The Impact of Trade Liberalization on the Canadian Labor Market since 1989

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Abstract

The Canada-United States Free Trade Agreement (FTA) is the most controversial agreement of its kind in Canadian history. This paper examines the impact of tariff liberalization on employment and average annual earnings in the Canadian manufacturing sector between 1989 and 2006.

The reduced-form equations were adopted to estimate the changes in the level of employment and earnings arising from changes in the tariff rates. The main finding of the study was that tariff liberalization had almost no effect on earnings and had a minimal impact on manufacturing employment, but that the extent of the employment impact varied across education levels. Moreover, it was found that the tariff reductions lowered employment predominately among less-skilled workers. It was also established that, in conjunction with tariff liberalization, other macroeconomic factors also affected the Canadian labor market during the same period.

1. Introduction

The impact of tariff liberalization on the labor market has always attracted popular discussion. Canada began debating free trade as early as 1911. However, it is the Canada-United States Free Trade Agreement (FTA) and the North American Free Trade Agreement (NAFTA) that are among the most significant institutional changes ever implemented, leading to a significant transformation of the Canadian and U.S. international trading environments. Fearing growing U.S. protectionism in the 1980s, Canada sought to secure access to the U.S. market outside of other possible regional groupings by proposing a regional trade agreement with the United States — the Canada-United States Free Trade Agreement (FTA).

FTA was concluded in October 1987 and went into effect on 1 January 1989. It stipulated that all tariffs were to be eliminated by 1 January 1998, and tariff cuts were to be phased in over the 10-year period according to prescribed formulae, which ensured accelerated reduction of tariffs in some sectors and a slower phasing out in other sectors. Since then, several academic studies focusing on examining if there were changes in earnings and employment of Canadian industrial workers after the implementation of the FTA have been produced.

The reason for which this topic interests me is that the force of economic globalization has emerged during the last two decades, which has coincided with a period of strong growth of the global economy. This growth has been associated with reduced trade barriers and increased trade volume. Goods and services produced in one part of the world

are increasingly available for consumption in all parts of the world. This is also true for Canada. The manufacturing imports from developing countries to Canada have increased greatly since the 1980s. Consumers can increasingly find products in the stores that are made in developing countries, such as Thailand, China or India. Most of these imports from developing countries are less skill-intensive goods, such as toys, clothing and footwear, which are produced by low-skill workers. Moreover, because of the low wage rate for low-skilled workers in the developing world, these goods are sold at a lower price than similar goods produced domestically. When compared with those developing countries, Canada has a comparative disadvantage in producing goods using unskilled labor. Canada also imports goods from developed countries, in particular the United States, using factors for which those trading partners are relatively well endowed, which accords them a comparative advantage in production. Hence, given the fact that Canada trades with developing countries as well as developed countries, how would this affect the wages and employment levels in certain Canadian industries?

Another reason why this topic is of interest to me is that the well-established Stolper-Samuelson theorem predicts that the wage and employment effects of trade depend on the factor intensities of the industries affected, thereby suggesting a particular industry/demographic group being impacted by globalization. To what extent does this theorem shed light on the impact of trade liberalization in Canada?

The goal of this paper is to analyze the effects of trade liberalization on earnings and employment of Canadian industrial workers after the ratification of the FTA during the 10-year period of the phasing out of the tariff by reviewing a set of notable studies on the

topic, and then conducting my own empirical research. In brief, the main finding is that the tariff reductions only had minimal impact on Canadian manufacturing employment, while showing almost no effect on earnings in the Canadian manufacturing labor market.

The rest of this paper is organized as follows. The next section reviews the theoretical context and previous research work in this area. Section 3 presents some stylized facts relating to trade liberalization and employment and earnings patterns for workers of different education groups in the Canadian manufacturing sector from 1986 to 2006. In section 4, I present the empirical approach adopted in this paper. First, the data that I collected and empirical methodology is discussed, and then I interpret the results. The conclusions are summarized in section 5.

2. Literature Review

During the twenty years since the implementation of the FTA, a number of empirical studies have examined the employment related effects of tariff liberalization on the Canadian economy. Among these studies, one notable Canadian study is by Gaston and Trefler (1997). Gaston and Trefler (1997) carried out their research seeking empirical validation of the Heckscher-Ohlin and the Stolper-Samuelson theorems. The Heckscher-Ohlin Theorem predicts that a country will export the commodity that uses its relatively abundant factor most intensively and import goods that are intensive in its relatively scarce factors of production. The critical assumption of the Heckscher-Ohlin model is that the two countries have identical production technologies, except for the difference in

resource endowments. This also implies that the aggregate preferences towards the two goods are the same. The relative abundance in capital will cause the capital-abundant country to produce the capital-intensive good more cheaply than the labor-abundant country and vice versa. The Stolper-Samuelson theorem predicts that, if the relative price of a factor increases, then the rate of return to the factor used intensively in the production of that good increases, while the rate of return to the other factor decreases. It claims that unskilled workers producing traded goods in a high-skill country will be worse off when international trade increases, because, relative to the world market in the good they produce, an unskilled worker is a less abundant factor of production than capital. By applying the Heckscher-Ohlin-Samuelson theorem, the wage and employment effects of trade depend on the factor intensities of the industries affected.

Gaston and Trefler (1997) examined the effects of the FTA on the Canadian labor market. They adopted a simple regression framework and a treatment control framework which used high-tariff industries as the treatment group and low-tariff industries as the control group to determine the impact of the tariff cuts on employment and earnings. In general, they found that the FTA had very little impact on real wages and the FTA tariff reduction could only account for 15% of the observed total employment decline. Additionally, Trefler (2004) investigated the impact of the FTA on a large number of performance indicators separately for manufacturing as a whole and for the most impacted industries. In the one-third of industries that experienced the largest tariff cuts from 1989 to 1996, ranging between 5 and 33 percent and averaging 10 percent, employment shrunk by 15 percent, output fell by 11 percent, and the number of plants declined by 8 percent. For manufacturing

as a whole, the comparable numbers were 5, 3, and 4 percent, respectively. "These numbers capture the large adjustment costs associated with reallocating resources out of protected, inefficient, low-end manufacturing. The fact that manufacturing employment and output have largely rebounded since 1996 suggests that some and perhaps most of the reallocation has been to high-end manufacturing," he noted. (Trefler, 2004, p. 882) Surprisingly, Trefler (2004) wrote, the tariff cuts raised annual earnings slightly. In the most affected industries, production workers' real wages increased by 0.8 percent per year and by 0.3 percent per year for the whole manufacturing industry. Besides, the tariff cuts did not affect earnings of higher-paid non-production workers or weekly hours of production workers. He concluded: "Most of the effects of the FTA tariff cuts are smaller than one would imagine given the heat generated by the debate." (Trefler, 2004, p. 887)

Beaulieu (2000) carried out pretty much similar research as Gaston and Trefler (1997), but with some interesting improvements. He did the research at a more disaggregated industry level. He investigates the effect of the FTA on the labor market outcomes of skilled (non-production) and less-skilled (production) workers in the manufacturing sector rather than on workers in general. He found that Canadian tariff reductions did not affect the earnings of either non-production or production workers, but lowered employment among production workers while having little or no effect on the employment level of non-production workers.

Gaston and Trefler (1997) and Beaulieu (2000)'s findings are consistent with the Heckscher-Ohlin-Samuelson theorem. However, some labor economists, such as Cahuc and Zylberberg (2004), believe that there are some limitations to the Heckscher-Ohlin-Samuelson

theorem because the circumstances under which the theorem will hold may not actually apply. The theorem assumes that all goods are traded freely, that the markets, including factor markets, are perfectly competitive, and that countries have access to the same production technologies. If these assumptions are not fulfilled, including the assumption of full employment, the results may turn out differently. Trade liberalization may be favorable to low-skilled workers instead of harmful to low-skilled workers in a developed country. These points suggest that the impact of international trade on the welfare of unskilled workers is strongly dependent on the structure of the economies in which they live and work. The growth of trade explains no more than a limited portion of the change that the labor market has undergone.

Cahuc and Zylberberg (2004) questioned Heckscher-Ohlin-Samuelson theorem in general and held different opinions than Gaston and Trefler (1997). Additionally, Stoke (1989) and Dungan and Wilson (1991) showed contrasting results regarding the impact of tariff reductions on Canadian employment compared with the results of Gaston and Trefler (1997).

Gaston and Trefler (1997) analyzed the impact of tariff liberalization on Canadian employment and earnings. They adopted an OLS regression procedure to estimate the effects of tariff cuts on employment and earnings by controlling interest rate spreads, exchange rate movements, imports, exports and US employment. Before Gaston and Trefler's study, Stoke (1989) and Dungan and Wilson (1991) also examined the macroeconomic effects of the tariff reductions on the Canadian economy.

Stoke (1989)[1] constructed a Canadian Annual Model (CAM), a small annual macro

[1] N.B.: The unit of observation for both employment and earnings was for the entire economy and, hence, much like Dungan and Wilson (1991), they analyze the FTA impact on the macroeconomic level..

econometric model of the Canadian economy, and employed two different versions (adaptive expectations and consistent expectations) to estimate the effects of tariff reductions on earnings, the labor force, consumer spending, exchange rate, and GDP. At the aggregate level, it was concluded that the FTA would have a small but positive impact on the Canadian economy between 1989 and 1996. Stoke (1989) noted that by 1996, a rise of employment of 0.3% would be generated by the FTA for both versions of the CAM model. Particularly, in the consistent expectations model, an additional 45,000 jobs would be created by 1996. With regard to the earnings variable, Stoke (1989) estimated that by 1996, the FTA would lead to an increase of earnings of 1.7% and 1.3% respectively for the adaptive expectations and consistent expectations model.

Dungan and Wilson (1991) examined the economic implications of the FTA. They adopted the FOCUS model which is "a medium – scale model consisting of over 300 behavioral equations and identities" (Dungan and Wilson, 1991, p. 435) to estimate the impact of the FTA on Canadian unemployment and income between 1990 and 2001. They estimated that a drop of the unemployment rate of 0.3% by 1996 and 0.2% by 2001 would be generated by the FTA. Besides, the wage rate for the whole economy would decrease by 0.2% by 1996 and 3.2% by 2001.

The estimated results of the FTA on Canadian employment are different between the works of Gaston and Trefler (1997), Stoke (1989) and Dungan and Wilson (1991). This may be due to the differences in the models they adopted, the approaches they took, and the assumptions they made. More studies analyzing the impact of the FTA on Canadian labor market movements through its effect on trade creation and/or trade diversion will be analyzed

below.

Since the FTA is a preferential trading agreement which requires the removal of many trade restrictions between Canada and the United States over a ten-year period, there were some studies investigating the impact of tariff liberalization on the growth of trade with both member countries and non-member countries. One notable study is by Clausing (2001)[2]. In the article, "Trade Creation and Trade Diversion in the Canada-United States Free Trade Agreement", Clausing (2001) assessed the effect of actual tariff changes on trade flows. The motivation of her empirical work was to add to the previous research to better isolate the effects of the FTA on Canadian trade flows with the United States. She focused particularly on analyzing the following two issues: (1) to what extent the increase in trade between Canada and the United States could be seen as a result of the FTA; and (2) to what extent this trade increase could be seen as a result of trade diversion. In terms of methodology, based on the simple demand and supply framework, Clausing (2001) estimated the percentage change in Canadian imports from 1989 to 1994 by controlling for, among others, the tariff rate changes, the share of imports that originated in Canada prior to the tariff liberalization, the "year effects" which was used to "control for circumstances that vary over time ... ." (Clausing, 2001, p. 687) To examine the possibility of trade diversion, Clausing (2001) used the percentage change in imports of a particular commodity from the rest of the world as the dependent variable and added another independent variable which indicates the degree of liberalization of imports from Canada. A major conclusion of her findings was that the FTA showed significant trade creation effects between Canada and the United States. Between

[2] Please take note: the unit of observation is at the industry level.

1989 and 1994, "the tariff liberalization brought about by the FTA was responsible for over half of the $42 billion increase in U.S. imports from Canada." (Clausing, 2001, p. 694) On the contrary, Clausing (2001) found that there was little evidence of trade diversion from non-member countries.

On the basis of Clausing's result, Trefler (2004)[3] noted that this trade creation "had no effect on employment at the plant level, but modestly reduced employment at the industry level." (Trefler, 2004, p.878) He suggested that tariff liberalization encouraged the Canadian exporters to expand their domestic operations at the expense of other Canadian non-exporters, and this meant that the tariff liberalization must have forced more labor-intensive plants to contract.

Additionally, Head and Ries (1999)[4] also considered the impact of changes in trade flows brought about by the tariff liberalization on the Canadian labor market. They investigated a panel of 230 Canadian manufacturing industries, analyzing the effect of trade liberalization on efficiency and scale. Head and Ries (1999) found that, over the period 1988-1994, the reductions in Canadian tariff rates reduced the number of Canadian manufacturing plants, whereas the U.S. tariff reductions showed no effect on entry. Altogether, the FTA led to the following results — "manufacturing output per plant in Canada increased by 34% while the number of plants declined by 21%." (Head and Ries, 1999, p. 296) This finding was similar to the result of Trefler (2004). The increase in efficiency and increase in scale worsened the employment situation for less-skilled Canadian workers more severely.

[3] The unit of observation is the industry.
[4] The unit of observation is the industry.

Furthermore, papers by Melitz (2003), Bernard et al. (2003), Melitz and Ottaviano (2005), Baggs (2005), Lileeva (2008) and Ederington and McCalman (2008) also considered the different impacts of tariff liberalization on skilled and less-skilled workers. Melitz (2003)[5] developed "a dynamic industry model with heterogeneous firms to analyze the intra-industry effects of international trade." (Melitz, 2003, p. 1695) He found that the FTA would induce only the more productive firms to enter the export market and force the least productive firms to exit. Hence, less-skilled workers are more likely to be affected by trade liberalization since they would have to face more fierce competition from foreign firms whose workers would also be comparatively less skilled. Melitz (2003) only considered the impact of an increase in exports on labor relocation, whereas Melitz and Ottaviano (2005) examined the labor market movements driven by an increase in imports. They noted that the FTA forced the least productive firms to exit through the increased market competition resulting from the rise in imports. Melitz and Ottaviano (2005) suggested that the tariff reductions mandated by the FTA in both Canada and the United States increased the exit rates of the least productive Canadian plants.

Bernard et al. (2003) also concluded that tariff liberalization would cause the aggregate productivity to rise as employment shifted from low-productivity plants to high-productivity plants. As well, Baggs (2005) found that Canadian tariff reductions increased the exit rates of Canadian plants, while a fall in American tariffs showed the opposite impact on Canadian firms. Similarly, Ederington and McCalman (2008) predicted that Canadian tariff cuts would increase exit rates among both Canadian exporters and

[5] Please take note: with the exception of Baggs (2005) where the analysis was done for the whole economy, all others studies, including Melitz (2003), Bernard et al. (2003), Melitz and Ottaviano (2005), Lileeva (2008) and Ederington and McCalman (2008).

non-exporters, while American tariff reductions would only cause exit rates to rise among non-exporters.

Additionally, Lileeva (2008) also investigated the productivity effects of the FTA on Canadian manufacturing industry and found that both Canadian and American tariff reductions caused market share reallocation in favor of more productive Canadian plants, with the Canadian tariff impact being more prominent. In particular, the FTA induced more of the less-productive plants to exit the market, and this in turn lowered employment predominantly among less-skilled workers. In a sense, these previously mentioned studies showed that the FTA was employment-reducing, and less-skilled Canadian workers were more likely to be affected as already discussed previously.

However, Wonnacott (1986) predicted that though tariff liberalization would have a negative impact on employment, this effect would be minimal. In his article "On the Employment Effects of Free Trade with the United States," Wonnacott (1986) constructed an input-output matrix to estimate the extent to which exports directly and indirectly affected the output of Canadian industry. He then used an employment coefficient which was obtained by dividing employment by output to multiply these estimates. Finally, the results were used to explain the employment effect of tariff liberalization. Wonnacott (1986)'s motivation was to add to the limited research on Canadian employment effects, and he wanted to assess the sensitivity of Canadian employment to trade with the United States. In the end, he predicted that tariff liberalization would have a minimal impact on Canadian employment.

A number of papers investigated the empirical relationship between the implementation of the FTA and Canadian labor market performance. These papers are

especially interested in examining the impact of the FTA on the massive job losses between 1989 and 1993 in Canada. They argued that no single factor could explain all the feature of the Canadian economic performance from 1989 to 1993. Below, some other macroeconomic factors that may have affected the Canadian economy during that period will be included in my empirical analysis.

Beaulieu (2000) argued that the following factors should be considered: (1) Both Canada and other industrial countries were going through a period of deindustrialization during the 1989-1993 period; (2) Since the second quarter of 1990, Canada and the United States were suffering from an economic recession, and this worsened the labor market situation; (3) Low labor productivity, accompanied by high labor costs in Canada, appeared to be an issue after the signing of the FTA; (4) The Manufacturing Sales Tax (MST) was replaced by the Good and Services tax (GST) in 1990; (5) The Canada-U.S. exchange rate appreciated, thereby making the relative cost of Canadian export goods increase; (6) The Bank of Canada adopted a new policy to lower the inflation rate, and this led to high real interest rates.

In terms of the effect of the implementation of the FTA on employment movements, Gaston and Trefler (1997) agreed with Beaulieu (2000), and they also considered the impact of the FTA tariff reductions on imports and exports. In their study, the Canadian exports to the United States and American exports to Canada were analyzed. Both real imports and exports between these two countries declined for most of the period. For Canadian exports, the 1988 levels of trade did not recover until 1992 and, for Canadian imports, it did not recover until 1993. Gaston and Trefler (1997, p. 23) claimed that "The FTA is expected to lead to trade

creation by promoting Canada-U.S. trade and leading to trade diversion away from third-party countries." Therefore, the observed trade destruction during that period could not be explained by the FTA, and the poor performance of the Canadian labor market, with massive job losses between 1989 and 1993, could not be considered as the consequence of the ratification of the FTA either.

Another study that has focused on analyzing the impact of the FTA on the Canadian employment and wage movements is John Whalley (1992). He questioned the effectiveness of the FTA. In this article, he mentioned that "the agreement does contain a commitment to eliminate bilaterally tariffs between the two countries over a 10-year period; but as tariffs were already small, little further impact on trade seems likely." (p. 133) Before the ratification of the agreement, the average tariff on Canadian exports to the United States was only about 1 per cent and roughly 80 per cent of the trade between these two countries was already largely duty free, except for some key sectors, such as the textiles, steel and agriculture. And after the agreement, in the 10-year tariff reduction period, within those key sectors, existing trade restrictions still remained largely untouched. He concluded "the FTA is certainly not the free trade agreement that it is labeled to be. It is a trade agreement, but not one which either achieves, or even seeks to achieve, free trade between the United States and Canada." (Whalley, 1992, p. 133)

The impact of the FTA on employment and earnings in Canada continues to be the subject of considerable studies and unfortunately no single conclusion regarding the empirical relationship between labor market outcomes and tariff reductions is accepted. Meanwhile, a large number of academic studies have examined the effects of international

trade on the United States labor market. In the following section, these works will be discussed.

Grossman (1987) and Revenga (1992) undertook analysis focusing on the impact of import competition on employment and wages in the United States. Grossman (1987) found that "wages are not very sensitive to competition from abroad, whereas the responsiveness of employment varies widely across sectors." (p. 17) Similar to Grossman's study, Revenga investigated the empirical relationship between import competition and employment and wage movements in the United States manufacturing industries over the 1977-1987 period. The main finding was that "the impact of an adverse trade shock on average wages is quite small, with most of the adjustment occurring through employment." (Revenga, 1992, p. 281) Both Grossman (1987) and Revenga (1992) reached a similar conclusion to Gaston and Trefler (1997) based on similar methodology. This is due to the strong resemblance between Canada and the United States in their market structures.

Besides, there were some other American studies at a more disaggregated level. The article "Are Your Wages set in Beijing" by Richard Freeman (1995) analyzes the unfavorable labor market outcomes of less-skilled workers in the United States and OECD-Europe during a period of rising manufacturing imports from third-world countries. This has created a debate about whether, in a global economy, wages and employment are determined by the global rather than domestic labor-market conditions. On one side, there are those who argue that trade pressure is all that matters. These economists believe in factor price equalization — that is, in an economy fully integrated into the world trading system, domestic market developments have no effect on wages. The wages of workers of a particular education and

skill level in advanced countries cannot remain above those of comparable workers in developing countries when holding productivity fixed.

Some economists, such as Cahuc and Zylberberg, argue that trade does not matter at all. These economists reject factor price equalization. They reject the notion that activity in the traded goods sector can determine labor market outcomes in an economy. They believe that domestic economic developments do affect wages, such as the baby boom, that could have affected the pay of younger workers. Freeman rejects these polarized views. He found modest but real trade effects in the displacement of less-skilled labor and a decline in the price of goods produced by low-skill workers. In the end, he came up with his own more eclectic views: "Trade matters, but it is neither all that matters nor the primary cause of observed changes." (Freeman, 1995, p. 26)

Also, Adrian Wood (1994) in his paper "North-South Trade, Employment and Inequality" argues that standard factor content analyses understate the effect of trade on employment. Hence, when the proper corrections are made, "trade becomes the root cause of the fall in demand for less-skilled workers in advanced countries." (Wood, 1994, p. 136) This would suggest, therefore, that the wage for these workers in advanced countries declines relative to the more skilled workers as trade increases. Wood (1994) stated that, in accordance with the standard economic theory of trade, in the developed countries — such as Canada and the United States, when international trade occurs, the production of skill-intensive goods for export would increase, while production of labor-intensive goods would be replaced by imports, thereby reducing the demand for less-skilled relative to skilled workers. He believed that trade liberalization imposes a significant impact on employment and wage movements in

industrialized countries such as Canada and the United States.

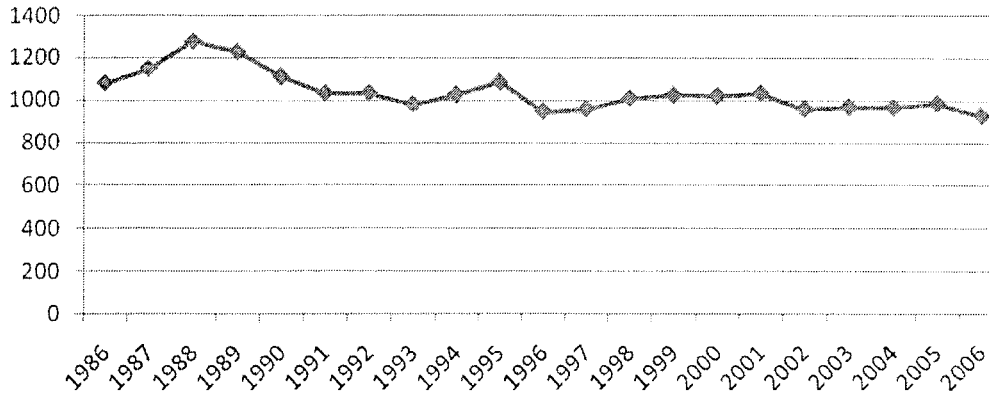
The FTA has been the heated subject of several studies since its implementation on January 1, 1989. In most of the articles, the results are similar to the estimates provided by Gaston and Trefler (1997) — namely, the movements in Canadian employment and wages due to the tariff reductions since 1989 would be minimal. To name a few, Head and Ries (1999) also concluded that the FTA had a puzzling effect on Canadian plant exit which was considered as the consequence of both falling Canadian and American tariffs and it had little net impact on industry level average output per plant. Beaulieu (2000) found that Canadian tariff reductions showed nearly no effect on earnings and had a minimal negative impact on manufacturing employment. Specifically, it is found that the tariff liberalization lowered employment predominantly among less-skilled workers. Clausing (2001) demonstrated that the FTA increased the United States imports from Canada (trade creation for Canada) but had little impact on diverting the United States imports away from its other trading partners. Romalis (2004) showed evidence that the FTA caused both trade creation and diversion in Canada. In the next section, with the use of more recent data, the changes in employment and earnings in the manufacturing sector (which was most affected by trade liberalization) will be presented to analyze the impact of the FTA on the Canadian labor market in more detail.

3. Stylized Facts

3.1. Trends in Employment and Earnings in the Canadian Manufacturing Sector

To analyze the impact of the ratification of the FTA on the Canadian labor market, it is of use to start by looking at the changes in employment and earnings in the manufacturing sector, which was most affected by trade liberalization. Figure 1 shows clearly that when the FTA went into effect in 1989, there was an obvious drop in the number of workers in the manufacturing sector. This fall continued until 1993 when it declined from 1,227,000 in 1989 to 979,000 in 1993. This was about a 20.2% drop from the 1989 level, and 248,000 jobs were lost. This trend was reversed a bit in 1994 when the number of workers (all education levels combined) increased to 1,027,000. However, there were still fewer workers in this sector in 1998 when compared with the 1989 level.

Figure 1 : Number of Workers in Manufacturing Sector for All Education Levels, 1986-2006



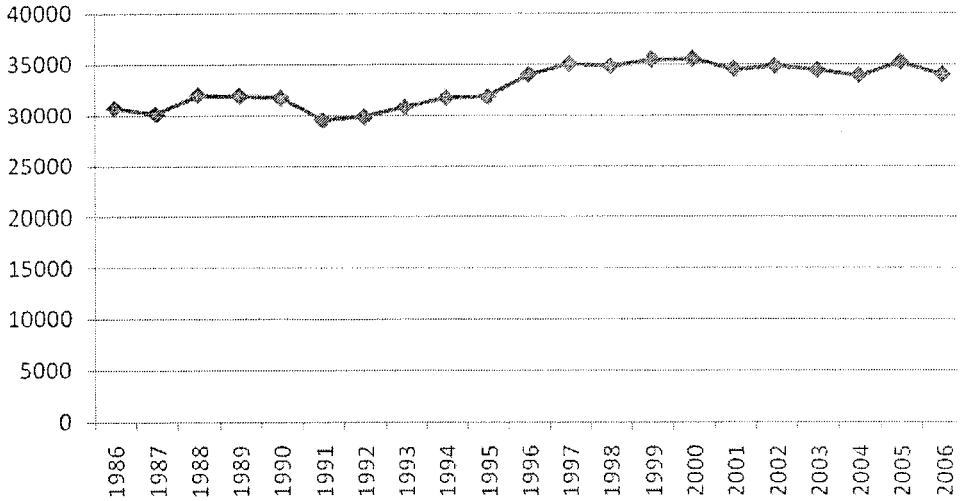
Unit: Thousands; Source: CANSIM II; Serial number: V25699813

Besides the employment trend, the adjustments in average annual earnings within the manufacturing sector are worth discussing as well. Figure 2 shows that, in 1989, average annual earnings in the manufacturing sector was about $ 31,900 (2002 Constant Dollars), and this value kept falling until 1992, when it bottomed out at $ 29,800. In 1993, it rose again to $ 30,800, and this trend continued until 1998, reaching the level of $ 34,800. It is interesting to see that average annual earnings fell only about 3.3% from 1989 to 1993, but for the entire period between 1989 and 1998, they rose by roughly 9.1% when compared with the 1989 level.

While looking at the huge job losses in manufacturing employment and minor drop in manufacturing average annual earnings between 1989 and 1993, a question has often been asked. Are these employment and average annual earnings trends related to the implementation of the FTA in 1989? If so, how much was due to the ratification of the FTA? Before answering this question, it may also be helpful to consider how the FTA impacted workers at different levels of educational attainment.

From the data obtained, workers are classified in accordance with the following categories of educational attainment: (1) Elementary Schooling (0 to 8 years); (2) Some Secondary Schooling; (3) Graduated/Completed Secondary Schooling; (4) Some Post-secondary Schooling; (5) Post-secondary Certificate or Diploma; (6) Completed University Degree. However, given data limitations, the group of people who have some years of university but have not yet graduated is not included

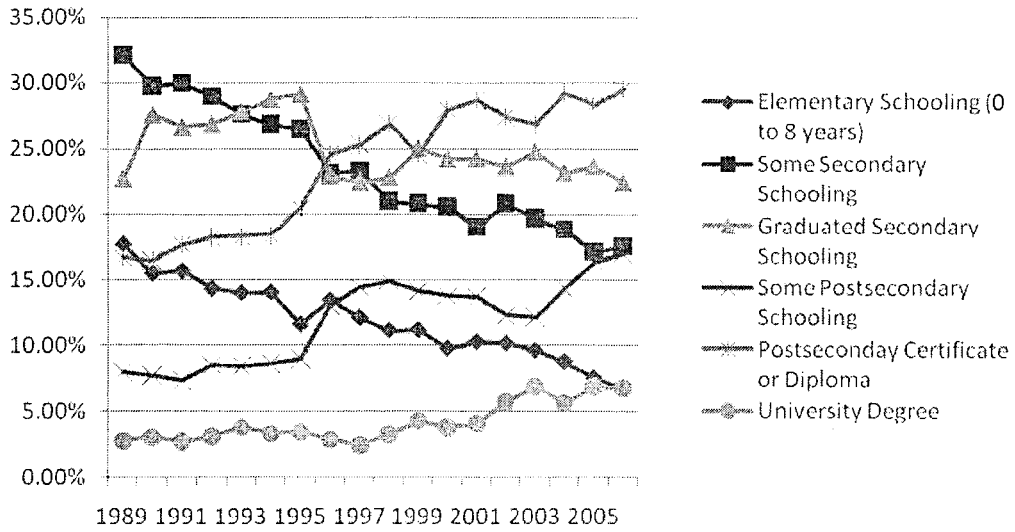
Figure 2 : Average Annual Earnings per Worker in Manufacturing Sector for All Education Levels, 1986-2006



Unit: Dollars (2002 Constant Dollars)
Source: Cansim II
Serial Number: V25699831

As the educational grouping will be used as a rough proxy of the difference between skilled and unskilled workers, this particular problem should not bring too much bias to our result. Also, it may be argued that workers with higher education levels are not necessarily skilled workers. For example, the person working at McDonald's could be a university graduate, but given the low skill requirements of the job, he/she obviously should not be taken as a skilled worker in that sense. This situation does exist, but given the fact that more university graduates than secondary school leavers would be able to take up jobs that would involve greater knowledge and skills, to some extent, it could be justified that a higher education level would broadly be associated with more skills requirements. In the following section, we shall be analyzing the workers grouped according to these six categories .

Figure 3: Composition of Workers at Different Education Levels in Manufacturing Sector, 1989-2005 (shares of the entire labor force)



Calculation: Percentage of a Certain Education Group = Number of Workers in the Education Group/ Total Number of Workers in the Industry (shares sum to 100)
Source: Cansim II
Serial Number: V25699814-V25699820

Figure 3 presents the employment shares for working people of each education level from 1989 to 2005, and it shows the change in the composition of the labor force in the manufacturing sector. Hence, 17.7% in 1989 means that 17.7% of workers in the manufacturing sector had only elementary schooling. This graph shows the following observations: (1) Over the entire 1989-2005 period, those workers with a university degree always accounted for the lowest percentage of workers within the sector. Also, in 1989, people with some secondary school education (but not high school graduates) constituted the highest share of workers, while in 1998 it was the group of people with a post-secondary certificate or diploma that represented the highest share of workers within the sector. (2) In terms of the change over the 10-year period of the phasing out of the tariff following the FTA in 1989, the employment share of those with only elementary schooling decreased steadily and, most significantly, from 17.7% down to 6.7% — representing about one-third of its 1989

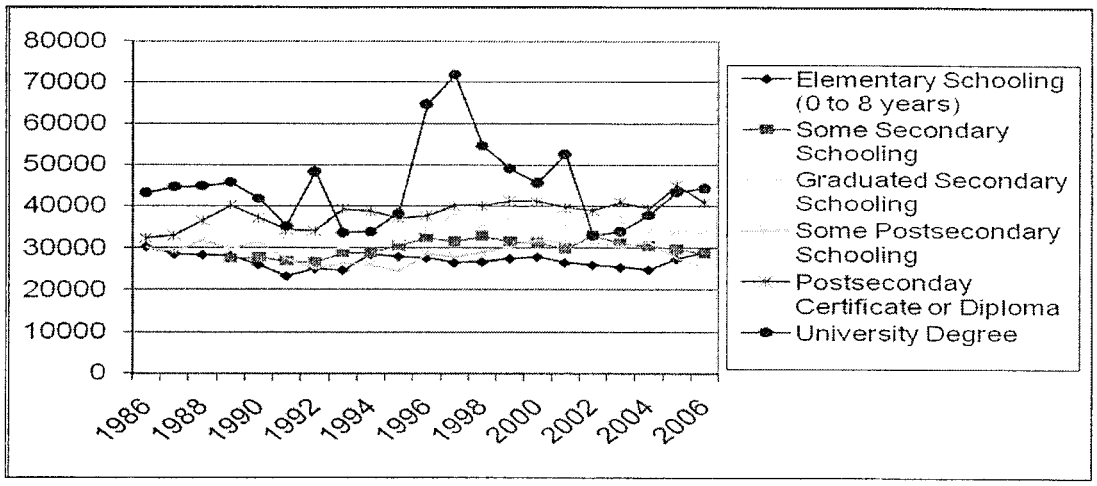
share. On the other hand, the employment share of those with a post-secondary certificate or diploma grew continually, from 16.7% to 29.5% — a share that almost doubled over that period. This would suggest that the labor force was becoming more and more eudcated.

From Figure 1 and Figure 2, it is observed that between 1989 and 2005, the employment changes in the manufacturing sector were more severe than the earnings adjustments. Furthermore, in Figure 3, the employment share of the lower education group declined, while that of the higher education group rose. This would suggest that, although the total employment dropped, the incidence differed considerably among individual education groups. Moreover, the employment share of working people with the lowest education level was affected most significantly, showing the largest decline. Has a similar change occured for the average annual earnings of manufacturing workers with different levels of educational attainment?

Figure 4 below shows the average annual earnings levels of different education groups between 1986 and 2006. From 1989 to 1998, these groups (with the exception of those with a university degree) all displayed fairly stable trends. However, the earnings were changing dramatically for those with a university degree. It started at $ 45,800 (2002 Constant Dollars) in 1989 and ended at $ 54,700 in 1998. To analyze this interesting trend further, Figure 5 presents the change of the earnings ratio, which is constructed as the weighted average of the earnings for elementary, some secondary and graduated secondary schooling groups measured as a ratio of the weighted average earnings of those with some post-secondary schooling, post-secondary certificate or diploma and completed university degree groups. The reason for regrouping the data in this way is to obtain a broad indicator of

the fact the employment shares of each education group had changed during that period. While lower education groups (elementary, some secondary and completed secondary schooling) all showed downward trends regarding their employment shares, the higher education groups (some postsecondary schooling, postsecondary certificate or diploma and completed university degree) showed opposite trends. These movements could partially explain the change of the earnings ratio. Because more low-skilled jobs were lost in the manufacturing sector and proportionally more of the higher skilled jobs were retained in the sector, the earnings ratio declined gradually from 1989 to 2006.

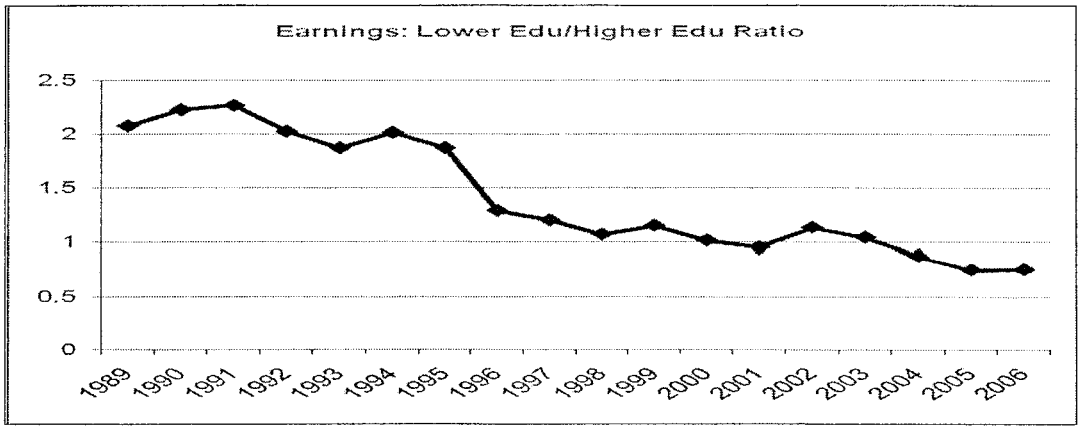
Figure 4: Average Annual Earnings Trend in Manufacturing Sector, 1986-2006



Unit: Dollars (2002 Constant Dollars)
Source: Cansim II
Serial Number: V25699832-V25699838

Previously, some basic stylized facts of the Canadian labor market were presented. If there is a relationship between the implementation of the FTA and the labor market adjustments, how did imports, exports and the tariff rate change since 1989 then? The next section will deal with this.

Figure 5: Earnings Ratio Movements, 1989-2006



Calculation: Employment Share* Earnings of Elementary Schooling Group + Employment Share* Earnings of Some Secondary Schooling Group + Employment Share * Earnings of Graduated Secondary Schooling Group

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Employment Share* Earnings of Some Postsecondary Schooling Group + Employment Share* Earnings of Postsecondary Certificate or Diploma Group + Employment Share * Earnings of University Degree Group

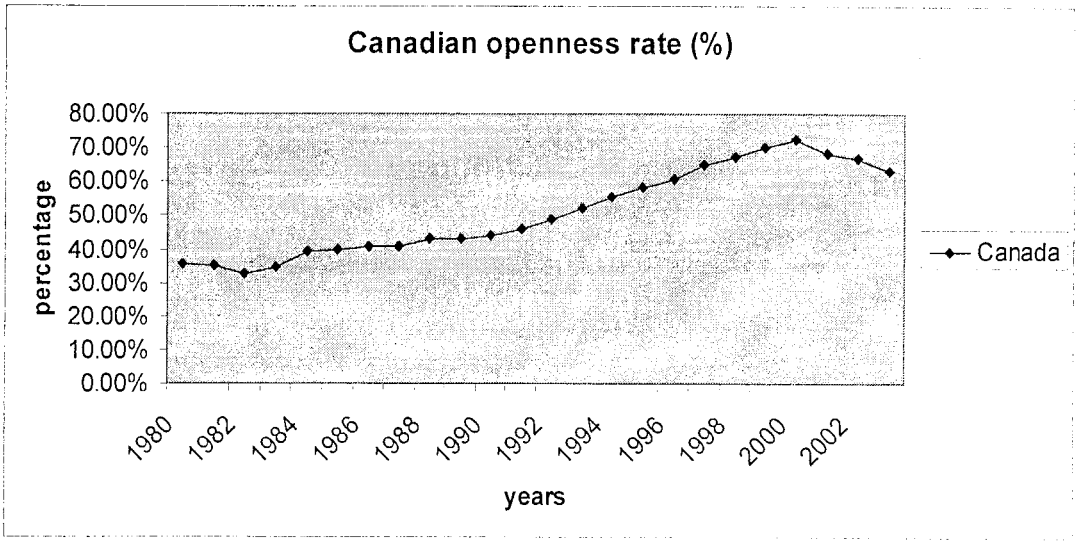
Note: Earnings are in 2002 Constant Dollars
Source: Cansim II
Serial Number: V25699832-V25699838; V25699814-V25699820

3.2. Evolution of Trade Pattern and the Tariff

Figure 6 presents the Canadian openness rate, which is calculated as the average

share of GDP of imports (of goods) plus exports (of goods) from 1989 to 2003. It shows that, on average, openness rates have grown since 1980 from 35.3% to 72.5% in 2000. Imports and exports as a percentage of GDP have become larger and larger. The imports and exports are important components of GDP in Canada. Figure 7 presents the trade balance, which is calculated as exports minus imports as a percentage of GDP for the whole Canadian economy. The trade balance/GDP ratio increased from 0.6% in 1989 to 4.4% in 1996, that is by 3.8 percentage points. Exports are higher than imports, and the change in exports is greater than the change in imports. During 1996-1997 period, the trade balance dropped somewhat, but it increased again after 1997. It increased from 2.5% in 1997 to 5.3% in 2001, that is by 2.8 percentage points. This may be indicative of increasing competitiveness of Canadian exporters versus their foreign counterparts.

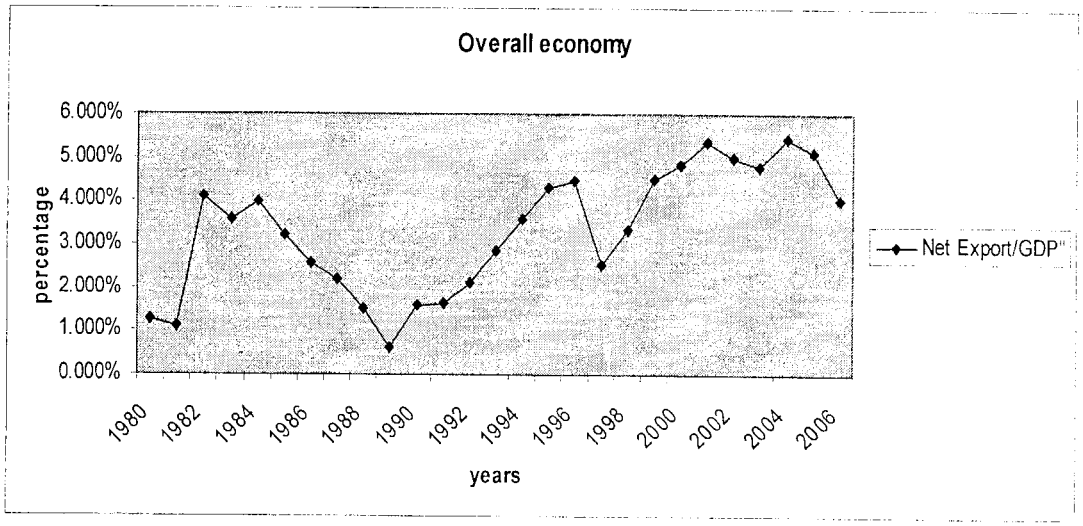
Figure 6: Canadian Openness Rate, 1980-2003



Source: Cansim II
Serial Number: V1992061, V1992064, V1992067
Note: GDP is Gross Domestic Product, Expenditure-based
Imports and Exports are Canadian exports and imports of goods

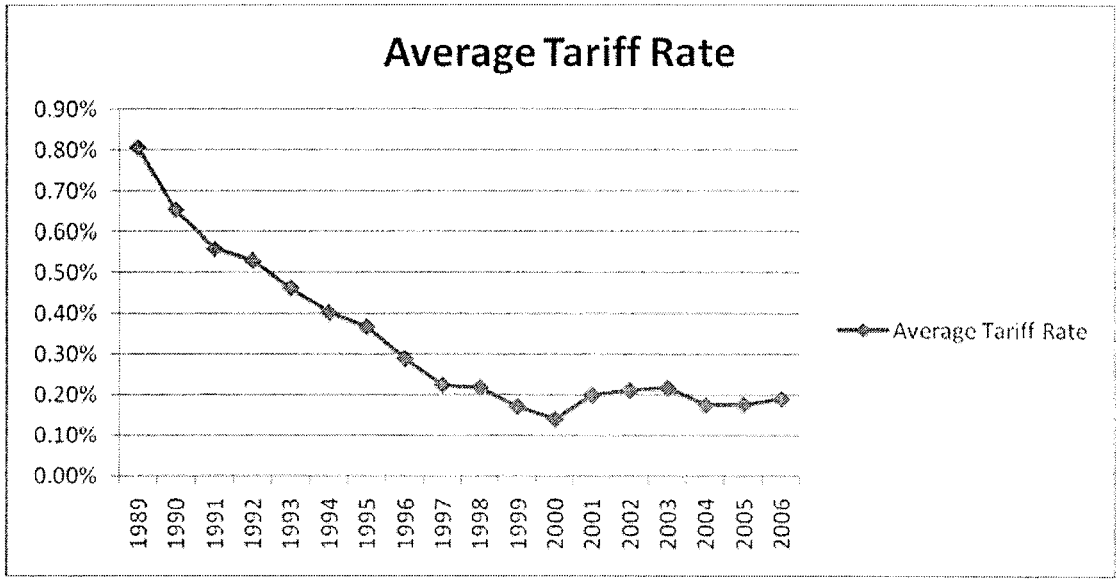
How about the change in the tariff rate since 1989? In Figure 8, the Canadian average tariff rate can be seen to decline from 1989 to 1998. After 1998, it stabilized. Part of the reason is that the FTA called for the removal of all tariffs between Canada and U.S. over a ten-year period ending in 1998. The increasing importance of trade in the economy is related to the reduction in the average tariff rate. Have these changes affected employment and earnings of Canadian workers? If yes, did they affect the lower educated/unskilled workers and higher educated/skilled workers differently? An empirical analysis on this topic is provided below so as to elaborate further on these issues.

Figure 7: Canadian Trade Balance, 1980-2006



Source: Cansim II
Serial Number: V1992061, V1992064, V1992067
Note: GDP is Gross Domestic Product, Expenditure-based
Imports and Exports are Canadian exports and imports of goods

Figure 8: Canadian Average Tariff Rate, 1989-2006



Calculation: Average Tariff Rate= Custom Duties Collected/Imports of Goods
Source: Cansim II
Serial Number: V1992064, V156131

4. Empirical Analysis

4.1. The Empirical Framework

The empirical analysis in this paper first follows the general approach taken by Gaston and Trefler (1997), Beaulieu (2000), Revenga (1992) and Grossman (1987) to measure the effects of trade liberalization on employment and average annual earnings by estimating the reduced-form equations derived from a general model of labor market equilibrium. This has become a standard approach for investigating the effects of international trade on labor markets. The reduced-form approach allows one to measure the quantitative effects on employment and earnings of changes in the variables of interest, but the disadvantage for this approach is that it does not allow one to examine the mechanism

through which the disturbances affect the employment and earnings in each sector. Each of the aforementioned studies considered the reduced-form employment and earnings equations taking the general form:

$$\Delta \ln L_{jt} = \alpha_0 + \alpha_1 \Delta X_t + \alpha_2 \Delta Z_{jt} + \alpha_3 \Delta T_{jt} + \nu_{jt}$$

$$\Delta \ln W_{jt} = \beta_0 + \beta_1 \Delta X_t + \beta_2 \Delta Z_{jt} + \beta_3 \Delta T_{jt} + \varepsilon_{jt}$$

where L_{jt} is the j^{th} sector employment in time t; W_{jt} is earnings; Δ is the first-difference operator (e.g., $\Delta Y_{jt} = (Y_{jt} - Y_{jt-1})$); X_t is a vector of time varying regressors common to all sectors; Z_{jt} is a vector of time-varying sector regressors representing both demand and supply determinants; T_{jt} is the vector containing the variables of interest; V_{jt} and ε_{jt} are random disturbances which are assumed to be independent and identically-distributed.

In this paper, I first estimate the effects of tariff liberalization on employment and earnings for the manufacturing sector only using the above two equations. For the manufacturing sector, the labor force is classified according to the following six categories by education level, namely (1) Elementary Schooling (0 to 8 years); (2) Some Secondary Schooling; (3) Graduated/Completed Secondary Schooling; 4) Some Post-secondary Schooling; (5) Post-secondary Certificate or Diploma; (6) Completed University Degree. The impact of the FTA on employment and earnings for each education level is then estimated separately for each category. Finally, the observations from the manufacturing sector will be pooled with those from the service sector. With the use of a dummy variable to distinguish between the two sectors, I shall test for the existence of different parameters estimates between the manufacturing sector, which was subjected to the FTA, and the service sector,

which, for the most part, was not. It is expected that the impact would be greater in the manufacturing sector, as the latter is the most exposed to foreign competition.

4.2. Data (1989-2006)

The data are annual data from 1989 to 2006. The dependent variables are employment and earnings by education level in the manufacturing and service sectors. Earnings are (real) average annual earnings per worker denominated in 2002 constant dollars. The independent variables are the real exchange rate (CAN$-U.S.$), GDP ratio (Canada GDP/U.S.GDP) and the Canadian tariff rate (Average Tariff Rate = Custom Duties Collected/Imports of Goods). The real exchange rate is included as a "macro" variable which has affectd the Canadian labor market. The GDP ratio takes into account all cyclically-sensitive demand side factors, including the change in imports and exports in both Canada and the United States. The explanatory variable of primary interest is the international trade variable. The trade variable included in the estimation is the Canadian tariff rate, defined as the dollar value of import duties as a proportion of the total value of imports. It is expected that the Canadian tariff rate would be positively correlated with earnings and employment levels.

4.3. The Results

The results from estimating the employment equations for workers of each education level and manufacturing sector as a whole are presented in Table 1. After checking

the Durbin-Watson Statistics, no autocorrelation is detected. This is due to the use of the first difference model which helps to correct this problem. The changes in the Canadian tariff rate had a statistically significant effect on employment for workers with elementary schooling, some secondary schooling, post-secondary certificate or diploma and also total manufacturing employment. The coefficients all have positive signs. Hence, a 1 percent reduction in the Canadian tariff rate is associated with a decrease in employment for workers with elementary schooling by 2.2 percent; a fall in employment for workers with some secondary schooling by 1.5 percent; a reduction in employment for workers with a post-secondary certificate or diploma by 0.8 percent; and a decrease in employment for the total manufacturing sector by 1.3 percent. The changes in the tariff rate seem to affect the employment of workers with elementary schooling the most, but affect the ones with a post-secondary certificate or diploma the least. This is consistent with Beaulieu's (2000) findings. Since Canada imports goods which are labor intensive, especially from the developing world, the tariff rate changes should affect the less-skilled workers the most. However, the effects of changes in the Canadian tariff rate on employment for workers with completed secondary schooling, some post-secondary schooling and a completed university degree are not statistically significant.

Moreover, the changes of the GDP ratio and the real exchange rate show more significant effects on manufacturing employment than the tariff rate change. Indeed, a 1 percent rise in the GDP ratio increases the total manufacturing employment by 9.9 percent, whereas a 1 percent rise in the real exchange rate decreases total employment by 2.3 percent. This finding is consistent with our previous analysis which states that the macroeconomic

situation of the Canadian economy must have had a considerable impact on the manufacuring sector between 1989 and 2006. For example, the real exchange rate is defined as the exchange rate of the $ CAN in U.S. funds, and therefore, as the real exchange rate goes up, the Canadian dollar appreciates, which means that Canadian products become more expensive in the international market. With international demand for these products falling, Canadian producers will need less input to produce these products and, consequently, employment would decline.

Table 1

OLS Estimates of Reduced-form Employment Equations for Manufacturing Sector by Education Level, 1989-2006

	All Edu Levels	Ele. School	Some.Sec School	Com .Sec School	Some Postsec. School.	Post.Sec Cer /dip	Uni. Degree
Variable Name	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate
GDP Ratio	0.099 (1.009)	0.012 (1.011)	0.017 (1.205)	0.143 (0.550)	-0.304 (-0.249)	-0.053 (-0.355)	0.126 (0.316)
Real Exch.	-0.023 (-1.928)	-0.055 (-1.496)	-0.013 (-1.039)	-0.178 (-0.282)	-0.587 (-0.098)	-0.040 (-1.116)	-0.049 (-0.508)
Tariff Rates	0.013 (1.962)	0.022 (1.054)	0.015 (1.079)	-0.022 (-0.064)	0.003 (0.011)	0.008 (1.235)	0.069 (0.129)
Constant	0.009 (0.079)	-0.024 (-1.462)	0.001 (0.093)	0.006 (0.228)	-0.010 (-0.374)	0.007 (0.438)	0.053 (1.256)
N	17	17	17	17	17	17	17
D-W stat	2.386	2.131	2.533	2.197	2.061	1.843	2.239
R^2	0.336	0.261	0.302	0.051	0.138	0.137	0.226
F	2.192 (0.012)	1.535 (0.025)	1.871 (0.018)	0.232 (0.872)	0.695 (0.571)	0.688 (0.075)	1.270 (0.326)

Note: The values in parentheses under the coefficient estimates are t-statistics.
The F-statistic is for the test of overall significance, with its p-value in parentheses.
* Please take note: The independent variables have all been transformed into logarithmic form so that the coefficients are estimates of the elasticities of the relevant variables.

Table 2 reveals the estimated results for average annual earnings equations for workers of each education level and total manufacturing sector. Again, no presence of autocorrelation is detected, given the use of a first difference model. The changes in the Canadian tariff rate only affect the earnings for the whole manufacturing sector and workers with elementary schooling. In regards to the impact of a lower tariff on the earnings variable, it is found that a 1 percent reduction in the Canadian tariff rate lowers the manufacturing average annual earnings by 0.3 percent and the average annual earnings for workers with elementary schooling by 0.1 percent, which are much smaller than the effects on employment.

Also, the GDP ratio exerts a positive influence on earnings, and the real exchange rate exerts a negative influence on earnings. As the GDP ratio increases by 1 percent, the earnings for workers with completed secondary schooling and some post-secondary schooling increase by 1.6 percent and 2.6 percent respectively. The change in the real exchange rate has influence on the earnings for workers with elementary schooling and some secondary schooling. A 1 percentage increase in the real exchange rate will decrease earnings for workers with elementary schooling by 3.2 percent and decrease earnings by 3.8 percent for workers with some secondary schooling. Tariff liberalization is found to have influence on employment and average annual earnings for the manufacturing sector, but the effect on earnings is very small. Besides, the GDP ratio and the real exchange rate exhibit more prominent impact on employment and earnings than the tariff rate does.

The next task is to examine the effects of the GDP ratio and the real exchange rate on the service sector in order to see if it has the same impact on employment and average

annual earnings as it is for workers in the manufacturing sector. To answer this question, a Chow test will be performed below.

Table 2

OLS Estimates of Reduced-form Average Annual Earnings Equations for Manufacturing Sector by Education Level, 1989-2006

	All Edu Levels	Ele. School	Some.Sec School	Com .Sec School	Some Postsec. School.	Post.Sec Cer /dip	Uni. Degree
Variable Name	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate
GDP Ratio	0.058 (0.913)	0.022 (0.018)	0.047 (0.504)	0.016 (1.517)	0.026 (1.789)	0.073 (0.504)	0.078 (1.641)
Real Exch.	-0.124 (-0.797)	-0.032 (-1.257)	-0.038 (-1.443)	0.032 (0.128)	0.103 (0.297)	-0.070 (-0.198)	-0.041 (-0.348)
Tariff Rates	0.003 (1.219)	0.001 (1.093)	-0.019 (-0.078)	-0.021 (-0.154)	-0.008 (-0.196)	-0.002 (-0.010)	0.005 (0.092)
Constant	0.004 (0.719)	-0.024 (-1.462)	0.002 (0.232)	0.010 (0.920)	0.011 (0.709)	0.008 (0.544)	-0.066 (-1.298)
N	17	17	17	17	17	17	17
D-W stat	2.114	1.987	2.051	2.353	2.236	2.365	1.853
R^2	0.175	0.198	0.227	0.199	0.266	0.041	0.177
F	0.916 (0.460)	1.075 (0.394)	1.272 (0.325)	1.082 (0.391)	1.572 (0.244)	0.187 (0.903)	0.934 (0.452)

Note: The values in parentheses under the coefficient estimates are t-statistics.
The F-statistic is for the test of overall significance, with its p-value in parentheses.
* Please take note: The independent variables have all been transformed into logarithmic form so that the coefficients are estimates of the elasticities of the relevant variables.

4.4. Chow Test

The Chow test is often used to determine whether the independent variables have statistically dissimilar effects on different subsets of a given population. Here we would like to examine if the GDP ratio and the real exchange rate affect the manufacturing and the

service sectors differently. The FTA was implemented to create a free trade area between Canada and the United States. The customs duties and restrictive measures on merchandise trade would be gradually eliminated. Hence, it is unlikely that the service sector would have been affected greatly. Thus, the employment and earnings equations in our analysis could take the following form:

$$\Delta \ln L_t = \alpha_0 + \alpha_1 Z + \alpha_2 \Delta X_t + \alpha_3 \Delta X_t * Z + \varepsilon_t$$

$$\Delta \ln W_t = \beta_0 + \beta_1 Z + \beta_2 \Delta X_t + \beta_3 \Delta X_t * Z + V_t$$

where L_t is sector employment; W_t is earnings; Δ is the first-difference operator (e.g., $\Delta Y_{jt} = (Y_{jt} - Y_{jt-1})$); X_t = the GDP ratio, the real exchange rate; Z_t is a dummy variable, which is set equal to 1 for manufacturing sector and 0 otherwise. V_t and ε_t are random disturbances which are assumed to be independent and identically distributed. As the service sector, for the most part, was not subjected to the FTA, the Canadian tariff rate variable is omitted here. Hence, if there is no difference between the two sectors, then $\alpha_1 = \alpha_3 = 0$ for employment ($\beta_1 = \beta_3 = 0$ for average annual earnings). If there is a difference between the two sectors, then either $\alpha_1 \neq 0$ or $\alpha_3 \neq 0$ or neither α_1 nor $\alpha_3 = 0$ for employment (either $\beta_1 \neq 0$ or $\beta_3 \neq 0$ or neither β_1 nor $\beta_3 = 0$ for average annual earnings).

When the manufacturing sector is pooled together with the service sector, there is now a total of 34 observations, and the results from estimating the employment equations for workers of each education level are presented in Table 3. First, the presence of autocorrelation is not detected. With regards to the existence of different parameters between the manufacturing and the service sectors, the GDP ratio and the real exchange rate have different impacts on these two sectors only for the workers with completed university degree.

Also, the change of the GDP ratio affects employment significantly only for the workers with elementary schooling and some secondary schooling. A 1 percent increase in the GDP ratio is associated with 4.8 percent rise for the workers with elementary schooling and 3.1 percent rise for those with some secondary schooling.

Table 3
OLS Estimates of Employment Equations for Manufacturing and Service Sectors Together by Education Level, 1989-2006

	All Edu Levels	Ele. School	Some.Sec School	Com .Sec School	Some Postsec. School.	Post.Sec Cer /dip	Uni. Degree
Variable Name	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate
Dummy	0.004	-0.018	-0.010	0.013	-0.010	0.006	0.062
	(0.252)	(-0.566)	(-0.343)	(0.377)	(-0.350)	(0.347)	(1.370)
GDP Ratio	0.068	0.048	0.031	0.047	-0.058	-0.069	-0.162
	(0.846)	(1.112)	(1.611)	(0.246)	(-0.297)	(-0.671)	(-0.065)
Real Exch.	0.097	0.004	0.068	-0.005	0.090	-0.182	0.129
	(0.418)	(0.009)	(0.786)	(-0.009)	(0.183)	(-0.610)	(0.179)
GDP*Z	0.086	-0.093	-0.198	0.084	-0.099	0.096	0.058
	(0.757)	(-0.373)	(-0.087)	(0.761)	(-0.041)	(0.656)	(1.642)
REX*Z	-0.027	-0.477	-0.446	-0.182	-0.531	-0.148	-0.344
	(-0.825)	(-0.653)	(-0.669)	(-0.235)	(-0.759)	(-0.349)	(-0.336)
Constant	0.006	-0.003	0.013	-0.007	0.005	0.002	-0.002
	(0.597)	(-0.141)	(0.634)	(-0.283)	(0.229)	(0.184)	(-0.054)
N	34	34	34	34	34	34	34
D-W stat	2.649	2.360	2.106	2.224	1.721	2.243	2.289
R^2	0.205	0.107	0.168	0.034	0.046	0.081	0.132
F	1.444	0.670	1.129	0.297	0.269	0.493	0.850
	(0.240)	(0.649)	(0.307)	(0.860)	(0.926)	(0.779)	(0.526)

Note: The values in parentheses under the coefficient estimates are t-statistics.
The F-statistic is for the test of overall significance, with its p-value in parentheses.
* Please take note: The independent variables have all been transformed into logarithmic form so that the coefficients are estimates of the elasticities of the relevant variables

Table 4 presents estimated results for average annual earnings equations relating

to workers of each education level. Surprisingly, the GDP ratio exerts different impacts on the manufacturing and the service sectors only for the workers with a completed university degree, but the real exchange rate does not show different effects on average annual earnings between the two sectors. The GDP ratio has a significant impact on average annual earnings for workers with some post-secondary schooling and the pooled manufacturing and service sectors. A 1 percent increase in the GDP ratio leads to a 2.6 percent rise in earnings for the workers with some post-secondary schooling and a 9.3 percent rise for the pooled manufacturing and service sectors. This would therefore further substantiate what was obtained from our previous regression results, which found that the effect of the tariff on the two labor market variables was quite mitigated or perhaps non existent.

To summarize, the empirical analysis conducted previously indicates that the tariff rate changes have almost no impact on average annual earnings of workers in the manufacturing sector, and that the impact on employment is minimal. It was also found that the tariff rate changes affect the employment of lower-educated workers more significantly. Moreover, the rise of the GDP ratio shows prominent positive effects on employment and average annual earnings within most of the manufacturing sector. The real exchange rate exerts negative influence on earnings only for workers with elementary schooling and some secondary schooling in the manufacturing sector. In terms of the impacts of the real exchange rate on employment, it shows significant negative effect on employment in the manufacturing sector. While comparing the impacts of the GDP ratio and the real exchange rate on manufacturing and the service sectors (except for the ones with completed university degree) the GDP ratio and the real exchange rate hardly show any different effects between the two

sectors.

Table 4
OLS Estimates of Average Annual Earnings Equations for Manufacturing and Service Sectors Together by Education Level, 1989-2006

	All Edu Levels	Ele. School	Some.Sec School	Com .Sec School	Some Postsec. School.	Post.Sec Cer /dip	Uni. Degree
Variable Name	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate	Coeff. Estimate
Dummy	-0.007	-0.002	0.001	-0.002	-0.019	-0.002	-0.074
	(-0.865)	(-0.098)	(0.026)	(-0.132)	(-0.943)	(-0.117)	(-0.607)
GDP Ratio	0.093	0.029	0.047	0.094	0.026	0.105	0.016
	(2.032)	(0.663)	(0.622)	(0.271)	(2.316)	(0.112)	(0.521)
Real Exch.	-0.054	0.026	-0.022	-0.022	-0.135	-0.064	-0.049
	(-0.402)	(0.664)	(-0.100)	(-0.112)	(-0.408)	(-0.237)	(-0.055)
GDP*Z	0.053	-0.061	-0.042	-0.025	-0.068	-0.035	-0.036
	(0.905)	(-0.403)	(-0.391)	(-0.254)	(-0.441)	(-0.246)	(1.585)
REX*Z	-0.104	-0.052	-0.034	-0.029	0.086	-0.007	-0.118
	(-0.555)	(-0.196)	(-0.396)	(-0.103)	(0.185)	(-0.018)	(-0.094)
Constant	0.011	0.009	0.001	0.009	0.026	0.010	0.015
	(1.898)	(0.721)	(0.093)	(1.031)	(1.797)	(0.868)	(0.372)
N	34	34	34	34	34	34	34
D-W stat	2.351	2.673	2.708	2.509	2.545	2.399	2.202
R^2	0.218	0.124	0.134	0.102	0.220	0.086	0.111
F	1.562	0.790	0.866	0.635	1.581	0.532	1.591
	(0.203)	(0.565)	(0.501)	(0.645)	(0.197)	(0.749)	(0.166)

Note: The values in parentheses under the coefficient estimates are t-statistics.
The F-statistic is for the test of overall significance, with its p-value in parentheses.
* Please take note: The independent variables have all been transformed into logarithmic form so that the coefficients are estimates of the elasticities of the relevant variables

4.5. The Limitations

Before we draw conclusions from the preceding analysis, it is important to consider

the limitations of the estimated results. The small sample size with only 17 observations constrains the explanatory power of this model a great deal. The relatively low R^2 values suggest that for certain educational groups this model may not explain the variability in the data well. Also, a high p-value of the F statistic indicates that the overall significance of the model is not statistically high. All these may have biased our results.

As only annual data are available for employment and average annual earnings by education levels in Cansim II, one could not increase the sample size. If some other database which could provide a longer annual data series is available, one would definitely try to improve the robustness of the model by including more data. Besides, the lack of the data disaggregated at the industrial level for both the manufacturing and the service sectors limited the explanatory power of the estimated results as well.

5. Conclusions

The impact of the Canadian-US Free Trade Agreement (FTA) on earnings and employment has always been the subject of considerable political speculation and academic research. This paper provides a brief review of the recent studies that have analyzed this issue and tries to assess the employment-related effects of the FTA on the Canadian economy by reviewing some of the most significant papers and empirical analysis in this literature.

This first began with a discussion of recent papers on this topic. In most of the articles, the results are similar to the estimates provided by Gaston and Trefler (1997). The studies by Gaston and Trefler (1997) and Beaulieu (2000) are of particular importance in

analyzing the labor market responses to trade policy changes. Both of them claimed that the FTA had almost no effect on earnings and had a small negative effect on manufacturing employment. Specifically, Gaston and Trefler's (1997) results suggested that the FTA tariff cuts accounted for no more than 15 per cent of the Canadian job losses, whereas, other factors, such as the Bank of Canada fight against inflation through high interest rate policy and economic recession of the early 1990s, explain more than 85 per cent of the job losses. Beaulieu (2000) did the research at a more disaggregated level. He investigated the effect of the FTA on the labor market outcomes of skilled (non-production) and less-skilled (production) workers in manufacturing industry rather than workers in general. He found that the Canadian tariff reductions did not affect the earnings of either non-production and production workers, but lowered employment predominantly among less-skilled workers. This is due to "the fact that relatively less-skilled-intensive industries were more highly protected than high-skilled-intensive industries prior to the FTA." (Beaulieu, 2000, p. 540)

Moreover, the massive job losses from 1989 to 1993 were not affected solely by the FTA but also by the macroeconomic situation of the Canadian economy during that period. Other factors included the continued deindustrialization trend during the FTA period, the economic recession in Canada, the rising Canadian dollar, and a tight monetary policy pursued by the Bank of Canada. Hence, there is no single factor that should be considered to be the cause of the poor performance of the Canadian labor market during the 1989-1993 FTA period. The macroeconomic situation seemed to have affected employment quite heavily.

Thirdly, some observed stylized facts of the Canadian labor market from 1989 to

2006 were presented. It showed that there was a total job loss in the manufacturing sector of 325,000 from 1,969,000 to 1,644,000 between 1989 and 1993. In terms of the earnings trends, real average annual earnings in the Canadian manufacturing sector did not change very much in the late 1980s and early 1990s.

My own empirical analysis provides a brief look at the impact of trade liberalization on earnings and employment of workers with elementary schooling, some secondary schooling, completed secondary schooling, some post-secondary schooling, post-secondary certificate or diploma and completed university degree who are employed in the manufacturing sector. It found that trade liberalization has either a small or no influence on earnings of workers for each education level in the manufacturing sector. On the other hand, it affects employment among lower educated workers but has less impact on employment of higher educated workers in the manufacuring sector. Moreover, the GDP ratio seems to exert significant effects on the labor market outcomes in both the manufacturing and the service sectors. On the other hand, the real exchange rate shows significant negative impact on employment in the manufacturing sector.

To summarize, although there are some shortcomings in this analysis, such as the fact that the data used were at the aggregated sector level and the sample size is small, the main finding suggests that, barring other considerations, the tariff reductions only had minimal impact on employment while showing almost no effect on earnings in the Canadian labor market.

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