University of Connecticut

Department of Economics Working Paper Series

Do Labor Issues Matter in the Determination of U.S. Trade Policy? An Empirical Reevaluation

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Working Paper 2004-36

November 2004

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Abstract

Some recent empirical studies, motivated by Grossman and Helpman's (1994) "protection for sale" model, suggest that very few factors (none of them labor-related) determine trade protection. This paper reexamines the roles that labor issues play in the determination of trade policy. We introduce collective bargaining, differences in labor mobility across industries, and trade union lobbying into the protection-for-sale model and show that the equilibrium protection rate in our model depends upon these labor market variables. In particular, our model predicts that trade protection is structurally higher than in the original protection-for-sale model if the trade union of a sector lobbies but capital owners do not, because union workers collect part of the protection rents; equilibrium protection is lower if capital owners lobby but the trade union does not, because part of the protection rents is dissipated to workers. Using data from U.S. manufacturing, we find that collective bargaining, differences in labor mobility across industries, and trade union lobbying indeed play important roles in the determination of U.S. trade policy.

Journal of Economic Literature Classification: F13, F16

Keywords: Trade protection, protection for sale, labor market

We thank the editor David Card and two anonymous referees for helpful comments that greatly improved this paper. We also thank Scott Taylor for his valuable comments and advice and Kishore Gawande and Daniel Trefler for providing data. We are grateful to Bruce Hansen, Bob Staiger, and Gautam Tripathi for for their helpful comments and suggestions and to Ellen Dykes and Jonas Robison for their help with editing the language and grammar. Xenia Matschke gratefully acknowledges financial support from a Deutsche Forschungsgemeinschaft research fellowship. This paper represents the views of the authors and does not necessarily represent the views of the Federal Reserve System, its members, or its staff.

1. Introduction

Lobbyists for trade and other industrial policies represent different interest groups in society. In particular, distinguishing between labor and capital lobbies is common. Labor interests, usually represented by trade unions, often lobby for trade protection. For example, U.S. trade unions strongly opposed NAFTA in the 1990s because of fears that freer trade would decrease domestic employment and wage levels. Further, according to Baldwin (1985) and Baldwin and Magee (2000), trade union contributions are positively correlated with the probability that a U.S. congressman votes against trade liberalization.

The "protection for sale" model of Grossman and Helpman (1994), however, suggests that very few factors — none of them labor-related — determine trade protection. In the protection-for-sale model, wages are fixed and equal across industries, and there is full employment. Only capital owners are allowed to lobby for trade policy, but even if workers, too, were allowed to lobby, they would want import subsidies in order to benefit from lower product prices. Hence, the GH model cannot explain why trade unions lobby for trade protection so as to secure higher wage and employment levels.

The GH model is also at odds with the older empirical trade protection literature (Rodrik, 1995, provides an overview) that finds that labor market considerations are an important trade policy determinant. However, more-recent empirical studies (for example, Goldberg and Maggi, 1999; Gawande and Bandyopadhyay, 2000; Eicher and Osang, 2002) find strong support for the protection-for-sale model. Some of these studies also test whether labor market variables have additional explanatory power and find them to be statistically insignificant.

This paper shows that the conclusion that labor market variables do not influence trade protection is misleading. The earlier papers that estimate the GH model employ the nonlinear form of protection suggested by that model for estimation.[1] But since the GH model has nothing to say about labor market variables, the inclusion of these variables in empirical studies thus far has been ad hoc. The main contribution of this paper is to show that, once labor market variables have been appropriately controlled for, statistical methods strongly reject the null hypothesis that labor market variables are irrelevant to trade protection.

To this end, we construct a model in the same spirit as GH but relax assumptions about the labor market. In particular, we allow for (1) industry-specific trade unions that bargain with capital owners over union wages and employment, (2) differences in labor mobility across industries, and (3) active lobbying by trade unions. Our model predicts

[1]For example, in the GH model, import protection decreases with import penetration ratio and import demand elasticity when capital owners lobby, but it increases with these two variables when capital owners do not lobby.

that trade protection is structurally higher than in the GH model if the trade union of an industry lobbies but capital owners do not, because union workers collect part of the protection rents. However, equilibrium protection is lower if capital owners lobby but the trade union does not, because workers receive part of the protection rents. Moreover, as long as trade protection increases the wages of at least some non-unionized workers, equilibrium protection is lower than in the GH model even if both the capital owners and the trade union of an industry lobby. In contrast to the protection-for-sale model without trade union activity, the equilibrium protection rate in our model depends upon sectoral wage and employment elasticities that, in turn, vary according to the mobility of workers across industries.

We test our model predictions using 1983 data from U.S. manufacturing. Since our framework nests the GH model, we can test the statistical validity of the GH restrictions. Our major finding is that we can reject the GH model in favor of our labor-augmented model. Consistent with our theory, we find that, compared with the GH predictions, trade protection is indeed higher when trade unions lobby and capital owners do not, but lower when capital owners lobby. Not only does trade protection vary according to whether capital owners of an industry lobby, but it also depends on trade union activity and differences in labor mobility across industries. Moreover, our labor-augmented model delivers considerably lower estimates of the percentage of lobbies in the population and the weight of contributions in the governmental welfare function, both of which had been found to be unreasonably high in previous tests of the GH model.

The remainder of this paper is organized as follows. In Section 2, we derive the equilibrium tariffs for industries with mobile and immobile labor when trade unions bargain with firms over wages and employment and are also allowed to lobby for trade protection. We present the econometric model and its predictions in Section 3. In Section 4, we describe the data, and we proceed with estimation and testing in Section 5. Finally, in Section 6, we conclude the paper and make suggestions for future research.

2. The Model

2.1. **Model Basics.** In the following, we augment the GH model to allow for labor market considerations. Consider a small country with $n+1$ industries, each producing a single good. The country has fixed endowments of labor, L, and industry-specific capital, K_i, where $i = 1, \ldots, n$. Each worker (capital owner) inelastically supplies one unit of labor (industry-specific capital).

On the consumption side, all individuals, $h = 1, \ldots, H$, have identical quasilinear preferences of the form $U_h = x_0^h + \sum_{i=1}^n u(x_i^h)$, where x_i^h denotes h's consumption of good i and u is strictly concave and increasing in x_i^h. If each individual has enough income to consume all goods, quasilinearity of preferences ensures that demand of a good $i = 1, \ldots, n$ depends only on its own price.

Let $\mathcal{I} = \{0, 1, 2, \ldots, n\}$ denote the set of all industries. The numeraire industry, $i = 0$, uses only labor for production according to $F^0 = L^0$. The world price of good 0 is fixed at $\bar{p}_0$, and no trade barriers are imposed on it. Each non-numeraire industry, $i = 1, \ldots, n$, consists of two sectors — A, which is unionized, and B, which is non-unionized — with identical production functions. Firms in these industries employ three production factors: capital, labor, and the numeraire good 0 as an intermediate input.[2] Each unit of the final good i requires a fixed (but differing with i) amount of good 0 (Leontief technology). To keep notation simple, we denote the price of the amount of good 0 required for one unit of good i by q_i and then write $(p_i - q_i)F^i(K_i, L_i)$ as value added. Unlike the intermediate good 0, capital and labor are substitutable in the production function. Capital employed in the sectors of any non-numeraire industry — namely, K_{iA} in the unionized sector A and $K_{iB} = K_i - K_{iA}$ in the non-unionized sector B — is immobile. In contrast, labor may or may not be mobile across industries as discussed in the next paragraph. The reduced production function $F^i(K_i, L_i)$ is linearly homogeneous and weakly concave, where $F^i_{LL} < 0$, $F^i_{KK} < 0$, and $F^i_{KL} > 0$.[3]

We allow for differences in the interindustry mobility of labor. For simplicity, we assume that non-union workers are either completely mobile between certain industries or that they cannot exit their industry and workers from other industries cannot enter. If industry $i \in \mathcal{I}_M$, its labor pool potentially consists of all laborers in the mobile subset of industries. If we assume that $0 \in \mathcal{I}_M$, the competitive wage must be $w_i = \bar{p}_0$ for $i \in \mathcal{I}_M$. Union workers may switch industries if $i \in \mathcal{I}_M$; however, they cannot be employed in the unionized sectors of industries other than i itself.[4] If industry $i \in \mathcal{I}_I$, where $\mathcal{I}_M \cup \mathcal{I}_I = \mathcal{I}$ and $\mathcal{I}_M \cap \mathcal{I}_I = \emptyset$, industry i's workers are immobile and can work only in industry i.

In the unionized sector A, the capital owners bargain with the i-specific trade union, which has N_i members, over wages and employment.[5] In the non-unionized sector B,

[2] To keep the analysis focused on the influence of labor issues on trade protection, the modeling of intermediate goods as inputs is kept as simple as possible. We introduce them only to take into account that firms and unions bargain over value added, not the entire value of shipments. Without this adjustment, we would substantially and systematically underestimate union bargaining strength.

[3] We omit the intermediate input as an argument in the production function. Because good 0 is a Leontief input, we must adjust the amount of good 0 proportionally with F^i when capital or labor inputs vary.

[4] This assumption maintains the de facto partial equilibrium structure of the GH model, which would be destroyed if the industry-specific trade unions also had to take into account that their members might find employment in unionized sectors elsewhere.

[5] Assuming bargaining over both wages and employment (efficient bargaining) restricts the effect of union-firm bargaining to redistributive issues. Efficient bargaining seems a justifiable assumption because empirical tests between this model and the competing right-to-manage model either have been inconclusive or have

employment is chosen by firms. As is commonly observed in practice, union workers do not work exclusively in the unionized sector, and non-union workers are not confined to work in the non-unionized sector. Employment of union workers in sector A is measured as a fraction α_i of the N_i union members, whereas the share of covered non-union workers in the non-union worker labor pool for industry i is $\delta_i \alpha_i$ (where $\delta_i \geq 0$). The union wage paid in sector A is denoted by $\bar{w}_i$.[6] In sector B, the wage is equal either to $\bar{p}_0$ (if $i \in \mathcal{I}_M$) or to the wage that equates residual labor supply and labor demand (if $i \in \mathcal{I}_I$).

In some of the industries (but not the numeraire industry 0), either capital owners or the trade union or both are active lobbies that solicit trade protection from the domestic government. In the first (lobbying) stage, each lobby offers the government a schedule that lists its contributions as a function of the domestic price vector. The domestic price, p, may differ from the world price, p^*, if the domestic government imposes a vector t of specific import tariffs (or import subsidies) or export taxes (or export subsidies) at this stage. In the second (production) stage, firms and unions take goods prices as given when they determine wages and employment. If good i is an import good, $t_i > 0$ ($t_i < 0$) implies that an import tariff (import subsidy) is imposed. In contrast, if good i is an export good, $t_i > 0$ ($t_i < 0$) implies an export subsidy (export tax). To facilitate the description, we focus on import goods when describing the determination of the equilibrium trade policy.

2.2. **Second Stage: Employment and Wage Determination.** To find the subgame-perfect Nash equilibrium, we start with the production stage and then consider the lobbying stage. At the production stage, we assume that firms maximize profits and that the union maximizes the wage bill of union workers.

2.2.1. *Industries with mobile labor.* In sector B, the firms choose the number of workers L_{iB} such that the first-order condition of profit maximization,

$$(p_i - q_i) F_L^i(K_{iB}, L_{iB}) = \bar{p}_0, \tag{2.1}$$

holds. The wage w_i is predetermined by $\bar{p}_0$ so that L_{iB} adjusts to ensure that (2.1) holds. Any labor not employed in the non-numeraire industries is absorbed by industry 0.

We assume that in sector A firms and union bargain over wages and employment jointly and split the surplus according to the generalized Nash bargaining solution. If bargaining is successful, the wage bill for union workers equals $\alpha_i \bar{w}_i N_i + (1-\alpha_i)\bar{p}_0 N_i$, that is, $\alpha_i N_i$ union workers work in sector A and receive union wage $\bar{w}_i$, and $(1-\alpha_i)N_i$ union workers work for the competitive wage in any of the non-unionized sectors within $\mathcal{I}_M$. We assume that if a worker is member of union N_i, he cannot receive a union wage in any

produced (weak) evidence in favor of the efficient bargaining model (MaCurdy and Pencavel, 1986). Matschke (2004) discusses how employing the right-to-manage model of union-firm bargaining alters these results.

[6] In section 2.2, we discuss how α_i and $\bar{w}_i$ are determined.

industry apart from i. If $\bar{N} = \sum_{i\in\mathcal{I}_M} N_i$, the profits that remain for capitalists in sector A amount to $\Pi_{iA} = (p_i - q_i)F^i(K_{iA}, \alpha_i[N_i + \delta_i(L_M - \bar{N})]) - \bar{w}_i\alpha_i[N_i + \delta_i(L_M - \bar{N})]$, where L_M denotes the total labor pool for all industries in $\mathcal{I}_M$ and $L_M - \bar{N}$ is the pool of non-union members within L_M. If bargaining fails, all workers have to find employment in the non-unionized sectors of the industries in $\mathcal{I}_M$, and the expected wage bill reduces to $\bar{p}_0 N_i$. If we assume that the union succeeds in interrupting production in sector A, profits drop to zero. The generalized Nash bargaining solution thus maximizes

$$\{\alpha_i(\bar{w}_i - \bar{p}_0)N_i\}^{s_i}\{(p_i - q_i)F^i(K_{iA}, \alpha_i[N_i + \delta_i(L_M - \bar{N})]) - \bar{w}_i\alpha_i[N_i + \delta_i(L_M - \bar{N})]\}^{1-s_i}, \quad (2.2)$$

where s_i and $1 - s_i$ denote the relative bargaining strength of industry i's trade union and industry i firms (both are assumed to be exogenously given). Maximizing (2.2) with respect to α_i and $\bar{w}_i$ leads to two equations. The first equation,

$$(p_i - q_i)F^i_L(K_{iA}, \alpha_i[N_i + \delta_i(L_M - \bar{N})]) = \bar{p}_0, \quad (2.3)$$

which mirrors (2.1), says that production is efficient. The second equation,

$$\bar{w}_i = s_i \frac{(p_i - q_i)F^{iA}}{L_{iA}} + (1 - s_i)\bar{p}_0, \quad (2.4)$$

describes how the union wage serves to distribute the bargaining surplus between the union and the capital owners. It is straightforward to show the following comparative statics:

Proposition 2.1. *If industry $i \in \mathcal{I}_M$, the competitive wage does not depend on p_i ($\frac{dw_i}{dp_i} = 0$), employment in the unionized sector is increasing in p_i ($\frac{d\alpha_i}{dp_i} = -\frac{\alpha_i\bar{p}_0}{(p_i-q_i)^2 L_{iA} F^{iA}_{LL}} > 0$), and the union wage weighted by the probability of a worker's receiving it is also increasing in p_i ($\frac{d(\alpha_i\bar{w}_i)}{dp_i} = \frac{s_i F^{iA}}{N_i+\delta_i(L_M-\bar{N})} + \bar{p}_0\frac{d\alpha_i}{dp_i} > 0$).*

Proof. $\frac{dw_i}{dp_i} = 0$ by construction of the numeraire industry production structure. The other results follow from comparative statics on (2.3) and (2.4). $\square$

2.2.2. *Industries with immobile labor.* When labor is immobile between industries, equilibrium labor in sector B has to equal the residual labor supply of the industry $L_i - \alpha_i[N_i + \delta_i(L_i - N_i)]$, that is, all labor not employed in sector A of i. Hence the competitive wage must adjust. From profit maximization and labor market clearing, we have

$$(p_i - q_i)F^i_L(K_{iB}, L_i - \alpha_i[N_i + \delta_i(L_i - N_i)]) = w_i. \quad (2.5)$$

In sector A, firms and union split the surplus according to the generalized Nash bargaining solution. If bargaining is successful, the wage bill for union workers equals $\alpha_i\bar{w}_i N_i + (1 - \alpha_i)w_i N_i$. The profits earned by capital owners in sector A equal $\Pi_{iA} = (p_i - q_i)F^i(K_{iA}, \alpha_i[N_i + \delta_i(L_i - N_i)]) - \bar{w}_i\alpha_i[N_i + \delta_i(L_i - N_i)]$. If bargaining fails, all workers must find employment in the non-unionized sector B of industry i, in which case the wage bill reduces to $\underline{w}_i N_i$, where $\underline{w}_i = (p_i - q_i)F^i_L(K_{iB}, L_i)$. Moreover, the union succeeds in interrupting production in sector A, so that profits are zero. The generalized Nash bargaining solution thus maximizes

$$\{\alpha_i \bar{w}_i N_i + (1-\alpha_i) w_i N_i - \underline{w}_i N_i\}^{s_i} \times \left\{(p_i - q_i) F^i(K_{iA}, \alpha_i[N_i + \delta_i(L_i - N_i)]) - \bar{w}_i \alpha_i [N_i + \delta_i(L_i - N_i)]\right\}^{1-s_i}. \tag{2.6}$$

Maximizing (2.6) with respect to α_i and $\bar{w}_i$ leads to two equations. The employment share α_i is determined by

$$F_L^{iA} = F_L^{iB} + (1-\alpha_i)[N_i + \delta_i(L_i - N_i)] F_{LL}^{iB}. \tag{2.7}$$

This equation shows that if $i \in \mathcal{I}_I$, the marginal product of labor across the sectors of i is usually not equalized because unions and firms realize that the competitive wage depends on their employment choice. Furthermore, (2.5) and (2.7) suggest that $\frac{d\alpha_i}{dp_i} = 0$.[7] Therefore, we find that, in contrast to the case of mobile labor, price changes are reflected solely in wage changes when labor is immobile.[8] The union wage is determined by

$$\bar{w}_i = s_i \frac{(p_i - q_i) F^{iA}}{L_{iA}} + (1 - s_i) \frac{\underline{w}_i - (1-\alpha_i) w_i}{\alpha_i}. \tag{2.8}$$

Since $w_i > \underline{w}_i$, the union wage is smaller than $\bar{w}_i = s_i \frac{(p_i - q_i) F^{iA}}{L_{iA}} + (1 - s_i) w_i$. The following comparative statics hold:

Proposition 2.2. *If industry $i \in \mathcal{I}_I$, employment in the sectors does not depend on p_i ($\frac{d\alpha_i}{dp_i} = 0$), whereas union and competitive wages are both increasing in p_i ($\frac{d\bar{w}_i}{dp_i} = \frac{\bar{w}_i}{p_i - q_i} > 0$, $\frac{dw_i}{dp_i} = \frac{w_i}{p_i - q_i} > 0$).*

Proof. The result follows from comparative statics on (2.5), (2.7), and (2.8). We showed above that $\frac{d\alpha_i}{dp_i} = 0$ solves (2.7); the results for the wage changes easily follow. □

2.3. **First Stage: Lobbying.** In this stage, trade union and capital owner lobbies present the domestic government with menus that map all possible tariff vectors, t, into contributions that a lobby would pay in case a certain t is chosen (common-agency model of Bernheim and Whinston, 1986). The government takes these menus as given and chooses the t that maximizes the weighted sum of total contributions and aggregate gross welfare (that is, the sum of production value, tariff revenue, and consumer surplus), where the weight on aggregate welfare is denoted by a and contributions receive weight 1. The equilibrium tariff vector t^* is defined by the following conditions (Grossman and Helpman, 1994): It maximizes the government's utility function, and it maximizes the sum of governmental utility and the utility of any lobby.

[7]This solution need not be unique, but without further assumptions about F_{LL}^i, the existence of other solutions is not guaranteed.

[8]This finding assumes flexible wages. With inflexible wages, unemployment is likely (see Matschke, 2004).

The common-agency framework in which lobbies confront the government with an infinite listing of tariff vectors and contributions attached to them clearly looks quite different from real-world lobbying. Lobbies typically tell the government what protection they want (or they provide selective information from which the government can infer these wishes). The government then takes a weighted average of the wishes of the different lobbies and its own ideas of what the optimal tariff would look like to determine the equilibrium tariff. Matschke (2004) reconciles these two alternative views of lobbying. She defines the "unilaterally optimal tariff" as the tariff that a group would set (if it could do so) to maximize its own welfare. Let $t_i^{N_j}$ and $t_i^{K_j}$ denote the unilaterally optimal tariffs of groups N_j and K_j. Also, let t_i^G denote the domestic welfare-maximizing tariff. This is the tariff that the government would set if no lobbies existed, and it can thus also be interpreted as a unilaterally optimal tariff. Matschke then shows that the equilibrium tariff for industry i in the lobbying game can be written as the weighted average of the unilaterally optimal tariffs for the different players of the lobbying game:

Lemma 2.1 (Matschke 2004)**.** *The equilibrium tariff for industry i is given by*

$$t_i^* = \frac{at_i^G(t_i^*)}{a+\Theta} + \sum_{K_j\in\Omega} \frac{\theta_{K_j} t_i^{K_j}(t_i^*)}{a+\Theta} + \sum_{N_j\in\Omega} \frac{\theta_{N_j} t_i^{N_j}(t_i^*)}{a+\Theta}, \tag{2.9}$$

where θ_{g_j} denotes the population share of group g_j and Ω is the set of all lobbies.

Therefore, t_i^* can be determined by first calculating the unilaterally optimal tariffs and then using Lemma 2.1.[9]

2.4. **Player Interests and the Equilibrium Tariff.**

2.4.1. *General results.* To understand the players' interests, we calculate their unilaterally optimal tariffs first. The natural starting point is the welfare-maximizing tariff t_i^G, that is, the tariff that the government would impose without lobby influence. The government maximizes domestic welfare (omitting parts that do not depend on p_i) $W_i^G = (p_i - q_i)F^{iA} + (p_i - q_i)F^{iB} + \bar{p}_0 F^0 + (L + \sum_{k=1}^n K_k)\, V_i + t_i M_i$ by choosing p_i, where $(L + \sum_{k=1}^n K_k)V_i$ is the consumer surplus from good i. If $i \in \mathcal{I}_M$, the government can use a tariff to increase production in i (at the expense of production in the numeraire industry), but because the marginal value added is the same across all industries, the government has no incentive to do so. If $i \in \mathcal{I}_I$, the marginal value added of labor is equal neither across industries nor across sectors of an industry. However, employment is independent of the product price,

[9]Here, the $t_i^{g_j}$ are functions of t_i^*. This does not diminish the usefulness of Lemma 2.1 because the equilibrium tariff predictions in the original GH model are also given only as implicit functions where t_i^* appears on both sides of the equilibrium tariff equation.

and therefore labor cannot be shifted to industries or sectors with higher marginal value added. Hence, free trade is welfare-maximizing in both cases. Thus,

$$t_i^G = 0. \tag{2.10}$$

For lobbies g_j outside industry i, the desire to drive a wedge between the domestic price and the world price for product i stems from two sources. First, as consumers, the lobby wants as low a price as possible. Second, as a recipient of tariff revenue, the lobby desires a strictly positive tariff. Formally, the lobby maximizes $W_i^{g_j} = \theta_{g_j}\left(L+\sum_{k=1}^{n} K_k\right)V_i + \theta_{g_j} t_i M_i$, where $j \neq i$. Maximizing $W_i^{g_j}$ by choice of t_i, we obtain

$$t_i^{g_j} = \frac{F^i}{M_i'}. \tag{2.11}$$

Because consumer surplus considerations outweigh tariff revenue considerations, lobby g_j would like to impose an import subsidy on good $i \neq j$.

Finally, we consider the interests of lobby groups inside industry i. Capital owners maximize the sum of profits, consumer surplus, and tariff revenue share, that is, $W_i^{K_i} = (p_i - q_i)F^{iA} + (p_i - q_i)F^{iB} - \bar{w}_i L_{iA} - w_i L_{iB} + \theta_{K_i}\left(L+\sum_{k=1}^{n} K_k\right)V_i + \theta_{K_i} t_i M_i$. The capitalists' unilaterally optimal tariff is given by

$$t_i^{K_i} = \frac{1}{\theta_{K_i} M_i'}\left[-(1-\theta_{K_i})F^i + (\bar{w}_i - (p_i - q_i)F_L^{iA})\frac{dL_{iA}}{dp_i} + L_{iA}\frac{d\bar{w}_i}{dp_i} + L_{iB}\frac{dw_i}{dp_i}\right]. \tag{2.12}$$

We see that $t_i^{K_i}$ consists of four components. The first component is also present in the original GH model. Capital owners are interested in a positive tariff for their industry because such a tariff increases sales revenues and leads to higher tariff revenues, but they also take into account that they consume their own good. Thus $t_i^{K_i}$ in the original GH model would be $-\frac{(1-\theta_{K_i})F^i}{\theta_{K_i} M_i'}$. However, when labor market influences are present, the capital owners realize that a higher tariff may lead to higher wages in sectors A and B and may distort production toward the unionized sector A, where workers receive wages above the marginal value added of labor. These influences decrease $t_i^{K_i}$.

The trade union of industry i maximizes the sum of the wage bill, consumer surplus, and tariff revenue share accruing to union members, that is, $W_i^{N_i} = \alpha_i \bar{w}_i N_i + (1-\alpha_i) w_i N_i + \theta_{N_i}\left(L+\sum_{k=1}^{n} K_k\right)V_i + \theta_{N_i} t_i M_i$. The unilaterally optimal tariff for the trade union in industry i is

$$t_i^{N_i} = \frac{1}{\theta_{N_i} M_i'}\left[\theta_{N_i} F^i - (\bar{w}_i - w_i)N_i\frac{d\alpha_i}{dp_i} - \alpha_i N_i \frac{d\bar{w}_i}{dp_i} - (1-\alpha_i)N_i\frac{dw_i}{dp_i}\right]. \tag{2.13}$$

In the original GH model, union workers, like all consumers who own no capital, desire an import subsidy for good i because consumer interests more than offset tariff revenue considerations. However, once we allow for labor market imperfections, three additional components appear that may make the union of industry i prefer a positive import tariff for its good. Not only may union workers obtain higher wages when the domestic price of good i increases, but more union workers may find employment in the unionized sector A, where rents can be earned because $\bar{w}_i > w_i$.

2.4.2. *Tariff predictions when labor is mobile.* To facilitate comparability with the expressions given by Grossman and Helpman (1994), we rewrite the optimal tariff equation in terms of the equivalent ad valorem tariff τ_i^*. Notice that $\frac{\tau_i^*}{1+\tau_i^*} = \frac{t_i^*}{p_i}$. Letting e_i denote the absolute value of the import demand elasticity, $-\frac{M_i' p_i}{M_i}$, the following proposition results:

Proposition 2.3. *If industry $i \in \mathcal{I}_M$, the equilibrium ad valorem tariff τ_i^* of the lobbying game is given by*

$$\frac{\tau_i^*}{1+\tau_i^*} = \begin{cases} -\frac{\Theta}{\Theta+a}\frac{F^i}{e_i M_i} & \text{if nobody in } i \text{ lobbies,} \\ -\frac{\Theta}{\Theta+a}\frac{F^i}{e_i M_i} + \frac{1}{\Theta+a}\frac{\alpha_i N_i}{L_{iA}} s_i \frac{F^{iA}}{e_i M_i} & \text{if only the union in } i \text{ lobbies,} \\ \frac{1-\Theta}{\Theta+a}\frac{F^i}{e_i M_i} - \frac{1}{\Theta+a} s_i \frac{F^{iA}}{e_i M_i} & \text{if only capitalists in } i \text{ lobby,} \\ \frac{1-\Theta}{\Theta+a}\frac{F^i}{e_i M_i} - \frac{1}{\Theta+a}\left(1 - \frac{\alpha_i N_i}{L_{iA}}\right) s_i \frac{F^{iA}}{e_i M_i} & \text{if all in } i \text{ lobby.} \end{cases}$$

Proof. Because $w_i = w_0 = \bar{p}_0$, the result follows from substituting (2.10)–(2.13) into Lemma 2.1, using the expressions for $\frac{dw_i}{dp_i}$, $\frac{d\alpha_i}{dp_i}$, and $\frac{d(\alpha_i \bar{w}_i)}{dp_i}$ from proposition 2.1. □

Not surprisingly, the equilibrium tariff equals the tariff of the original GH model when nobody in industry i lobbies. When both the union and capital owners of industry i lobby, the tariff would also be the same as in the original GH model if union wages were paid only to union workers. This follows because efficient union wage bargaining then redistributes income only between the two lobbies. However, as long as non-union workers, too, benefit from higher union wages, protection benefits are dispersed from a lobby (the capital owners) to a population group that does not lobby (the non-union workers), and therefore the equilibrium tariff τ_i^* will be structurally lower than in the GH model. Protection may be even further reduced if capital owners decide that lobbying is not worthwhile since rent dispersion to workers lowers the protection rents that they could capture. Finally, if one of the two groups in industry i does not lobby, τ_i^* in our model is distinct from τ_i^* in the GH model. The reason for this result lies in the profit sharing due to union wage bargaining. If capital owners lobby, they take into account that they cannot capture all the protection rents and are therefore less interested in tariff protection for their product. The resulting τ_i^* is hence lower by a dispersion component. If the trade union lobbies, τ_i^* is now higher than in the GH model by a collection component because part of the protection rents is captured by the trade union, an active lobby. The discrepancy between the equilibrium tariffs found here and in the GH model is higher the greater the share of unionized production in industry i and the higher the bargaining strength of the trade union. Only if $\bar{w}_i = w_i$ (i.e., $s_i = 0$) would the results match the predictions of the GH model.

2.4.3. *Tariff predictions when labor is immobile.* For industries with immobile labor, the following equilibrium tariff structure emerges:

Proposition 2.4. *Let λ_i denote the labor force share in industry i which is covered by collective bargaining (that is, rewrite $L_{iA} = \lambda_i L_i$ and $L_{iB} = (1-\lambda_i)L_i$). If industry $i \in \mathcal{I}_I$, the equilibrium ad valorem tariff τ_i^* of the lobbying game is given by*

$$\frac{\tau_i^*}{1+\tau_i^*} = \begin{cases} -\frac{\Theta}{\Theta+a}\frac{F^i}{e_i M_i} & \text{if nobody in } i \text{ lobbies,} \\ -\frac{\Theta}{\Theta+a}\frac{F^i}{e_i M_i} + \frac{1}{\Theta+a}\frac{\alpha_i \bar{w}_i + (1-\alpha_i) w_i}{e_i(p_i - q_i)M_i} N_i & \text{if only the union in } i \text{ lobbies,} \\ \frac{1-\Theta}{\Theta+a}\frac{F^i}{e_i M_i} - \frac{1}{\Theta+a}\frac{\lambda_i \bar{w}_i + (1-\lambda_i) w_i}{e_i(p_i - q_i)M_i} L_i & \text{if only capitalists in } i \text{ lobby,} \\ \frac{1-\Theta}{\Theta+a}\frac{F^i}{e_i M_i} - \frac{1}{\Theta+a}\frac{\alpha_i \delta_i \bar{w}_i + (1-\alpha_i\delta_i) w_i}{e_i(p_i - q_i)M_i} (L_i - N_i) & \text{if all in } i \text{ lobby.} \end{cases}$$

Proof. The result follows immediately from substituting (2.10)–(2.13) into Lemma 2.1, using the expressions for $\frac{d\alpha_i}{dp_i}$, $\frac{dw_i}{dp_i}$, and $\frac{d\bar{w}_i}{dp_i}$ from proposition 2.2. □

If nobody in industry i lobbies, τ_i^* will be the same as in the original GH model. But the tariff structure differs as soon as industry i lobbies enter the scene. As with mobile labor, the GH predictions are altered by a collection component if the trade union lobbies and capital owners do not, and by a dispersion component if capital owners lobby and the union does not. And just as with mobile labor, a dispersion component arises even if both groups lobby. When labor is immobile, however, this dispersion component does not disappear as δ_i goes to zero: Trade protection increases the wages paid to workers even if no unionized sector exists. A higher tariff increases labor demand that meets completely inelastic supply. The price increase is thus accompanied by an increase in the competitive wage w_i. This wage increase in turn means that workers in the non-unionized sector share in the protection rents. Profit-sharing is even higher in the unionized sector because $\bar{w}_i > w_i$. The union interest in a higher wage partly counterbalances the dispersion effect when both capital owners and the union lobby. The dispersion component is then caused only by wage increases that go to non-union workers: Every non-union worker in i gets at least w_i, and $\alpha_i\delta_i(L_i - N_i)$ non-union workers get even more because they are employed in sector A and receive the higher union wage $\bar{w}_i$.

3. The Econometric Model

To write the equilibrium tariff equation to include both mobile and immobile labor, we define the following indicator variables: k_i takes the value 1 when capitalists in industry i lobby (0 otherwise), n_i equals 1 when trade unions in industry i lobby (0 otherwise), and m_i equals 1 when labor in industry i is mobile (0 otherwise).

Proposition 3.1. *The equilibrium ad valorem tariff τ_i^* for industry i is given by*

$$\frac{\tau_i^*}{1+\tau_i^*} = -\frac{\Theta}{\Theta+a}\frac{F^i}{e_i M_i} + \frac{1}{\Theta+a} k_i \frac{F^i}{e_i M_i} + \frac{1}{\Theta+a}\frac{labvar_i}{e_i}, \tag{3.1}$$

where

$$labvar_i = \begin{pmatrix} (1-k_i)n_i m_i \frac{\alpha_i N_i}{L_{iA}} s_i \frac{F^{iA}}{M_i} - k_i(1-n_i)m_i s_i \frac{F^{iA}}{M_i} - k_i n_i m_i \left(1 - \frac{\alpha_i N_i}{L_{iA}}\right) s_i \frac{F^{iA}}{M_i} \\ +(1-k_i)n_i(1-m_i)\frac{\alpha_i \bar{w}_i + (1-\alpha_i)w_i}{(p_i - q_i)M_i} N_i - k_i(1-n_i)(1-m_i)\frac{\lambda_i \bar{w}_i + (1-\lambda_i)w_i}{(p_i-q_i)M_i} L_i \\ -k_i n_i (1-m_i) \frac{\alpha_i \delta_i \bar{w}_i + (1-\alpha_i\delta_i)w_i}{(p_i-q_i)M_i}(L_i - N_i) \end{pmatrix}.$$

Proof. Use k_i, n_i, and m_i to collapse propositions 2.3 and 2.4 into one expression. □

The variable $labvar_i$ is positive if the trade union of industry i lobbies but capital owners do not, negative if capital owners in i lobby, and zero if nobody in i lobbies.

To obtain our main estimation equation, we start with proposition 3.1, move e_i to the left side, and introduce an additive error term ε_i, where $\mathbb{E}[\varepsilon_i] = 0$ and $\mathbb{E}\left[\varepsilon_i^2\right] = \sigma^2$. Our estimation equation is thus

$$\frac{\tau_i^*}{1+\tau_i^*} e_i = \beta_0 + \beta_1 \frac{F^i}{M_i} + \beta_2 k_i \frac{F^i}{M_i} + \beta_3 labvar_i + \varepsilon_i. \tag{3.2}$$

According to our theory, $\beta_0 = 0$, $\beta_1 = -\frac{\Theta}{\Theta + a}$, and $\beta_2 = \beta_3 = \frac{1}{\Theta + a}$. A more parsimonious specification results by letting $\beta_2 = \beta_3$, as the theory predicts:

$$\frac{\tau_i^*}{1+\tau_i^*} e_i = \beta_0 + \beta_1 \frac{F^i}{M_i} + \beta_2 \left(k_i \frac{F^i}{M_i} + labvar_i\right) + \varepsilon_i. \tag{3.3}$$

This stricter interpretation of our model in (3.3) facilitates the analysis of the structural parameters a and Θ since over-identification of a and Θ in (3.2) leads to two (potentially very different) estimates per parameter.

4. The Data

Following earlier literature, we limit our analysis to manufacturing industries in the United States during 1983. The time period and industry range are the same as those used in the studies by Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000), and Eicher and Osang (2002), who all found that the basic GH model without labor market influences predicts U.S. trade policy well. This data set has the major advantage of letting us directly investigate whether model misspecification is responsible for the finding that the introduction of extraneous labor market variables does not improve the empirical model fit. On the downside, 1983 was a recession year in the United States and therefore may be unrepresentative of the link between economic data and U.S. trade policy over a longer period. On the other hand, the fact that the early 1980s were marked by a deep recession may help explain why the protection-for-sale model has been found to work well for 1983 U.S. data — the government being more sympathetic towards lobbies suffering from the economic crisis. But since the question we focus on is whether we can improve upon the performance of the basic GH model with our labor market augmentation, data availability and comparability with the above-mentioned earlier studies encourage the use of the 1983 data set.

To test our labor-augmented model, we need additional data compared with previous studies. We extract information about wages and unionization from the 1983 Current Population Survey (CPS). These data are given at the 3-digit CIC level but are concorded to their 3-digit SIC counterparts. We keep the data set at the 4-digit SIC level to retain as much information as possible. Whenever variables are available only at the 3-digit or even 2-digit level, they are simply replicated for all 4-digit SIC codes within the corresponding 3-digit (or 2-digit) classification,[10] following the study by Gawande and Bandyopadhyay (2000). After deleting industries for which our data set was incomplete, we are left with 194 observations. Descriptive statistics and units of measurement for key variables are provided in table 1.

Like the earlier empirical studies, we employ non-tariff barrier (NTB) coverage ratios as a measure for trade barriers.[11] While the use of NTBs in the protection-for-sale model is problematic (Maggi and Rodriguez-Clare, 2000), U.S. tariffs in 1983 were determined by multilateral (GATT) tariff negotiations, whereas the protection-for-sale model assumes that a country has the power to set tariffs unilaterally, precluding the use of tariff data.

The import demand elasticity is included as a component of the left-hand side to reduce possible multicollinearity, but our results are not very sensitive to this choice (see Section 5.3).[12] Apart from wages, unionization, and coverage measures, the explanatory variables in the trade protection equation are the import penetration ratio and indicator variables for union and capital owner lobbying and labor mobility. The import penetration ratio is defined as value of gross imports divided by the value of shipments.[13] To correct for the existence of intermediate inputs, we also use value added to substitute for $(p_i - q_i)F^i$. As in Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000), estimates of who is organized as a lobby are based on political action committee (PAC) contributions data for congressional elections 1977-78, 1979-80, 1981-82, and 1983-84 (Gawande, 1995). Diverging from previous tests of the protection-for-sale model, however, we use separate data for corporate PAC contributions and labor PAC contributions (for a description, see Gawande, 1995) to distinguish between firm and union lobby groups. The corporate PAC contributions are available at the 3-digit SIC level, the labor PAC contributions at the 2-digit level. To determine whether the capital owners of an industry lobby for trade protection, we modify the procedure in Gawande and Bandyopadhyay (2000): We regress corporate contributions divided by profits against the import penetration ratio interacted with 2-digit

[10]We account for clustering at the 3-digit SIC level in the estimation.

[11]Gawande and Trefler provided these data.

[12]Gawande provided the import demand elasticities. The original source for these elasticities is Shiells, Stern, and Deardorff (1986), who based their estimates on import demand data for 1962-78. The correction procedure to account for these variables being generated regressors is described in Gawande (1997).

[13]These series come from the NBER trade and immigration database.

SIC dummies. Industries with positive coefficients are assumed to have an active capital owner lobby. Similarly, to determine whether trade unions in an industry lobby for trade protection, we regress trade union contributions divided by wage bills against the import penetration ratio interacted with 2-digit SIC dummies. Industries with positive coefficients are assumed to have an active trade union lobby. In our sensitivity analysis, we experiment with alternative ways of determining who lobbies.

To obtain the remaining variables, we employ CPS data from 1983.[14] One important aspect of these data is the percentage of union workers. In the sample of manufacturing industries, 27.9% of workers were union members in 1983. Unionization varies widely across industries, with percentages between 0 and nearly 100. Equally important for our model is the question of how many workers are covered by collective bargaining agreements. Unfortunately, a major problem with the CPS data is that, after workers in the outgoing rotation groups were asked whether they were union members, only those workers who answered "no" were then asked whether they were covered by a collective bargaining agreement. The BLS assumed that union workers were covered. For this reason, the BLS's reported coverage ratios have always exceeded actual unionization rates. In fact, according to newer information obtained from the BLS, when union workers were asked in 2001 whether they were covered by a collective bargaining agreement, only 85% of union workers answered "yes." It seems reasonable to assume that union workers who did not work at the time of the CPS survey were not covered by a collective bargaining agreement. When this assumption is made, we find that 7.8% of the union workers are not covered. This number can be viewed as a lower bound on the percentage of uncovered union workers because at any time there are also union workers employed in firms that are not yet subject to collective bargaining. Union and non-union wages for the different industries are calculated using hourly wage data from the CPS, adjusted for worker characteristics. These hourly wages are then adjusted by multiplying by annual work time to obtain an annual wage bill per worker. To calculate the union bargaining strength s_i, we use $s_i = \frac{\bar{w}_i - w_i}{\frac{(p_i - q_i)F^{iA}}{L_{iA}} - w_i}$ from (2.4).[15]

We experiment with several approaches to decide which industries have mobile labor. We could write down the equilibrium tariff equation without deciding which industries have mobile or immobile labor, but then we would need sound estimates of wage and employment elasticities in the unionized and non-unionized sectors for the different industries. Because we do not have such estimates, we adopt the approach of sorting industries into mobile and immobile classes, but we perform extensive sensitivity analysis to account for the arbitrariness of such sorting. In our basic specification, we identify mobile industries based on

[14]From the NBER data disk "Current Population Survey: Merged Outgoing Rotation Groups 1979-2001."

[15]In practice, s_i need not always lie between 0 and 1 when calculated this way. We therefore rescale s_i to impose this condition.

industry unemployment rates—an industry is considered mobile if the unemployment rate does not exceed 10%. In our sensitivity analysis, we explore alternative methods of defining mobile industries.

Table 2 reports means for several key variables across our capitalist lobby, trade union lobby, and labor mobility classifications. The main result is that trade protection ($\frac{\tau_i^*}{1+\tau_i^*}$) depends not only upon our measure of capitalist lobby activity and the import penetration ratio, but also upon our measures of trade union activity and labor mobility.

As with the earlier empirical studies, we use the same instruments for the endogenous variables, plus the capital-labor ratio and the relative bargaining strength of the trade union. The instruments include factor shares (defined as factor revenues divided by production value) for physical capital, inventories, engineers and scientists, white-collar labor, skilled labor, semiskilled labor, cropland, pasture, forest, coal, petroleum, and minerals, as well as seller concentration, seller number of firms, buyer concentration, buyer number of firms, scale, capital stock, unionization, geographic concentration, and tenure (see Trefler, 1993).

5. Estimating and Testing the Model

5.1. **Methodology.** We estimate and compare the GH specification, i.e., (3.2) with $\beta_3 = 0$, to the labor-augmented full specification (3.2) and the labor-augmented short specification (3.3). Several complications arise in estimating the econometric model. First, our measure of trade protection is censored, requiring the use of limited dependent variable methods. Second, components of the explanatory variables are endogenously determined, thereby suggesting that we implement instrumental variables techniques. To this end, we use the approach of Smith and Blundell (1986) to estimate a Tobit model with endogenous explanatory variables (Wooldridge, 2001, provides a discussion). Last, certain components of our explanatory variables (k_i, n_i, and m_i) are constructed. We therefore explore the sensitivity of our results to different variable formulations.

The first step in implementing the Smith and Blundell approach is to estimate the residuals from the instrumental variable equations. Letting z_i denote the column vector of instruments and x_i the column vector of (endogenous) explanatory variables for industry i, the estimated residuals are given by $\hat{v}_i' = x_i' - z_i'\hat{\Pi}$, with $\hat{\Pi} = (Z'Z)^{-1}Z'X$ (equation-by-equation OLS). The second step then involves estimating the Tobit model $\frac{\tau_i^*}{1+\tau_i^*} = \max\{0, x_i'\beta + \hat{v}_i'\gamma + \varepsilon_i^*\}$ with the estimated residuals as additional explanatory variables. We then need to adjust the usual Tobit variance-covariance matrix for the first-stage estimation (see Smith and Blundell, 1986, and Amemiya, 1979, for the exact form). If $\gamma \neq 0$ (where the test of weak exogeneity uses the *unadjusted* Tobit variance-covariance matrix), we reject the null hypothesis of weakly exogenous x_i's .

Various studies suggest that the import penetration ratio in our model is an endogenous variable. That is, not only does import penetration affect trade protection, but trade protection in turn influences import penetration, higher trade protection leading to lower import penetration. Furthermore, capitalist and union lobbying are endogenously determined in the model. Wages, employment, and trade protection per industry are intrinsically linked and thus endogenous. We therefore treat each of our explanatory variables as endogenous.[16] Our instruments do a decent job of explaining variation in our endogenous explanatory variables.[17]

5.2. **Results.** Parameter estimates are reported in table 3. As shown, our labor market variable is indeed an important determinant of trade protection. We reject the null hypothesis that the labor market has no effect on trade protection ($\beta_3 = \gamma_3 = 0$), as evidenced by a Wald test score (p-value) of 13.50 (.0012). Hence, our estimation results favor the labor-augmented model, and so labor immobility issues and trade union lobbying indeed seem to influence trade policy. Also, as table 1 shows, the redistributive labor market variable can be quite sizable. Interestingly, the average labor market component in the sample is negative, so that (with fixed coefficients) accounting for trade union activity and labor immobility reduces the average in-sample tariff prediction.

Further, we fail to reject the null that $\beta_2 = \beta_3 = \gamma_2 = \gamma_3$ with a Wald statistic of 4.31 (.1159). Thus, we cannot reject the short specification in favor of the full specification. For all three specifications, $\beta_1 < 0$ and $\beta_2 > 0$ to statistically significant degrees, and $\beta_0 = 0$ cannot be rejected, all of which is in accordance with our theory. All three models explain a significant portion of the variance in our trade protection measure because Wald tests reject the null hypothesis that all the coefficients are zero, that is, $\beta = 0$. We also reject the null hypothesis of weakly exogenous explanatory variables ($\gamma = 0$). We marginally reject the null hypothesis that $\beta_1 + \beta_2 \leq 0$ in the labor-augmented specifications, in contrast to the basic GH specification in which the point estimate of $\beta_1 + \beta_2$ is negative.

Under the GH specification, we estimate the structural parameters, Θ and a, to be 1.13 and 706. These estimates compare to estimates of 0.77 and 321 under the short specification (and 0.34-0.75 and 178-392 in the full specification). We cannot reject the null hypotheses that $\Theta \in [0, 1]$ and $a \geq 0$ at any standard significance level level.[18] Thus, the government places much more weight on gross social welfare — around 99.7% of total weight — than on political contributions. Still, our estimate of the weight on contributions in the domestic welfare function is higher than that found in the GH specification. Also, we estimate the percentage of the population organized as a lobby at about 77%, which is

[16] Contrary to the approach of Goldberg and Maggi (1999), we treat entire explanatory variables as endogenous, not just components of the explanatory variables. In other words, we treat $\frac{F^i}{M_i}$, $k_i \frac{F^i}{M_i}$, and $labvar_i$ as endogenous, instead of $\frac{F^i}{M_i}$, k_i, m_i, n_i, etc. In fact, in the 2SLS framework, one can show that a nonlinear function of fitted values is not the same as fitted values of a nonlinear function.

[17] First-stage R^2 values range from 0.16 to 0.18, so that we reject the null of weak instruments.

[18] Standard errors are calculated using the Delta method.

much lower and thus more realistic than in the basic GH specification which is subject to omitted variable bias. Most likely, our structural parameter estimates are still too high, but the labor augmentation has brought down the estimates considerably. Together with the fact that all the estimated coefficients have the correct signs and are significant, our results provide strong support for the labor-augmented protection-for-sale model.

5.3. **Sensitivity Analysis.** In table 4, we consider several alternatives to the variable formulations used in table 3. We report results for the short specification only, but also provide Wald test results of the restrictions implied by the GH and short specifications. Overall, we find that our estimates are quite robust to these alternatives.

We first consider alternatives to our unemployment-based labor mobility indicator variable — mobility observed from the Panel Study of Income Dynamics (PSID), mobility based on average worker tenure, complete labor immobility in all industries, and complete labor mobility in all industries.[19] For mobility based on the 1983 PSID, we treat any household that reports changing jobs and occupations as mobile. Alternatively, any household that reports changing jobs but not occupations or reports keeping the same job is treated as immobile.[20] An industry is then classified as mobile if at least 40% of its workers are mobile. As a second measure using the PSID, we compare industry classifications from 1983 to 1984. Household heads and spouses who report changing industries are considered mobile; those who report no change are treated as immobile. An industry is then considered mobile if at least 55% of its workers are mobile. We also define an alternative labor mobility measure based on average worker tenure in an industry. If average tenure is below 5 years, we classify labor of an industry as mobile. In each alternative specification, the parameter estimates obtain the correct (statistically significant) signs. We reject the GH restriction and fail to reject the restriction imposed by the short specification whenever labor is not completely mobile, and the estimates of the structural parameters Θ and a are always considerably lower than in the GH specification reported in table 3.

Next, we examine the sensitivity of our results to the definition of active capitalist lobbying. We consider two alternatives to our regression-based approach: the industry organization indicator from Gawande and Bandyopadhyay (2000) and the politically organized indicator from Goldberg and Maggi (1999). Not surprisingly, the GB formulation produces results very similar to our original specification because our capitalist lobby indicator variable was constructed in much the same manner as GB's. GM's formulation, however, yields different results. The parameter estimate for β_2 is only marginally statistically significant, and the structural parameter estimates have far larger standard errors

[19] We also considered mobility based on inter-industry wage differentials and average worker age. These results, not reported here, are similar to those in table 4.

[20] The PSID collects this information only when a household head enters the sample. The response is then carried forward with no updating as long as the household head remains in the sample.

than any results we have seen so far. We should note that the construction of the GM political organization dummy is based on a threshold of corporate contributions and does not reflect per-value-added influence or cost; size probably matters here.

We also explore different definitions for active trade union lobbying, based on contributions divided by industry wage bill and contributions per union worker. Again, the parameter estimates have the correct (statistically significant) signs. In each case, we reject the restriction imposed by the GH model and fail to reject the restriction implied by the short specification. Moreover, the estimates of Θ and a are close to our original results.

We also compare our estimation results with results using Gawande's corrected import demand elasticities on the right-hand side of the estimating equation (as in Gawande and Bandyopadhyay, 2000). The parameter estimates for β_1 and β_2 have the right signs and are significant. We reject the GH specification in favor of the full specification, we cannot reject the short specification in favor of the full specification, and the structural parameter estimates each take on values similar to those already reported.

Overall, our estimation results are quite robust to the choice of labor mobility measure and capitalist and trade union lobby measures. We also show that our results are insensitive to how the import demand elasticity is treated in estimation.

6. Conclusion

In this paper, we show how trade union lobbying, collective bargaining, and differences in labor mobility across industries can be incorporated into the protection-for-sale model in a theoretically consistent manner to generate empirically verifiable implications. We demonstrate that, for tests of the importance of variables beyond the ones in the basic protection-for-sale model, previous empirical studies suffer from model misspecification.

We show that trade union activity leads to a redistribution of protection rents between capital owners, union workers, and non-union workers which introduces labor market variables into the equilibrium tariff equation. We test the predictions of our labor-augmented model against the GH model using the same 1983 manufacturing data set, which has been used extensively in the literature to test the protection-for-sale model, and find that labor market variables have a significant impact on trade policy once they have been appropriately controlled for. Moreover, we find that the estimated structural parameters of the protection-for-sale model (percentage of population represented by lobbies and weight on domestic welfare in the governmental welfare function) are lower and thus more realistic than in the GH model, although they probably still lie above their true values. Additional augmentations of the GH model may be needed to arrive at more realistic estimates. Ultimately, this caveat aside, we find that trade union activity and labor mobility, in addition to the import penetration ratio, import demand elasticity, and capitalist lobby activity, indeed play important roles in the determination of trade policy.

Several important extensions of our work seem noteworthy. First, an application using more-recent data would be interesting. Second, a theoretical underpinning mapping political contributions to trade union and capitalist lobby activity would be useful. Third, good estimates of wage and employment elasticities would eliminate the need to define mobile and immobile industries. Last, our model seems particularly well suited to those countries outside the United States for which collective bargaining, trade union lobbying, and labor mobility are significant issues.

Appendix A. Tables

Table 1. Descriptive Statistics

Variable Name	Unit	Mean	Median	Std. Dev.	Minimum	Maximum
τ_i^*	ratio	0.11	0.00	0.23	0.00	1.00
$\frac{\tau_i^*}{1+\tau_i^*}$	none	0.08	0.00	0.13	0.00	0.50
$\frac{F^i}{M_i}$	none	92.48	14.51	552.38	0.11	7,521.42
$k_i \frac{F^i}{M_i}$	none	70.41	5.25	545.96	0.00	7,521.42
$labvar_i$	none	-22.15	-0.71	227.76	-3,156.63	164.00
Annual $\bar{w}_i$	$1,000	18.44	18.44	2.17	13.21	23.86
Annual w_i	$1,000	16.74	16.93	1.71	12.98	22.32
Import demand elasticity	absolute value	1.47	1.57	0.37	0.55	2.13
Imports	$100 million	5.57	1.67	15.95	0.00	174.83
Shipments	$100 million	52.58	24.14	142.66	0.73	1,825.92
Union shipments	$100 million	22.25	7.59	69.88	0.06	860.57
Value added	$100 million	21.24	11.14	31.61	0.52	215.93
Labor force	thousands	38.49	21.10	54.54	1.30	486.00
Covered union	percent	92.00	91.34	4.00	75.93	100.00
Covered non-union	percent	3.72	3.46	2.24	0.00	11.54
Covered	percent	28.34	25.52	10.67	6.59	60.09
Unionized	percent	28.20	24.82	11.54	6.69	65.23

Table 2. Variable Means Across Industry Types

			$m_i = 0$				$m_i = 1$			
			$k_i = 0$		$k_i = 1$		$k_i = 0$		$k_i = 1$	
Variable	Unit	Total	$n_i = 0$	$n_i = 1$	$n_i = 0$	$n_i = 1$	$n_i = 0$	$n_i = 1$	$n_i = 0$	$n_i = 1$
τ_i^*	ratio	0.11	0.05	0.08	0.08	0.22	0.00	0.31	0.02	0.12
$\frac{\tau_i^*}{1+\tau_i^*}$	none	0.08	0.04	0.06	0.05	0.15	0.00	0.17	0.01	0.09
$\frac{\tau_i^*}{1+\tau_i^*}e_i$	none	0.11	0.09	0.09	0.08	0.21	0.00	0.18	0.03	0.14
$\frac{M_i}{F^i}$	percent	23.45	4.72	40.87	23.11	11.37	3.07	18.38	21.34	21.51
e_i	absolute	1.47	1.56	1.54	1.48	1.51	1.59	1.08	1.37	1.55
$labvar_i$	none	-22.15	2.09	7.65	-60.25	-19.25	0.00	3.11	-1.83	-0.48
Annual $\bar{w}_i$	$1,000	18.44	19.50	17.24	18.61	16.71	18.52	19.82	19.56	19.40
Annual w_i	$1,000	16.74	18.22	15.66	16.62	15.61	15.66	18.32	18.05	17.64
PACCORP/profits	percent	0.93	0.23	0.46	1.26	0.95	0.10	0.20	0.89	1.53
PACLAB/wage bill	percent	3.95	0.02	6.72	4.72	1.77	0.47	2.78	3.19	2.35
Unemployment	percent	12.10	11.67	15.91	14.79	12.13	5.94	7.33	5.97	5.69
Tenure	years	5.36	6.70	5.24	4.38	5.73	6.64	5.62	5.25	5.62
Unionized	percent	28.20	20.34	27.68	29.88	17.95	15.50	28.48	37.01	32.85
# observations		194	9	38	61	30	3	16	12	25

TABLE 3. Estimation Results

Parameter	GH Specification	Full Specification	Short Specification
β_0	.0242	.0178	.0176
	(.0290)	(.0319)	(.0292)
β_1	-.0016	-.0019	-.0024
	(.0007)	(.0007)	(.0007)
β_2	.0014	.0025	—
	(.0008)	(.0009)	
β_3	—	.0056	—
		(.0016)	
$\beta_2 = \beta_3$	—	—	.0031
			(.0009)
γ_1	.0011	.0012	.0013
	(.0006)	(.0006)	(.0005)
γ_2	-.0009	-.0019	—
	(.0006)	(.0009)	
γ_3	—	-.0022	—
		(.0014)	
$\gamma_2 = \gamma_3$	—	—	-.0020
			(.0009)
σ	.2985	.2825	.2887
	(.0233)	(.0219)	(.0224)
Θ	1.1264	$\substack{.7502 \\ .3397}$	.7731
	(.1427)	$\left(\substack{.1869 \\ .1374}\right)$	(.1049)
a	705.68	$\substack{392.33 \\ 177.65}$	321.47
	(377.10)	$\left(\substack{136.33 \\ 49.74}\right)$	(92.85)
GH	—	13.50	—
		[.0012]	
Short	—	4.31	—
		[.1159]	
$\beta_1 + \beta_2 \leq 0$	—	5.47	2.72
		[.0650]	[.0989]
$\beta = 0$	6.67	17.89	13.33
	[.0355]	[.0005]	[.0013]
$\gamma = 0$	4.71	7.25	7.21
	[.0948]	[.0644]	[.0272]
$\ln L$	-82.26	-74.40	-77.16

Standard errors in parentheses; p-values in brackets.

TABLE 4. Alternative Specifications

	Labor Mobility					Capitalist Lobbying		Union Lobbying		Gawande's
	1983 PSID	1983-84 PSID	Tenure	Completely		Gawande-	Goldberg-	PACLAB/wage bill	PACLAB/n_i	Elasticity
Parameter	$\geq 40\%$	$\geq 55\%$	< 5	Immobile	Mobile	Bandyopadhyay	Maggi	$> 1/17500$	> 15	on RHS
β_0	.0141	.0114	.0165	.0145	.0230	.0125	.0195	.0082	.0135	.0121
	(.0294)	(.0303)	(.0297)	(.0301)	(.0287)	(.0296)	(.0310)	(.0298)	(.0295)	(.0207)
β_1	-.0022	-.0018	-.0020	-.0022	-.0019	-.0024	-.0022	-.0018	-.0019	-.0023
	(.0007)	(.0007)	(.0007)	(.0007)	(.0008)	(.0007)	(.0009)	(.0007)	(.0007)	(.0007)
$\beta_2 = \beta_3$	.0028	.0022	.0027	.0026	.0019	.0031	.0017	.0021	.0024	.0030
	(.0008)	(.0008)	(.0010)	(.0008)	(.0009)	(.0009)	(.0010)	(.0009)	(.0010)	(.0009)
γ_1	.0012	.0012	.0012	.0012	.0012	.0014	.0004	.0009	.0010	.0011
	(.0005)	(.0005)	(.0005)	(.0005)	(.0006)	(.0005)	(.0006)	(.0005)	(.0006)	(.0005)
$\gamma_2 = \gamma_3$	-.0017	-.0017	-.0017	-.0018	-.0012	-.0021	-.0003	-.0012	-.0015	-.0017
	(.0008)	(.0008)	(.0009)	(.0008)	(.0008)	(.0009)	(.0008)	(.0009)	(.0010)	(.0009)
σ	.2902	.2941	.2945	.2906	.2974	.2900	.2979	.2954	.2946	.2057
	(.0225)	(.0229)	(.0229)	(.0226)	(.0232)	(.0225)	(.0232)	(.0230)	(.0229)	(.0160)
Θ	.8075	.8214	.7632	.8499	.9786	.7723	1.2585	.8543	.7970	.7638
	(.1229)	(.1532)	(.1233)	(.1383)	(.1068)	(.1045)	(.2884)	(.1702)	(.1425)	(.1140)
a	359.56	444.87	376.49	384.86	515.22	325.16	576.86	479.33	421.59	328.49
	(109.33)	(165.99)	(139.22)	(118.20)	(238.53)	(98.08)	(317.32)	(202.59)	(170.08)	(99.33)
GH	10.62	5.44	8.01	8.99	7.70	11.90	4.23	4.72	4.93	11.42
	[.0049]	[.0660]	[.0182]	[.0111]	[.0213]	[.0026]	[.1206]	[.0946]	[.0850]	[.0033]
Short	3.60	0.90	4.00	2.59	6.91	5.23	0.59	2.33	1.86	4.02
	[.1657]	[.6383]	[.1352]	[.2736]	[.0316]	[.0731]	[.7440]	[.3116]	[.3951]	[.1337]
lnL	-77.98	-79.85	-79.78	-78.14	-81.63	-77.91	-81.91	-80.80	-80.52	-43.93
$\#\{d_i = 1\}$	75*	74*	71*	0*	194*	127**	155**	132***	70***	—

Standard errors in parentheses; p-values in brackets. * $d_i = m_i$. ** $d_i = k_i$. *** $d_i = n_i$.

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