The Role of International Trade and Trade Policy in the Labour Markets of Canada and the United States

Noel Gaston and Daniel Trefler

1. INTRODUCTION

THE Canada–United States Free Trade Agreement (CUSTA) and the North American Free Trade Agreement (NAFTA) are among the most significant changes ever to the Canadian and US international trading environments. The most controversial feature of the Agreements, their impact on Canadian and US labour markets, has rightly become the centre of heated debate in a period of labour market upheaval. It is not clear how much of this upheaval is due to CUSTA itself and how much is due to other factors. Unfortunately, in the politicised debate surrounding the Agreements, even the facts upon which analysis must rest have been obscured: thoughtful analysis is absent. The problem, aside from political posturing, is that implementation of CUSTA coincided with the onset of a protracted recession and ongoing structural change in both the Canadian and US labour markets. In addition, the Canadian experience has been characterised by a strong Canadian dollar and high Canada–US interest rate differentials. Disentangling these effects has stymied attempts to assess the impact of CUSTA and the likely impact of NAFTA on Canadian and US workers.

The first goal of this paper is to document the major employment and wage trends in the Canadian and US labour markets. We do this for the periods both

NOEL GASTON is from Tulane University and is currently a visiting scholar at Cornell University. DANIEL TREFLER is from the University of Toronto. The authors would like to thank participants of the Canada–United States Trade Research Group for numerous suggestions and the Donner Foundation for generous research support. Edgard Rodriguez supplied indispensable research assistance.

before and after implementation of CUSTA in January 1989. The second goal is to relate these trends to the broad features of the post-CUSTA economic climate in order to isolate the impact of CUSTA on employment and wages. The estimates of employment and wage elasticities presented below are the first using trade and protection data from the post-CUSTA period.

2. EMPLOYMENT TRENDS

The dataset contains annual data for 22 2-digit SIC manufacturing and mining industries over the period 1979–91. The start date 1979 was chosen because 1979 was the base year for the tariff reductions agreed to under the GATT Tokyo Round and thus provides additional sample variation needed to identify the impact of tariff changes. All nominal values are expressed in constant 1986 Canadian dollars. A detailed description of data sources is available on request.

Table 1 records the performance of the US and Canadian labour markets over the CUSTA period. The reported numbers are year-to-year percentage changes averaged over three years — 1988–89, 1989–90 and 1990–91. In parentheses are the corresponding numbers for the pre-CUSTA 1979–87 period. $\%\Delta L_j$ is the average annual employment change. For example, in the Canadian leather products industry, employment fell by 14.3 per cent per annum during the CUSTA period. The corresponding US drop was 4.4 per cent per annum. $\%\Delta w_j$ is the average annual percentage change in weekly earnings. For example, in the Canadian leather products industry, weekly earnings fell by 0.1 per cent per annum over the CUSTA period. The corresponding US drop was 0.2 per cent per annum. In the Canada columns, Δt_j is the CUSTA-period average annual percentage point change in the tariff against the United States, and $\%\Delta m_j$ is the CUSTA-period average annual percentage change in imports from the United States. In the US columns, Δt_j relates to the US tariff against Canada, and $\%\Delta m_j$ relates to US imports from Canada.

At the top of the Table 1 list are sunset industries such as leather, textiles and apparel. The industries at the bottom of the list fared better on the employment front. Not surprisingly, these are Canada's resource-based industries. The striking features of Table 1 are the large employment losses on both sides of the border and the relatively larger losses in Canada. The cross-industry correlation of employment losses between the two countries is 0.55. This suggests that job flight from Canada to the United States cannot by itself account for the large Canadian losses.

Table 2 relates changes in Canadian employment to a variety of factors. Let j index industries and t index time. Let L_{jt}, X_{jt}, M_{jt}, Y_{jt} and t_{jt} be Canadian values for employment, exports to the United States, imports from the United States, industry output, and tariffs against the United States, respectively. Column (1) is

TABLE 1
Average Employment and Wage Growth: 1988–1991

SIC Industry	*Canada*						*United States*					
	$\%\Delta L_j$		$\%\Delta w_j$		Δt_j	$\%\Delta m_j$	$\%\Delta L_j$		$\%\Delta w_j$		Δt_j	$\%\Delta m_j$
Leather	−14.3	(−3.2)	−0.1	(−0.3)	−2.9	−12.7	−4.4	(−5.8)	−0.2	(−0.7)	−2.1	−6.2
Textiles	−10.5	(−0.6)	−0.1	(−0.0)	−1.0	2.5	−2.7	(−2.1)	−1.1	(−0.0)	−1.5	10.7
Lumber and wood	−10.4	(0.2)	4.4	(4.2)	−0.3	−4.8	−4.0	(0.0)	−2.3	(−1.3)	0.1	−7.1
Furniture and fixtures	−10.3	(3.1)	−0.3	(−0.9)	−2.2	16.1	−3.6	(0.8)	−1.9	(−0.1)	−1.1	7.3
Apparel	−10.0	(−0.5)	0.2	(−0.9)	−1.7	19.9	−2.4	(−2.0)	−1.3	(−0.8)	−2.4	−3.1
Metal fabricating	−9.0	(0.3)	0.2	(−0.7)	−0.8	1.0	−1.7	(−1.9)	−2.4	(−0.6)	−0.6	−7.4
Machinery	−8.7	(0.4)	−0.2	(−0.3)	−1.0	−5.6	−1.3	(−1.8)	−2.4	(−0.5)	−0.5	0.7
Non-metal minerals	−8.0	(−0.0)	−0.5	(−0.4)	−0.5	−9.4	−2.7	(−1.8)	−2.7	(−0.4)	−0.2	−5.0
Electrical	−7.4	(1.2)	0.2	(0.8)	−0.9	1.2	−3.3	(−0.1)	−1.9	(−0.3)	−0.8	21.6
Instruments & misc.	−6.6	(2.4)	1.3	(−0.0)	−0.7	1.5	−1.7	(−0.2)	−1.7	(0.7)	−0.9	3.8
Primary metals	−5.9	(−2.3)	−0.6	(0.6)	−0.4	−2.7	−2.0	(−5.0)	−2.6	(−1.5)	−0.0	−6.9
Food and beverages	−4.9	(0.5)	−0.7	(−0.4)	−0.4	10.7	0.8	(−0.7)	−1.7	(−1.1)	0.1	4.8
Metal mining	−4.2	(−2.3)	0.7	(0.8)	−0.0	4.5	4.2	(−6.5)	−0.3	(−1.1)	−0.0	−10.7
Transportation	−4.0	(1.4)	−1.1	(0.2)	−0.3	−10.0	−2.4	(0.0)	−1.8	(−0.0)	−0.3	−4.0
Printing	−3.7	(3.4)	−1.2	(−0.3)	−0.3	6.0	−0.1	(2.5)	−2.0	(−0.6)	−0.0	−11.2
Rubber and plastic	−3.6	(2.9)	0.2	(0.7)	−0.9	11.8	−0.1	(0.7)	−2.1	(−0.3)	0.6	17.0
Tobacco	−3.4	(−5.2)	1.6	(2.7)	−1.6	10.2	−3.4	(−2.7)	−1.0	(4.0)	−2.6	76.0
Paper	−3.1	(−0.2)	−0.4	(0.4)	−0.8	7.0	−0.1	(−0.0)	−1.8	(0.3)	−0.1	−3.8
Chemicals	−1.4	(0.9)	−0.2	(0.5)	−1.0	5.8	0.4	(−0.5)	−0.9	(0.4)	−0.3	−1.7
Non-metal mining	−1.2	(−3.0)	−0.8	(−0.4)	−0.1	−6.6	−2.1	(−1.1)	−2.4	(−0.1)	−0.0	6.1
Mineral fuels mining	0.5	(4.5)	1.0	(1.4)	−0.0	−2.6	−1.3	(−2.5)	1.0	(−1.2)	−0.0	7.4
Petro and coal	0.7	(0.8)	−1.4	(0.6)	−0.1	−2.6	−0.3	(−2.9)	−0.6	(0.0)	−0.1	8.0
All	−6.0	(0.4)	0.4	(0.2)	−0.8	−2.0	−3.2	(−1.9)	−1.9	(−0.7)	−0.6	−1.3

Note: j indexes industries, L_j is employment, w_j is average weekly earnings, t_j is the bilateral tariff rate between Canada and the United States, and m_j is bilateral imports between Canada and the United States. Figures are year-to-year percentage changes averaged over 1988–89, 1989–90 and 1990–91. For tariffs, figures are year-to-year percentage point changes averaged over the same years. Averages for the eight years of changes from 1979–80 to 1986–87 are in parentheses.

TABLE 2
Changes in Canadian Employment, 1988–91

SIC Industry	Employment		Exports		Imports		Tariffs	CUSTA
	Canada	USA	$	ΔL_X	$	ΔL_M	%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Metal fabricating	−41,500	−72,000	−251	−6,100	30	−700	−2.5	access
Lumber and wood	−34,200	−89,900	−836	−18,300	−173	3,800	−1.0	access
Food and beverages	−33,800	41,000	267	5,300	435	−8,600	−1.3	−
Electrical	−26,700	−167,900	1,733	28,200	204	−3,300	−2.6	+
Apparel	−26,100	−77,300	−46	−1,600	127	−4,500	−5.2	
Transportation	−25,800	−146,600	−3,907	−62,200	−6,635	105,600	−0.8	Auto Pact
Machinery	−25,300	−85,500	145	3,800	−2,565	66,900	−2.9	
Textiles	−24,400	−56,600	93	3,400	75	−2,800	−3.0	
Furniture and fixtures	−18,400	−56,100	133	5,000	355	−13,400	−6.6	−
Primary metals	−17,300	−45,400	−1,534	−21,200	−352	4,900	−1.3	access
Printing	−15,700	−6,700	−151	−3,600	227	−5,400	−0.8	
Instruments & misc.	−14,900	−70,500	208	7,000	130	−4,400	−2.0	+/−
Non-metal minerals	−12,400	−44,600	−103	−1,700	−549	9,100	−1.6	
Paper	−11,500	−1,700	−786	−12,100	256	−3,900	−2.4	−
Rubber and plastic	−8,600	−3,900	56	1,500	121	−3,200	−2.8	−
Leather	−7,000	−18,100	−22	−900	−106	4,100	−8.6	
Metal mining	−5,800	6,300	−336	−3,600	46	−500	−0.1	
Chemicals	−4,600	13,400	−197	−2,700	665	−9,100	−3.1	−
Tobacco	−500	−5,500	111	900	3	0	−4.8	+
Non-metal mining	−400	−6,900	36	500	−57	700	−0.4	
Petro and coal	300	−1,300	408	4,400	−175	1,900	−0.2	
Mineral fuels mining	800	−22,300	1,479	6,600	−141	600	−0.1	
All	−353,800	−918,100	−3,500	−67,400	−8,079	137,900	−2.5	

Note: Columns 1 and 2: $L_{91} - L_{88}$. Columns 3 and 5: $X_{91} - X_{88}$ and $M_{91} - M_{88}$ in millions of dollars. Columns 4 and 6: ΔL_X and ΔL_M defined in equation (1). Column 7: $t_{91} - t_{88}$. Column 8: + (−) indicates $t_{91} - t_{88} < -1.0\%$, $L_{91} - L_{88} < 0$, and $\Delta \hat{L}_X < -0.25$ ($\Delta \hat{L}_M > 0.25$), where $\Delta \hat{L}_X$ and $\Delta \hat{L}_M$ are defined in equation (2); 'access' indicates that NAFTA failed to guarantee Canadian access to the US market.

the number of lost jobs over the 1988–91 period, i.e. $L_{j,91} - L_{j,88}$. Overall, 353,800 jobs were lost in Canada. Only 918,100 jobs were lost in the tenfold larger US economy. This asymmetry is unique historically and mirrors the depth of the Canadian recession relative to the US recession. Column (3) reports the change in Canadian exports to the United States over the period, i.e. $X_{j,91} - X_{j,88}$. Column (5) reports changes in Canadian imports from the United States, i.e. $M_{j,91} - M_{j,88}$. A feature of trade over the period is that in constant dollars *both* imports and exports contracted. Only six industries experienced significant expansion of both imports and exports. Thus, the overall movement in imports and exports cannot be explained by CUSTA, since CUSTA is expected to lead to trade creation and diversion that would increase both imports and exports. Another feature of merchandise trade is that the Canadian surplus widened over the period by \$4.6 billion (= \$8,079 million − \$3,500 million). This by itself would tend to create jobs in Canada; however, it came with falling exports which are associated with lost jobs, and falling imports which are not necessarily replaced by domestic production.

In order to translate shifts in merchandise trade into employment losses, we constructed the following measure. $L_{j,88}/Y_{j,88}$ is the ratio of employment to output in industry j in 1988. Assume that this ratio was constant over the 1988–91 period. Also assume that the labour intensity of imports and exports in industry j was comparable to the labour intensity of all industry j output. Under these assumptions, \$1 of imports or exports requires $L_{j,88}/Y_{j,88}$ units of labour input. Finally, assume that increases in exports lead dollar for dollar to increases in domestic output. For imports, make the less realistic assumption that increases in imports lead dollar for dollar to decreases in domestic production. Then the number of jobs created by changing exports and imports is (dropping j subscripts):

$$\Delta L_X = (X_{91} - X_{88}) \frac{L_{88}}{Y_{88}} \quad \text{and} \quad \Delta L_M = -(M_{91} - M_{88}) \frac{L_{88}}{Y_{88}}. \tag{1}$$

These formulae are based on strong assumptions and ignore general equilibrium effects. Thus, they must be interpreted with caution.

Columns (4) and (6) of Table 2 report ΔL_X and ΔL_M, respectively. The figures are very large. For example, rising electrical exports potentially increased employment by 28,200 jobs. Given the large tariff reductions for this industry, it is likely that CUSTA ameliorated job losses in this industry. On the other hand, rising imports in the food and beverage industry potentially led to 8,600 lost jobs. To gauge the magnitude of these potential job changes, express them as a percentage of lost jobs in the industry:

$$\Delta \hat{L}_X = \frac{\Delta L_X}{L_{91} - L_{88}} \quad \text{and} \quad \Delta \hat{L}_M = \frac{\Delta L_M}{L_{91} - L_{88}}. \tag{2}$$

There are many industries for which increased imports potentially led to job losses in excess of 25 per cent of the actual job losses ($\Delta\hat{L}_M > 0.25$). These are indicated by a minus sign in column (8). Minus signs are only recorded where jobs have been lost and tariffs have fallen by more than 1 percentage point. There are only three industries for which increased exports potentially led to job creation in excess of 25 per cent of the job losses ($\Delta\hat{L}_X < -0.25$). This is indicated by a plus sign in column (8). Informally, apparel and printing are also very close to meeting our criterion for a negative CUSTA effect. The many negative signs are suggestive of the harm caused by CUSTA.

More careful consideration of job losses and job gains based on ΔL_M and ΔL_X leads to the following observations. First, while 353,800 jobs were lost, declining imports potentially led to the creation of 137,900 jobs. This number, based on the strong assumption that declining imports are replaced by domestic production, points again to the fact that CUSTA has been associated with a period of trade destruction, contrary to expectations. Second, of the 353,800 lost jobs, 67,400 are potentially associated with declining exports. These 67,400 potential jobs again cannot be attributed to CUSTA since CUSTA is expected to promote exports. Third, many of the potential lost jobs associated with falling exports are due to the failure of CUSTA to guarantee market access: 45,600 of the potential lost jobs occur in lumber and wood products, primary metal manufacturing and fabricated metal manufacturing. These are industries that have been subject to major trade disputes (softwood lumber, plywood and steel) and so have not had market access guaranteed by CUSTA. They are indicated in column (8) by 'access'. Fourth, potential job losses and gains in transportation equipment are enormous relative to all other industries. This is associated with the recent contraction of the automotive sector, an event that has little to do with CUSTA since sectoral trade comes under the purview of the Auto Pact. While some of the lost jobs were due to recent domestic content rulings by the United States, most of them are better explained by the down-sizing of the Big 3. Thus, Table 2 does not provide any hard evidence that recent Canadian job losses are primarily due to CUSTA-related merchandise trade movements.

3. WAGE TRENDS

For average weekly earnings, no clear picture of the effects of CUSTA emerges from Table 1. There was a downward trend in US weekly earnings over the 1979–87 period, a trend that accelerated in the CUSTA period. This contrasts with the very slight upward trend in Canadian weekly earnings during 1979–90. Only in 1991 did weekly earnings start falling. Even though Canadian employment has been devastated, Canadian earnings have shown little downward flexibility.

A feature of the data that partly explains why CUSTA has been so disruptive is the odd co-movement of earnings, employment and output. The slight growth in Canadian earnings and fall in US earnings over the 1979–91 period represents a prolonged deterioration of Canada's competitive position unless the earnings gains were matched by productivity gains. In fact, Canadian output per worker fell sharply over the 1982 recession and was flat over the 1984–89 boom. Daly (1990) argued that, relative to the United States, Canadian costs in 1986 were at their highest level in over 30 years. More recently, Canada's competitive position has rebounded. The recent recession saw increased productivity as employment fell by 18 per cent, while output fell by only 10 per cent. Recent events, likely associated with CUSTA, have forced Canadian producers to restore competitiveness through massive job shedding and, starting in 1991, through wage cuts.

4. REVIEW OF THE ECONOMETRIC EVIDENCE

There has been no econometric research on the labour market consequences of CUSTA. Table 3 reviews the regression-based studies relating trade flows to wages for the pre-CUSTA period. To read the table, consider the first entry. Lawrence and Lawrence (1985) examined US data for 57 manufacturing industries in the years 1960, 1970, 1980 and 1984. They estimated cross-industry regressions of average industry wages in levels (w_j) and changes (Δw_j). In levels, the partial correlation between wages and imports was negative. In changes, the correlation was statistically insignificant at the five per cent level or sign reversals were reported across specifications. Further explanations and notation appear at the bottom of the table.

Three facts are apparent from Table 3: (i) imports are negatively correlated with wages, (ii) exports are positively correlated with wages, and (iii) unit-value import price indices are negatively, but weakly, correlated with wages. Hardly any work has been done relating wages directly to trade protection. In a cross-industry setting with micro data that control for the human capital, demographic, occupational and regional characteristics of individual workers, we have found the following: NTBs are uncorrelated with wages (Gaston and Trefler, 1993); tariffs are negatively correlated with wages even after controlling for the fact that low wages lead to high levels of tariffs (Gaston and Trefler, 1992a); and the negative tariff effect appears only for unionised workers (Gaston and Trefler, 1992b).

There is a long history of research into the effects of trade flows on employment (see Gunderson, 1992). Recent regression-based studies clearly indicate that trade flows have a large impact on employment. These studies are presented in Table 4. The main conclusions to emerge from the table are: (i)

TABLE 3
Summary of Econometric Research on Wages and the International Economy

Authors	*Data and Dependent Variable*	*Pertinent Findings*
Lawrence and Lawrence (1985)	US: 57 three-digit SIC manufacturing industries. 1960, 1970, 1980, 1984. i. w_j and ii. Δw_j Employment and Earnings (BLS).	i. w_j: m_j (−) ii. Δw_j: Δm_j (?)
Abowd (1987)	US: 317 four-digit SIC manufacturing industries. Union wage settlements, 1976–82. $\%\Delta w_{jt}$ Collective Bargaining Negotiations and Contracts (Bureau of National Affairs).	$\%\Delta w_{jt}$ for 20 two-digit SIC industries: $m_{j,t-1}$ (2++: apparel, primary metals); (7+); (9−); (2− −: electrical; transportation)
Grossman (1987)	US: 9 three-/four-digit SIC import-competing industries. Δw_j Employment and Earnings (BLS), monthly, 1969–79.	Δw_j for 9 industries: Δp_j (3++, 5+, 1−) Small wage elasticities (except for radios/TV and ball bearings)
Macpherson and Stewart (1990)	US: 75 three-digit CIC manufacturing industries. Union and non-union workers. i. w_{ij} and ii. Δw_j^* CPS 1975–81.	i. w_{ij}: m_j (− − for union, − for non-union) ii. Δw_j^*: Δm_j (?) union and non-union
Abowd and Lemieux (1991)	US: Δw_j BLS Current Wage Developments, 1959–84. Canada: Δw_j Collective Bargaining Review (Labour Canada).	Δw_j US: Δm_j (− −), Δx_j (+) Δw_j Canada: Δm_j (?)[a], Δx_j (?)[a], Δp_j (−)
Brauer (1991)	US: 141 three-digit SIC manufacturing industries, 1958–84. i. w_j and ii. Δw_j NBER Trade and Immigration data set.	i. w_j: m_j (− −), x_j (+) ii. Δw_j: Δm_j (?), Δx_j (?)
Freeman and Katz (1991)	i. US: 428 four-digit SIC manufacturing industries. Δw_j NBER Trade and Immigration data set, 1958–84. ii. US: Δw_j^* 1974 and 1984 CPS 58 three-digit CIC manufacturing industries.	i. Δw_j: Δm_j (− −), Δx_j (+) ii. Δw_j^*: Δm_j (− − all, union, non-union) Δx_j (+ all, + non-union, − union)
Grey (1993)	Canada: 97 three-digit SIC manufacturing industries. w_j 1986 Census of Canada.	w_j: m_j (+), x_j (−)

TABLE 3 (continued)

Authors	*Data and Dependent Variable*	*Pertinent Findings*
Revenga (1992)	US: 38 three-/four-digit SIC manufacturing industries. Δw_j Employment and Earnings (BLS), quarterly, 1977–87.	Δw_j: Δp_j (?)[b]
Gaston and Trefler (1992a)	US: 74 three-digit CIC manufacturing industries. w_{ij}, w_j and w_j^* 1984 CPS. Tariffs (t_j) from GATT Tariff Study. NTBs (n_j) from UNCTAD Trade Control Measures Data Base.	w_j, w_{ij}, w_j^*: t_j (− −), n_j (?), x_j (+ +), m_j (−)
Gaston and Trefler (1992b)	US: 68 three-digit CIC manufacturing industries. w_j^* i. union workers ii. non-union workers.	i. w_j^*: t_j (− −), n_j (?), x_j (?), m_j (− −) ii. w_j^*: t_j (− −), n_j (?), x_j (+ +), m_j (?)

Key to notation:
j indexes industries, i indexes individuals, and t indexes time. w_j denotes average industry wages, w_{ij} individuals' wages, w_j^* interindustry wage diffrentials, Δ the difference operator, x_j exports, m_j imports, and p_j unit-value import price indexes.

Key to signs in last column:
+ + (− −) the coefficient is positive (negative) and statistically significant (5 per cent level) in all specifications reported.
+ (−) the coefficient is positive (negative), but statistically insignificant in some or all specifications reported.
? the coefficient is statistically insignificant in some or all specifications with sign reversals across reported specifications.

Note:
[a] The ambiguity for Canada relates to sign reversals for effects of anticipated (+) vs. unanticipated (−) import changes and anticipated (− −) vs. unanticipated (+ +) export changes.
[b] (−) for OLS and (+) for IV.

TABLE 4
Summary of Econometric Research on Employment and the International Economy

Authors	*Data and Dependent Variable*	*Pertinent Findings*
Abowd (1987)	US: $\%\Delta l_j$, 1970–86. i. Bargaining unit employment ii. Total union employment.[a]	$m_{j,t-1}$ for 20 two-digit SIC industries: i. 8+, 11−, 1− − (rubber/plastic) ii. 6+, 10−, 4− − (rubber/plastic; apparel; leather; fabricated metals)
Grossman (1987)	US: Δl_j, average manhours per week (number of production workers/ average weekly hours).[a]	Δp_j: 2++, 6+, 1−; employment elasticities small (except radios/TVs)
Freeman and Katz (1991)	US: Δl_j i. annual personhours worked ii. annual hours of production workers.[a]	i. and ii. Δm_j (− −), Δx_j (++)
Abowd and Lemieux (1991)	US and Canada: Δl_j, percentage change in bargaining unit employment.[a]	US: Δm_j (− −), Δx_j (+) Canada: Δm_j (− −), Δx_j (++)
Revenga (1992)	US: Δl_j, change in i. average weekly hours ii. production worker employment.[a]	i. and ii. Δp_j (+)
Borjas, Freeman and Katz (1992)	US: 21 manufacturing industries; March CPS 1964–88. Δl_j, ratio of production worker employment to total industry employment.	Δm_j (− −) 1960–85, (−) 1979–85 Δx_j (−) both periods

Key to notation: j indexes industries and t indexes time. Δl_j denotes the change in a measure of industry employment.

Key to signs in last column: See notes to Table 3.

Note: [a] Details of data sources are the same as for Table 3.

exports have a large and positive impact on employment, (ii) imports have a large and negative impact on employment, and (iii) higher values of unit-value import price indices lead to higher employment. In addition, these studies indicate that trade flows and import prices have a more pronounced impact on employment than on wages.

5. ECONOMETRIC ANALYSIS

In this section we outline a strategy for estimating reduced-form equations for the supply and demand of labour. Each observation applies to a 2-digit SIC industry j in year $t = 1979, \ldots, 1991$. Let $L_{jt}^S = S_j(w_{jt}, x_{jt}^S)$ be labour supply and $L_{jt}^D = D_j(w_{jt}, x_{jt}^D)$ be labour demand, where w_{jt} is labour earnings and $x_{jt} = (x_{jt}^S, x_{jt}^D)$ collects determinants of the supply and demand for labour. Setting supply equal to demand ($L_{jt}^S = L_{jt}^D = L_{jt}$) yields the reduced-form equations $L_{jt} = L_j(x_{jt})$ for employment and $w_{jt} = W_j(x_{jt})$ for earnings. Assuming L_j and W_j are log-linear functions, measuring variables in natural logs and first differencing, e.g. $\Delta\ln(L_{jt}) = \ln(L_{jt}) - \ln(L_{jt-1})$, yields:

$$\begin{aligned} \Delta\ln(L_{jt}) &= \Delta\ln(x_{jt})\beta_j + \epsilon_{jt} \quad \text{employment changes} \\ \Delta\ln(w_{jt}) &= \Delta\ln(x_{jt})\gamma_j + \nu_{jt} \quad \text{earnings changes} \end{aligned} \tag{3}$$

where ϵ_{jt} and ν_{jt} are the residuals.

Estimation of equation (3) raises a variety of specification issues. First, the coefficients (β_j, γ_j) are assumed stable over the period 1979–91. Second, in order to reduce the number of parameters we pool across the 22 2-digit SIC industries. That is, we assume $\beta_j = \beta$ and $\gamma_j = \gamma$ for all j. The pooling hypotheses across industries and time are investigated below. Third, the assumed lag structure is one year. While longer lags may be desirable, parsimony precludes them.

Another set of issues relates to the choice of regressors (x_{jt}). Data limitations have led us to exclude the usual supply and demand regressors such as the price of non-labour inputs. Gunderson (1992) argues that this is reasonable because factor mobility forces prices of factors other than labour to be similar across industries. We include regressors affecting the post-CUSTA Canadian and US labour markets.

(*a*) *Tariffs:* While CUSTA is a complex document, its key feature from the perspective of this paper is its implications for tariffs. Thus, x_{jt} includes measures of US tariffs against Canada, and Canadian tariffs against the United States.

(*b*) *Imports and exports:* We include bilateral trade flows between Canada and the United States, i.e. Canadian imports from and exports to the United States.

(*c*) *Recession:* Domestic real GDP is included to capture the effects of business cycles.

(*d*) *Exchange Rate Movements:* Shortly after CUSTA was signed, the Canadian dollar appreciated sharply against the US dollar. This may have depressed Canadian employment and wages. The Canada–US exchange rate is included.

(*e*) *Interest Rate Differentials:* Shortly after CUSTA was signed, the interest rate spread between the United States and Canada rose sharply. Many businessmen claim that for firms embarking on major capital expenditures, the interest rate spread led these firms to relocate south of the border (see Senate of Canada, 1990). To capture this feature, we include the difference between Canadian and US three-month Treasury Bill rates.

(*f*) *Deindustrialisation:* Since CUSTA was signed, the decline of manufacturing industry or 'deindustrialisation' has accelerated (see Grey and Pager, 1991). To the extent that the underlying causes of deindustrialisation are similar in both Canada and the United States, we use the US experience to control for the process of deindustrialisation in Canada. Thus, we include US employment in the Canadian employment and wage equations.

(*g*) *Employment Flight:* It is often argued that CUSTA led to job flight from Canada to the United States. This is examined in the same way as (*f*) above.

Many of these regressors are potentially endogenous. The endogeneity of GDP growth is particularly obvious and is dealt with below. Less obvious is the political economy bias associated with endogenous protection. Policy makers react to wage and employment conditions when setting levels of protection so that tariffs are endogenous in the employment and earnings equations (see Trefler, 1993).

Table 5 reports estimates of the employment changes and earnings changes equations. The 'All' columns contain results for all 22 industries. A series break between 1987 and 1988 led us to delete changes over this period. Also, 1979–87 data for the furniture and fixtures industry were missing. This leaves us with 234 observations. Canadian wage rigidity is reflected in the poor goodness-of-fit for the earnings equations. Tariffs have a negligible effect on earnings. Imports have a significant effect with a one per cent increase in imports leading to a 3.4 per cent reduction in earnings. A one per cent increase in exports only increases earnings by 1.4 per cent. The positive coefficient on real GDP indicates that there is a statistically significant, but economically small, pro-cyclical component of earnings. To control for the endogeneity of GDP, US GDP was used in place of Canadian GDP.

TABLE 5
Regression Results for Canadian Employment and Earnings Changes

Dependent Variable:	*Employment:* $ln(L_{j,t}) - ln(L_{j,t-1})$				*Wages:* $ln(w_{j,t}) - ln(w_{j,t-1})$			
Sample of industries: †	*All*	*High Tariff*	*High Import*	*High Wage*	*All*	*High Tariff*	*High Import*	*High Wage*
Canadian tariffs	0.026	0.024	0.037	0.032	−0.001	0.000	0.001	−0.012
	(2.584)	(1.942)	(1.155)	(1.438)	(0.165)	(0.093)	(0.114)	(1.451)
US tariffs	−0.004	−0.001	0.004	−0.006	−0.002	−0.003	0.003	0.002
	(0.510)	(0.159)	(0.235)	(0.484)	(0.699)	(1.187)	(0.436)	(0.487)
Imports	−0.044	−0.164	−0.026	−0.010	−0.034	−0.034	−0.032	−0.030
	(0.848)	(1.128)	(0.420)	(0.152)	(1.975)	(0.854)	(1.302)	(1.199)
Exports	−0.043	−0.125	−0.050	−0.010	0.014	0.049	−0.005	0.011
	(1.003)	(0.690)	(0.854)	(0.211)	(1.003)	(0.986)	(0.199)	(0.621)
US real GDP	1.039	1.205	0.912	0.958	0.160	0.206	0.218	0.188
	(4.512)	(2.715)	(1.854)	(2.987)	(2.024)	(1.674)	(1.121)	(1.576)
Interest rate spread	−0.039	0.487	0.307	−0.340	0.031	−0.064	−0.180	−0.002
	(0.101)	(0.731)	(0.489)	(0.646)	(0.246)	(0.347)	(0.724)	(0.012)
Exchange rate	−0.430	−0.628	−0.676	−0.218	0.075	−0.017	0.162	0.195
	(2.565)	(2.047)	(2.460)	(0.957)	(1.371)	(0.202)	(1.493)	(2.304)
US employment	0.488	0.446	0.510	0.506	0.078	0.079	0.111	0.092
	(4.936)	(1.794)	(2.211)	(4.496)	(2.421)	(1.149)	(1.214)	(2.186)
Intercept	−0.016	−0.018	−0.000	−0.012	0.026	−0.002	0.005	0.000
	(1.898)	(1.082)	(0.008)	(1.003)	(0.082)	(0.413)	(0.539)	(0.092)
Observations	234	91	88	121	234	91	88	121
Adjusted R^2	0.255	0.203	0.234	0.239	0.077	0.025	0.087	0.116
F-statistic	10.971	3.869	4.315	5.710	3.428	1.290	2.035	2.976

Note: Absolute values of *t*-statistics in parentheses. The dependent variables and regressors are expressed as first differences of natural logs, except for tariffs and the interest rate spread which are expressed as percentage point changes. Larger values of the exchange rate correspond to a stronger Canadian currency.

† For 'High Tariff', 'High Import' and 'High Wage', only a subset of industries is included in the regression. See text for details.

The employment equations perform moderately well. Consider the 'All' column which reports results for the entire sample. With the exception of exports, all the coefficient signs are as expected. Further, their magnitudes seem very reasonable, a point we turn to now.

Canadian tariffs: A one percentage point rise in the Canadian tariff against the United States raises Canadian employment by 2.6 per cent. Over the 1988–91 period, this tariff fell from 3.8 percentage points down to 2.3 percentage points. This implies that Canadian tariff reductions induced a 3.9 per cent (= (3.8 − 2.3) × 2.6) fall in Canadian employment. This 3.9 per cent of the 1988 level of employment amounts to 79,283 lost jobs in our sample of industries. The five per cent confidence interval is ±30,683.

US tariffs: A one percentage point rise in the US tariff against Canada reduces Canadian employment by 0.4 per cent. Over the 1988–91 period, US tariff reductions of 0.9 percentage points led to a 0.36 per cent increase in jobs or 7,319 jobs gained, ±14,350 jobs.

Canadian imports from and exports to the United States: In terms of statistical significance and magnitude, the trade regressors are insignificant. The reduction in imports over the 1988–91 period led to a 0.7 per cent increase in employment or 13,873 jobs gained, ±16,360 jobs. For exports, the corresponding figure is 5,514 jobs gained, ±5,497 jobs. One explanation for the small sizes and insignificance of these figures is that merchandise trade effects are captured by tariffs and the exchange rate, i.e. there is a problem of multicollinearity. Another possibility is that what matters for employment is competitiveness and that trade flows are a poor measure of competitiveness. In particular, the Eastman and Stykolt (1967) model of increasing returns argues that Canadian tariffs create inefficiency by sheltering Canadian firms from foreign competition and by promoting inappropriately small scale production. This inefficiency likely translates into low wages and unduly high employment. This effect will not be captured by trade flows, but will be captured by high tariffs or an unduly strong dollar.

US real GDP: Critics of CUSTA argue that the recession was deepened by the Agreement. The endogeneity of GDP is addressed by using US GDP rather than Canadian GDP. The large real GDP coefficient reflects the strong pro-cyclicality of employment. A one per cent increase in GDP increases employment by 1.089 per cent. For the 1989–91 period, Canadian real GDP contracted by 2.2 per cent leading to 56,622 jobs lost, ±13,666 jobs. However, over the 1988–91 period, the Canadian economy was essentially flat so that the 0.1 per cent growth created only 1,997 jobs, ±443 jobs.

Interest rate spread: A one percentage point increase in the spread between Canadian and US 90-day Treasury Bill rates reduces employment by 3.9 per cent, a statistically insignificant but economically large amount. For the 1988–91 period, the interest rate spread grew by 67 basis points, leading to 53,461 lost

jobs, ±529,318 jobs.

Exchange rate: A one per cent strengthening of the Canadian dollar against the US dollar reduces employment by 0.43 per cent. The sharp 6.8 per cent appreciation of the Canadian dollar over the period 1988–91 led to 59,700 lost jobs, ±23,275.

US employment: This variable captures industry-level structural adjustment occurring in the United States. It is intended as a control for similar changes in Canada. That the coefficient is less than unity indicates that Canada has been adjusting less rapidly than the United States. Over the 1988–91 period, such adjustment amounted to a 4.7 per cent contraction of US employment in our sample of industries. This in turn is associated with a loss of 47,024 jobs, ±9,527.

Prediction error: Over the 1988–91 period we predicted that Canadian employment in our sample of industries would contract by 11 per cent, when in fact it contracted by 19 per cent. In levels, we predicted that 210,767 jobs would be lost when in fact 353,800 jobs were lost. This is a close prediction considering that the bulk of the sample variation comes from variation across industries (industry pooling) and variation over the period 1979–87. The residual is best left unexplained: it reflects the considerable uncertainty surrounding our econometric estimates.

Summarising, there are four factors influencing Canadian employment in the CUSTA period for which statistically significant effects can be discerned. In order of importance these are: Canadian tariff reductions (49,000–110,000 lost jobs); the strong Canadian dollar (36,000–83,000 lost jobs); underlying structural change also occurring in the United States (37,000–57,000 lost jobs); and the 1989–91 recession (43,000–70,000 lost jobs, all of which were offset by growth during 1988–89). Of course, these numbers are model dependent so that caution must be exercised in using them.

6. SENSITIVITY TO POOLING ACROSS INDUSTRIES AND TIME

To investigate the legitimacy of pooling across industries, three additional specifications are reported in Table 5 — those for high tariff industries, high wage industries and high import penetration industries. The high tariff industries are the nine industries that had the highest tariffs in 1988. In all cases, these industries had Canadian tariffs greater than six per cent and US tariffs greater than four per cent. (These are tobacco, textiles, apparel, furniture, rubber, leather, metal fabrication, electrical, and instruments and miscellaneous.) From an endogenous political economy perspective, high protection industries have characteristics that may make employment and wages respond more adversely to imports and trade liberalisation. Confining our attention to high tariff industries,

the CUSTA tariff reductions have had similar effects in promoting and discouraging employment (2.4 per cent versus 2.6 per cent).

We also stratify our sample according to high import penetration. The same argument is true for high import penetration industries as for high tariff industries — they may be more susceptible to trade agreements than are less trade-exposed industries. The eight industries with the highest import levels and import penetration ratios, averaged over 1979–87, were chosen. (These are lumber, chemicals, rubber, primary metals, machinery, electrical, transportation, and instruments and miscellaneous.) There is some evidence that these industries have made larger employment adjustments than low import penetration industries (3.7 per cent versus 2.6 per cent).

Finally, the ten highest average earnings industries during 1979–87 were chosen. (These are metal mining, mineral fuels mining, non-metal mining, tobacco, lumber, paper, chemicals, petro, non-metal minerals, primary metals and transportation.) In line with the view that certain industries have high wages for efficiency wage reasons, high wage levels may signal a greater readiness of workers to trade off wages in return for employment guarantees. This possibility is supported by the larger employment elasticities with respect to tariffs (3.2 per cent versus 2.6 per cent) and the negative wage elasticity with respect to tariffs. Additionally, there is some support for the view that trade liberalisation has led to a more competitive labour market and to an erosion of economic rents.

Overall, Table 5 indicates that the estimated effects of trade barriers and trade flows across different subsamples are very similar to the estimates obtained by pooling our data across all industries. Unfortunately, the same is not true for our assumption about pooling the sample across time. There is evidence of a 1988–89 structural break for many of the earnings coefficients and for the intercept of the employment equation (not reported). This may reflect the significant and non-marginal nature of CUSTA on product and labour markets. In addition, it may be that our tariff and trade data tell only part of the story about the effects that CUSTA has had on the Canadian labour market since 1989.

7. CONCLUSIONS

This paper has documented the major trends in employment and average industry wages in the Canadian and US labour markets both before and after implementation of CUSTA in January 1989. The striking trends over the period are the massive job losses and wage inflexibility in Canada as compared to the moderate job losses and wage declines in the United States. In examining the industry level data, it is apparent that some of the job losses are attributable to CUSTA. However, since CUSTA has been unexpectedly associated with a period of trade destruction rather than creation, it is difficult to argue that

CUSTA-induced merchandise trade movements are solely responsible for these labour market trends. Other sources of job losses include the failure of CUSTA to guarantee access to US markets, the poor performance of the automotive sector, the recession, and the fact that Canadian wages were slow to respond to productivity developments at a time when tariff protection was disappearing.

Using multivariate econometric techniques, we isolated sources of Canadian job losses. Three factors were identified which we list in order of importance: (1) CUSTA tariff reductions; (2) the budget deficit and the Bank of Canada's inflation fight that drove up interest rates, helped plunge the economy into recession and, most importantly, strengthened the Canadian dollar; and (3) ongoing structural change in manufacturing that has led to job losses on both sides of the border.

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