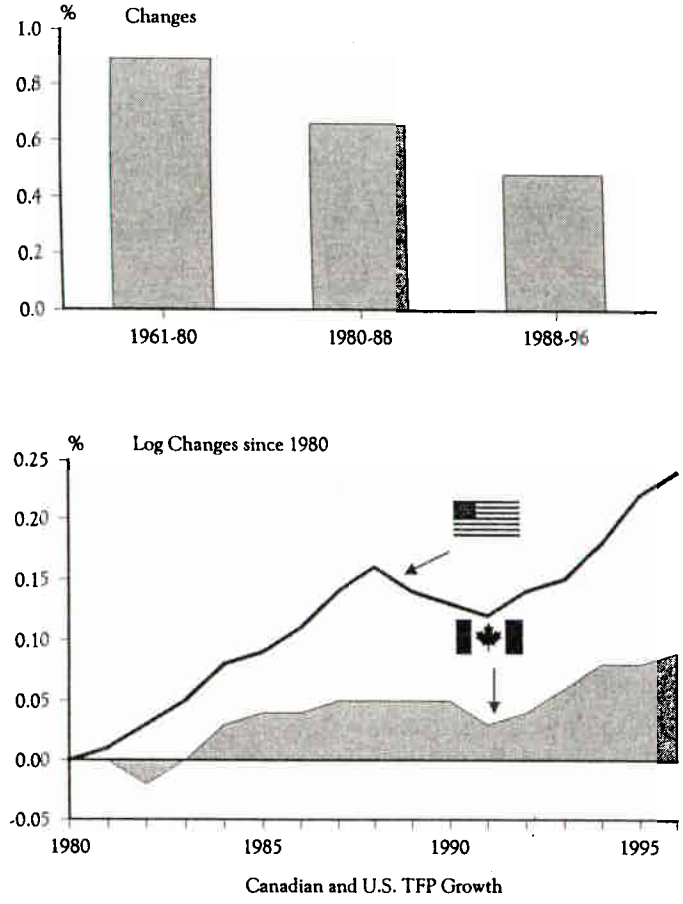
CANADA'S RECENT PRODUCTIVITY PERFORMANCE

PRODUCTIVITY IS COMMONLY MEASURED in one of two ways. Total factor productivity (TFP) measures the difference between output and the inputs of capital, labour, energy, materials and services. The top panel of Figure 2 displays movements in manufacturing TFP growth. The FTA was implemented on January 1, 1989. Figure 2 depicts changes over the 8-year FTA period (1988-96),[3] the 8-year pre-FTA period (1980-88), and the remaining period for which data are available (1961-80). 1980 and 1988 were chosen as base years for measuring changes over these periods because each marks the peak of a business expansion. Figure 2 shows that productivity growth during the FTA period has been weak relative to past performance. The bottom panel displays the now famous observation about diverging Canadian and U.S. TFP growth. In that panel, we have chosen 1980 as the base year since up until then Canadian labour productivity had tracked its U.S. counterpart very closely. (Indeed, the picture is identical if 1961 is chosen as the base year.) Whatever the productivity gap was in 1980, by 1988 it had widened by 11 percentage points, and by 1996 it had widened another 4 percentage points. Annualizing these numbers for the FTA period, the Canadian productivity growth rate of 0.5 percent was overshadowed by the U.S. productivity growth rate of 1 percent.

Since the Agreement was expected to force Canadian firms into a more competitive position vis-à-vis U.S. firms, Figure 2 is often used to argue that the Agreement was a failure. In this view, the depreciation of the Canadian dollar is the only reason why Canada has stayed competitive (Rubin, 1997).

FIGURE 2

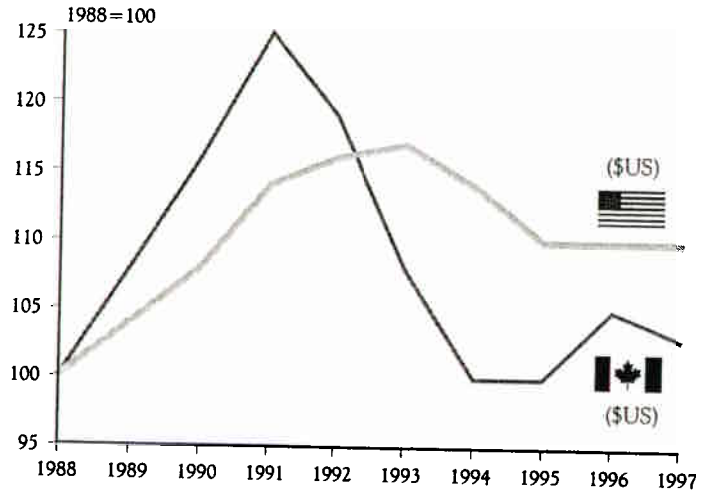
MULTIFACTOR PRODUCTIVITY GROWTH IN MANUFACTURING



Source: Canadian data are the Fisher value-added multifactor productivity (MFP) measure from CANSIM, as updated on March 23, 1999. The U.S. data are the MFP series taken from http://www.bls.gov/news.release/prod3.t01.htm, as updated on February 11, 1999.

FIGURE 3

UNIT LABOUR COSTS IN CANADA AND THE UNITED STATES



Source: Data are from the U.S. Bureau of Labor Statistics, foreign labor statistics home page, as updated on June 23, 1999.

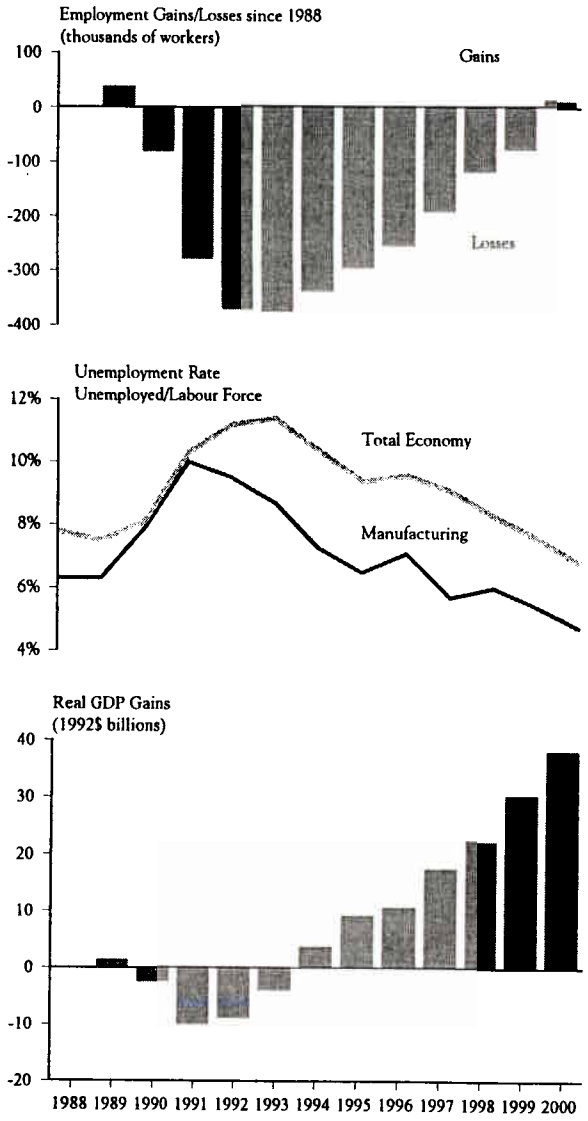
Figure 3 lends partial support to this argument. Between 1988 and 1996, Canadian relative to U.S. unit labour costs (both expressed in U.S. dollars) fell by 7 percent. However, the data series discussed next paint a picture of more solid Canadian competitiveness.

OTHER ECONOMIC INDICATORS

EARLY ON IN THE DEBATE ABOUT THE MERITS OF THE FTA, interest was focused on the collapse of manufacturing employment. The top panel of Figure 4 shows the enormous employment losses experienced in manufacturing. The left-hand scale shows the cumulative reduction in manufacturing employment since 1988. In 1993, there were almost 400,000 fewer employees in manufacturing than in 1988. This amounted to a staggering loss of 17 percent of the 1988 work force. Many have blamed the FTA for these lost jobs. From the current perspective, these losses appear to have been short-lived (which is not to minimize them). Manufacturing employment in 2000 was 0.7 percent higher than in 1988. And the middle panel of Figure 4 reveals that there has been no long-run impact on the unemployment rate in Canada overall.

FIGURE 4

MANUFACTURING EMPLOYMENT, UNEMPLOYMENT RATE AND REAL GDP



Source: CANSIM.

We also plot the unemployment rate for manufacturing. This is defined as those unemployed whose last job was in manufacturing divided by manufacturing employment. Both overall and for manufacturing, unemployment rates were actually lower in 2000 than in the boom year 1988 that immediately preceded implementation of the FTA.

Some commentators have argued that the unemployment rate is not relevant because the FTA forced a rise in part-time employment. Given the rise of part-time employment in Canada, so the argument goes, many of those who worked full-time in 1988 may now be working part-time because of the FTA. This possibility is not backed up by the data on average weekly hours in manufacturing. Weekly hours stood at 38.9 in *both* 1988 and 2000.[4]

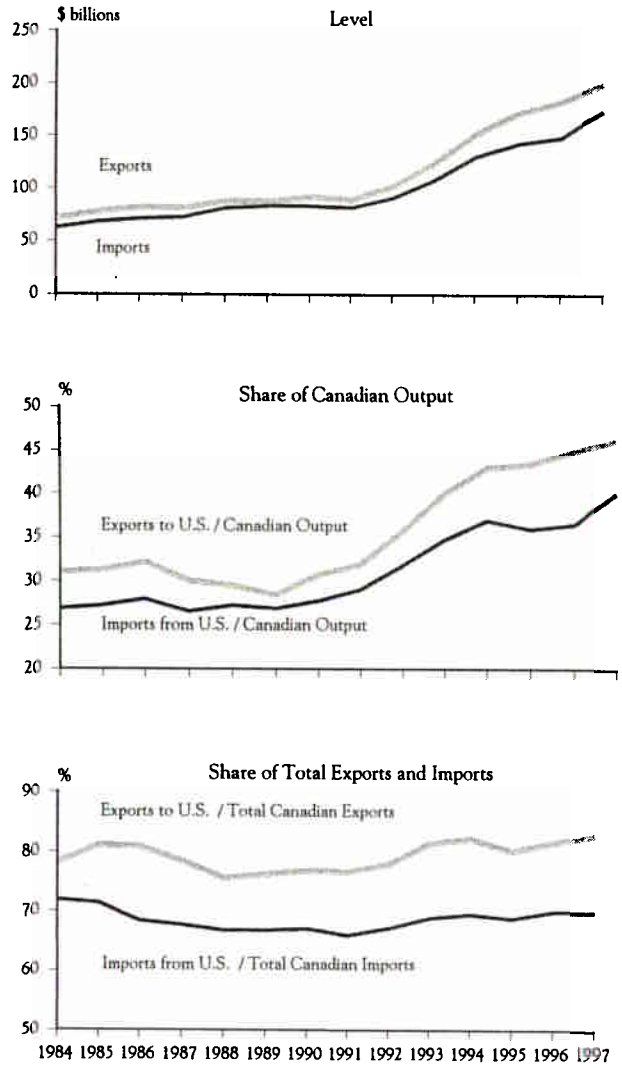
The bottom panel of Figure 4 plots real GDP for manufacturing. One can again see the large hit to manufacturing of the early 1990s followed by a strong recovery. At the trough in 1991, manufacturing GDP was down 10 percent from its 1988 level. By 2000 it was up 36 percent from its 1988 level. The information about employment and real GDP do not sit well with indicators of poor Canadian productivity growth. Figure 4 tells a story of rising GDP per worker. The fact that manufacturing employment, output and unemployment rates have all sharply improved since the recession of the early 1990s is suggestive of an FTA-induced restructuring of Canadian manufacturing. This strengthens the economic outlook for Canada's manufacturing sector under free trade.

Another piece of evidence that is hard to reconcile with the contention that the FTA had a negative impact on employment and productivity appears in Figure 5. There was unprecedented export and import expansion throughout the 1990s (see the top panel of Figure 5). This growth cannot be explained by exchange rate movements because imports should have declined as a result of the Canadian dollar devaluation. The middle panel of Figure 5 shows that trade growth outstripped growth in manufacturing output. The Canadian ratio of trade to output of close to 40 percent makes Canada one of the most open economies in world history. One would not expect lagging productivity to be associated with an export boom. The bottom panel shows that since 1988, the United States has increased its share of Canadian trade. This trade-diversion effect is precisely what the FTA is expected to do.

To recap, a simple time series comparison of productivity in the years before and since the implementation of the FTA may lead to an unjust indictment of the FTA's impact. Many other series, such as the enormous manufacturing boom in GDP, GDP per worker, and exports to the United States all actually paint a picture of strong productivity performance.

FIGURE 5

CANADIAN IMPORTS FROM AND EXPORTS TO THE UNITED STATES



Source: Authors' calculations.

Isolating the FTA Effect – Method of Analysis and Data

A DEFECT OF THE PREVIOUS SECTION'S ANALYSIS was its reliance on aggregate time series. By implicitly attributing all post-1988 trends to the FTA, the analysis ignored the role of other sources of change. In this section, we will use more sophisticated econometric techniques to isolate the role of the FTA. Let $i = 1, \ldots, 213$ index the 213 industries in our sample, let t' index years, and let $Y_{it'}$ be employment or labour productivity of industry i in year t'. The FTA was implemented on January 1, 1989. Let's define

$$(1)\quad \Delta y_{i1}(t) \equiv (\ln Y_{i,1988+t} - \ln Y_{i,1988})/t \quad \text{and} \quad \Delta y_{i0}(t) \equiv (\ln Y_{i,980+t} - \ln Y_{i,1980})/t.$$

$\Delta y_{i1}(t)$ is the average log point change in $Y_{it'}$ over the first t years of the FTA period. $\Delta y_{i0}(t)$ is the average log point change in $Y_{it'}$ over the first t years since 1980. Note that t' is a year while t is the number of years since either 1980 or 1988. We have data for the FTA period (1989-96) and the pre-FTA period (1980-88). Let s index periods, with $s = 1$ being the FTA period and $s = 0$ being the pre-FTA period. Then, we may compactly capture the above with the notation $\Delta y_{is}(t)$, $s = 0,1$ and $t = 1, \ldots, 8$. Note that $\Delta y_{is}(t)$ is expressed as an annual compound growth rate.

Let $\tau_{it'}^{US}$ be the Canadian tariff against the United States in industry i in year t' and let $\tau_{it'}^{ROW}$ be the Canadian tariff against the rest of the world. Then $\tau_{it'}^{US} - \tau_{it'}^{ROW}$ is the FTA-mandated preferential tariff concession extended to the United States. Its average annual change during the first t years of the FTA period ($s = 1$) is

$$(2)\quad \Delta\tau_{i1}^{FTA}(t) \equiv \left((\tau_{i,1988+t}^{US} - \tau_{i,1988+t}^{ROW}) - (\tau_{i,1988}^{US} - \tau_{i,1988}^{ROW})\right)/t.$$

For the pre-FTA period, tariff rates were extended on a most-favoured nation (MFN) basis, at least in industries that were not covered by the Auto Pact. Mathematically, for non-Auto Pact industries i and for years $t' \leq 1988$, $\tau_{it'}^{US} - \tau_{it'}^{ROW} = 0$ and $\Delta\tau_{i0}^{FTA}(t) \equiv 0$. We will not need to define $\Delta\tau_{i0}^{FTA}(t)$ for Auto Pact industries because these industries will be eliminated when it comes to estimating our econometric model. We do this in order to ensure that our results are not driven by the automotive sector. As it turns out, however, our results are the same whether or not that sector is included in the econometric work. We will return to this point below.

Examining the FTA-mandated Tariff Concessions ($\Delta\tau_{i1}^{FTA}$)

IT IS NATURAL TO ASK whether the FTA tariff cuts were deep enough to have mattered. After all, the average tariff rate against the United States in 1988 in manufacturing was 4.5 percent, a level too low to have had much effect. However, Trefler (2001) makes the following points:

- Tariffs tend to be lowest on less-processed manufactures and highest on processed ones. For Canada, this means that the tariff rate understates the effective rate of protection. Indeed, Canada's average manufacturing tariff rate has historically been half that of its effective rate of protection.
- The pre-FTA distribution of tariff rates across industries was highly skewed, with many industries facing steep tariff rates. For example, of the 213 4-digit Standard Industrial Classification (SIC) industries in Canadian manufacturing, 54 were sheltered behind a tariff in excess of 10 percent. By 1996, no industry had tariffs in excess of 10 percent. For low-end manufacturing, where profit margins are tight, this represents very steep tariff cuts indeed.
- The FTA called for reductions not only in Canadian tariffs against the United States, but also in U.S. tariffs against Canada, and various forms of non-tariff barriers to trade between the two countries. In this regard, it is important to note that the structure of tariffs across industries is similar in Canada and the United States, and that protected industries often receive both tariff and non-tariff protection. Thus, the FTA-mandated Canadian tariff cuts are highly correlated both with the cuts in non-tariff barriers to trade and with the U.S. tariff cuts. In a regression setting, this means that the coefficient on $\Delta\tau_{i1}^{FTA}$ will also be picking up these other effects. That is, our tariff variable will be capturing the broader aspects of the FTA.

The bottom line is that $\Delta\tau_{i1}^{FTA}$ will be capturing FTA effects that are far from being too small to matter.

Inference in a Non-experimental Setting

THE ECONOMETRIC WORK IN THIS PAPER is all about correlating $\Delta\tau_{i1}^{FTA}$ with Δy_{i1}, where Δy_{i1} is the FTA-period change in either employment or labour productivity. In studying this issue it is tempting to draw an analogy with a clinical drug trial. In such a trial, patients are randomly allocated between the treatment and control groups. In our setting, industries facing steep tariff cuts are

being treated to the *drug* of free trade. However, the analogy does not go very far because industries that receive the drug (mainly low-end manufacturing) are and were very different from those where tariffs were not cut (high-end manufacturing). Restated, there is no randomization of industries into treatment and control groups. As a result, any difference between the *treated* and *untreated* industries may be spurious: The industries that experienced the deepest tariff cuts may have had non-FTA related characteristics that may have led to falling employment and rising productivity. Ignoring the difference in group characteristics may lead one to incorrectly attribute falling employment and rising productivity to the FTA.

Before reviewing these differences, Table 1 shows the classification of industries into groups that will be used throughout this paper. We divide the industries into four groups, based on the depth of the FTA-mandated tariff cuts between 1988 and 1996. Note that we put a minus sign in front of $\Delta\tau_{i1}^{FTA}$ in order to convert it into a positive number.

We now turn to examining the differences between these four groups. We know that if there were random assignment of industries into the four groups, then the characteristics of these groups would be identical. However, Table 2 shows that this is not the case. In fact, each indicator trends strongly with the depth of the tariff cut. Consequently, we can focus our attention solely on the heavily impacted versus non-impacted industries (and avoid reporting results for the moderately and lightly impacted industries). From Table 2, it is clear that the deeper the FTA-mandated tariff cut, the lower was the industry's labour productivity, capital-labour ratio, and output per plant in 1988. Table 2 also reports results for production and non-production workers. Production workers are involved in shop-floor activities and are less educated on average than non-production workers. Non-production workers include employees in management and other activities that are not directly related to production. In Table 2, we can see that the deeper the tariff cut, the lower were the wages and

TABLE 1

DEFINITION OF INDUSTRY GROUPS

	MINIMUM TARIFF CUT ($-\Delta\tau_{i1}^{FTA}$)	MAXIMUM TARIFF CUT ($-\Delta\tau_{i1}^{FTA}$)	NUMBER OF INDUSTRIES (OBSERVATIONS)
Heavily Impacted Industries	8%	33%	34
Moderately Impacted Industries	4%	8%	51
Lightly Impacted Industries	1%	4%	56
Non-impacted Industries	0%	1%	72

TABLE 2

AVERAGE INDUSTRY CHARACTERISTICS AND SIZE OF TARIFF CUTS, 1988

	HEAVILY IMPACTED INDUSTRIES	ALL INDUSTRIES	NON-IMPACTED INDUSTRIES
Industry Characteristics			
Labour Productivity	0.029	0.043	0.050
Capital/Labour	0.015	0.044	0.061
Output per Plant	0.008	0.027	0.052
Employment and Earnings			
Hourly Wages of Production Workers	$10.92	$14.04	$15.26
Weekly Hours of Production Workers	41.4	41.8	42.2
Annual Earnings of Non-production Workers	$39,017	$42,950	$44,303
(non-production workers)/(all workers)	18%	25%	29%
Trade Characteristics			
Imports from United States/Total Imports	31%	61%	69%
Imports from United States/Canadian Output	9%	28%	51%

Note: All data apply to 1988. Cell entries are unweighted averages across all industries in the group. See Table 1 for the definition of the groups.

weekly hours of production workers, the annual earnings of non-production workers, and the ratio of non-production workers to the total number of workers in 1988. Finally, the deeper the tariff cut, the lower the level of imports from the United States that same year. This is true relative to total imports and relative to Canadian (domestic) production. Clearly, in 1988 the heavily impacted industries looked very different from the non-impacted industries.

TESTING THE EFFICACY OF THE FREE-TRADE "DRUG"

IN A CLINICAL TRIAL SETTING, the average characteristics of patients in the treatment group are identical to the average characteristics of patients in the control group. This is the result of random assignment. In our non-experimental setting, there is a commonly used strategy for dealing with the fact that groups differ in their characteristics. We turn to this now.

We are interested in a regression model that explain the impact of FTA tariff cuts on the growth rates of employment and productivity. For each t, we will examine a model of the form:

$$(3)\quad \Delta y_{is}(t) = \alpha_i + \alpha_s + \beta\Delta\tau_{is}^{FTA}(t) + \gamma\Delta y_{is}^{US}(t) + \delta_i\Delta\chi_s(t) + \varepsilon_{is},$$
$$s = 0, 1 \text{ and } i = 1, \ldots, N.$$

α_i, α_s, Δy_{is}^{US}, and $\delta_i \Delta z_s$ are regressors that control for the fact that heavily impacted industries are different from non-impacted industries. We will briefly explain each of these regressors. However, before doing so note that Equation (3) will be estimated separately for each t, that is for each choice of number of years in the FTA period (1988, 1988 + t). This will allow us to investigate the timing of the effects of the FTA. This constitutes our new econometric contribution.

Controlling for Secular Growth (α_i)

Figure 6 illustrates a potential pitfall for efforts to assess the FTA. The figure plots the evolution of employment in some fictitious industry, say women's garments, from 1980 to 1996. Looking just at the FTA period, one sees that as the tariff came down, so did employment. The obvious inference is that the FTA reduced employment. Clearly, this inference is misleading: a look at the pre-FTA period shows a secular downward trend unrelated to the FTA.

Figure 6

Secular Growth

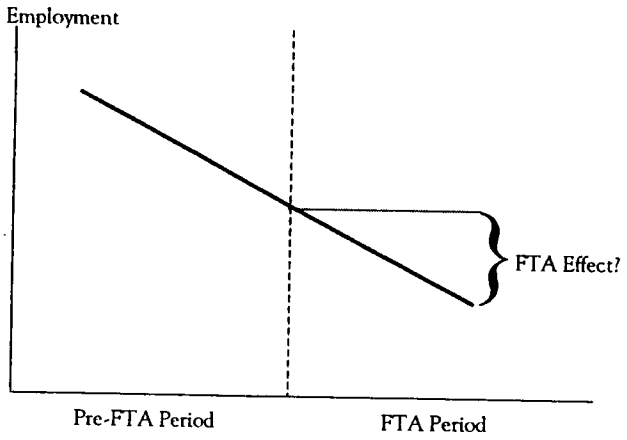


Table 3

Highly Impacted Industries Displaying Secular Behaviour (Figure 6)

	Employment Growth, FTA Period (Δy_{i1})	Employment Growth, Pre-FTA Period (Δy_{i0})	Tariff Cut, FTA Period ($-\Delta \tau_{i1}^{FTA}$)
	(Percentage Rate)		
Women's Blouse and Shirt Industry	-17	-19	9
Women's Dress Industry	-12	-6	16
Women's Coat and Jacket Industry	-10	-10	16
Shipbuilding and Repair Industry	-8	-8	24
Men's and Boys' Coat Industry	-6	-6	14

Notes: Industries are defined at the 4-digit SIC level. For Δy_{i1} and $\Delta \tau_{i1}^{FTA}$, changes are over 1988-96. For Δy_{i0}, changes are over 1980-86.

If all the industries that experienced deep tariff cuts just happened to look like our Figure 6 industry, then we would mistakenly attribute employment losses to the FTA. What makes this possibility worrisome is that there is every reason to think that Figure 6 is representative. Sluggish growth or even decline is an important factor determining an industry's ability to lobby successfully for protection. This political economy effect is well documented (e.g. Trefler 1993). Thus, industries that declined in the pre-FTA period likely had high tariffs in 1988 and hence deep FTA-period tariff cuts. Table 3 provides examples of these industries.

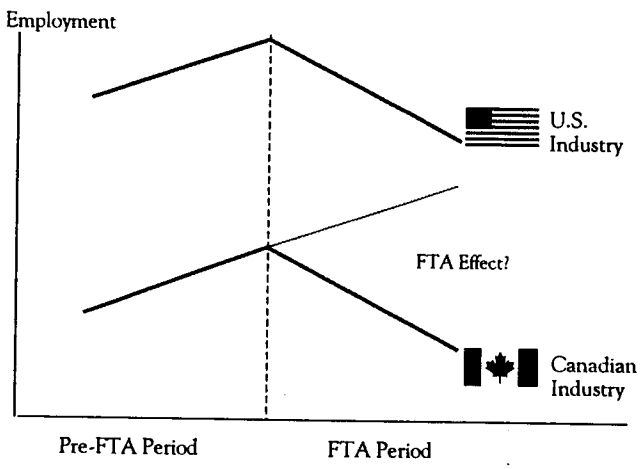
To prevent secular growth trends from being imputed to the FTA tariff cuts, we introduce a growth fixed effect, α_i, into Equation (3). As a result, our analysis only picks up growth effects that are departures from trend growth. This is important: The aggregate time-series trends in employment and labour productivity that underlie the analysis of the second section will be irrelevant in the following econometric analysis.

Taking into Consideration Idiosyncratic Shocks (Δy_{is}^{US})

Figure 7 illustrates a different type of problem, one that arises from putting too much stock in secular trends. In the fictitious Canadian industry illustrated in Figure 7, there is employment growth up to the implementation of the FTA and a decline afterwards. The secular trend argument of Figure 6 leads one to think that, in the absence of the FTA, the industry would have continued growing at a rate given by the grey line. That is, the difference

FIGURE 7

IDIOSYNCRATIC SHOCKS



between the Canadian and grey line would be viewed as employment losses attributable to the FTA. Now consider the top line in Figure 7, which shows the U.S. counterpart of our fictitious Canadian industry. This fictitious U.S. industry takes a sharp employment hit during the FTA period. This may be due to technical change that made its product obsolete or to new competition from Korea, or to one of many other possible demand and supply shocks that were *idiosyncratic* to the industry during that period.

Examples of industries that behaved as in Figure 7 are common. Table 4 lists a number of such industries that belong to the highly impacted group. In each case, failure to control for idiosyncratic shocks would lead one to incorrectly attribute Canadian labour productivity gains to the FTA. To avoid this, we control for idiosyncratic supply and/or demand changes by introducing a U.S. control variable, Δy_{is}^{US}, into the regression of Equation (3). Δy_{is}^{US} is the U.S. counterpart to Δy_{is}. For example, if Δy_{is} is Canadian employment growth, Δy_{is}^{US} is U.S. employment growth. Trefler (2001) examines the endogeneity of Δy_{il}^{US} and provides abundant evidence that endogeneity is not empirically important.

TABLE 4

HIGHLY IMPACTED INDUSTRIES DISPLAYING IDIOSYNCRATIC BEHAVIOUR (FIGURE 7)

	CANADIAN LABOUR PRODUCTIVITY GROWTH, FTA PERIOD (Δy_{i1})	U.S. LABOUR PRODUCTIVITY GROWTH, FTA PERIOD (Δy_{i1}^{US})	CANADIAN LABOUR PRODUCTIVITY GROWTH, PRE-FTA PERIOD (Δy_{i0})	TARIFF CUT, FTA PERIOD ($-\Delta\tau_{i1}^{FTA}$)
	(PERCENTAGE RATE)			
Fur Goods Industry	-15	-12	5	10
Luggage and Handbag Ind.	-8	-9	0	8
Footwear Industry	-8	-8	1	13
Children's Clothing Ind.	-7	-10	2	16
Other Clothing and Apparel Industry	-5	-4	3	10
Sweater Industry	-5	-9	6	16
Other Office Furniture Ind.	-1	-3	10	9

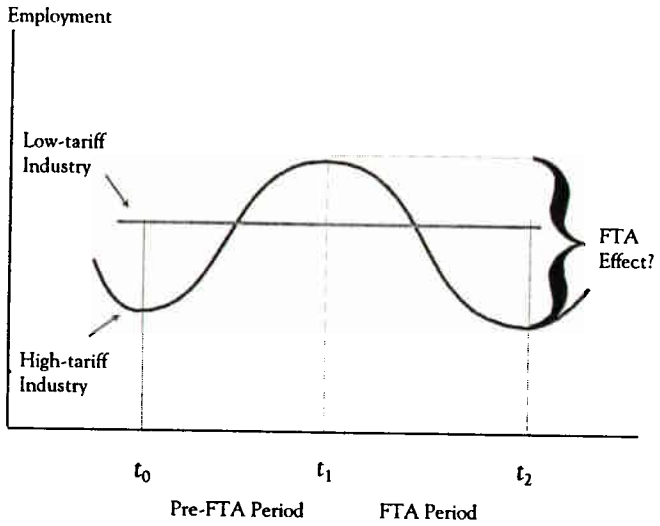
Notes: Industries are defined at the 4-digit SIC level. For Δy_{i1}, Δy_{i1}^{US} and $\Delta\tau_{i1}^{FTA}$, changes are over 1988-96. For Δy_{i0}, changes are over 1980-86.

CYCLICALITY AND BUSINESS CONDITIONS (ΔZ_s)

A KEY ISSUE IN EXAMINING THE FTA is the treatment of the early 1990s recession. The recession started in 1989 and GDP did not recover to 1988 levels until 1993. A major problem arises from the fact that industries differ both in terms of their sensitivity to business cycles and in terms of the peak-to-peak timing of their cycles. Figure 8 illustrates the problem using two fictitious industries. To make matters as clear as possible, our fictitious low-tariff industry features no cyclicality and is represented by a straight line in Figure 8. In contrast, our Figure 8 high-tariff industry is cyclical. Suppose that we examine employment changes over the period going from t_1 to t_2. We would observe no employment losses in the low-tariff industry and large employment losses in the high-tariff industry. However, if we compared year t_2 with a comparable point on the pre-FTA business cycle (i.e. year t_0), a different conclusion emerges. Again, to keep things simple, we have drawn Figure 8 so that employment is down by the same amount at both t_0 and t_2. In this case, the correct inference is thus that the FTA had no impact.

FIGURE 8

CYCLICALITY AND BUSINESS CONDITIONS



In practice, as opposed to our fictitious example, it is not possible to guess at the direction of bias introduced by cyclicality. The main message is only that one must control for cyclicality. General business conditions can be introduced into Equation (3) by including a regressor $\Delta z_s(t)$ that measures movements in GDP, the exchange rate, Canada-U.S. interest rate differentials, and other macro variables. The s subscript indexes the period while the t argument indexes the number of years into the period. $\Delta z_s(t)$ has no industry subscript. However, the impact of these macro variables will vary from industry to industry. Thus, in Equation (3), $\Delta z_s(t)$ has a coefficient, δ_i, that varies across industries.

DOUBLE DIFFERENCING

WE HAVE NOW FINISHED EXPLAINING EQUATION (3). We repeat it here for reference. For each t,

$$(4)\quad \Delta y_{is}(t)=\alpha_i+\alpha_s+\beta\Delta\tau_{is}^{FTA}(t)+\gamma\Delta y_{is}^{US}(t)+\delta_i\Delta z_s(t)+\varepsilon_{is},$$
$$s = 0, 1 \text{ and } i = 1, \ldots, N.$$

With N industries and 2 periods, there are $2N$ observations. However, there are $2N + 4$ parameters for each t.[5] To eliminate the α_s, we follow the usual approach of differencing across periods. Further, by judicious choice of t's, we can also eliminate the $\delta_i\Delta z_s(t)$. The argument is as follows.

From Table 5, one can see that the 1980-86 and 1988-96 periods had many common elements. The start year of each was the end year of a prolonged expansion. The second year of each ushered in a deep recession that reduced manufacturing GDP by 10 percent. The major difference between the two recessions is in their length. After these recessions, GDP growth was similar in both periods. Since our sample ends in 1996, this means that GDP growth was similar over the 1983-86 and 1993-96 periods.

The upshot of all of this is that we have identified common periods in the two business cycles. These are shown in panel B of Table 5. First, 1980 and 1988 were comparable points on the two cycles. Second, $1980+t-2$ and $1988+t$ (for $t = 5, 6, 7, 8$) were comparable points on the two cycles. It follows that $\Delta z_1(t) = \Delta z_0(t-2)$ for $t = 5, 6, 7, 8$.

If we now difference Equation (4) across periods, we obtain:

$$(5)\quad \left(\Delta y_{i1}(t)-\Delta y_{i0}(t-2)\right)=\alpha+\beta\Delta\tau_{i1}^{FTA}(t)+\gamma\left(\Delta y_{i1}^{US}(t)-\Delta y_{i0}^{US}(t-2)\right)+v_i$$
$$t = 5, 6, 7, 8 \text{ and } i = 1, \ldots, N.$$

TABLE 5

MATCHING THE BUSINESS CYCLE

PRE-FTA PERIOD	FTA PERIOD	
PANEL A – COMPARISON ACROSS PERIODS		
1980	1988	Year of robust growth
1981	1989	Peak of the business cycle
1982	1990-92	Deep recessions
1983-86	1993-96	Manufacturing GDP off by 10% in both periods Expansionary periods Manufacturing GDP growth similar in both periods
PANEL B – YEAR-BY-YEAR MATCH		
1980-83	1989-93	
1980-84	1989-94	
1980-85	1989-95	
1980-86	1989-96	

Note: The FTA was implemented on January 1, 1989. The year 1988 appears in the FTA-period column because it is used as the base year for calculating FTA-period changes.

where $\alpha \equiv \alpha_1 - \alpha_0$ and we have used the fact that $\Delta\tau_{i0}^{FTA}(t) = 0$. In words, by a judicious choice of periods, we have placed industries at about the same point on the business cycle in each of the two periods. In this way, the pre-FTA period data on each industry's business cycle sensitivity has been used to control for its FTA-period cyclical sensitivity.

An examination of Equation (5) reveals that we have eliminated all but three unknown parameters: α, β, and γ. At the same time, we have controlled for secular trends, idiosyncratic demand and supply shocks, and differential business cycle sensitivity. Equation (5) is far more complex than its parsimonious specification suggests. It is our estimating equation.[6]

DATA

A WORD ABOUT THE DATABASE. It spans the years 1980-96 and combines detailed industry data from a large number of disparate sources. Canadian data come from Statistics Canada (1996). The variables include: imports and tariff duties from special tabulations of the International Trade Division; employment of all workers, hours worked by production workers, and value added in production activities, from special tabulations by the Canadian Annual Survey of Manufactures (ASM) Section; output deflators from the Input-Output Division and the Prices Division; and concordances from U.S. SIC (1987) and Canadian SIC (1970) to Canadian SIC (1980), from the Standards Division. Most of the U.S. data come from the National Bureau of Economic Research (NBER) Manufacturing Productivity Database (Bartelsman and Gray, 1996). See Trefler (2001) for details.

A key issue has to do with the measurement of productivity. It would be ideal to look at total factor productivity (TFP) using detailed 4-digit SIC data. Unfortunately, the Canadian ASM does not record the capital stock or investment information necessary for calculating 4-digit SIC-level TFP. We must thus use labour productivity, i.e. value added per unit of labour.

There are two other issues. First, it is better to measure labour by hours worked rather than by employment. But such information is available for production workers only. Recall that the Canadian data distinguish between workers employed in manufacturing activities and non-manufacturing activities. We have been referring to these as production and non-production workers since that distinction broadly follows the one used in the U.S. ASM. We therefore define labour productivity as value added in production activities divided by hours worked in production activities. As Trefler (2001) shows, our results are robust to redefining labour productivity as value added in all activities divided by total employment. Second, value added must be deflated. We use output deflators rather than the preferred, but unavailable, value-added deflators. Trefler (2001) provides some evidence at the 2-digit SIC level that this

does not matter for the purposes at hand. Finally, there are a number of other more standard issues to be dealt with; these are described in Trefler (2001). One issue not dealt with here has to do with the treatment of purchased services. This issue is discussed in Appendix A.

FINDINGS – PRODUCTIVITY GROWTH AND EMPLOYMENT LOSSES

LABOUR PRODUCTIVITY

TABLE 6 REPORTS THE ESTIMATES OF EQUATION (5) for labour productivity. There are three parameters: α, which is the intercept, β, which is the coefficient on $\Delta\tau_{i1}^{FTA}(t)$, and γ, which is the coefficient on $\Delta y_{i1}^{US}(t) - \Delta y_{i0}^{US}(t-2)$. The parameter of interest is β, which gives the impact of tariff cuts on labour productivity. Each row corresponds to a different end-point of the pre-FTA and FTA periods, i.e. up to a different t. For example, row 1 corresponds to pre-FTA changes over 1980-86 and FTA changes over 1988-96. This is the longest horizon we can consider because 1996 is the last year for which data is available. Row 4 corresponds to pre-FTA period changes over 1980-83 and FTA changes over 1988-93. This is the shortest horizon that we can properly consider because of the timing of the two business cycles. See Table 5 for further details.

Rows 1 to 4 of Table 6 provide a strong sense of the timing of the labour productivity effects. The outstanding feature is that the estimated β rise and their standard errors fall as the FTA-period horizon is pushed from 1993 to 1996. That is, the impact on labour productivity of a given tariff cut strengthens as the adjustment period lengthens.

It would be nice to extend the analysis back to the early years of the FTA, before any significant adjustment period had elapsed. In other words, it would be interesting to consider the effects on labour productivity for horizons ending in 1990, 1991, and 1992. As discussed earlier, this is not possible because of business cycle timing issues. Indeed, for this reason, we did not even collect the 1981-82 data that would have allowed for a crude examination of this issue. This said, a very rudimentary but feasible approach for 1992 is to match the 1989-92 and 1980-84 periods (row 5 of Table 6). Likewise, a very crude approach for 1991 is to match the 1989-91 and 1980-83 periods (row 6). The results presented in Table 6 show that the estimated β do fit the pattern described above: the coefficient grows as the time horizon is lengthened.

Trefler (2001) only reports the results for a single specification, which is similar to that of row 1 of Table 6. This is because he was not interested in the timing issues that are at the heart of our own study. Also, Trefler's results corresponding to row 1 are slightly different, reflecting the fact that, unlike him,

TABLE 6

REGRESSION ESTIMATES FOR LABOUR PRODUCTIVITY

ROW	FTA PERIOD HORIZON	$\Delta\tau_{i1}^{FTA}(t)$ β	s.e.	$\Delta y_{i1}^{US}(t) - \Delta y_{i0}^{US}(t-2)$ γ	s.e.	INTERCEPT α	s.e.	$\bar{R}^2$
1	1996	-1.56**	0.49	0.32**	0.09	0.01*	0.00	0.09
2	1995	-1.43**	0.52	0.15	0.10	0.00	0.00	0.04
3	1994	-1.32*	0.54	-0.04	0.10	-0.01	0.01	0.02
4	1993	-0.79	0.64	-0.15	0.11	0.00	0.01	0.01
5	1992	-0.75*	0.34	0.17	0.12	0.00	0.01	0.02
6	1991	-0.59	0.62	0.04	0.12	-0.01	0.01	-0.01

Notes: Regression estimates of equation (5). There are 202 observations; s.e.: standard error.
The FTA period horizon is the end year chosen for the FTA period. See Table 5 for details.
* and ** indicate statistical significance at the 5% and the 1% levels, respectively.

we omitted the nine 4-digit SIC industries making up the automotive sector. Finally, Trefler (2001) considers a considerable number of specification checks. We have examined all of these checks only to arrive at the same conclusion as: our estimates are robust to a wide variety of alternative specifications.

We are interested in the timing of the labour productivity impacts. This is not completely answered by our estimated β. For one, β is an elasticity whereas we are interested in the total impact. For another, even if β were constant over time, the FTA impact would progressively rise because the size of the tariff cut deepens as the FTA horizon lengthens. To obtain the impact of the FTA on labour productivity we need two definitions. Let *Observed Change* be the log or percentage change in labour productivity over the first t years of the FTA period. The percentage change is calculated as the weighted average of the percentage changes observed in each industry. The weights used are the industry's share of value added in production activities (the numerator of labour productivity). Let *Change Due to FTA* be the log or percentage change in labour productivity estimated to be caused by the FTA. Appendix B provides exact formulas for *Observed Change* and *Change Due to FTA*.

The top and bottom panels of Table 7 report *Change Due to FTA* and *Observed Change*, respectively, for different values of the time horizon, t. Consider first the *All Industries* column. The FTA had raised labour productivity by 1.1 percent as of 1991, by 2.6 percent as of 1993, and by 4.7 percent as of 1996. Further, these figures rise at each time horizon t, indicating that the productivity benefits of the FTA have not plateaued. The results are even more striking when one considers the highly impacted industries (those with tariff cuts in excess of 8 percent over 1988-96). For this group, the FTA had raised labour productivity

TABLE 7

LABOUR PRODUCTIVITY IMPACTS OF THE FTA

TIME HORIZON	β	ALL INDUSTRIES	HIGHLY IMPACTED INDUSTRIES	MODERATELY IMPACTED INDUSTRIES	LIGHTLY IMPACTED INDUSTRIES	NON-IMPACTED INDUSTRIES
		CHANGE DUE TO FTA (%)				
1988-96	-1.56	4.7	26	9	4	-1
1988-95	-1.43	4.5	22	8	4	-1
1988-94	-1.32	4.3	17	8	4	1
1988-93	-0.79	2.6	11	4	2	0
1988-92	-0.75	2.3	13	3	2	0
1988-91	-0.59	1.1	5	2	1	0
		OBSERVED CHANGE (%)				
1988-96		20	28	16	25	18
1988-95		17	25	10	19	17
1988-94		16	23	8	19	15
1988-93		9	19	4	16	5
1988-92		2	16	1	6	-2
1988-91		-2	12	-3	1	-6
$\Delta\tau_{i1}^{FTA}$			> 8	> 4	> 1	< 1
Number of observations			34	51	56	72

by 5 percent as of 1991, by 11 percent as of 1993, and by an extraordinary 26 percent as of 1996. Further, the increase in the productivity gains shows no sign of abating.

In this study, we implicitly compare several hypotheses. The first states that because of agglomeration economies, all productivity gains from the FTA flow to the United States. This is obviously incorrect. The second states that there are productivity gains, but that these are small and come only after a long period of incubation. This is also incorrect. Table 7 shows that the labour productivity effects of the FTA were enormous, arrived quickly, and continue to accrue.

A NOTE ON THE SIZE OF LABOUR PRODUCTIVITY GAINS

FROM THE *OBSERVED CHANGE* PANEL OF TABLE 7, we can see that the FTA labour productivity effect has been a major contributor to rising productivity. For example, the FTA explains 4.7 percentage points of the 20 percentage point increase in labour productivity experienced by all of manufacturing as of 1996. That is, manufacturing experienced substantial productivity benefits in the FTA period, about one quarter of which are due to the FTA.

This 4.7 percent labour productivity effect is large when we consider that most industries had very low tariffs going into the FTA. The average tariff cut was only 4.5 percent. For highly impacted industries, the FTA-induced productivity gains by 1996 were a huge 26 percentage points and account for almost all of the productivity gains in those industries.

Finally, it is helpful to present the 1996 productivity gains on an annual basis as they are then expressed in units comparable to more familiar indicators such as GDP growth. Since we are working in log changes, the numbers can be put into compound annual changes simply by dividing by 8. For all of manufacturing, the FTA tariff concessions raised labour productivity by 0.6 percent per year. For highly impacted industries, the tariff concessions raised labour productivity by 3.3 percent per year. These are enormous changes, large enough to wipe out differences between Canadian and U.S. productivity growth. We find it amazing that a government policy could be so effective in raising labour productivity.

EMPLOYMENT

TABLE 8 REPORTS THE ESTIMATES OF EQUATION (5) for employment and for various time horizons t. The coefficient β on $\Delta\tau_{il}^{FTA}(t)$ is statistically significant for almost every t, indicating that the FTA-mandated tariff cuts reduced employment. Most interesting for our purposes is the time profile of these employment reductions. Table 8 shows that the estimated β increase only up to 1994. That is, the impact of a given tariff cut diminishes after 1994 as the sector adjusts.

As before, one must distinguish between the impact for a *given* tariff cut (i.e. β) and the change due to the FTA as tariffs were cut year after year. Table 9 provides information on *Change Due to FTA* and on *Observed Change*. From the *All Industries* column, we can see that the FTA had reduced employment by 1.3 percent as of 1991, by a peak 6.4 percent as of 1994, and by 5.3 percent as of 1996. The evidence is quite clear that the employment losses have already peaked. This is as true for all of manufacturing and for each group of industries. For example, the highly impacted industries had lost an incredible 21 percent of their employment by 1994. This was vividly shown earlier in Figure 1.

The size of these employment losses is alarming. The bottom panel of Table 9 indicates that the FTA-induced employment losses account for a third of all lost jobs as of 1996. It is of some interest, though, that these employment losses do not explain all of the employment losses in the highly impacted industries. Early on, in 1992, these industries had taken a big employment hit that appears to have been independent of the FTA. This casts doubt on whether the recession was induced by the FTA.

TABLE 8

REGRESSION ESTIMATES FOR EMPLOYMENT GROWTH

Row	FTA Period Horizon	$\Delta\tau_{il}^{FTA}(t)$		$\Delta y_{il}^{US}(t) - \Delta y_{i0}^{US}(t-2)$		Intercept		$\bar{R}^2$
		β	s.e.	γ	s.e.	α	s.e.	
1	1996	1.57**	0.55	0.20*	0.08	-0.01**	0.00	0.08
2	1995	1.76**	0.55	0.22**	0.08	-0.01	0.01	0.10
3	1994	1.75**	0.59	0.22**	0.08	0.00	0.01	0.08
4	1993	1.21*	0.62	0.27**	0.07	0.00	0.01	0.09
5	1992	0.99**	0.34	0.21*	0.08	-0.02**	0.01	0.07
6	1991	0.66	0.59	0.24**	0.07	-0.01	0.01	0.05

Notes: Regression estimates of Equation (5). There are 204 observations; s.e.: standard error.
The FTA period horizon is the end year chosen for the FTA period. See Table 5 for details.
* and ** indicate statistical significance at the 5% and 1% levels, respectively.

TABLE 9

EMPLOYMENT IMPACTS OF THE FTA

Time Horizon	β	All Industries	Highly Impacted Industries	Moderately Impacted Industries	Lightly Impacted Industries	Non-Impacted Industries
			Change Due to FTA (%)			
1988-96	1.57	-5.3	-22	-9	-4	1
1988-95	1.76	-6.0	-22	-10	-5	0
1988-94	1.75	-6.4	-21	-10	-6	-1
1988-93	1.21	-4.2	-14	-7	-4	-1
1988-92	0.99	-2.8	-10	-4	-2	0
1988-91	0.66	-1.3	-4	-2	-1	0
			Observed Change (%)			
1988-96		-16	-36	-20	-16	-8
1988-95		-15	-33	-18	-15	-7
1988-94		-17	-32	-18	-18	-11
1988-93		-18	-30	-18	-20	-14
1988-92		-17	-29	-15	-23	-11
1988-91		-13	-21	-9	-19	-9
$\Delta\tau_{il}^{FTA}$			> 8	> 4	> 1	< 1
Number of observations			34	51	56	72

To summarize, the industries that were heavily impacted by the FTA suffered staggering employment losses. Further, the timing of these losses was not straightforward: most of the losses came after the recession (i.e. after 1992) and by 1994 these losses had peaked.

General Equilibrium Considerations

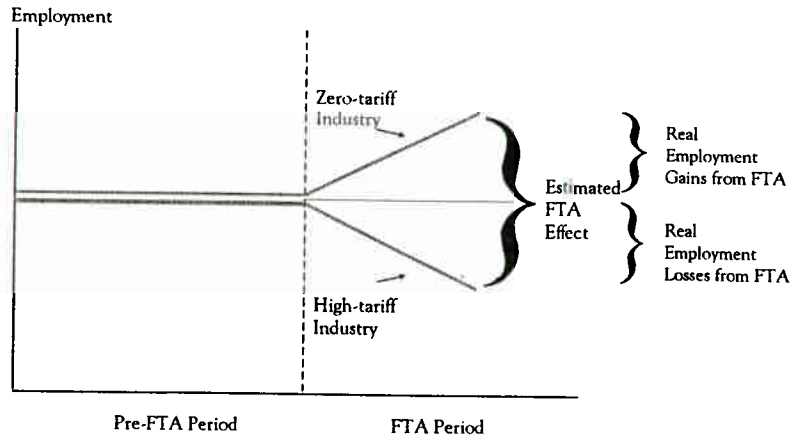
A MAJOR LIMITATION OF THIS STUDY is that it does not take into account the general equilibrium interactions between industries. These interactions are the primary channels through which international trade is expected to affect domestic economies. In the standard trade model, tariff reductions lead to a reallocation of employment from the least competitive to the most competitive sectors. This mechanism cannot be captured by our methodology. Indeed, it is not easily or obviously captured by any known methodology.

However, we can determine the sign of the bias associated with this elusive general equilibrium effect. Consider employment in Figure 9. The top line plots employment for some fictitious industry that had zero tariffs going into the FTA period. The bottom line plots employment for some fictitious industry that lost employment as a result of FTA-mandated tariff cuts. Our methodology implicitly compares the performance of the two industries and attributes the difference to the FTA. (*Estimated FTA Effect*, in Figure 9.) However, a different interpretation is that the FTA shifted employment out of the less-competitive industry (the high-tariff industry) and into the more-competitive industry (the zero-tariff industry). In this case, the FTA induced employment losses in one industry, employment gains in the other, and only modest net employment losses.

Is there any evidence of this possibility? Between 1988 and 2000, U.S. manufacturing employment contracted by 4.4 percent. Using this as a benchmark, we expect Canadian manufacturing to have also contracted by 4.4 percent. In fact, it expanded by 0.7 percent — Canadian manufacturing growth did 5.1 percentage points better than its U.S. counterpart. Similar conclusions emerge from the spotty data available on manufacturing employment in other countries. The International Labour Organization has a project aimed at putting manufacturing employment data on a consistent basis across countries and over time. The available data are limited: the most recent year is 1994 and Canada is absent from the sample. Table 10 reports the compound annual rates of change in manufacturing employment for all countries included in that project. (For reference, Canada has been added to the table.) The data presented in Table 10 places Canadian manufacturing employment growth in a favourable light. Among the G-8 countries listed in Table 10, Canada has the best performance. Indeed, most countries experienced significant employment contractions.

FIGURE 9

GENERAL EQUILIBRIUM EFFECTS



This leads us to believe that the FTA did not reduce employment in Canadian manufacturing. Rather, the FTA induced a shift of employment from high-tariff industries to low-tariff industries, just as predicted by trade theory. Nevertheless, the large employment losses in high-tariff industries are indicative of the large transition costs associated with moving out of low-end, heavily protected industries and into high-end, competitive industries.

We next turn to productivity. Our results suggest that the FTA induced productivity growth *within* industries. However, the results say nothing about the general equilibrium impact of the FTA on aggregate productivity. From Table 2, we know that the highly impacted industries tend to have below-average labour productivity. If the FTA shifted output away from these industries and towards less-impacted, high-productivity industries, then it should have raised labour productivity in a way not captured by our results.

We can analyze this imperfectly by asking whether the FTA period witnessed a rise in the between-industry component of productivity growth. In fact, there has been no such trend. During a period where productivity grew by 20 percent (see Table 7), the between-industry component of productivity growth was effectively 0 percent at each time horizon t. Thus, we have the surprising and puzzling result that the FTA re-allocated labour out of low-productivity industries and into high-productivity industries, but that this shift did not contribute to rising productivity.

TABLE 10

COMPOUND ANNUAL CHANGE IN MANUFACTURING EMPLOYMENT

COUNTRY	EMPLOYMENT CHANGE (%)	PERIOD
Hong Kong	-7.1	1988-94
Germany	-6.1	1991-94
Finland	-5.7	1989-94
Sweden	-4.6	1988-94
Spain	-2.1	1988-94
France	-1.8	1988-94
Norway	-1.8	1988-94
Australia	-1.8	1988-93
United States	-1.7	1988-93
Korea	-0.8	1990-94
Japan	0.5	1988-94
New Zealand	0.5	1988-94
Canada	0.7	1988-2000
Turkey	0.8	1989-93
Netherlands	1.2	1988-92
Portugal	1.4	1988-91
Singapore	1.5	1988-94
Philippines	2.4	1988-94
Indonesia	9.9	1988-94

Source: International Labour Office. "ILO-Comparable Annual Employment and Unemployment Estimates (No. 6)," *Bulletin of Labour Statistics*, 1996-2, pp. XI-XLVI.
Canadian data are not available from this source. Instead, CANSIM data have been used.

CONCLUSIONS

WHAT ARE OUR MAIN FINDINGS? Our estimates show that between 1988 and 1996, the FTA reduced employment by 5 percent in manufacturing as a whole and by 22 percent in manufacturing industries that experienced the deepest cuts. On the other hand, the FTA raised manufacturing labour productivity by 5 percent and, in industries that experienced the deepest cuts, by a remarkable 26 percent. These numbers would seem to suggest that the FTA involved heavy employment adjustment costs and huge productivity benefits. This study addresses two issues raised by these costs and benefits. First, there is the timing of these employment losses. We offer strong evidence that the employment losses were both temporary and concentrated early on. That they were

concentrated early on is crystal clear from Figure 1: employment losses had peaked, or at least plateaued, by 1994. That the employment losses were not permanent is less clear. However, the fact that the Canadian manufacturing sector has returned to its 1988 employment level, whereas the manufacturing sectors of the United States and other G-8 countries have not suggests to us that the FTA had no net employment effects. Of course, this is not meant to minimize the adjustment costs borne by labour as the FTA shifted employment out of low-end, high-tariff industries and into high-end, low-tariff industries.

Second, there is a question about the *net* benefits accruing from the FTA. With discounting, the more front-ended are the employment costs relative to the productivity benefits, the lower are the net benefits from the FTA. Thus, we need to know the timing of the costs and benefits before we can properly past judgement on the achievements of the FTA. As shown in Figure 1, these costs and benefits accrued at roughly the same rate. For the highly impacted industries especially, there is no sense in which the employment costs were front-ended relative to the productivity gains. Thus, any assessment of the FTA must be independent of the discount rate used. It should focus instead on winners and losers — on those workers and industries that bore the brunt of the short-run employment losses *versus* those workers, industries, and consumers that garnered the benefits of long-run productivity gains.

Without in any way denigrating the employment losses, we conclude by focussing on the productivity gains. The reason is simple. Despite the many claims about the productivity benefits of freer trade, the econometric evidence is entirely unpersuasive. Our work thus fills an important gap in the literature. This study implicitly compares several hypotheses. The first states that because of agglomeration economies, all productivity gains from the FTA flow to the United States. We show this to be incorrect. The second states that there are productivity gains, but that these are small and come only after a long period of incubation. We also show that this is incorrect. In fact, we show that the FTA induced enormous labour productivity gains. Further, these gains arrived quickly and continue to accrue. This finding is an important contribution to discussions concerning the net benefits of tariff concessions – discussions that are bound to be revisited as we debate the merits of a Free Trade Area of the Americas.

ENDNOTES

1 The analysis for all of manufacturing is trickier since, as we will discuss in the next paragraph, the employment losses plotted in the bottom panel of Figure 1 are overstated.

2 These numbers differ from the 15 percent reduction in employment and the 17 percent increase in productivity cited in Trefler (2001). The difference is one of definition rather than substance. In Trefler (2001), the numbers refer to the group of 71 industries with tariff cuts in excess of 5 percent. In our study, the numbers refer to the more narrowly focused group of 34 industries with tariff cuts in excess of 8 percent. These industries experienced deeper cuts and hence larger FTA impacts.

3 The FTA period is 1989-96. Changes over the FTA period are percentage changes using 1988 as the base year. Thus, even though the FTA period is 1989-96, we sometimes write 1988-96 as the FTA period in order to emphasize the use of 1988 as the base year.

4 Data are from CANSIM matrix L97800.

5 The $2N$ parameters are the α_i and the δ_i. The 4 parameters are β, γ, and the α_s for $s = 0, 1$. Note that all parameters should be indexed by t. We forgo this additional notation.

6 We will not discuss the issue of the endogeneity of tariffs. For all the specifications we report, we have tested for endogeneity using a Hausman test. In every case, endogeneity is rejected. Details of the endogeneity test appear in Trefler (2001).

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APPENDIX A

A DATA ISSUE RELATED TO LABOUR PRODUCTIVITY

WE SAW THAT THERE ARE DATA LIMITATIONS preventing us from using a TFP definition of productivity. But there are also a large number of data issues to be aware of when using definition of productivity based on labour productivity. Some of these are taken up in Trefler (2001). However, there is one other — the data problem created by benchmarking purchased services and the inclusion of purchased services in the definition of value added. In fact, this problem plagues all productivity research. Basically, firms do not report all purchased services in the ASM questionnaires of either country. Instead, the data are benchmarked using separate surveys. In Canada, the last survey is now 15 years old. Given that Canada invests more in timely input-output tables, we can only guess that the U.S. benchmark is even older. Benchmarking means that the measure of purchased service inputs in period t is $S_t = \sigma Q_t \varepsilon_t$, where Q_t is output, $\sigma = S_0/Q_0$ is the ratio of purchased services to output in the benchmark year, and ε_t is the benchmarking error. Using obvious notation and simplifying to avoid issues of chaining, deflation, and multiple inputs, let's define $TFP_t \equiv \ln Q_t - \alpha \ln X_t - \beta \ln S_t$, where X_t collects all non-service inputs. Then, the change in TFP_t is $\Delta TFP = \Delta \ln Q - \alpha \Delta \ln X - \beta \Delta \ln Q - \beta \Delta \ln \varepsilon$ and what researchers are reporting is not ΔTFP, but $\Delta TFP + \beta \Delta \ln \varepsilon$. Thus, sectoral TFP growth includes trends in the contracting out of services which benchmarking fails to pick up. This raises a number of important issues. Their relevance here depends on whether the $\Delta \ln \varepsilon$ are correlated with tariff cuts and, if so, whether the trends in $\Delta \ln \varepsilon$ are captured by our secular growth and idiosyncratic controls.

APPENDIX B

THE DEFINITION OF *OBSERVED CHANGE* AND *CHANGE DUE TO FTA*

LET I BE A GROUP OF INDUSTRIES, e.g. the highly impacted group. Recall that $Y_{i,1988}$ is the level of, say, productivity in industry i in 1988. The percentage change in the productivity of industry i over the first t years of the FTA period is given by $\Delta y_{i1}(t)t$, where $\Delta y_{i1}(t)$ is the average annual log or percentage change in productivity over the first t years of the FTA. The industry i change in productivity over the first t years of the FTA period is approximately $(\Delta y_{i1}(t)t)Y_{i,1988}$ — that is, the log or percentage change in the initial level times the initial level. The change in productivity among industries in any group I is approximately $\sum_{i \in I}(\Delta y_{i1}(t)t)Y_{i,1988}$. The percentage change in productivity is approximately $\sum_{i \in I}(\Delta y_{i1}(t)t)Y_{i,1988} / \sum_{j \in I} Y_{j,1988}$. This can be rewritten as:

$$\sum_{i \in I}(\Delta y_{i1}(t)t)\omega_i \text{ where } \omega_i \equiv Y_{i,1988} / \sum_{j \in I} Y_{j,1988}.$$

In the case of labour productivity, ω_i is industry i's share of value added in production activities, i.e. the numerator of labour productivity. Using the fact that $\hat{\beta}\Delta\tau_{i1}^{FTA}(t)$ is the prediction of the impact of tariff concessions, the predicted tariff-induced log change in productivity is $\sum_{i \in I}\hat{\beta}\Delta\tau_{i1}^{FTA}(t)t\,\omega_i$. We collect these observations in the following equations.

$$\textit{Observed Change in the first } t \textit{ years of the FTA period} \equiv \sum_{i \in I}\Delta y_{i1}(t)t\,\omega_i.$$

$$\textit{Change Due to FTA in the first } t \textit{ years of the FTA period} \equiv \sum_{i \in I}\hat{\beta}\Delta\tau_{i1}^{FTA}(t)t\,\omega_i.$$