PROTECTION, TRADE, AND WAGES: EVIDENCE FROM U.S. MANUFACTURING

NOEL GASTON and DANIEL TREFLER*

This paper investigates the effects of international trade policy on wages in U.S. manufacturing industries in 1983. The data set combines micro labor market data with comprehensive data on tariffs and nontariff trade barriers such as quotas and antidumping duties. The authors find that workers in unprotected, export-oriented industries had higher wages than workers with similar observable characteristics in protected, import-competing industries; more specifically, exports had a positive wage effect and imports had a smaller negative wage effect. Other findings are that nontariff barriers had no significant effect on wages, and tariffs appear to have had a large negative wage effect, even after the authors control for the trade protection received by low-wage industries.

Labor interests have been, and continue to be, a focal point in discussions of international trade liberalization. As Stolper and Samuelson (1941:58) noted in their celebrated paper, "Second only in political appeal to the argument that tariffs increase employment is the popular notion that the standard of living of the American worker must be protected against the ruinous competition of cheap foreign labour." More recently, during the negotiations with Mexico over the North American Free Trade Agreement, a key U.S. fear was that U.S. wages would be forced down to the level of Mexican wages. Despite the importance of wages and protection for current political decision-making, however, research on the relationship between trade policy and labor market outcomes, especially wages, is sparse. Indeed, we know of no econometric study of the role of protection as a determinant of wages, a gap we begin to fill with this study.

The basic question addressed in this paper is whether workers in a heavily protected industry earn higher wages than comparable workers in a less-protected industry. To answer this question, we treat pro-

*Noel Gaston is Assistant Professor of Economics at Tulane University and Daniel Trefler is Assistant Professor of Economics at the University of Toronto. The authors are indebted to Dwayne Benjamin, Albert Berry, James Brander, James Harrigan, James Hartigan, Gerry Helleiner, Aloysius Siow, George Slotsve, and Insan Tunali for many helpful comments. This research was supported by the Social Sciences and Humanities Research Council of Canada, a summer research grant from Tulane University, and the Lynde and Harry Bradley Foundation.

The CPS data used in this study are available from the authors, ICPSR, or the NBER. Trade flows data are available from the authors or the NBER's Trade and Immigration File. Tariff and NTB data are proprietary and were kindly supplied by the World Bank. Data were analyzed using SAS.

Industrial and Labor Relations Review, Vol. 47, No. 4 (July 1994). © by Cornell University.
0019-7939/94/4704 $01.00

tection as an industry characteristic. Certain industries have been the recipients of protection for years and even decades (for example, textiles, clothing, and footwear), whereas other industries have rarely received protection. In general, heavily protected industries also tend to employ many more less-skilled (and low-wage) workers than do nonprotected industries. Hence, in order to quantify the long-term relationship between protection and wages, it is necessary to control for the human capital characteristics of workers.

We use a unique data set that combines data on labor market outcomes with data on international trade protection. The labor market data are from the 1984 Current Population Survey (CPS); they include detailed information on the characteristics of over 20,000 workers employed in manufacturing industries. The protection data are from the 1983 GATT (General Agreement on Tariffs and Trade Organization) tariff schedules and the 1983 UNCTAD (U.N. Conference on Trade and Development) Data Base on Trade Control Measures. The UNCTAD Data Base is the most comprehensive record available of nontariff trade barriers (NTBs). Examples of NTBs are quantity restraints (for example, quotas and voluntary export restraints), price restraints (for example, countervailing duties and variable levies), and threats (for example, antidumping investigations by the federal government).

Wage Responses to Import Competition and Protection

The main channels through which trade and protection affect wages are well known. Protection reduces imports, and reduced imports increase labor demand, which in turn increases wages. This mechanism raises wages in the industry relative to the economy-wide average wage. Protection also, however, affects the economy-wide level of wages. The most familiar general equilibrium trade model leads to an odd result. The Stolper-Samuelson theorem states that protection placed on labor-intensive industries tilts the product market mix in favor of increased overall labor demand. Although this influence raises the economy-wide average wage, the theorem states that there is no change in relative wages, since wages are assumed to be equalized across industries. Thus, the theorem does not address relative wage issues. In the specific factors model (Mayer 1974), in which labor is assumed to be immobile and wages therefore are not equalized across industries, protection raises relative wages, but has an indeterminate effect on the economy-wide average wage. Thus, care must be taken in predicting relative and average wage movements using general equilibrium trade models, particularly when the subject is trade liberalization that simultaneously affects many industries. In this paper, our focus is on relative wages and the structure of wages across industries rather than the economy-wide average wage.

A second channel through which trade and protection affect wages is imperfectly competitive factor markets. For example, unions may extract part of the rents from protection in the form of more jobs rather than higher wages. In the McDonald and Solow (1981) model, an increase in protection need not always result in higher wages, because the risk-averse union may respond to the increased protection by pushing for a low wage–high employment contract (see Gaston and Trefler 1994b). Grossman (1984) developed this model further by considering what happens when random layoff rules are replaced by seniority-based layoff rules. Such a system induces senior workers to push for higher wages and junior workers to push for the low wages that prevent layoffs; the correlation of wages with imports and trade barriers then depends on the seniority structure of the union. Thus, the links among wages, trade, and protection are potentially more complicated than is implied by the protection–reduced imports–higher labor demand–higher wages argument.

A third channel from trade and protection to wages appears in international trade models with imperfectly competitive product markets (for example, Brander and Krugman 1983). With imperfect competition, trade and protection affect the strategic interaction between firms, thus affecting firm performance and wages. This channel is especially interesting, for it suggests why protection may have effects on wages independent of its effects on trade levels. Consider just two examples. First, 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, thus severing the direct link between tariffs and imports (for example, Harris 1984). Second, if protection promotes entry into an industry by enhancing the profitability of existing firms, and if new entrants face set-up costs, then protection promotes inefficient entry (Horstmann and Markusen 1986). There is abundant empirical evidence, based on computable general equilibrium models, that protection can induce inefficiency and reduce wages (for example, Cox and Harris 1985; Brown et al. 1992). Thus, protection's effects on industry performance, worker productivity, and industry wages are far more complicated than the effects captured by a focus on export- and import-induced shifts in product demand.

Certain features of the relationship between wages and the international economy have been studied elsewhere. Most of the recent econometric studies regress average industry wages on imports and exports (for example, Lawrence and Lawrence 1985; Freeman and Katz 1991). The evidence points to a negative relationship between imports and wages and a positive relationship between exports and wages. These generalizations partly break down in the case of contractual union-negotiated wages (Abowd 1987; Abowd and Lemieux 1991). In a different vein, Grossman (1987) and Revenga (1992) found a weak negative relationship between average industry wages and import price indices.[1]

Studies using average industry wage data treat average industry earnings as being independent of the characteristics of individual workers in the industry. Recent research highlights the fact that the industries most affected by increasing import penetration tend to employ large numbers of less-educated, less-skilled workers. Hence, without controls for education, skill, and other individual characteristics, it is premature to attribute the low wages in these industries to high levels of import penetration. In other words, using average industry wages may exaggerate the effect of imports or exports on wages.

Using industry wage premiums in place of average industry wages addresses this deficiency. A wage premium is that portion of a wage that cannot be explained by the worker's characteristics (such as human capital, demographics, and occupation) but can be explained by the worker's industry. Estimating wage premium equations, Macpherson and Stewart (1990) and Freeman and Katz (1991) found a negative relationship between wage premiums and imports, and Freeman and Katz (1991) found a positive relationship between wage premiums and exports. None of these studies examined the role of trade policy, either tariffs or NTBs, in wage determination. This study fills that gap using the wage premiums approach.

A key issue is the endogeneity of protection. Many political economy theories predict that the level of wages influences the decision to protect an industry. If protection is endogenous, then OLS leads to inconsistent estimates of the protection coefficient in a cross-industry wage equation. The direction of the bias cannot be predicted except in special cases (Magee et al. 1989). For example, some versions of "capture" theory predict that the bias will be positive, a prediction consistent with the many instances of trade policy directed at supporting incomes in high technology, high-wage industries. The "public interest" hypothesis predicts that the bias will be

[1]Their studies come closest to estimating ad valorem tariff elasticities of average industry wages. Compared to the direct measures of tariffs and NTBs that we use, however, import price indices are more difficult to interpret as a measure of protection (see Lipsey et al. 1991).

negative, since low-wage industries will be the recipients of protection. Evidence for the United States favors the latter prediction (Ball 1967; Baldwin 1985), suggesting that the cross-industry correlation of wages with trade barriers is negative.

To summarize, given the importance of wages in international policy discussions, there has been remarkably little empirical research on the relationship between wages, trade, and protection. With few exceptions, previous researchers have used average industry wages rather than individuals' wages or wage premiums that correct for the variation across industries in the distribution of worker characteristics. Most important, there have been no econometric studies treating tariff and nontariff barriers to trade as determinants of wages.[2]

The Data

An important feature of this paper is that it combines detailed data on trade protection with detailed micro data on individual labor characteristics and earnings. All data apply to U.S. manufacturing. Micro data on individual earnings and characteristics are from the Current Population Survey (CPS). To ensure that there are sufficient observations to accurately estimate industry wage premiums, we pool seven monthly surveys for 1984 to obtain a final sample of 21,230 individuals. 1983 CPS data yield exactly the same conclusions, but suffer from their proximity to a severe recession. In contrast to the previous studies of the relation between trade flows and labor market outcomes that use highly aggregated industry average data, our data allow us to control for individual heterogeneity within and across industries.

The trade protection data are from the 1983 GATT tariff schedules and the 1983 UNCTAD Data Base on Trade Control Measures, which documents NTBs. The data dictate that NTBs be measured as coverage ratios, that is, as the proportion of an industry's imports covered by an NTB. Tariffs are measured as import-weighted averages. Averaging is necessary because CPS data are reported at the Census Industry Classification level of 74 industries, whereas tariffs (and NTBs) are applied at the tariff-line level of about 10,000 items. Since only import data are comparably disaggregated, it is standard to define the tariff of an industry as the import-weighted average of the tariffs on all tariff-line items feeding into the industry. The unit of measurement is such that a tariff value of 0.10 indicates an ad valorem tariff of 10%.

Unless otherwise stated, trade data are from unpublished Bureau of Commerce sources. Exports, imports, and net imports are scaled by domestic consumption (domestic production less net exports). Import growth is scaled imports in 1983 less scaled imports in 1980. Intra-industry trade is defined in the usual way as $1 - |x_j - m_j|/(x_j + m_j)$, where x_j is exports and m_j is imports for industry j.

Methodology

Our focus is on the impact of trade and protection on individuals' wages and on the inter-industry wage structure. We take an industry characteristics approach to trade protection. Dickens and Katz (1987), Krueger and Summers (1988), and Helwege (1992) have shown that although industry wage premiums vary substantially across industries, they are persistent over time. For example, the correlation between wage premiums in 1974 and 1984 is 0.91 (Krueger and Summers 1988:68). This persistence would appear to eliminate any role for trade and protection in wage determination if trade and protection vary considerably over time. In fact, however, the structure of trade and trade barriers was stable prior to 1983.

Although the GATT Tokyo Round led to tariff cuts after 1979, the reduction formula was approximately linear; that is, it

[2]Computable general equilibrium studies in no way obviate the need for econometric work. Such studies usually assume that wages are equalized across industries; they are necessarily concerned with the economy-wide average wage rather than the structure of wages across industries; and they rarely exploit the rich micro labor market data we use in this study.

affected the level but not the structure of tariffs. Thus, for example, the correlation between post–Kennedy Round tariffs (1972) and post–Tokyo Round tariffs (1988) is 0.98. With a few exceptions, NTBs in the sample were in place at least a few years prior to 1983 and often more than a decade prior to 1983 (for example, the Multifibre Arrangement in textiles).

The inter-industry variation in imports and exports has also been stable over time. The correlation between exports in 1972 and exports in 1985 is 0.96, and the correlation between imports for those years is 0.91.[3] Thus, the stability of the inter-industry structure of wage premiums is matched by the stability of the inter-industry structure of trade barriers, exports, and imports. As a result, it is sensible to refer to trade and trade barriers as industry characteristics and as potential determinants of the structure of wages across industries. Further, this stability makes it likely that our results are unaffected by business cycles, short-term industry fluctuations, or the choice of 1983 as the period under study.

We adopt the inter-industry wage differentials approach to determine whether workers in more heavily protected industries have higher wages, *ceteris paribus*. Let $i = 1, 2, ..., I_j$ index workers in industry j. Let $\ln(w_{ij})$ be the natural logarithm of the hourly wage of individual i in industry j, H_{ij} be a vector of human capital, demographic, occupation, and geographic characteristics of individual i, and P_j be a vector of characteristics of industry j, which in this paper will always include measures of international trade and protection. We estimate the following:

Individuals' Wages (one-step):

$$\ln(w_{ij}) = H_{ij}\beta_H + P_j\beta_P + \varepsilon_{ij}$$
$$i = 1, ..., I_j, \; j = 1, ..., J.$$

The one-step estimator is consistent, but if there are errors that are shared by all individuals within the industry, the standard errors will be biased downward. The two-step inter-industry wage differentials or wage premiums approach corrects this bias (see Dickens and Katz 1987):

Wage Premiums (two-step):

$$\ln(w_{ij}) = H_{ij}\beta_H + D_{ij}w_j^* + \varepsilon_{ij},$$
$$i = 1, ..., I_j, \; j = 1, ..., J. \text{ (step 1)}$$
$$w_j^* = P_j\beta_P + u_j \qquad j = 1, ..., J. \text{ (step 2)},$$

where D_{ij} is a dummy for industry j, w_j^* is the wage premium in industry j, and P_j includes measures of trade and protection for industry j. In the first stage, log wages are regressed on individual characteristics and J industry dummies with coefficients w_j^*. In the second stage, the w_j^* are regressed on industry characteristics. Whether wage premia are attributable to the fact that the industry of affiliation is important per se, or whether industry affiliation, and therefore wages, are systematically correlated with unobserved worker attributes (as would result from a worker sorting process based on unobserved ability), is still an unresolved issue in the literature. (See Gibbons and Katz 1992.)

Single Equation Results

In this section we present estimates of the individuals' wages and wage premiums specifications. Only a single choice of explanatory regressors is presented. Although inferences based on this single choice must be tentative, the inferences drawn are robust, as will be shown in the following sections, in which protection is treated endogenously and the single choice is subjected to an extensive sensitivity analysis.

Table 1 presents elements of the correlation matrix. A striking feature is the large negative correlation of wage premiums with tariffs (–0.44). The data confirm Dickens and Lang's (1988) and Katz and Summers's (1989) observation that wage premiums are negatively correlated with imports (–0.23) and positively correlated with exports (0.38). The endogeneity of protection is suggested by the positive correlation

---

[3]The tariff correlation is calculated from data in Deardorff and Stern (1986), Table 4.2 (p. 50) and Table 4.3 (p. 51). The export and import correlations are calculated from data in the *NBER Trade and Immigration* data set (see Abowd 1991).

Table 1. Correlations of Wage Premiums, Protection, and Trade, 1983.

	Wage Premiums	*Imports*	*Exports*	*Import Growth (1980–83)*	*Intra-Industry Trade*
Wage Premiums	1.00	–0.23	0.38	0.11	0.04
Tariffs	–0.44	0.14	–0.27	–0.15	–0.04
NTBs	–0.08	0.13	–0.30	–0.01	–0.13

Notes: Correlations are across 74 three-digit CIC (Census Industry Classification) manufacturing industries. Wage premiums are calculated from 1984 CPS data; trade data for 1983 are from unpublished Commerce Department sources; tariff data are from the 1983 GATT *Tariff Study;* and NTB data are from the 1983 UNCTAD *Data Base on Trade Control Measures.*

of protection with imports and the negative correlation with exports.

Table 2 reports the results for the individuals' wages specification. The individual characteristics regressors form a conventionally selected set of included variables. Not surprisingly, their coefficients have signs and magnitudes that are very similar to those reported by many previous researchers. (No intercept is included, since the five occupation dummies sum to one.) The novel element in the regression is the inclusion of trade and protection regressors. Their coefficients are carried over to Table 3 in the column labeled "Individuals' Wages." Table 3 also reports the results of the wage premiums specification. Although only OLS estimates are reported, we also considered GLS estimates with weights proportional to the covariance matrix of the first-stage wage premiums estimates. As in the Dickens and Katz (1987) study of wages and industry characteristics, GLS and OLS yield very similar results;[4] we follow Dickens and Katz by reporting the OLS estimates and standard errors.

Consider the negative coefficient for tariffs. This coefficient implies that workers in an industry with high tariffs are paid less than workers with identical observable characteristics in an industry with low tariffs. Note that this result does not merely reflect the well-documented fact, based on studies of highly aggregated average industry data, that heavily protected industries employ less-skilled workers; we have controlled for skill levels, as well as a variety of other

Table 2. Effects of Various Factors on Individuals' Wages, 1983.

Dependent Variable Log of Hourly Wages	*Estimated Coefficient*	*t Statistic*
Individual Characteristics		
Schooling	0.06	46.91
Labor Force Experience	0.02	32.51
Experience Squared	–0.001	23.52
Employed Full-Time	0.22	22.24
Union Member	0.16	26.85
Male	0.23	33.53
White	0.06	7.14
Household Head	0.08	11.10
Married	0.03	4.75
Lives in South	–0.06	10.07
Lives in Inner City	0.01	1.90
Veteran	0.03	4.65
Engineer-Scientist	0.94	34.87
White-Collar	0.74	32.09
Skilled	0.64	28.57
Semi-Skilled	0.52	24.36
Unskilled	0.46	20.94
Trade and Protection		
Tariffs	–0.65	12.76
NTBs	0.05	4.72
Exports	0.44	14.23
Imports	–0.06	1.27
Import Growth (1980-83)	–0.14	1.42
Intra-Industry Trade	0.01	1.17
Observations	21,230	
F-Statistic	954	
R^2	0.50	

Sources: see notes to Table 1.

[4]For example, the GLS estimates (t-statistics) corresponding to the "Wage Premiums" column in Table 3 were –0.717 (3.36) for tariffs, 0.039 (0.93) for NTBs, 0.448 (3.41) for exports, –0.201 (1.52) for imports, –0.326 (1.13) for import growth, 0.020 (0.51) for intra-industry trade, and 0.002 (0.04) for the intercept (R^2 = 0.332).

Table 3. Single Equation Results, 1983.
(t–Statistics in Parentheses)

Individual Controls	*Individuals' Wages* *YES*[a]	*Wage Premiums* *YES*	*Average Industry Wages*[b] *NO*	*Sensitivity*[c]
Tariffs	–0.645	–0.730	–1.959	
	(12.76)	(3.27)	(4.67)	
NTBs	0. 052	0. 042	0. 042	†
	(4.72)	(0.97)	(0.52)	
Exports	0.443	0.433	0.882	
	(14.23)	(3.09)	(3.34)	
Imports	–0.055	–0.261	–0.206	
	(1.27)	(2.22)	(0.93)	
Import Growth, 1980–83	–0.137	–0.354	–0.170	
	(1.42)	(1.35)	(0.35)	
Intra-Industry Trade	0.010	0.007	–0.025	†
	(1.17)	(0.20)	(0.33)	
Intercept		0.015	2.120	†
		(0.40)	(31.09)	
n	21,230	74	74	
R^2	0.498	0.324	0.416	

[a]The coefficients on the individual characteristics, β_H, are reported in Table 2.
[b]For each industry, this is the individual's log wage averaged across individuals in the industry. Hence, there is no correction for variation across industries in worker characteristics.
[c]A † indicates that the coefficient sign is sensitive to the regression diagnostics reported below.

individual characteristics, including human capital variables, demographic variables, and union status. This point is demonstrated in the fourth column, labeled "Average Industry Wages," in which there are no controls for the variation across industries in worker characteristics. Without such controls, the tariff coefficient for the average industry wage regression is expected to be much more negative, reflecting the political economy of protection (whereby industries employing less-skilled labor receive more trade protection) and the sorting of workers based on observable characteristics such as education and skill levels.[5] That this expectation is borne out suggests that political economy bias and self-selection (based on observable characteristics) are present and that working with individual data at least partially purges the estimates of these biases. We develop this point further in the next section.

Consider the magnitude of the tariff coefficient. A one standard deviation fall in tariffs leads to a 3.5% increase in wages. Another way of thinking about the size of the tariff coefficient is to conduct a conceptual experiment in which a worker is shifted from an industry with an average level of tariffs (5.3%) to an industry with no tariffs. The estimated coefficient implies that this worker's wage would rise by 3.4% (= –0.645 × –5.3%). The comparable figure for the wage premiums specification is 4.1%. In the most protected industries the tariff effect is substantial. For example, in clothing, which has a 22.7% tariff, we estimate that a worker earns 14.6% (= –0.645 × 22.7%) less than a worker with the same observable characteristics in an industry with no tariffs.

[5]The dispersion of the estimated wage premia (variance = 0.010) is less than that of average wages (0.042), since differences in worker characteristics and the sorting of workers across industries (based on observable characteristics) have been controlled for in the former. Since average wages and wage premia are highly correlated (0.93), we expect the coefficients in the average wage regression to be higher (in absolute terms) with similar t–ratios.

Unlike tariffs, NTBs appear to be associated with higher wages. A one-standard deviation increase in NTBs increases wages by 1.2%. Thus, shifting a worker from an industry with an average level of NTBs (16.6%) to an industry with no NTBs would reduce that worker's wage by 0.9% (= 0.052 × –16.6%). A possible explanation for the asymmetry is that NTBs have been more effective than tariffs in supporting wages and wage premiums, a position argued by Deardorff 1987. Note, however, that the sign and magnitude of the NTB coefficient (unlike those of the tariff coefficient) are shown below to be sensitive to the choice of specification. Shifting a worker with average levels of tariffs and NTBs into an industry with no protection would raise that worker's wage by 2.5% (= 3.4% – 0.9%).

As for the effects of trade flows, our findings mesh with those of previous studies. There is a positive relationship between wage premiums and exports and a negative relationship between wage premiums and imports. A one standard deviation change in exports increases wages by an average of 3.9%. The corresponding figure for imports is a much smaller –0.5%.[6] The coefficient on import growth has the expected negative sign, but is statistically insignificant. Intra-industry trade explains little.

The Endogeneity of Protection and Trade

The coefficients in the wage premiums regression will be inconsistent if protection is endogenous. Evidence of endogeneity is provided by Baldwin (1985), who found that policy-makers consider average industry wages when deciding whether or not to protect an industry. To examine endogeneity, we use 2SLS to simultaneously estimate wage, tariff, and NTB equations.

Let j index industries and let w_j^*, t_j, and n_j be wage premiums, tariffs, and NTBs, respectively. We estimate the simultaneous equations model shown below. X_j consists of exports, imports, import growth, and intra-industry trade, and Z_{Pj} is a vector of the determinants of tariffs and NTBs as suggested by the political economy of protection literature. We identify the tariff and NTB equations by excluding tariffs from the NTB equation and NTBs from the tariff equation; the 2SLS estimates of the wage premium equation, however, are unaffected by these exclusion restrictions.

2SLS estimation of the wage premium equation is equivalent to instrumental variables estimation using X_j and Z_{Pj} to instrument tariffs and NTBs. As usual, one expects the choice of instruments to affect the inferences. Thus, we consider two models or sets of instruments representing very different choices of Z_{Pj}. Model A is the set of regressors used by Trefler (1993) to instrument protection in a cross-industry regression of imports on protection. He found that when protection is treated exogenously, its impact is negligible, but when it is instrumented by the Model A instruments, the protection coefficients become much larger and the impact of protection on imports increases ten-fold. The instruments are standard in the endogenous protection literature (for example, Ray 1981) and are listed in Table 4. Note that they include two measures of historical industry performance: growth in imports (1980–83) and growth in industry output (1979–83). Model B is the individual characteristics data averaged over individuals in the industry. The argument is that politicians consider the composition of workers employed in an industry (average age, average education, percentage of part-time workers, average skill levels, and so on) when deciding whether to protect that industry (Cheh 1974; Baldwin 1985).

Table 4 reports the 2SLS results for the wage premiums equation. For ease of comparison, the OLS results have been transcribed from Table 3. NTBs now have a stronger positive effect, but the coefficient remains statistically insignificant. Tariffs

[6]Freeman and Katz (1991) regressed changes (1984 less 1974) in wage premiums on changes in imports and exports. Their export coefficient was smaller than ours, but their import coefficient was almost identical to ours (–0.228). Freeman and Katz did not include any measures of trade protection in their regressions.

(Wage Premiums)	$w_j^* =$	$\beta_{wt}t_j + \beta_{wn}n_j$	$+ \beta_{wx}X_j + \varepsilon_{wj}$
(Tariffs)	$t_j = \beta_{tw}w_j^*$		$+ \beta_{tz}Z_{Pj} + \varepsilon_{tj}$
(NTBs)	$n_j = \beta_{nw}w_j^*$		$+ \beta_{nz}Z_{Pj} + \varepsilon_{nj}$

Simultaneous Equations Model (I).

now have a more negative effect. At first glance, this result is puzzling. Consider, however, a simple 2-equation model, $w_j^* = \gamma_t t_j + \beta_x x_j + \varepsilon_j$ and $t_j = \gamma_w w_j^* + \beta_z z_j + \nu_j$, where x_j and z_j are (exogenous) scalars and all variables are expressed in deviations from their means. Then the sign of the OLS bias is given by

$$plim\gamma_t^{OLS} - \gamma_t = [\sigma_x^2/(\sigma_x^2\sigma_t^2 - \sigma_{xt}^2)] \cdot [(\gamma_w\sigma_\varepsilon^2 + \sigma_{\nu\varepsilon})/(1 - \gamma_w\gamma_t)].$$

Table 4. Wage Premiums with Endogenous Tariffs and NTBs, 1983. (t–Statistics in Parentheses)

		2SLS	
Wage Premiums	*OLS*	*Model A*	*Model B*
Tariffs	−0.73 (3.27)	−1.33 (3.51)	−1.22 (3.68)
NTBs	0.04 (0.97)	0.12 (1.16)	0.18 (1.60)
Exports	0.43 (3.09)	0.42 (2.45)	0.50 (2.71)
Imports	−0.26 (2.22)	−0.27 (2.06)	−0.30 (2.21)
Import Growth, 1980–83	−0.35 (1.35)	−0.45 (1.54)	−0.51 (1.66)
Intra-Industry Trade	0.01 (0.20)	0.02 (0.37)	0.02 (0.52)
Intercept	0.02 (0.40)	0.03 (0.65)	0.003 (0.07)
R^2	0.32	0.31	0.32

Notes: There are 74 observations. The 2SLS regressors in the tariff and NTB equations are the following: Model A—exports, imports, import growth, seller concentration, buyer concentration, seller number of firms, buyer number of firms, scale, capital stock, unionization, employment, geographic concentration, proportion of workers in each of five occupations, unemployment, and industry growth; Model B—the individual characteristics variables (see Table 2) averaged across individuals in the industry.

It is not possible to argue *a priori* that the sign of the bias is negative. For simplicity, suppose $\sigma_{\nu\varepsilon} = \sigma_{xt} = 0$ and that $\gamma_w < 0$. If $\gamma_t > 0$, then the bias is negative, that is, opposite that appearing in Table 4. If γ_t is large and negative, however, then the bias is positive, as in Table 4. Thus, the direction of the bias is consistent with $\gamma_w < 0$ and a large negative value of γ_t.

When comparing the null hypothesis that the OLS estimates of the wage equation are consistent with the alternative hypothesis that they are inconsistent due to endogeneity of tariffs and NTBs, the Hausman test fails to reject the null hypothesis ($\chi_7^2 = 5.95$ for Model A). Thus, the endogeneity of protection does not lead to inconsistent estimates. The fact that these inferences are not sensitive to the choice of models increases our confidence in the results. Further, we now show that models A and B do very well in correcting for endogeneity elsewhere in the system.

Arguably, trade flows are endogenous because they depend on wage costs. To investigate this possibility, we simultaneously estimate a net imports equation along with the wage premiums, tariff, and NTB equations (see below). We let M_i be net imports (that is, $M_j = m_j - x_j$); Z_{mj} is a vector of 13 factor shares suggested by the Heckscher-Ohlin model. Each factor is the total (direct plus indirect, in an input-output sense) factor earnings generated by producing one dollar of final industry output. These data are constructed in the same way as the factor share data used by Trefler (1993). Although this model is of considerable interest, the results are tentative because of the small-sample properties of 2SLS in such a heavily parameterized model (see Nelson and Startz 1990).

(Wage Premiums)	$w_j^* =$		$\beta_{wm}M_j$	$+ \beta_{wt}t_j + \beta_{wn}n_j$	$+ \beta_{wx}X_j + \varepsilon_{wj}$
(Net Imports)	$M_j =$	$\beta_{mw}w_j^*$		$+ \beta_{mt}t_j + \beta_{mn}n_j$	$+ \beta_{mz}Z_{mj} + \varepsilon_{mj}$
(Tariffs)	$t_j =$	$\beta_{tw}w_j^*$	$+ \beta_{tm}M_j$		$+ \beta_{tz}Z_{Pj} + \varepsilon_{tj}$
(NTBs)	$n_j =$	$\beta_{nw}w_j^*$	$+ \beta_{nm}M_j$		$+ \beta_{nz}Z_{Pj} + \varepsilon_{nj}$

Simultaneous Equations Model (II).

Table 5 reports the 2SLS estimates for Model A. Similar results were obtained for Model B. Each column represents an equation; only the coefficients of the endogenous regressors are reported, and OLS estimates appear for ease of comparison. As before, correcting for simultaneity bias leads to an even more negative coefficient on tariffs. The coefficient has fallen from –0.76 to –1.32. Further, in a comparison of the null hypothesis that the OLS estimates of the wage equation are consistent with the alternative hypothesis that they are inconsistent due to the endogeneity of net imports, tariffs, and NTBs, the Hausman test fails to reject the null hypothesis ($\chi_6^2 = 6.92$). Thus, the endogeneity of trade flows plays no role.

Table 5 provides further evidence that we have chosen satisfactory models for the tariff and NTB equations. Consider the OLS estimates of the net import equation. The tariff and NTB coefficients display a theoretically unsatisfactory positive sign, indicating that high levels of protection lead to high levels of imports. Leamer (1988) found a similar result in an OLS setting. The obvious explanation is political economy bias: high import levels lead politicians to protect an industry. When this simultaneity is eliminated by using 2SLS, the coefficients on tariffs and NTBs in the net import equation switch to their expected negative signs. (The coefficients of some of the specifications reported in the next section are statistically significant.) Thus, we have successfully addressed political economy bias in the import equation, which increases our confidence in our overall results.[7]

Sensitivity Analysis

We have demonstrated that our results are not sensitive to the endogeneity of the regressors. In this section, other econometric assumptions likely to be violated are identified and relaxed. The conclusion emerges that the inferences about the impact of tariffs and exports on wages are remarkably robust to changes in these assumptions. Not so, however, for NTBs.

Influential observations. Figure 1 is a bivariate plot of tariffs and wage premiums. Census Industrial Classification codes are appended to each observation. To illustrate how to interpret the premiums, a value of 0.10 indicates that, controlling for the heterogeneity of workers across industries, the industry has wages that are 10% above the employment-weighted average manufacturing wage premium. Although the plot shows considerable noise, it reinforces the econometric findings of a negative relationship between tariffs and wage premiums. Some of the noise is readily explainable. When attention is focused on the black boxes representing industries with import penetration in excess of 10%, there is less noise and a clearer relationship emerges between tariffs and wages. Other noise is observation-specific, such as that associated with publishing (a non-tradable), tobacco (with its powerful lobby), and footwear and textiles (which are subject to substantial NTBs).

[7]The other 2SLS coefficients in Table 5 are also sensible. High levels of imports lead to high levels of tariffs and NTBs. Positive wage premia are associated with high net exports, and reduced imports lead to positive wage premia.

Table 5. Wage Premiums with Endogenous Protection and Trade, 1983.
(t–Statistics in Parentheses)

	2SLS				OLS	
	Wage Premiums w^*	*Net Imports* $m-x$	*Tariffs* t	*NTBs* n	*Wage Premiums* w^*	*Net Imports* $m-x$
Endogenous Regressors						
Wage Premiums		–0.56	–0.23	0.90		–0.47
		(2.24)	(1.81)	(1.23)		(2.82)
Net Imports	–0.35		0.06	1.05	–0.33	
	(2.89)		(0.85)	(2.48)	(3.43)	
Tariffs	–1.32	–0.24			–0.76	0.04
	(4.28)	(0.34)			(3.45)	(0.12)
NTBs	0.09	-0.10			0.04	0.08
	(1.27)	(0.56)			(0.83)	(0.03)
Exogenous Regressors	X	Z_M	Z_P	Z_P	X	Z_M
R^2	0.34	0.59	0.48	0.31	0.31	0.64

Notes: There are 74 observations. Each column represents an equation. The wage premium, net import, tariff, and NTB equations were simultaneously estimated using 2SLS. Coefficients for exogenous regressors are not reported. These exogenous regressors are as follows:

X: import growth (1980–83) and intra-industry trade.

Z_M: 13 total (direct plus indirect in an input–output sense) factor costs per dollar of output. The factors consist of 2 types of capital (fixed assets and inventories), 5 types of labor (unskilled labor, semi-skilled labor, skilled labor, white-collar labor, and engineers and scientists), 3 types of land (cropland, pasture, and forest), and 3 types of subsoil resources (coal, petroleum, and minerals).

Z_P: import growth, seller concentration, buyer concentration, seller number of firms, buyer number of firms, scale, capital stock, unionization, employment, geographic concentration, proportion of workers in each of five occupations, unemployment, and industry growth.

Figure 1 shows that there are no influential observations or outliers of the kind described by Belsley et al. (1980); that is, as observations are deleted one at a time, the tariff coefficient varies in a tight range between –0.81 and –0.65. Thus, the tariff effect is always large and negative. This procedure cannot deal with groups of two or more jointly influential observations. One such suspect group is comprised of the observations located to the lower right of Figure 1, that is, observations with tariffs in excess of 11%. When all of these observations are omitted, the tariff coefficient rises to –1.17, so they cannot account for the negative coefficient on tariffs.

Figure 2, a bivariate plot of NTBs and wage premiums, reveals no obvious relationship between NTBs and wage premiums. For example, recipients of protection include low-wage industries such as footwear and textiles as well as high-wage industries such as steel and automobiles. Although omission of observations one by one does not induce sign reversals in the NTB coefficient, it does cause the NTB coefficient to vary dramatically from a high of 0.06 (delete leather 222) to a low of 0.01 (delete petro/coal 201). Further, when petro (200) and petro/coal (201) are jointly omitted, the coefficient on NTBs becomes negative.

Figure 2 may indicate the need to disaggregate NTBs. To address this issue, we disaggregated NTBs into quantity restraints, price restraints, and threats. The same conclusion, however, always emerges: inferences about NTBs are sensitive to the choice of measure and specification (see Gaston and Trefler 1993). Stated otherwise, the data are not informative about the correlation of NTBs with wages and wage premiums.

Choice of regressors. Table 6 indicates that the signs of the NTB and intra-industry trade coefficients are sensitive to the choice

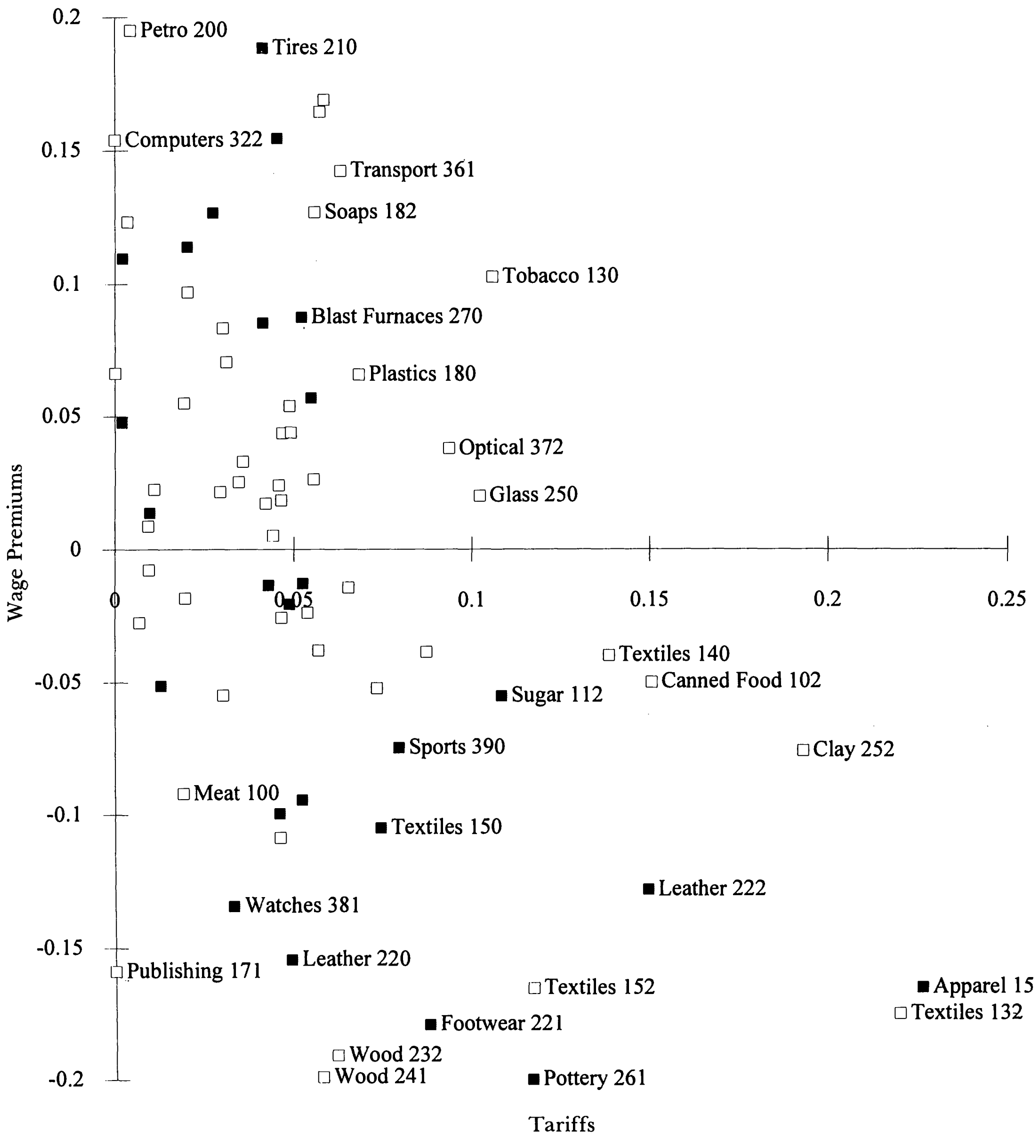

Figure 1. Wage Premiums and Tariffs, 1983.

(Shaded boxes represent industries with import penetration in excess of 10%; CIC (Census Industry Classification) codes are appended to each observation)

of regressors. Further, when intra-industry trade and import growth ($m_{1983} - m_{1980}$) are omitted, the import penetration coefficient (m_{1983}) becomes smaller. Notice that when trade flows are omitted, the tariff and NTB coefficients are more negative, since they now capture the correlation of protection with trade flows. Overall, inferences about the tariff, export, import, and import growth regressors are not sensitive to the choice of regressors. Similar conclusions apply to the individuals' wages specification.[8]

[8]Table 6 also indicates the relative importance of protection and trade flows. Protection explains between 13% (= 0.32 – 0.19) and 19% of the variation in wage premia. Trade flows have similar explanatory power.

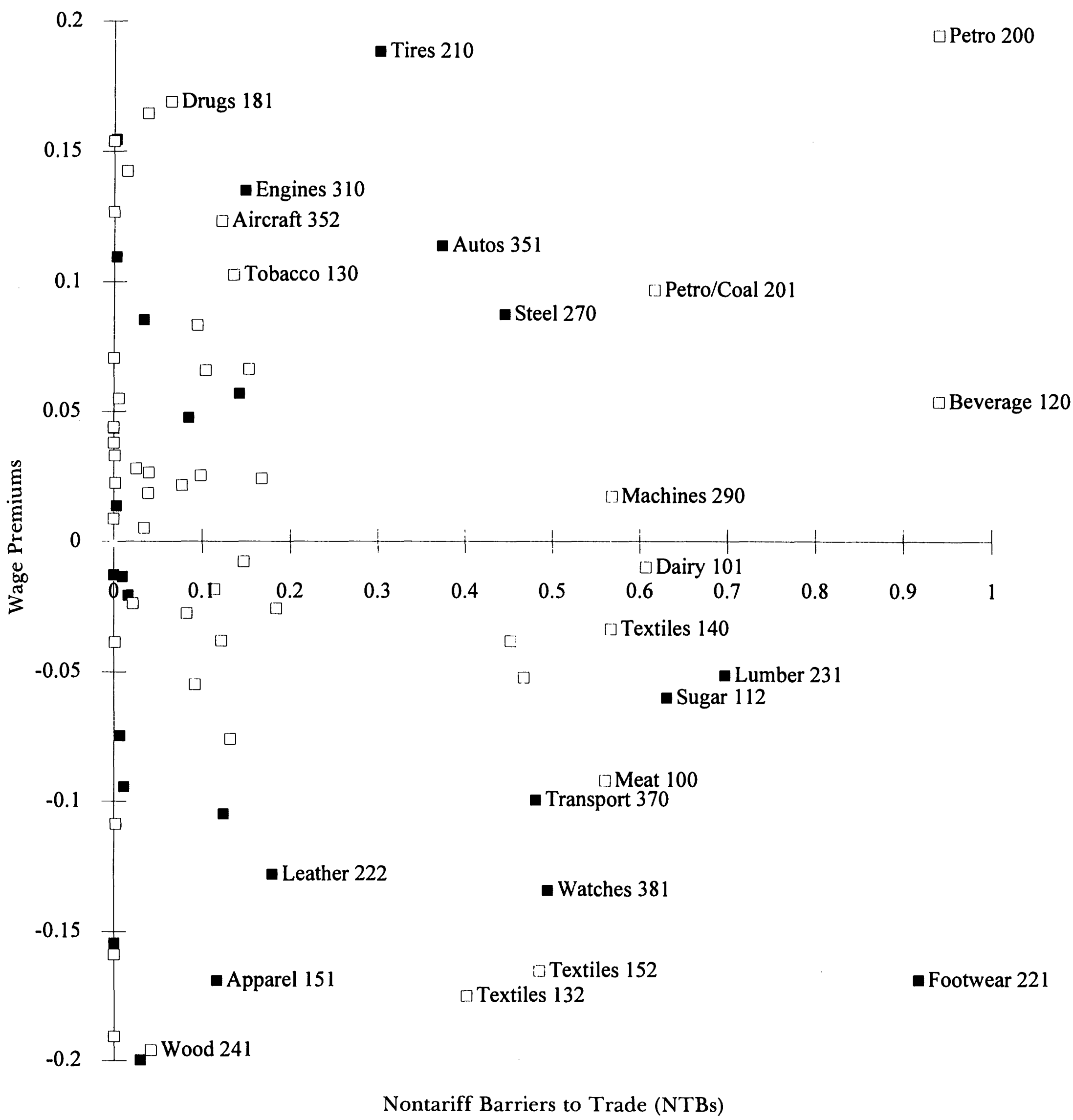

Figure 2. Wage Premiums and NTBs, 1983.

(Shaded boxes represent industries with import penetration in excess of 10%; CIC (Census Industry Classification) codes are appended to each observation)

All the industry characteristics that have been included in the wage regressions are related to international trade. Yet, protection is correlated with domestic determinants of wage premiums, the omission of which may bias our estimates. Consider the impact of estimating a model with many more regressors. Dickens and Katz (1987), in their examination of the determinants of the cross-industry variation in wage premiums, considered a very different, but larger set of 21 regressors.[9] We combined

[9]These were schooling, tenure at current job, experience, percentage of male workers, percentage black workers, percentage production workers, layoff rate, injury rate, hours of work per week, hours of overtime per week, ratio of nonwage compensation to

Table 6. Sensitivity of the Wage Premiums Specification to the Choice of Regressors, 1983.

*Dependent Variable: w**	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
Tariffs	−0.92**			−0.72**	−0.73**
NTBs	−0.06			0.03	0.04
Exports		0.48**	0.50**	0.40**	0.43**
Imports		−0.20*	−0.27*	−0.17	−0.26*
Import Growth (1980–83)			−0.28		−0.35
Intra-Industry Trade			−0.004		0.01
Intercept	0.05**	−0.02	−0.02	−0.02	0.01
R^2	0.19	0.20	0.21	0.31	0.32

There are 74 observations.
*Statistically significant at the 5% level; **at the 1% level.

the Dickens and Katz regressors with our own regressors to estimate a larger specification. Unfortunately, with so many parameters (28 regressors) and so few data (the Dickens and Katz data set has only 51 complete manufacturing observations), it is not surprising that the coefficient signs and magnitudes were sensitive to the choice of included regressors. Nonetheless, the tariff, import, and export coefficients usually had the signs reported above.

Our conclusions coincide with those of Dickens and Katz. They observed that virtually all of their coefficient signs were sensitive to the choice of specification, making it impossible to disentangle the independent effects of these regressors on wages. Dickens and Katz went on to conclude that industries vary along a single dimension, with high-wage industries being composed of large firms with large, capital-intensive plants, employing highly educated workers. To their statement we would add that high-wage industries also tend to be net exporters shielded by little or no tariff protection.

Interactions. A priori, it seems likely that trade protection will have its largest effect in industries with high levels of import penetration. Figure 1 suggests that this type of interaction effect may be important. To explore this possibility, in Table 7 we report the results of interacting tariffs and NTBs with imports. For ease of comparison, column (1) reports the non-interaction results carried over from Table 3 and column (2) reports the interaction model. The negative tariff-import interaction coefficient indicates that the negative effect of tariffs on wages is largest in industries with high levels of import penetration. The hypothesis that the two interaction coefficients are nonzero, however, is rejected ($F_{2,65} = 1.73$). That imports are endogenous and influenced by protection clouds somewhat the interpretation of these interaction effects.

A negative tariff coefficient might result if protected industries were shrinking industries, because such industries need only pay the going wage less the mobility costs of switching jobs. That is, the tariff coefficient might be capturing the relationship between wages and employment growth. Although we do not have data on mobility costs, we can verify that long-term employment growth and tariffs are negatively and significantly correlated (−0.30). In addition, the correlations of long-term employment growth with exports (0.37) and imports (−0.44) are also significant.[10] To fur-

total compensation, unemployment rate (averaged for 1979, 1982, and 1984), union coverage rate, employees per establishment, employees per firm, sales per firm, four firm concentration ratio, R&D expenditures divided by sales, capital-labor ratio, average rate of return on capital, and net income divided by sales. See Dickens and Katz (1987) for details. We thank Larry Katz for providing these data.

[10]Employment growth is defined as the average annual percentage change in employment over the

Table 7. Interactive Models of the Wage Premiums Specification, 1983.

*Dependent Variable: w**	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
Tariffs	−0.73**	−0.46	−0.79	−0.82**	−0.47*
NTBs	0.04	0.08	−0.10	0.07	−0.15
Exports	0.43**	0.41**	0.30*	0.42**	0.49**
Imports	−0.26*	0.002	−0.03	−0.24**	−0.35
Import Growth (1980–83)	−0.35	−0.35			−0.64*
Intra-Industry Trade	0.01	−0.02	−0.01	0.02	0.01
Intercept	0.01	0.01	−0.04	0.01	−0.05
Imports					
Interacted with Tariffs		−2.92			
Interacted with NTBs		−0.37			
Employment Growth (1972–83)			0.75		
Interacted with Tariffs			3.75		
Interacted with NTBs			2.11		
Import Growth (1982–83)				1.37	
Interacted with Tariffs				7.62	
Interacted with NTBs				−2.72	
Union coverage					0.15
Interacted with Tariffs					−0.28
Interacted with NTBs					0.62
R^2	0.32	0.36	0.38	0.35	0.44

There are 74 observations.
*Statistically significant at the 5% level; **at the 1% level.

ther examine this issue, we interact employment growth with tariffs and NTBs to test whether higher tariffs and NTBs lead to higher wages in industries with strong employment growth.

Column (3) of Table 7 reports estimates of the interaction model. The positive coefficients on tariffs and NTBs seem to support the argument. The effect of including employment growth and the interaction terms, however, is not statistically significant ($F_{3,65} = 2.47$). More important, dw^*_j/dt_j, which equals $-0.79 + 3.75x_j$, where x_j is employment growth in industry j, is negative for all industries in the sample. That is, higher tariffs lead to lower wages for all industries in the sample. For dw^*_j/dt_j to be positive, an industry would have to experience long-run employment growth in excess of 21% per annum (= 0.79/3.75 per annum), a rate that is impossibly high.

A trade-related alternative measure of industry shrinkage is growth in import penetration. In column (4) we interact tariffs with growth in import penetration. Although the tariff-import growth coefficient is positive, it is statistically insignificant, and dw^*_j/dt_j is negative for all industries. Further, the positive interaction term is not robust, as the reader will have gathered from the fact that we use import growth over the period 1982–83 rather than 1980–83. The problem is that the coefficients on the interaction terms are very sensitive to the choice of start and end years for the change in imports. They are also very sensitive to whether growth in imports or growth in industry output is used. Once again, none of the conclusions stated above is affected by the introduction of interaction terms. That is, the large negative tariff coefficient, the large positive export coeffi-

period 1972–83. 1972 was chosen because it was the year the Kennedy Round tariff cuts were completed. For employment growth over the 5-year period 1979–83, none of the correlations are statistically significant. Employment growth data are from the *NBER Trade and Immigration Dataset.* The mean (standard deviation) of long-run employment growth is 0.066 (0.024).

cient, and the small import coefficient remain. Overall, the data are not particularly informative about the mobility cost explanation.[11]

Unions may translate the rents associated with protection into wage gains or employment guarantees. Hence, the effect of protection on wages may depend on the extent of unionization. Column (5) of Table 7 reports results from interacting a union density measure with our measures of protection. The mean and standard deviation of union coverage—the proportion of workers covered by union awards—are 0.31 and 0.14, respectively. We obtain similar results when we use a union membership measure of union density, as well as when we use the individual wages' specification augmented with interactions of a union dummy with tariffs and NTBs. The negative coefficient on the interaction term for tariffs is consistent with the view that unions take advantage of protection by negotiating wage concessions in return for job guarantees. Thus, unions do not appear to be taking advantage of protection to raise wages. The null that the union coverage and union interaction terms are zero is rejected ($F_{3,64} = 4.55$).

In Table 7 the coefficients on tariffs and NTBs fluctuate somewhat. The derivatives dw_j^*/dt_j and dw_j^*/dn_j evaluated at the mean of the interaction variable, however, are close to their column (1) values of –0.73 and 0.04, respectively. This result allays our concerns about the robustness of the tariff coefficient.

In summary, in this section we have identified and relaxed a set of assumptions used to estimate the impact of protection and trade on individuals' wages and industry wage premiums. We have shown that the large negative tariff coefficient, the large positive export coefficient, and the smaller negative import coefficient are insensitive to the choice of assumptions.

[11]This mobility cost conjecture was prominently asserted, but left unsupported in an earlier version of this paper. We are indebted to a referee for suggesting that we pursue the conjecture.

Conclusions

There is widespread fear that the North American Free Trade Agreement (NAFTA), by reducing or eliminating many tariffs and nontariff trade barriers (NTBs) such as quotas and antidumping duties, will result in wage losses for U.S. workers. In view of that fear, the lack of econometric studies of the role of trade and protection in wage determination is surprising. The data we use in this study, from the 1984 Current Population Survey (CPS), the 1983 GATT tariff schedules, and the 1983 UNCTAD Data Base on Trade Control Measures, are unique in combining detailed information on labor market outcomes with detailed data on international trade and both tariff and nontariff trade barriers. These data have enabled us to go beyond previous studies that relied on average industry wages, which may exaggerate the wage effects of imports or exports.

When we isolated that portion of wages that is related solely to trade and protection, we found that workers in a protected, import-competing industry earn lower wages than do workers with identical observable characteristics in an unprotected, export-oriented industry. More specifically, tariffs were negatively correlated with industry wage premiums, and the correlations were economically large and robust across a wide variety of specifications and regression diagnostics. Although we find that NTBs were positively correlated with wages and industry wage premiums, the fragility of the NTB coefficient rules out reliable inferences: it was statistically and economically small; it had a sign that was sensitive to the choice of specification; and it had the same negative sign as the tariff coefficient when the petroleum industry, always a troublesome industry for empirical work in international trade, was omitted.

We subjected four explanations of the negative tariff coefficient to empirical examination. The most obvious relates to regressor endogeneity. It could be that the impact of tariffs reflects the endogeneity of protection, that is, policy-makers protect low-wage industries. We found no evidence of such a mechanism. Another possible explanation hinges on mobility costs: protected industries tend to be shrinking industries, and therefore need only pay the going wage less mobility costs. This argument about the relationship between wages and employment growth found some support in a bivariate correlation analysis, but not in a regression analysis. A third possibility is that unions use the introduction of tariffs to negotiate wage cuts in exchange for employment guarantees. We found some evidence in support of this hypothesis. Finally, long-term protection may discourage the efficient reallocation of resources, including labor, out of import-competing industries. The negative tariff coefficient may mirror this inefficiency. That the negative tariff effect remains even when imports and exports are included as regressors supports a point that has been made repeatedly in the strategic trade policy literature: tariffs affect the strategic interaction between firms in ways that imports do not.

It is tempting to apply our results to the question of whether protection lowers the absolute as well as relative wages of workers in protected industries. We estimated that in 1983 an average level of protection reduced wages in a protected industry by 2.5% relative to the economy-wide average wage. If protection were to increase the economy-wide average wage by substantially more than 2.5%, however—by, for example, altering the product market mix in favor of increased overall labor demand—our results would be consistent with trade protection raising the *absolute* level of wages for workers in protected industries. Published empirical evidence, however, suggests that the wage effects of protection are much more modest. In particular, computable general equilibrium models predict that U.S. protection changes the economy-wide average wage by less than 0.5% (see the review by Brown [1992] for NAFTA trade liberalization experiments); and a time-series analysis relating 1979–91 movements in Canadian average wages to changes in protection showed negligible average wage effects of tariff reductions (Gaston and Trefler 1994a).

As for the wider issues of worker welfare, it is important to recognize that we have ignored the short-run adjustment costs associated with trade-induced worker displacement. The increased tax burden of social insurance schemes such as trade adjustment assistance appears to be small (Stern et al. 1992), but a trade-displaced worker who is forced to switch firms, industries, or occupations may suffer a wage cut of as much as 10–25% (Kruse 1988; Topel 1991). Older workers with long firm-specific tenures are particularly exposed, and such workers tend to be concentrated in trade-sensitive, durable manufacturing industries (Jacobson 1992). In addition, trade-displaced workers tend to have lengthier unemployment spells than the average worker (Kruse 1988). Hence, although the large positive export effect and large negative tariff effect on wages imply substantial gains for many workers from trade liberalization, these gains must be weighed against the possibility of large short-run adjustment costs to many other workers.

DATA APPENDIX

In the CPS, each household in the sample is interviewed once a month for four consecutive months in one year and again for the corresponding period a year later. By using information on individuals in "outgoing rotations" we are assured of having a sample representing unique individuals. Further, only outgoing rotations are asked the detailed questions on earnings needed to compute an individual's hourly wage. To ensure that there are sufficient observations to accurately estimate industry wage premia, we pool seven monthly surveys to obtain our final sample. We merge the months that are available from the Inter-university Consortium for Political and Social Research (ICPSR): January, March, May, June, July, October, and November 1984.

Individuals meeting the following criteria are retained in our sample: (1) the individual is in an outgoing rotation group; (2) the individual's hourly wage is between $1 and $250, where hourly wage is defined as usual weekly earnings divided by usual weekly hours worked; (3) the individual has positive usual weekly hours; (4) the individual is between 16 and 75 years old; (5) the individual works in a manufacturing industry (CIC code between 100 and 399) that is not described as "miscellaneous" (that is, not in industry codes 122, 301, 332, 350, 383, or 392), for which reliable trade data are available (CIC codes 140 and 142 were merged and 362 deleted), and for which aggregation is sensible (CIC code 211 was deleted).

Occupations were defined using the CPS occupational classifications: Engineers and scientists (43–83); White-collar (3–27, 84–389); Skilled (494, 497, 503–699); Semi-skilled (703–859); and Unskilled (403–469, 499, 863–889). The 16 workers classified in farming occupations (472–494) were omitted.

"Lives in South" is defined as living in either Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, or Texas.

Table A.1
Sample Statistics

Variable	*Mean*	*Std. Dev.*
Log of Hourly Wages	2.086	0.489
Individual Characteristics		
Schooling (years)	12.320	2.631
Labor Force Experience (years)	19.531	13.122
Experience Squared	553.664	616.982
Employed Full-Time (= 1)	0.935	0.246
Union Member (= 1)	0.260	0.439
Male (= 1)	0.664	0.472
White (= 1)	0.884	0.320
Household Head (= 1)	0.538	0.499
Married (= 1)	0.697	0.460
Lives in South (= 1)	0.274	0.446
Lives in Inner City (= 1)	0.214	0.410
Veteran (= 1)	0.240	0.427
Engineer-Scientist(= 1)	0.048	0.214
White-Collar (= 1)	0.301	0.459
Skilled (= 1)	0.193	0.354
Semi-skilled (= 1)	0.383	0.486
Unskilled (= 1)	0.075	0.263
Trade and Protection		
Tariffs	0.053	0.055
	(0.056)	(0.048)
NTBs	0.166	0.236
	(0.190)	(0.252)
Imports	0.097	0.086
	(0.103)	(0.113)
Net Imports	0.009	0.126
	(0.023)	(0.139)
Import Growth (1980–83)	0.023	0.038
	(0.017)	(0.050)
Intraindustry Trade	0.582	0.281
	(0.565)	(0.265)

Notes: Statistics are for 21,230 individual observations. Statistics in parentheses are for the 74 3-digit CIC (Census Industry Classification) observations.

REFERENCES

Abowd, John M. 1987. "The Effects of International Competition on Collective Bargaining Settlements in the United States." Unpublished paper, Princeton University.

____. 1991. "The NBER Immigration, Trade, and Labor Market Data Files." In John M. Abowd and Richard B. Freeman, eds., *Immigration, Trade, and Labor Markets.* Chicago: NBER, pp. 407–21.

Abowd, John M., and Thomas Lemieux. 1991. "The Effects of International Trade on Collective Bargaining Outcomes: A Comparison of the United States and Canada." In John M. Abowd and Richard B. Freeman, eds., *Immigration, Trade, and Labor Markets.* Chicago: NBER, pp. 343–67.

Baldwin, Robert E. 1985. *The Political Economy of U.S. Import Competition.* Cambridge, Mass.: MIT Press.

Ball, David Stafford. 1967. "United States Effective Tariffs and Labor's Share." *Journal of Political Economy,* Vol. 75, No. 2 (April), pp. 183–87.

Belsley, David A., Edwin Kuh, and Roy E. Welsch. 1980. *Regression Diagnostics.* New York: Wiley.

Brander, James A., and Paul R. Krugman. 1983. "A 'Reciprocal Dumping' Model of International Trade." *Journal of International Economics,* Vol. 15, No. 3–4 (November), pp. 313–21.

Brown, Drusilla K. 1992. "The Impact of a North American Free Trade Area: Applied General Equilibrium Models." In Nora Lustig, Barry Bosworth, and Robert Z. Lawrence, eds., *North American Free Trade: Assessing the Impact.* Washington, D.C.: Brookings Institution, pp. 26–68.

Brown, Drusilla K., Alan V. Deardorff, and Robert M. Stern. 1992. "A North American Free Trade Agreement: Analytical Issues and a Computational Assessment." *World Economy,* Vol. 15, No. 1 (January), pp. 11–30.

Cheh, John H. 1974. "United States Concessions in the Kennedy Round and Short-run Labor Adjustment Costs." *Journal of International Economics,* Vol. 4, No. 4 (November), pp. 323–40.

Cox, David, and Richard G. Harris. 1985. "Trade Liberalization and Industrial Organization: Some Estimates for Canada." *Journal of Political Economy,* Vol. 93, No. 1 (February), pp. 115–45.

Deardorff, Alan V. 1987. "Why Do Governments Prefer Nontariff Barriers?" *Carnegie Rochester Conference Series on Public Policy,* Vol. 26, No. 1 (Spring), pp. 191–216.

Deardorff, Alan V., and Robert M. Stern. 1986. *The Michigan Model of World Production and Trade: Theory and Applications.* Cambridge, Mass.: MIT Press.

Dickens, William T., and Lawrence F. Katz. 1987. "Inter-Industry Wage Differences." In Kevin Lang and Jonathan S. Leonard, eds., *Unemployment and the Structure of Labor Markets.* New York: Basil Blackwell, pp. 48–89.

Dickens, William T., and Kevin Lang. 1988. "Why It Matters What We Trade: A Case for Active Policy." In Laura D'Andrea Tyson, William T. Dickens, and John Zysman, eds., *The Dynamics of Trade and Employment.* Cambridge, Mass.: Ballinger, pp. 87–112.

Freeman, Richard B., and Lawrence F. Katz. 1991. "Industrial Wage and Employment Determination in an Open Economy." In John M. Abowd and Richard B. Freeman, eds., *Immigration, Trade, and Labor Markets.* Chicago: NBER, pp. 235–59.

Gaston, Noel, and Daniel Trefler. 1993. "Tariffs, Nontariff Barriers to Trade, and Workers' Wages." In Erkin Bairam, ed., *Studies in Labour Economics.* Aldershot: Ashgate, pp. 72–110.

____. 1994a. "The Role of International Trade and Trade Policy in the Labor Markets of Canada and the United States." *World Economy,* Vol. 17, No. 1 (January), pp. 45–62.

____. 1994b. Union Wage Sensitivity to Trade Protection: Theory and Evidence." Unpublished paper, University of Toronto.

Gibbons, Robert, and Lawrence F. Katz. 1992. "Does Unmeasured Ability Explain Inter-Industry Wage Differentials?" *Review of Economic Studies,* Vol. 59, No. 3 (July), pp. 515–35.

Grossman, Gene M. 1984. "International Competition and the Unionized Sector." *Canadian Journal of Economics,* Vol. 17, No. 3 (August), pp. 541–56.

____. 1987. "The Employment and Wage Effects of Import Competition in the United States." *Journal of International Economic Integration,* Vol. 2, No. 1 (Spring), pp. 1–23.

Harris, Richard. 1984. "Applied General Equilibrium Analysis of Small Open Economies with Scale Economies and Imperfect Competition." *American Economic Review,* Vol. 74, No. 5 (December), pp. 1016–32.

Helwege, Jean. 1992. "Sectoral Shifts and Interindustry Wage Differentials." *Journal of Labor Economics,* Vol. 10, No. 1 (January), pp. 55–84.

Horstmann, Ignatius J., and James R. Markusen. 1986. "Up the Average Cost Curve: Inefficient Entry and the New Protectionism." *Journal of International Economics,* Vol. 20, No. 3–4 (May), pp. 225–47.

Jacobson, Louis. 1992. "Congressional Testimony on the Effectiveness of Trade Adjustment Assistance and Suggestions for Improving the Program." W.E. Upjohn Institute for Employment Research, Working Paper No. 92-12.

Katz, Lawrence F., and Lawrence H. Summers. 1989. "Can Inter-Industry Wage Differentials Justify Strategic Trade Policy?" In Robert C. Feenstra, ed., *Trade Policies for International Competitiveness.* Chicago: University of Chicago Press, pp. 85–116.

Krueger, Alan B., and Lawrence H. Summers. 1988. "Efficiency Wages and the Inter-Industry Wage Structure." *Econometrica,* Vol. 56, No. 2 (March), pp. 259–93.

Kruse, Douglas L. 1988. "International Trade and the Labor Market Experience of Displaced Workers." *Industrial and Labor Relations Review,* Vol. 41, No. 3 (April), pp. 402–17.

Lawrence, Colin, and Robert Z. Lawrence. 1985. "Manufacturing Wage Dispersion: An End Game Interpretation." *Brookings Papers on Economic Activity,* Vol. 16, No. 1, pp. 47–106.

Leamer, Edward E. 1988. "Cross-Section Estimation of the Effects of Trade Barriers." In Robert C.

Feenstra, ed., *Empirical Methods for International Trade.* Cambridge, Mass.: MIT Press, pp. 51–82.

Lipsey, Robert E., Linda Molinari, and Irving B. Kravis. 1991. "Measures of Prices and Price Competitiveness in International Trade in Manufactured Goods." In Peter Hooper and J. David Richardson, eds., *International Economic Transactions: Issues in Measurement and Empirical Research.* Chicago: University of Chicago Press, pp. 144–95.

Macpherson, David A., and James B. Stewart. 1990. "The Effect of International Competition on Union and Nonunion Wages." *Industrial and Labor Relations Review,* Vol. 43, No. 4 (April), pp. 434–46.

Magee, Stephen P., William A. Brock, and Leslie Young. 1989. *Black Hole Tariffs and Endogenous Policy Theory: Political Economy in General Equilibrium.* New York: Cambridge University Press.

Mayer, Wolfgang. 1974. "Short–Run and Long-Run Equilibrium for a Small Open Economy." *Journal of Political Economy,* Vol. 82, No. 5 (September/October), pp. 955–67.

McDonald, Ian M., and Robert M. Solow. 1981. "Wage Bargaining and Unemployment." *American Economic Review,* Vol. 71, No. 5 (December), pp. 896–908.

Nelson, Charles R., and Richard Startz. 1990. "Some Further Results on the Exact Small Sample Properties of the Instrumental Variables Estimator." *Econometrica,* Vol. 58, No. 4 (July), pp. 967–76.

Ray, Edward John. 1981. "The Determinants of Tariff and Nontariff Trade Restrictions in the United States." *Journal of Political Economy,* Vol. 89, No. 1 (February), pp. 105–21.

Revenga, Ana L. 1992. "Exporting Jobs? The Impact of Import Competition on Employment and Wages in U.S. Manufacturing." *Quarterly Journal of Economics,* Vol. 107, No. 1 (February), pp. 255–84.

Stern, Robert M., Alan V. Deardorff, and Drusilla K. Brown. 1992. "A U.S.-Mexico-Canada Free Trade Agreement: Sectoral Employment Effects and Regional/Occupational Employment Realignments in the United States." In *The Employment Effects of the North American Free Trade Agreement: Recommendations and Background Studies,* Special Report No. 33, National Commission for Employment Policy.

Stolper, Wolfgang F., and Paul A. Samuelson. 1941. "Protection and Real Wages." *Review of Economic Studies,* Vol. 9, No. 1 (November), pp. 58–73.

Topel, Robert H. 1991. "Specific Capital, Mobility, and Wages: Wages Rise with Job Seniority." *Journal of Political Economy,* Vol. 99, No. 1 (February), pp. 145–76.

Trefler, Daniel. 1993. "Trade Liberalization and the Theory of Endogenous Protection: An Econometric Study of U.S. Import Policy." *Journal of Political Economy,* Vol. 101, No. 1 (February), pp. 138–60.