The labour market consequences of the Canada-U.S. Free Trade Agreement

NOEL GASTON Tulane University and
the University of Adelaide
DANIEL TREFLER University of Toronto

Abstract. The Canada-U.S. Free Trade Agreement (FTA) was expected to reallocate workers from high-cost firms to low-cost firms, thus promoting specialization and trade creation. Instead, employment contracted across all industries during 1989–93 and real exports and imports contracted over most of the period. This trade destruction provides some evidence that the massive 1989–93 Canadian job losses were not primarily caused by the FTA. We further show that FTA tariff cuts account for no more than 15 per cent of the Canadian job losses. Restated, other factors (including the fight against inflation) explain more than 85 per cent of the job losses.

Les conséquences de l'Accord de libre-échange entre le Canada et les Etats-Unis pour le marché du travail. On anticipait que l'Accord de libre-échange entre le Canada et les Etats-Unis allait ré-allouer les travailleurs des entreprises à coûts élevés vers les entreprises à bas coûts, encourageant par le fait même la spécialisation et la création de commerce international additionnel. Or, l'emploi a décliné dans toutes les industries dans la période 1989–93 et les niveaux des exportations et des importations réelles ont chuté pendant le gros de la période. Cette réduction du commerce international suggère que les pertes d'emploi massives enregistrées entre 1989 et 1993 n'ont pas été causées d'abord par cet Accord. On montre que les réductions dans les niveaux de tarifs douaniers attribuables à l'Accord ne peuvent pas expliquer plus de 15% des pertes d'emplois au Canada. Pour le dire autrement, ce sont d'autres facteurs (comme la lutte à l'inflation) qui expliquent plus de 85% des pertes d'emplois.

Nothing has undermined the position of free traders more than the dismal performance of Canadian manufacturing employment since implementation of the

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Canada-U.S. Free Trade Agreement. Calls for the renegotiation and abandonment of the agreement enjoy popular political support in Canada, support that erupted in the comprehensive 1993 electoral defeat of the Conservative party, which had engineered the agreement. Looking forward to the North American Free Trade Agreement era, Canadian job losses are being held up as a harbinger of things to come for both Canadian and U.S. workers.

The impact of the Canada-U.S. Free Trade Agreement (FTA) on earnings and employment continues to be the subject of considerable political speculation. Unfortunately, little is known about the empirical relationship between labour market outcomes and trade protection. One specific goal of this paper is to evaluate the impact of the cuts in tariff rates on Canada's recent employment and earnings experience. While the tariff cuts are not the only aspect of the FTA that may have affected labour market outcomes, the cuts themselves have certainly been the focal point in the debate over freer trade. More generally, we examine other factors that have been proposed as important determinants of Canadian employment and earnings during the FTA period. These include the recession, the Bank of Canada's fight against inflation that led to high interest rates and a strong Canadian dollar, deindustrialization, and deteriorating labour productivity and rising labour costs in Canada relative to the United States.[1]

The data are a panel for the period 1980–93. By the 'FTA period' we will mean the five-year period 1989–93. Industries in the panel account for 96 per cent of non-agricultural employment in the tradeables (i.e., goods-producing) sector. Tradeables is the relevant sector, since by definition it is the only one with tariffs and merchandise trade. Our conclusions fall into four groups.

1. The FTA was expected to create trade by promoting specialization: tradeables-sector industries with a comparative advantage would expand employment; tradeables-sector industries with a comparative disadvantage would contract employment. This did not occur. Employment contracted in every tradeables-sector industry throughout the FTA period. Real exports and imports contracted for most of the FTA period.
2. The primary explanation for these events is the recession on both sides of the border. Two questions remain. (1) To what extent was the FTA responsible for the Canadian recession? We argue that it was not the primary force behind the recession. (2) Controlling for the recession in a regression-setting, how large was the impact of the FTA-mandated tariff cuts on employment and earnings? We find that it was small, accounting for only 9–14 per cent of the lost jobs.
3. Wages changed little during the FTA period. In addition, the tariff cuts do not explain why wages did not rise more.

1 Gaston and Trefler (1994a) presented a preliminary assessment of the FTA tariff cuts. Unfortunately, the data extended only to 1991, so that the almost exact coincidence of a deep recession and the FTA period confounded attempts to isolate the effects of the tariff cuts on earnings and employment. By the end of 1991 Canada had moved out of the deep recession that had obscured the effects of the FTA.

4. There have been winners and losers from the agreement. Winners include less-unionized industries; losers include those that are sensitive to a Canada-U.S. interest rate spread and a strong Canadian dollar.

There are a number of important caveats to our conclusions. First, services are excluded from the analysis. For example, we cannot discuss the impact of service sector FTA provisions such as national treatment. Nor can we quantify the extent to which FTA-related job losses in the tradeables sector have been absorbed by FTA-related job gains in the service sector. In the extreme, concern about manufacturing job losses would be mitigated if displaced workers were able to find equally well-paying service sector jobs. This seems unlikely in view of the job displacement literature, which emphasizes that post-displacement earnings do not recover to anywhere near their pre-displacement levels, especially when workers are forced to change industries (Jacobson et al. 1993). Second, our analysis is partial equilibrium in that economic linkages between industries are not allowed. For example, a tariff cut in textiles cannot be channelled into an employment increase in the downstream clothing sector. Third, we sidestep the more subtle pro-competitive aspects of the agreement associated with imperfectly competitive markets.

I. AN OVERVIEW OF THE FTA EXPERIENCE

We begin by reviewing the extent of the job losses and earnings reductions during the 1989–93 FTA period. We then offer informal insights into the causes of the FTA-period labour market trends. Throughout this study we restrict our attention to the twenty-two industry aggregates listed below in table 1. These industries accounted for 96 per cent of tradeables sector non-agricultural employment in 1988. The data are annual for 1980–93. The period 1980–8 was the implementation period for the tariff reductions agreed to under the GATT Tokyo Round and so provides additional sample variation needed to identify the impact of tariff changes on earnings and employment. 1980 was also the year that the Canadian SIC was revised and so represents a data-imposed break in our time series. Details about data construction appear in the appendix.

1. Employment and earnings losses since the FTA

The top panel of figure 1 plots yearly employment growth for the industries in our sample.[2] Values below the horizontal axis correspond to employment contractions. Shortly after implementation of the FTA in January 1989 employment began falling and continued doing so until 1992. A total of 390,600 jobs were lost, representing 19 per cent of the tradeables sector non-agricultural workforce. In contrast, employ-

2 By growth and percentage changes in x we shall mean $100^*(x_t - x_{t-1})/x_{t-1}$. In all the figures in this paper dark lines represent Canada or Canada-U.S. differences and light lines represent the United States. All panels within a single figure use the same scale in order to convey a clear impression of magnitudes across series.

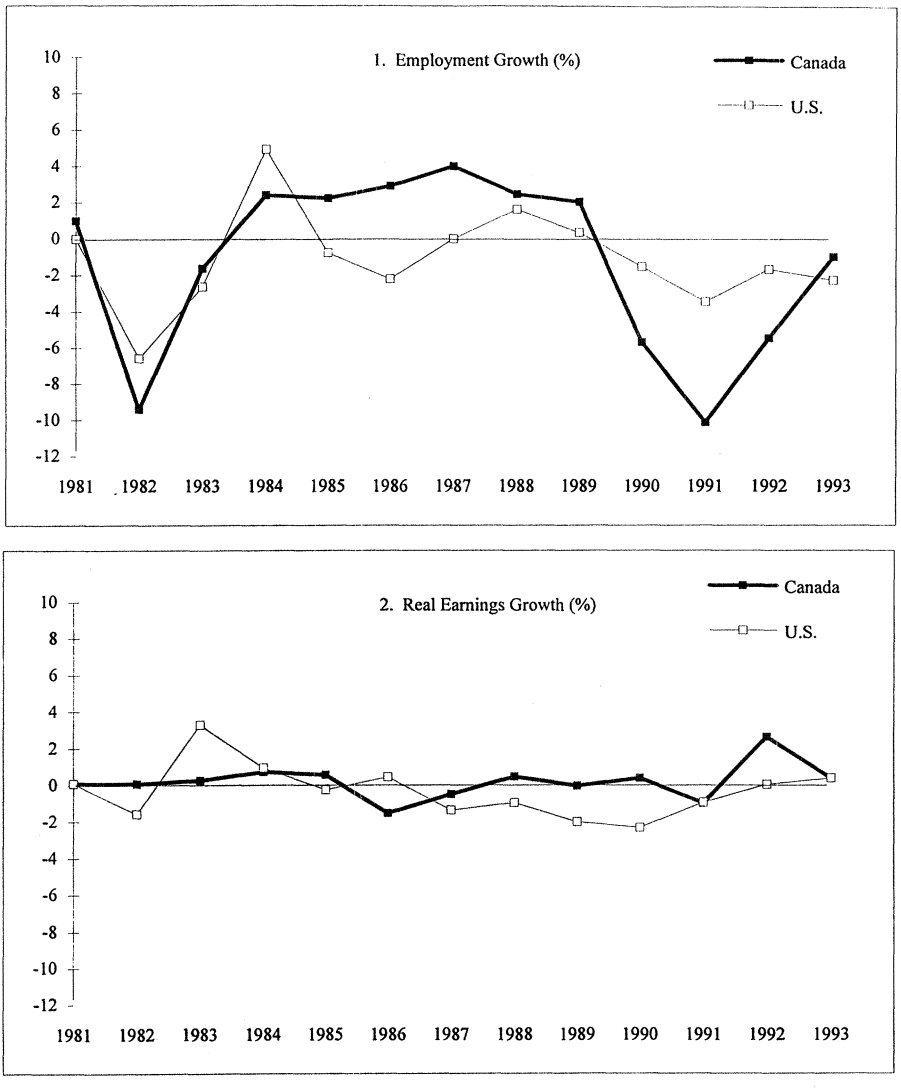

FIGURE 1 Employment and real earnings growth (per cent)

ment in the service sector rose modestly by 123,000 jobs, or 1.6 per cent. Canadian job losses in percentage terms were more than twice as large as job losses in the United States. The bottom panel of figure 1 plots growth in CPI-deflated real earnings. Surprisingly, real earnings have been stable over the FTA period, rising by a slight 3 per cent. This pattern of employment variability and earnings stickiness has also been noted in other settings (e.g., Grossman 1987, Revenga 1992).

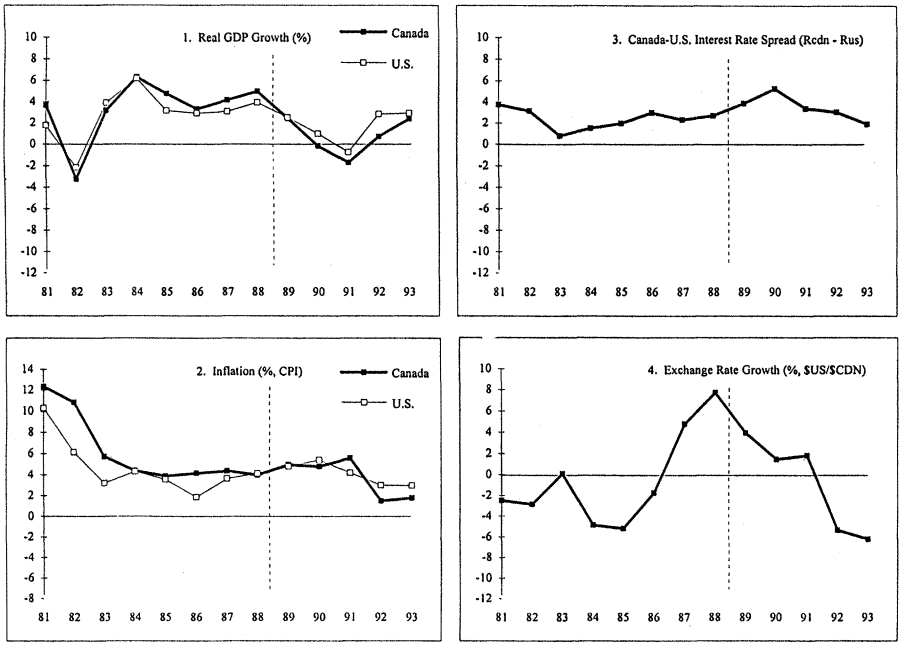

FIGURE 2 The macroeconomy

2. Impact of the FTA and alternative explanations

Can the FTA account for these employment and earnings movements? We will argue that while it can account for part of the movements, there are a number of alternative hypotheses that can also account for them. Figure 2 reviews the broad macroeconomic aggregates for our sample period. The FTA period is demarcated by the dashed vertical line. Panel 1 plots GDP at 1986 prices (Statistics Canada 13-0001) and illustrates that implementation of the FTA in January 1989 coincided with a protracted recession that hit manufacturing particularly hard. That the recession followed the largest post-war expansion and coincided with a U.S. recession suggests that a recession was due, regardless of the FTA. However, the similar timing of the FTA and the recession and the fact the Canadian recession was deeper and longer lasting than both its U.S. counterpart as well as its 1982 predecessor suggests that the FTA may have worsened the economic climate.

3. The fight against inflation

Another explanation for the large employment losses is the Bank of Canada's fight against inflation that was initiated at the same time as the 1986–8 FTA negotiations. Panel 2 plots inflation, measured as the percentage change in the CPI, and shows that the fight yielded fruit beginning in 1992. The anti-inflation stance had two consequences: a rise in the spread between Canadian and U.S. interest rates and a stronger Canadian dollar. Panel 3 shows the percentage point spread between

returns on Canadian and U.S. three-month treasury bills. The most notable feature is that the interest spread in 1990 was double its 1980–93 average of 2.7 per cent. Panel 4 plots percentage changes in the average noon spot exchange rate between the Canadian and U.S. dollars, where a rise corresponds to a Canadian dollar appreciation. The Canadian dollar strengthened over the period 1986–91. Canadian business viewed the interest rate spread and exchange rate trends, rather than the FTA, as the key reasons for the recession (e.g., Senate of Canada 1990 and *Globe and Mail*, 27 May 1995, A1).

4. Productivity and earnings

Another explanation for the large job losses, though not their timing, is labour costs and productivity movements. From 1975 to 1988 Canada's hourly compensation costs tripled, while those in the United States only doubled. By 1986 Canada had its highest costs relative to the United States in over thirty years (Daly 1990). This comparison worsened with the sharp Canadian dollar appreciation after 1986. High Canadian labour costs were not offset by high productivity. During the period 1980–8 U.S. manufacturing productivity grew by 17 per cent compared with only 8 per cent in Canada (Statistics Canada 15-204E). The deterioration of Canadian competitiveness was a time bomb waiting to go off. This view is supported by the fact that in the FTA period Canada has been restoring its competitiveness through job 'shedding,' thereby increasing its output per worker. A weakness of this explanation for job losses, however, is that it does not address why the losses began in 1990. In contrast, the FTA does provide such an explanation. Of course, the two factors may have interacted.

5. Deindustrialization

Another explanation for job losses in manufacturing is 'deindustrialization,' that is, the long-term shift of the economy towards services. There is some evidence of this for the United States in that employment for our sample contracted by 6 per cent during the pre-FTA period. However, Canadian employment in our sample actually grew by 3 per cent over the same period. Thus, there is little evidence of significant deindustrialization in the pre-FTA period.

6. Trade destruction, not trade creation

A final consideration is the impact of the FTA tariff reductions on employment via effects on imports and exports. Figure 3 plots Canadian exports to the United States (light line) and U.S. exports to Canada (dark line). Surprisingly, real exports and imports between the two countries contracted for most of the FTA period. The 1988 levels of trade did not recover until 1992 for Canadian exports and 1993 for Canadian imports. 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. Hence, the FTA cannot explain the observed trade destruction. Likewise, trade destruction cannot directly be explained by exchange rate movements. Rather, it is consistent with Keynesian income dynamics in which the Canadian and U.S.

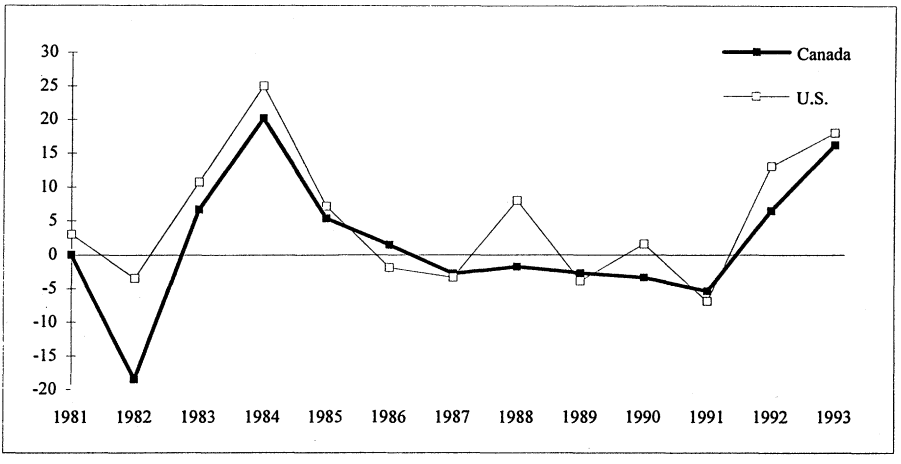

FIGURE 3 Bilateral Canadian and U.S. real import growth (per cent)

recessions reduced import demand. Since the U.S. recession was less severe than its Canadian counterpart, this explains why the Canadian trade surplus widened. Note that trade as a fraction of domestic consumption increased in the FTA period, suggesting that there was trade creation but that it was more than offset by the recession.

7. Summary

No single factor, including the FTA, can explain all the features of Canadian economic performance in the FTA period. We are impressed by two facts. (1) The primary negative impact of the FTA on tradeables sector jobs is expected to be via increased import competition. Yet much of the FTA period was characterized by a reduction in real imports and exports. This cannot be explained by the FTA, but it can be explained by the U.S. and Canadian recessions. (2) The fight against inflation (with its high interest-rate spread and strong Canadian dollar) likely contributed more heavily to the recession than did the FTA.

II. WINNERS AND LOSERS IN THE FTA PERIOD

A central question in the debate over the FTA was whether employment losses in import-competing and protected industries would be more than offset by employment gains in the export-oriented sectors of the economy. In this section we discuss the industries that have been the most affected, and the most unaffected, since implementation of the FTA.

Table 1 reports the key statistics for each industry in our sample. The columns for employment, imports, exports, and tariffs represent the change (1993 less 1988) in the levels of these variables for each industry in our sample. For example, 390,600 Canadian jobs were lost and 1,661,500 U.S. jobs were lost; Canadian

TABLE 1
Changes in employment, trade, and tariffs, 1988–93: by industry

	Employment		Bilateral imports			Type*	
Industry	Canada	United States	Canada	United States	Tariffs	High	Low
Electrical equipment	−39,100	−252,900	2,059	1,811	−4.2	*m*	
Apparel	−35,800	−110,400	293	201	−8.6	*t*	*m*, *x*
Metal fabricating	−35,500	−120,300	313	−9	−4.2	*t*	*m*, *x*
Food & beverages	−35,300	19,300	954	950	−2.2	*u*	*m*, *x*
Transportation equipment	−26,900	−311,000	−2,748	5,334	−1.3	*m*, *x*	*t*
Paper	−24,800	−9,700	541	−435	−3.9	*x*, *u*	*m*
Primary metal manuf.	−23,400	−95,000	406	−225	−2.2	*m*, *x*, *u*	
Machinery	−20,000	−192,900	643	3,271	−4.4	*m*, *x*, *u*	
Lumber & wood products	−19,800	−83,300	77	1,109	−1.6	*x*	*t*, *u*
Furniture & fixtures	−19,600	−47,600	753	697	−11.0	*t*, *x*	*u*
Instruments & misc.	−18,100	−174,400	927	1,097	−3.4	*t*, *m*, *x*	*u*
Nonmetal mineral manuf.	−14,000	−56,300	99	31	−2.3	*m*, *u*	*t*, *x*
Textiles	−13,900	−62,700	345	336	−5.0	*t*	*x*
Metal mining	−12,600	700	55	−300	−0.1	*u*	*t*, *m*
Mineral fuels mining	−12,000	−102,800	−155	3,369	−0.2		*t*, *m*, *u*
Leather	−9,500	−27,000	−60	6	−9.7	*t*, *m*	*x*
Rubber & plastic	−9,000	18,200	1,173	687	−4.7	*t*, *m*	*u*
Petro & coal products	−7,600	−4,800	−192	643	−0.3	*x*	*t*, *u*
Chemicals	−6,800	14,600	1,925	496	−5.1		*u*
Printing	−4,900	−43,400	352	46	−1.4		*t*, *m*, *x*, *u*
Non-metal mining	−1,600	−12,000	−25	22	−0.5	*u*	*t*
Tobacco	−600	−7,800	1	488	−8.0	*t*, *u*	*m*, *x*
All industries	−390,600	−1,661,500	7,735	19,626	−3.8		

NOTES
Employment changes are measured in number of workers, import changes are measured in millions of 1986 Canadian dollars, and changes in the Canadian tariff against the United States are measured in percentage points.
* Industry Type (in 1988): *t* = tariffs, *m* = imports, *x* = exports, *u* = union membership percentage. See section II for details.

imports from the United States rose by $7.735 billion (1986 Canadian dollars), and Canadian exports to the United States rose by $19.626 billion (1986 Canadian dollars); and the unweighted average Canadian tariff against the United States fell by 3.8 percentage points.

A striking feature of table 1 is the large employment losses in almost every industry in both Canada and the United States during the FTA period. Further, although Canadian job losses are proportionately larger, the pattern of job losses is similar in both countries. (The correlation between columns 2 and 3 is 0.53.) There are exceptions. Canadian job losses have been accompanied by U.S. job gains in food and beverages, chemicals, rubber and plastics, and metal mining. In addition, paper products and petroleum and coal products have experienced smaller job losses in the United States than in Canada. This provides evidence that these industries have suffered under the FTA.

TABLE 2
Canadian earnings and employment levels, 1988 and 1993

		Employment			Earnings		
	Tariff change	1988	1993	Difference (per cent)	1988	1993	Difference (per cent)
High tariff	−6.1	586,450	444,510	−24.2	415	421	1.5
Low tariff	−1.2	669,177	569,836	−14.8	573	581	1.4
Differences	−4.9			−9.4			0.1
High import	−3.2	807,371	647,407	−19.8	541	563	4.1
Low import	−3.5	887,814	726,363	−18.2	503	509	1.0
Differences	0.3			−1.6			3.1
High export	−3.1	821,742	661,692	−19.5	552	569	3.1
Low export	−4.1	800,282	650,840	−18.7	441	444	0.7
Differences	1.0			−0.8			2.4
High union	−2.6	667,432	535,305	−19.8	554	560	1.1
Low union	−3.4	641,753	543,988	−15.2	512	519	1.4
Differences	0.8			−4.6			−0.3
Canada	−3.6	2,056,307	1,665,706	−19.0	517	530	2.5
United States	−2.2	20,063,200	18,401,700	−8.3	363	346	−4.7

NOTES
i. Industry employment levels are used as weights in the earnings and tariff calculations. Earnings are in 1986 Canadian dollars. *ii.* There are eight industries in each group. Industries with high and low levels of the attributes are listed in table 1. The data in the 'Canada' and 'United States' rows are for all twenty-two industries.

To investigate further, industries were classified by some of their key characteristics in 1988: high tariffs, high union membership (as reported in Statistics Canada 71-202), and high imports or exports as a share of industry output. Table 2 reports employment and average earnings in 1988 and 1993 for different industry classifications. To obtain the numbers the twenty-two industries were ranked by a 1988 characteristics (e.g., Canadian tariff levels) and statistics calculated separately for the top eight and bottom eight industries. The middle six industries were deleted. The last two columns of table 1 list which industries are in each group. The employment numbers are the sum for the group, the earnings and tariff-change numbers are employment-weighted averages. Turning to tariffs, industries with high tariffs in 1988 experienced an FTA-mandated 6.1 percentage point tariff cut by 1993. Low-tariff industries in 1988 experienced only a 1.2 percentage point tariff cut. Correspondingly, between 1988 and 1993, high and low-tariff industries experienced employment cuts of 24.2 per cent and 14.8 per cent, respectively. That is, high-tariff industries lost a disproportionate number of jobs. Very little happened on the real earnings front. The rows 'Canada' and 'United States' report numbers for all twenty-two industries.

The only other high-low classification involving large performance gaps is

unions. Despite the fact that heavily unionized industries experienced shallower tariff cuts, they still lost a disproportionate number of jobs, 19.8 per cent compared with 15.2 per cent for less-unionized industries. This explains why the Canadian Labour Congress has been a vocal opponent of the FTA. Organized labour's high visibility evidences the vulnerability of union employment to changing patterns of international trade and protection. A similar conclusion using 1983 U.S. data appears in Gaston and Trefler (1995).

In keeping with the treatment-control approach to program evaluation, difference-in-differences are easily computed from table 2. In using this approach care is needed to ensure that the tariff cuts are those mandated by the FTA. In principle, some cuts might have been obtained outside the FTA framework either by lobbying activities or by changes in the imports used as weights to calculate average tariffs. In fact, our 1989–93 tariff-cut data were constructed to capture only FTA-mandated cuts. They use unchanging 1985 import weights and only those tariff cuts that appear in the agreement itself. Under the FTA, tariffs were to be phased out as a rate proportional to the height of the 1988 tariff level: the higher the 1988 tariff, the larger the tariff cut. Thus, take high-tariff industries to be the group 'treated' to FTA tariff cuts and low-tariff industries to be the 'control' group. From table 2, industries 'treated' to tariff cuts experienced 9.4 per cent deeper employment losses ($9.4 = 24.2 - 14.8$). This represents job losses of 55,126 ($= 0.094 \times 586{,}450$). This is a large number of jobs, but they comprise only 14 per cent of the jobs lost in this period ($0.14 = 55{,}126/390{,}600$). Restated, while the FTA tariff cuts contributed to job losses, most of the job losses during 1989–93 are not attributable to the agreement.

For earnings, industries 'treated' to FTA tariff cuts experienced 0.1 per cent higher real earnings. This represents a slight 33 cents-per-week spread over five years. These numbers require one to accept a random-assignments view of tariff cuts, when in fact tariffs in 1988 were not randomly assigned. That is, the control group is suspect. It should be stated that the most obvious source of suspicion is misplaced. It is tempting to argue that low-tariff industries were the ones facing high U.S. tariffs and U.S. tariff cuts, so that the FTA helped these industries expand rather than leaving them as an unaffected control. In fact, the low-tariff group is composed of the same industries in both countries. Likewise for the high-tariff group. Thus, in this limited sense, both the U.S. and the Canadian tariff cuts are built into the above estimates of job losses and the low-tariff group forms a reasonable control. We return to this issue below.

III. THE EFFECTS OF TARIFF CUTS ON EARNINGS AND EMPLOYMENT

The increasing openness and vulnerability of the United States and Canada to international competition has led to a wealth of new research on the effects of imports and exports on earnings and employment. Recent and widely cited regression-based studies dealing with the dynamic effects of trade flows on both industry earnings and employment are by Grossman (1987), Abowd and Lemieux (1991),

Freeman and Katz (1991), and Revenga (1992). Apart from Gaston and Trefler (1994a), however, there have been no regression-based studies of the earnings and employment responses to changes in trade policy.

Whether motivated by market-clearing models of the labour market or by models of union-firm bargaining, each of the aforementioned studies considered reduced-form employment and earnings equations taking the general form,

$$\Delta \ln L_{jt} = \alpha_0 + \alpha_1 \Delta X_t + \alpha_2 \Delta Z_{jt} + \alpha_3 \Delta T_{jt} + \nu_{jt} \tag{1a}$$

$$\Delta \ln W_{jt} = \beta_0 + \beta_1 \Delta X_t + \beta_2 \Delta Z_{jt} + \beta_3 \Delta T_{jt} + \varepsilon_{jt}, \tag{1b}$$

where L_{jt} is industry employment; W_{jt} is earnings (or wages); 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 industries; Z_{jt} is a vector of time-varying industry regressors. First-differencing eliminates time-variant industry effects. Some of the variables on the right-hand-side of (1) are intended to capture determinants of the supply and demand for labour. The random disturbances ν_{jt} and ε_{jt} are assumed i.i.d. normal. T_{jt} is the vector containing the variables of interest such as trade flows (and in this paper, tariff barriers).

Of the studies mentioned above, Grossman has X_t = (wholesale price index, aggregate industrial production, aggregate capital stock); $Z_{jt} = 0$; T_{jt} = (import price index). Abowd and Lemieux have $X_t = 0$; $Z_{jt} = (\Delta \ln L_{jt-q}, \Delta \ln W_{jt-q})$, where q is the length of a collective bargaining agreement; T_{jt} = (domestic consumption, import penetration ratio, exports). Freeman and Katz have $X_t = 0$; Z_{jt} = (immigrants-employees ratio, percentage of workers unionized); T_{jt} = (domestic consumption, import penetration ratio, exports). Revenga has X_t = (aggregate unemployment, average earnings of service industry workers, materials price index); $Z_{jt} = 0$; T_{jt} = (import price index). Revenga also included industry dummies in her regressions.[3]

For our study, data limitations necessitate the exclusion of the usual supply and demand regressors such as the price of non-labour inputs. Gunderson (1992) argues that this is reasonable because the mobility of non-labour factors of production will equalize factor prices across industries. We improve upon the approach taken in Gaston and Trefler (1994a). First, we include the 'macro' variables identified in the previous section as having affected Canadian labour markets in the pre-FTA and FTA periods. That is, X_t = (interest rate spread, exchange rate). In section IV.1 we also consider five other macro variables. Second, we include U.S. employment levels to control for underlying determinants of structural change, that is, Z_{jt} = (U.S. employment). As mentioned in the previous section, the FTA had minimal effects on the United States (e.g., Perroni and Whalley 1994 and our unreported regressions of equation (1), which yield zero effects of the FTA tariff cuts on U.S.

3 The assumed lag structures differ in each study. For example, Freeman and Katz use first differences. Our annual data and the shortage of observations for the FTA period lead us to consider primarily first differences. Other lag structures appear in parts of table 5, below.

earnings and employment), and Z_{jt} can therefore be treated exogenously for the purpose of investigating the impact of the FTA tariff cuts on Canadian wages and employment.

Finally, and most important, T_{jt} = (Canadian and U.S. tariffs, Canadian imports from the United States, Canadian exports to the United States, and domestic consumption). The reasons for including both tariffs *and* trade flows in T_{jt} are provided by Gaston and Trefler (1994b, 1995).[4] With perfectly competitive product markets, the best-known channel through which trade barriers affect the labour market is that lower protection stimulates imports, which in turn decreases the demand for domestic labour and hence reduces earnings and employment. With imperfectly competitive product markets, trade and protection can affect the strategic interaction between firms, thus affecting firm performance and hence earnings and employment. This channel is especially interesting, since it provides reasons why protection may affect earnings and employment independently of any effect that protection may have on trade flows. For example, domestic firms sometimes price just below the world price plus tariff so as to exclude imports. In this case a higher tariff helps domestic firms, since it raises the domestic price but leaves imports unchanged at a low level, thus severing the direct link between tariffs and imports. Another example is that firms may respond to import barriers by reducing output and moving up their average cost curves (that are decreasing throughout their relevant ranges), thus becoming high-cost, inefficient producers. Eastman and Stykolt (1967) provide Canadian evidence that supports the view that trade protection leads to an inefficiently small scale of production for a small domestic market. Overall, lower protection is likely to have an effect that is far more complicated than that captured by an export- or import-induced shift in product demand.

We follow Freeman and Katz and Abowd and Lemieux in their treatment of the adjustment of earnings and employment to domestic and international demand shocks. They decompose industry output into weighted components of imports, exports, and domestic consumption. The definition of domestic consumption is $\text{DOM} \equiv S + M - X$, where S is industry value of shipments, X is exports, and M is imports. This can be written in first differences as $\Delta S \equiv \Delta\,\text{DOM} + \Delta X - \Delta M$. Dividing by S and converting variables to natural logs yields: $\Delta s = (\text{DOM}/S)\Delta dom + (X/S)\Delta x - (M/S)\Delta m$ (where lower-case variables are logs). Hence, changes in domestic consumption, imports, and exports are scaled by their contributions to total industry shipments.[5] We will use bilateral trade rather than total trade.

Estimates of the employment equation (1a) are reported in table 3 and estimates of the earnings equation (1b) are reported in table 4. The adjusted-R^2 is good for the employment equation and poor for the earnings equation. The latter finding reflects the considerable earnings rigidity throughout our entire sample period (recall figure 1). While all coefficient signs are as expected, it is apparent that the FTA tariff cuts have had little impact upon earnings.

4 Results omitting trade flows appear in table 5, below.

5 Results for unweighted changes in domestic consumption, imports, and exports appear in table 5, below.

TABLE 3
Regression Results for Canadian Employment Changes, 1980–93

	All (1)	High tariff (2)	High import (3)	High union (4)	1980–8 (5)	1989–93 (6)
Canadian tariffs	0.013	0.012	−0.005	−0.001	0.006	0.005
	(1.874)	(1.205)	(0.394)	(0.128)	(0.400)	(0.537)
U.S. tariffs	−0.004	−0.002	0.016	−0.008	−0.001	−0.003
	(0.640)	(0.261)	(1.220)	(1.021)	(0.062)	(0.451)
Imports	−0.205	−0.344	−0.213	−0.138	−0.217	−0.168
	(4.371)	(3.506)	(2.885)	(2.647)	(5.529)	(1.257)
Exports	0.192	0.262	0.206	0.160	0.218	0.243
	(4.523)	(2.500)	(2.885)	(3.273)	(5.549)	(2.319)
Domestic consumption	0.228	0.375	0.236	0.201	0.227	0.307
	(6.053)	(4.032)	(3.372)	(4.681)	(7.228)	(2.730)
Interest-rate spread	−0.005	−0.003	−0.007	−0.005	0.009	−0.007
	(1.612)	(0.452)	(1.196)	(1.279)	(2.229)	(0.753)
Exchange rate	−0.152	−0.158	−0.231	0.050	−0.084	−0.386
	(1.756)	(0.847)	(1.432)	(0.463)	(1.003)	(1.562)
U.S. employment	0.556	0.471	0.601	0.457	0.514	0.750
	(7.702)	(2.160)	(3.420)	(6.188)	(8.591)	(2.995)
Intercept	0.011	0.006	0.017	−0.002	−0.017	−0.002
	(1.006)	(0.275)	(0.861)	(0.128)	(1.419)	(0.052)
Observations	278	96	104	104	168	110
Adjusted R^2	0.393	0.308	0.414	0.536	0.565	0.220
F	23.371	6.292	10.081	15.846	28.099	4.845

NOTES
i. Absolute value of *t*-statistics are in parentheses. *ii*. The dependent variable is the first difference of log employment. *iii*. The interest-rate spread and the first differences of tariffs are in percentage points. The exchange rate and U.S. employment are first differences of logs. Domestic consumption, imports, and exports are first differences of logs and are weighted as described in section III. *iv*. High-tariff, high-import, and high-union industries are listed in table 1.

While the impact of the FTA upon earnings has been small, lower tariffs did have a negative effect on employment levels. We estimate that each 1 percentage point reduction in Canadian tariffs lowers employment by about 1.3 per cent, and each 1 percentage point reduction in U.S. tariffs raises employment by about 0.4 per cent. Under the FTA Canadian tariffs against the United States will fall to zero from their 1988 average level of 3.2 per cent, and U.S. tariffs against Canada will fall to zero from their 1988 average level of 2.0 per cent. Holding all other regressors constant (notably imports and exports), this implies that the FTA tariff cuts would reduce Canadian employment by 3.36 per cent (=(1.3 × −3.2 per cent) + (−0.4 × −2.0 per cent)) and reduce Canadian earnings by 0.16 per cent (=(0.3 × −3.2 per cent) + (= 0.4 × −2.0 per cent)). The *t*-statistic for the sum of the Canadian and U.S. tariff reductions is 1.80 for employment and $t = 0.07$ for earnings. Hence, the tariff reductions are likely to have a minimal impact on Canadian real earnings. Restated, over the 1989–93 period, the effect is 1.68 per

TABLE 4
Regression results for Canadian earnings changes, 1980–93

	All (1)	High tariff (2)	High import (3)	High union (4)	1980–8 (5)	1989–93 (6)
Canadian tariffs	0.003	0.001	0.005	−0.005	0.001	0.004
	(0.743)	(0.203)	(0.861)	(0.926)	(0.087)	(1.147)
U.S. tariffs	−0.004	−0.004	−0.005	−0.002	0.003	−0.007
	(1.508)	(0.992)	(0.793)	(0.468)	(0.338)	(2.162)
Imports	−0.025	−0.075	−0.063	−0.016	0.004	−0.113
	(1.050)	(1.450)	(1.796)	(0.671)	(0.131)	(2.066)
Exports	0.044	0.095	0.075	0.011	−0.006	0.128
	(2.005)	(1.718)	(2.202)	(0.472)	(0.206)	(2.972)
Domestic consumption	0.027	0.089	0.079	0.018	−0.00002	0.109
	(1.385)	(1.822)	(2.368)	(0.913)	(0.001)	(2.369)
Interest-rate spread	−0.002	−0.006	−0.0001	0.0002	−0.007	0.007
	(1.051)	(1.617)	(0.039)	(0.113)	(2.480)	(1.859)
Exchange rate	0.067	−0.085	0.018	0.119	0.026	0.254
	(1.506)	(0.864)	(0.229)	(2.390)	(0.452)	(2.505)
U.S. employment	0.039	−0.111	−0.144	0.084	0.055	0.066
	(1.046)	(0.967)	(1.731)	(2.447)	(1.338)	(0.641)
Intercept	0.007	0.018	0.0002	0.003	0.021	−0.021
	(1.375)	(1.592)	(0.027)	(0.512)	(2.557)	(1.493)
Observations	278	96	104	104	168	110
Adjusted R^2	0.047	0.036	0.037	0.066	0.012	0.191
F	2.698	1.441	1.493	1.903	1.259	4.213

NOTES
i. Absolute value of *t*-statistics are in parentheses. *ii*. The dependent variable is the first difference of log employment. *iii*. The interest-rate spread and the first differences of tariffs are in percentage points. The exchange rate and U.S. employment are first differences of logs. Domestic consumption, imports, and exports are first differences of logs and are weighted as described in section III. *iv*. High-tariff, high-import, and high-union industries are listed in table 1.

cent (= 3.36/2) or 34,546 lost jobs. These lost jobs account for only 8.8 per cent of the 390,600 lost jobs in the period. Notice that employment falls because the Canadian tariff is higher than the U.S. tariff and because Canadian employment is more sensitive to the Canadian tariff than to the U.S. tariff.

As expected, imports (exports) exert a negative (positive) influence on earnings and employment. Judging by the coefficients on domestic consumption, employment is procyclical and earnings appear to be acyclical. This is consistent with the impressions gained from figure 1. The recession contributed substantially to the weak Canadian labour market. Higher values of the exchange rate in the tables refer to a stronger Canadian currency; hence, the rising Canadian dollar seems to have had a negative effect on employment – a 10 per cent strengthening of the Canadian dollar is associated with a 1.5 per cent fall in employment. The interest rate spread has an economically large and statistically insignificant effect on employment and earnings. For example, a one percentage point rise in the interest-rate

spread decreases employment by 0.5 per cent. Finally, the strong direct relationship between Canadian earnings and employment and U.S. industry employment levels suggests that the effects of ongoing North American structural change have been quite pervasive.

IV. DATA DISCOVERIES AND DIAGNOSTICS

So far we have treated the specification with greater confidence than is warranted, given that our model, like any other, is unlikely to satisfy the many assumptions upon which the desirable properties of OLS rest. In this section we address these specification issues. In so doing we distinguish between robust and fragile results and highlight the features of the data that drive our conclusions.

1. Choice of regressors

Since there is no well-defined supply-demand model underlying our reduced-form regressions, a strong case can be made for omitting some regressors and adding others. Given that there are only five years in our FTA period, we need a parsimonious set of macro variables (ones that vary over time but not across industries). We chose the interest rate spread and the exchange rate because these are the most commonly cited explanations for the job losses (see section I). The omission of other determinants of employment and earnings, however, could bias our estimates. Hence, we also considered the following regressors: the ratio of the federal government deficit to GDP, the ratio of federal government expenditure to GDP, dummies for the Mulroney and Chrétien governments, and the ratio of immigrants to employees. Data are from Statistics Canada 11-210. The results appear in table 5. Line 1 reports the model presented in section III. To save space, as we vary the regressor set we report only the coefficients on Canadian and U.S. tariffs and on regressors with fragile coefficients (the interest-rate spread and the exchange rate). Line 2 reports the result of including all seven macro regressors in the regression. This leads to a decrease in the effects of Canadian and U.S. tariff cuts on employment. Using the same calculus as before, during 1989–93 the tariff cuts cost Canada 0.86 per cent of its tradeables sector workforce, or 17,684 lost jobs. Again, this is a small proportion of the lost jobs in this period (17,684/390,600 = 0.05).

Another approach is to consider all the 2^k regressions in which each of the seven macro regressors are included or excluded. Across all $2^7 = 128$ regression specifications the Canadian tariff coefficient varies between 0.006 and 0.015 and the U.S. tariff coefficient varies between −0.005 and −0.0005. The bounds imply that the tariff cuts reduced tradeables employment by 0.8–2.0 per cent, or eliminated 17,000–41,000 jobs, or explain 4–11 per cent of all jobs lost in the FTA period. It is remarkable how tight these bounds are across so many different specifications.

Expanding the regressor set highlights the fragility of our inferences regarding macro variables. All their coefficients flip signs across the 128 specifications. In contrast, all the non-macro variables (ones that vary across industries and time) have coefficients that never switch signs across the 128 specifications.

TABLE 5
Regression diagnostics

Description	Employment					Earnings				
	Canadian tariffs	U.S. tariffs	Interest rate	Exchange rate	R^2	Canadian tariffs	U.S. tariffs	Interest rate	Exchange rate	R^2
1. Full model	0.013*	−0.004	−0.005	−0.152*	0.410	0.003	−0.004	−0.002	0.067	0.074
Choice of regressors										
2. 7 macro variables	0.006	−0.001	−0.005	0.498*	0.505	0.004	−0.005*	0.004	−0.207*	0.109
3. No U.S. tariffs	0.010*		−0.005	−0.158*	0.409	−0.0005		−0.002	0.061	0.066
4. No macro variables	0.016*	−0.004			0.400	0.003	−0.004			0.059
5. No trade	0.013*	−0.005	−0.013*	−0.120	0.323	0.002	−0.005	−0.003*	0.088*	0.057
6. Unweighted demand	0.016*	−0.005	−0.012*	−0.142	0.356	0.002	−0.005	−0.003*	0.064	0.155
7. Sales	0.010	−0.003	−0.003	−0.116	0.413	0.002	−0.004	−0.002	0.089*	0.067
Endogeneity										
8. Lags	0.011	0.002	−0.032*	−0.144	0.314	0.001	−0.003	−0.004*	−0.009	0.037
9. Lagged GDP	0.013*	−0.003	−0.016*	−0.189*	0.339	0.004	−0.005	−0.003	0.074	0.071
10. 5 year tariff phase-out	0.018*	−0.003	−0.004	−0.116	0.426	0.004	−0.005*	−0.002	0.076*	0.080
11. 10 year tariff phase-out	0.022*	−0.001	−0.006*	−0.129	0.413	0.008	−0.004*	−0.002	0.079*	0.080
12. Errors in variables	1.659	−2.422			0.362	−0.626				
Influential observations										
13. Omit rubber & plastics	0.018	−0.010*	−0.005	−0.099	0.451	0.002	−0.004	−0.003	0.071	0.087
14. Omit furniture & fixtures	0.007*	0.002	−0.005	−0.143*	0.407	0.003	−0.004	−0.002	0.066	0.069
15. Omit 1980–81, 1981–82	0.011	−0.004	−0.007*	−0.231*	0.335	0.004	−0.006*	−0.001	0.061	0.082

* Statistically significant at the 10 per cent level

We now turn to the non-macro regressors. Out of concern about the degree of collinearity between Canadian and U.S. tariff reductions, line 3 reports the effects of omitting U.S. tariffs. Line 4 explores the effects of omitting the interest rate spread and exchange rate regressors. Line 5 omits imports and exports on the grounds that the primary impact of tariffs is via trade. Line 6 examines whether the weighting scheme used for imports, exports, and domestic consumption matters by using unweighted imports, exports, and domestic consumption. Line 7 investigates the effects of restricting imports, exports, and domestic consumption to have identical slopes. This might be expected if all that mattered were the level of demand and not the source of demand. The F-statistics for the restriction of equality of these three coefficients are 1.09 for the employment equation and 0.96 for the earnings equation, both of which support the null of equal magnitudes.

2. Endogeneity

Another important issue is regressor endogeneity. To account for this, in line 8 we include lagged rather than contemporaneous values of all but the tariff regressors. Tariffs are predetermined by international agreements. In line 9 we continue to lag regressors and also substitute lagged domestic consumption in the industry for lagged Canadian GDP.

Finally, the tariff cuts are potentially endogenous. The cuts were determined both by the 1988 level of tariffs and by the number of years before tariffs were phased out. In treatment-control language, an industry that successfully lobbied for tariffs in 1988 and a ten-year tariff phase-out chose whether to be treated *and* chose the level of the treatment. We construct tariff cut instruments in two stages. First, we posit that the government benevolently grants protection whenever average earnings are low or worker displacement is high (proxied by high import growth and negative output growth). This is done by a cross-section regression of 1988 tariffs on industry earnings, 1980–7 import growth, and 1980–7 output growth. Second, to the fitted values of the 1988 tariffs we then apply a common tariff phase-out rule for all industries. This gives two instruments for tariff cuts corresponding to five- and ten-year tariff phase-out periods. The results are displayed on lines 10 and 11 of table 5. The coefficient on Canadian tariffs in the employment equation are now slightly higher. With one exception, the Hausman test is unable to reject the exogeneity of the tariff cuts for the employment and earnings equations in both cases. For the five-year tariff phase-out case, the test statistics for the employment equation suggests the possibility of endogeneity ($F(1,268) = 7.25$). The latter result appears to be driven by the large negative correlation of average wages with tariffs in the instrumenting equation (i.e., low-wage industries are the beneficiaries of higher protection).[6]

Overall, instrumenting makes little difference to the conclusions about the employment and earnings impacts of the FTA tariff cuts drawn in the previous sec-

6 When both U.S. and Canadian tariffs are instrumented, the results are virtually identical to those reported in lines 10–11.

tion.[7] In the case of the five-year phase-out instrument, the Canadian employment response to the FTA tariff cuts is 5.16 per cent (=(1.8 × −3.2 per cent) + (−0.3 × −2.0 per cent)) and the Canadian earnings response is 0.28 per cent (=(0.4 × −3.2 per cent) + (0.5 × −2.0 per cent)). Hence, over the 1989–93 period, the employment effect is 2.58 per cent (= 5.16/2) or 53,053 lost jobs. These lost jobs account for only 13.6 per cent of the 390,600 lost jobs in the period. Using the ten-year phase-out instrument, the earnings response is 1.76 per cent and the employment response is 6.84 per cent, or 18.0 per cent of the 390,600 lost jobs in the period.

3. Parameter instability across industries

Pooling data across industries is not ideal, because it imposes homogeneity of technology and demand structures across industries. Indeed, in table 2 we documented heterogeneity in the performance of, for example, high- versus low-tariff industries. In columns 2–4 of tables 3 and 4 we examine whether parameter estimates and standard errors are stable across the sample stratifications that are considered in table 2. For example, in column 2 of table 3 we examine whether the impact of tariff reductions on employment growth is the same for high-tariff industries as it is for our entire sample. We find that high-tariff industries tend to be particulary sensitive to demand conditions: imports, exports, and domestic consumption. Among the more interesting findings to emerge from sample stratification is that the interest-rate spread and the exchange rate come into play most forcefully for employment in high-import industries. This supports the business press view.

Another approach to parameter stability investigates whether industries are influential in the sense of Belsley, Kuh, and Welsch (1980). We confine our attention to the employment equation (similar conclusions apply to the earnings equation). Consider what happens to coefficient estimates when all the observations corresponding to, say, the rubber and plastics industry are omitted. As reported in line 13 of table 5, the Canadian tariff coefficient rises from 0.013 to 0.018 (t = 2.67) and the U.S. tariff coefficient rises in magnitude from −0.004 to −0.010 (t = 1.76). That is, tariff reductions have greater prominence. More generally, we estimated twenty-two regression models, each corresponding to the omission of one of the twenty-two industries in the sample. We found that the coefficients on imports, exports, domestic consumption, and U.S. employment were insensitive to the omission of observations, the coefficients on the interest-rate spread and exchange rate were somewhat sensitive, and only the coefficients on tariffs were sensitive.

7 In addition, the IV estimates are robust to classical measurement error in the tariff variable. By their very nature, the tariff data are suspect. For example, aggregating the tariffs of industries with different demand elasticities is dubious: a 5 per cent tariff on price-sensitive cheap radios is much more restrictive than a 20 per cent tariff on inelastically demanded high-end consumer electronics. To capture mismeasurement of tariffs we postulate that the data were generated by a classical errors-in-variables process. In this setting the maximum likelihood estimator of each of the two tariff coefficients is an interval rather than a point (see Klepper and Leamer 1984). In the present context the coefficients are bounded by the OLS estimates and the numbers in line 12 of table 5. Thus, the possibility of classical measurement error leads one to consider tariff effects of *larger* magnitudes than those we have reported.

Both Canadian and U.S. tariff coefficients attain their largest magnitudes when the rubber and plastics industry is omitted. At the other extreme, the tariff coefficients attain their smallest magnitudes when the furniture and fixtures industry is omitted (see line 14 of table 5). This suggests that the furniture and fixtures industry has been one of the hardest hit by the FTA tariff reductions. Notice that the U.S. tariff coefficient reverses sign: we report this in part because it is the *only* instance of a sign reversal on any coefficient as the result of omitting any industry.

The partial fragility of the tariff coefficient has a clear economic implication. If one is interested in industries like furniture and fixtures, then including industries like rubber and plastics leads one to downplay the role of tariff reductions and to underscore the role of the fight against inflation (i.e., the interest-rate spread and the exchange rate coefficients are larger).[8] If one is interested in industries like rubber and plastics then including furniture and fixtures leads one to emphasise the role of the tariff reductions. This is exactly what theory predicts about the pro-competitive and efficiency-enhancing effects of trade liberalization (see Markusen 1985): some industries will benefit from the tariff reductions; others will be hurt. This point is central to our paper as well.

4. Parameter instability across time

Specification instability over time can be investigated by separately estimating models for the pre-FTA period 1980–8 and the FTA period 1989–93. This allows slopes, intercepts, and regression standard errors to differ. The results for employment and earnings appear in the last two columns of tables 3 and 4, respectively. For the employment equation the null of equal slopes in the two periods is accepted. Since our main interest is in slopes, this justifies pooling. A surprising result is that the standard error of the regression rose sharply in the FTA period. The adjusted-R^2 falls from its pre-FTA value of 0.57 to its FTA value of 0.022. Conditional on the model, idiosyncratic employment shocks have apparently become increasingly important. The earnings regression results reveal the opposite. For the pre-FTA period the earnings equation fits poorly and the null that all coefficients equal zero is accepted. For the FTA period the adjusted-R^2 jumps dramatically, all but one coefficient (that on the interest rate spread) has the expected sign, and many coefficients are now statistically significant. One interpretation of the pre-FTA poor earnings fit and good employment fit is that demand shocks translated into employment shifts with little effect on earnings in this period. Similarly, the improved FTA-period earnings fit and weakening employment fit suggest that, in the FTA-period, employment has been partially buffered from demand shocks by increasing earnings flexibility.

V. CONCLUSION

In the first five years following implementation of the FTA, Canada lost a staggering 390,600 jobs in the tradeables sector. This paper has attempted to identify

8 'Like' is defined by the design matrix. See the last two columns of table 1 for details.

those jobs lost to the FTA tariff cuts and those lost to other factors: the recession, the Bank of Canada fight against inflation that led to high interest rates and a strong Canadian dollar, deindustrialization, and deteriorating labour costs and productivity in Canada relative to the United States. The FTA was expected to create trade by specialization: tradeables-sector industries with a comparative advantage would expand employment, and tradeables-sector industries with a comparative disadvantage would contract employment. This did not occur. Employment contracted in every tradeables-sector industry throughout the FTA period. Both exports and imports contracted for most of the FTA period. The primary explanation of these events is the recession on both sides of the border. There were two questions remaining. (1) To what extent was the FTA responsible for the Canadian recession? We argued that it was not the primary force behind the recession. (2) Controlling for the recession in a regression-setting, how large was the impact of the FTA-mandated tariff cuts on employment and earnings? We argued that it was small, accounting for only 9–14 per cent of the lost jobs.

Returning to our first question, we used informal techniques to establish the importance of non-FTA causes of the recession. First, if the FTA were recessionary, then one would expect the mechanism to be via increased import competition; yet real imports declined. Second, the recession was preceded by an unusually long period of expansion, suggesting that a Canadian recession was due. Third, Canadian and U.S. recessions typically move together, suggesting that a Canadian recession was due at about the same time as the U.S. recession. Of course, neither of the latter two points explain why the recession came right on the heels of the FTA implementation. What does explain the timing and depth of the recession is the Bank of Canada fight against inflation that raised interest rates and strengthened the Canadian dollar. We argued that these non-FTA factors were most important.[9]

As to the second question, we used two methods for determining the impact of the tariff cuts on employment and earnings. The first was a treatment-control framework using high-tariff industries as the treatment group and low-tariff industries as the control group. This led to the conclusion that by 1993 the FTA had left earnings unchanged but had reduced employment by about 55,000. This is only 14 per cent of the 390,600 lost jobs. This method suffered from the defect that the control group was not randomly selected. The second method was a regression framework. The econometric specification implied that Canadian and U.S. tariff cuts combined resulted in about 35,000 lost jobs in the first five years. This represents less than 9 per cent of the lost jobs in this period. This method suffers from the defect that it depends on correctly specifying all the determinants of employment changes. Nevertheless, neither method gives large estimates of the employment losses associated with the FTA tariff cuts. In addition, both methods yield very small earnings effects. We are struck by the fact that unlike U.S. earnings, Canadian earnings did not decline in the wake of massive job losses.

9 In a regression setting, the results of section IV.1, where other macro variables were added, lead to fragility of this conclusion.

It is important to remember that our figures are point estimates subject to considerable uncertainty and that our tariff-cutting experiments are neither general equilibrium in nature nor comprehensive as a picture of the entire FTA package. Finally, we have repeatedly pointed out that much of the fragility in our estimates stems from the fact that the impact of the FTA is not uniform across industries: some industries have been hurt by the tariff cuts, while others have been hurt by non-FTA factors such as high interest rates and a strong dollar.

DATA APPENDIX

U.S. data

Earnings and employment data are from the following Bureau of Labor Statistics publications: 1979–1988 from *Employment, Hours, and Earnings, United States, 1909–1990*, vol. 1; 1989–1991 from *Revised Establishment Data on Employment, Hours, and Earnings for the United States, 1989–1992*, August 1992; 1992 and 1993 from the 1993 and 1994 March issues of *Employment and Earnings*, respectively. Employment is 'employees on nonfarm payrolls.' Average weekly earnings are for 'all production or nonsupervisory employees.' Real GDP and CPI (used to deflate earnings) are from the *Economic Report of the President*, February 1994.

Canadian data

Most of the Canadian data are from CANSIM, the Statistics Canada database. The data cover the period 1980 to 1993 and are for twenty-two industries – three mining and nineteen manufacturing industries. Canadian sales or value of shipments by industry is GDP, expenditure based, in 1986 dollars. Earnings are average weekly earnings from monthly surveys and are averaged over the year. Earnings are before taxes, exclude supplementary labour costs, and are deflated by the CPI. Employment is total employment and is averaged over the year. Starting in 1983, the employment and earnings survey coverage was changed to include small establishments (fewer than twenty employees), so that no consistent series for employment or earnings over our period exists. The old and new surveys overlapped for January–March 1983, enabling us to calculate for each industry a coverage-adjustment factor to apply to the 1980–2 data. Fortunately, omitting the pre-change observations, 1980–1 and 1981–2, from our sample does not affect our conclusions (see line 15 of table 5).

Bilateral data

Import data are from an H.S. series backdated to 1980 by Statistics Canada and the export data are from an X.C.C. series updated to 1993 by Statistics Canada. The data on employment, earnings, and output are classified on an industry basis, but the data on trade flows and protection are classified on a commodity basis. This problem is somewhat alleviated by aggregation and the fact that the classifications were reconciled in Canada starting in 1988. The industry classification of import and export data is still problematic, however, particularly for food, tobacco, and wood

TABLE A1
Descriptive statistics: annual percentage changes, 1980–93

Variable	Mean	Std Dev	Minm	Maxm
Canadian wages	0.003	0.029	−0.117	0.193
Canadian employment	−0.019	0.068	−0.246	0.151
U.S. wages	−0.001	0.024	−0.059	0.106
U.S. employment	−0.016	0.049	−0.297	0.139
Canadian imports from United States	0.035	0.241	−0.748	1.942
Canadian exports to United States	0.077	0.220	−0.390	2.071
Canadian tariffs	−0.480	0.619	−7.500	0
U.S. tariffs	−0.298	0.718	−5.917	3.282
Real GDP – Canada	0.023	0.026	−0.032	0.063
Real GDP – United States	0.024	0.020	−0.022	0.062
CPI – Canada	0.052	0.030	0.015	0.124
CPI – United States	0.044	0.020	0.019	0.103
Exchange rate	0.009	0.042	−0.072	0.066
Interest-rate spread	2.854	1.120	0.803	5.295

NOTES
i For tariffs, the means are average annual percentage point changes. The interest rate spread is annual percentage points.
ii. Observations = 278. The observations for 1980 to 1987 for the furniture and fixtures industry were not available.

products, because of the close relationship of these manufactures to agriculture and forestry.

Trade data were deflated by the Canadian CPI. At our level of disaggregation, trade deflators are not reliable. Deflating Canadian imports from the United States by the Canadian aggregate import Paasche index leads to similar conclusions. Deflating Canadian exports to the United States by the Canadian aggregate export Paasche index leads to the result that exports grew by 70 per cent during 1988–93. This implies an unbelievable trade surplus of $Cdn 80 billion.

It should also be noted that the Canadian-generated and U.S.-generated measures of Canadian exports to the United States are very different. Further, published data are a weighted average of the two measures with changing weights over the period: the weight on the Canadian-generated measure has fallen from unity to zero. Despite these difficulties it seems likely that the trade data are measured more precisely than the labour market and production data. Nevertheless, the interpretation of trade data requires caution. For example, Canadian imports from the United States embody inputs produced around the globe: in what sense other than an accounting one are these imports really from the United States?

Tariffs were obtained from a variety of sources. Bilateral tariff changes for 1987–88 to 1992–3 are from 'Open borders: an assessment of the Canada-U.S. Free Trade Agreement,' by S. Magun, S. Rao, B. Lodh, L. Lavallé, and J. Pierce, Discussion Paper No. 344 (1988), Economic Council of Canada. Canadian tariff changes for 1980–1 to 1986–7 were constructed from the import-weighted series in

'New estimates of Canadian tariff rates by industry and commodity,' by J. Lester and T. Morehen, Working Paper No. 88-2 (1988), Fiscal Policy and Economic Analysis Branch, Department of Finance. They reported data for 1979 and 1987. We used a (Tokyo Round) linear interpolation formula to calculate tariffs for intervening years. Knitting mills and textiles were aggregated using import weights. U.S. tariff changes for 1980–1 to 1986–7 were constructed from the GATT *Tariff File*, which gives MFN base rates (1979), MFN bindings (1987), and import weights. Data for intervening years were constructed in the same way as for Canada.

The interest rate spread is the difference between Canadian and U.S. three-month Treasury bill rates. U.S. data are from various issues of the *Federal Reserve Bulletin*. The exchange rate is the U.S. noon spot rate in U.S. currency units per Canadian dollar.

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