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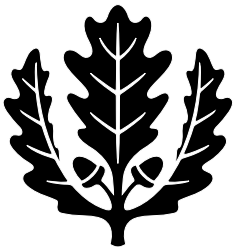
Xenia Matschke
University of Connecticut



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Xenia Matschke
University of Connecticut

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341 Mansfield Road, Unit 1063
Storrs, CT 06269–1063
Phone: (860) 486–3022
Fax: (860) 486–4463
http://www.econ.uconn.edu/

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Abstract

Labor market imperfections are commonly believed to be a major reason for imposing trade impediments. In this paper, I introduce labor market rigidities that are prevalent in continental European countries into the well-known protection for sale model proposed by Grossman and Helpman (1994). I show that contrary to commonly held views, imperfections in the labor market do not necessarily increase equilibrium trade protection. A testable equilibrium trade protection equation is also derived. The findings in this paper are hence particularly relevant for empirical tests of trade policy determinants in economies with more regulated labor markets.

Journal of Economic Literature Classification: F13, F16

Keywords: Tariffs, trade protection, protection for sale, labor market.

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1. Introduction

There are many reasons to believe that employment considerations are a major determinant of trade protection. The conventional wisdom is that labor market imperfections will increase the level of trade protection. Trade union influence, for instance, is usually believed to lead to higher import barriers. Since trade protection allows unions to demand higher wages and/or employment guarantees, unions are likely to favor the imposition of trade barriers. Not surprisingly then, U.S. trade unions led a determined public campaign against the ratification of NAFTA, and union contributions to U.S. congressmen were positively correlated with the likelihood that these representatives voted against trade liberalization.[1] Moreover, firms may also become less flexible in adapting to increased import competition when facing binding collective bargaining agreements, so they may lobby for compensating trade protection. Inflexible wages, caused by trade union activity or by effective minimum wages, can cause unemployment when import competition increases, and generous unemployment benefits can undermine the willingness of workers to accept new jobs. If wages cannot adjust downward, then import barriers may be welfare-enhancing, so higher trade protection may result even without assuming any lobbying influence. Not surprisingly, high unemployment rates, low employment growth rates, and high shares of unskilled labor have been found to go hand in hand with higher trade protection (Rodrik 1995). The earlier empirical literature on the political economy of trade protection has essentially concluded that labor market considerations are a major determinant of trade protection, and this seems in accordance with common perception.

This paper examines the question of whether and how labor market frictions influence trade policy in the light of new theoretical advances in the trade protection literature. Thus far, it seems that the new political economy of trade protection literature has downplayed the influence of labor market imperfections on trade protection. For instance, consider the preeminent model in the political economy of trade protection literature, the protection for sale model of Grossman and Helpman (1994)[2]. The GH model derives a higher weight for the welfare of lobby groups in the governmental objective function in a principal-agent framework where lobbies offer the government contributions in exchange for trade policy. In the GH model, labor is the only mobile factor and earns a competitive wage which is independent of any protection influences. Lobbying is undertaken by the owners of sector-specific capital in the different industries. They compete against each other by paying campaign contributions to buy protection. From first principles, GH derive a set of predictions about the determinants of protection levels. The number of relevant variables in

[1] See, e.g., Baldwin (1985), table 2.2 for 1973, and Baldwin and Magee (2000), for more recent congressional votes such as on the Uruguay Round bills and NAFTA.

[2] Henceforth referred to as the GH model.

their optimal tariff equation is very small. In particular, no employment-related variables appear. This is by design: Perfect labor mobility and the presence of a numeraire industry free of policy influences make wages independent of trade protection. Thus a tariff changes only the output prices and not the wages. There is always full employment since the numeraire sector absorbs any labor which might be set free in other industries. Furthermore, excluding labor unions ensures that capital owners capture all created rents.

The objective of this paper is threefold: First, it shows that the equilibrium tariff of the lobbying game in the GH model can be viewed as a weighted average of tariffs desired by the various lobby groups and the welfare-maximizing tariff. This aggregation result is of independent interest because it provides a useful link between the menu-auction approach of lobbying in GH, where each lobby offers a menu of contributions for each possible trade policy vector, and the common perception that lobby groups voice their trade policy wishes and the government then aggregates these wishes and its own convictions of what is optimal for the economy to determine the equilibrium tariff. Second, the paper shows that labor market frictions, such as union activity and effective minimum wages, can be very naturally incorporated into the protection for sale model. Labor market variables then enter the equilibrium trade protection equation in an intuitive, but non-additive manner. My paper thus provides a theoretical foundation for testing the protection for sale model for countries with rigid labor markets, such as the continental European economies.[3] Third, this paper shows that the common wisdom that labor market rigidities always increase trade protection may not be correct. In particular, union influence has ambiguous effects on the level of trade distortions. Thus, it is possible that strong union influence may actually lower trade protection.

The modelling of labor market imperfections in this paper is motivated by continental European labor market characteristics since the major economies in this region, France and Germany, are commonly considered prime examples of industrialized countries with rigid labor markets. Table 1 gives an idea of the considerable differences in the organization of labor markets within the industrialized world. The first line provides information on the generosity of unemployment and welfare benefits. The numbers represent the average of net income replacement rates over 60 months of unemployment for four family types and two earning levels and include social assistance payments. Clearly, the two European countries provide much more generous assistance to the unemployed than the United States.

[3]The protection for sale model has been found to fit actual trade policy outcomes well; see, e.g., Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000), Eicher and Osang (2002), and Matschke and Sherlund (2006) for the United States, Mitra, Thomakos, and Ulubasoglu (2001) for Turkey, and McCalman (2004) for Australia. An empirical estimation and test of the protection for sale model for continental European countries has not yet been attempted, probably because such a test would have to deal with the issue of substantial labor market rigidities in these countries.

TABLE 1. Labor market characteristics (OECD 2004 and 2005)

Variable (in %)	France	Germany	USA
income replacement in 2002	72	77	30
trade union density in 2000	10	25	13
bargaining coverage in 2000	90+	68	14
unemployment rate in 2004	9.7	9.5	5.5
share long-term (> 1 year) unemployed in 2004	41.6	51.8	12.7

More generous unemployment benefits, at least in theory, reduce the willingness of workers to accept a new job and increase unemployment. The second line shows that the trade union density (i.e., the percentage of workers organized in unions) is substantially higher in Germany than it is in the U.S. and France. In contrast, line 3 shows that more than two thirds of employed workers are covered by collective bargaining in the European countries, whereas collective bargaining coverage is far from extensive in the U.S. economy.[4] The emerging picture of considerable labor market differences becomes even starker when we compare unemployment measures as labor market outcomes. Line 4 displays the overall unemployment rate in the countries, and line 5 the share of long-term unemployed as a percentage of all unemployed. In the U.S., both the unemployment rate and the long-term unemployment rate are low, whereas for the European countries unemployment rates and long-term unemployment shares are rather high, the latter topping 50% in Germany.

I show in this paper that different types of labor market rigidities lead to distinct effects on trade policy that can be easily identified in the equilibrium trade protection equation. Suppose wages are not market-clearing so that unemployment results, and assume further that unemployed workers receive unemployment benefits. In this case, there are two major reasons why the equilibrium tariff is higher than the one predicted by GH: First, in order to increase overall employment, the government would set strictly positive import tariffs even without lobbying. Second, unemployment benefits create a common interest for lobbies to demand trade protection for all industries in order to reduce unemployment and, consequently, unemployment tax payments. These two effects lead to a higher equilibrium tariff. Results from the introduction of union lobbying and collective bargaining are also very intuitive. Collective bargaining causes rent sharing between capital owners and workers in an industry. If either group is not represented by a lobby, protection rents are lost for lobbies and the resulting equilibrium tariff is lower than if all rents are captured by them. Moreover, if collective bargaining agreements also cover non-union workers who are not

[4]The numbers for trade union density and bargaining coverage are very close: The reported U.S. bargaining coverage number is probably overstated since the Bureau of Labor Statistics counts all union members as covered by collective bargaining.

represented by any lobby, some protection rents are always dissipated, thereby leading to a lower equilibrium tariff.

The introduction of trade unions and minimum wages into the GH framework is not completely novel to the literature. Rama and Tabellini (1998) consider a two-sector model where in one sector, capital owners and trade union lobby the domestic government simultaneously for trade protection and minimum wages. Their model, however, is clearly tailored for developing countries and concentrates on investigating whether international agencies such as the World Bank should target labor market or trade distortions when imposing rules for restructuring the economy. In Rama and Tabellini's model, wages are fixed by the state, so there is no role for the trade union in collective bargaining, and all workers in the manufacturing sector are assumed to be trade union members. Moreover, there is always full employment. In contrast, this paper considers an industrial country scenario by making the following assumptions: (i) Industry-specific unions negotiate with firms over wages and/or employment and also lobby for trade protection. (ii) Collective bargaining results can cover non-union members. (iii) Binding minimum wages cause unemployment, and as a consequence, unemployment assistance to unemployed workers creates additional fiscal needs.

The remainder of the paper is organized as follows: In section 2, I set up the model. In section 3, I derive a convenient way of expressing the equilibrium tariffs as a weighted sum of tariffs that the players in the lobbying game would unilaterally set. This allows me to interpret the effects of labor market regulations on the equilibrium tariff structure as straightforward extensions of the effects on tariffs preferred by the different lobbying game participants. I discuss these unilateral changes in section 3 and then aggregate these effects in section 4 to see how equilibrium trade policy is affected. It is shown that trade unionization, coverage of non-union workers by collective bargaining, and minimum wage induced unemployment influence equilibrium tariff levels in the GH model. However, it is not true that labor market rigidities necessarily increase trade protection. In particular, I demonstrate the following: Binding minimum wages lead to higher tariffs, higher bargaining coverage lowers tariff rates, and the effect of a higher degree of unionization is ambiguous. Section 5 concludes.

2. Model Description

2.1. **Basic setup.** Consider a small country with $n + 1$ production sectors (henceforth called industries) which faces an exogenous vector of world prices. The country owns a fixed amount of labor L and fixed amounts of industry-specific capital K_i, where $i = 1, \ldots, n$. Each industry produces a single good, with good 0 being the numeraire.

On the consumption side, it is assumed that all individuals have identical quasilinear preferences. The utility function for any individual is the sum of his good 0 consumption

and strictly concave and increasing transformations of the consumption of each of the non-numeraire goods 1 to n.[5] Quasilinearity of preferences implies that the indirect utility function of any individual is additively separable into an income and a price component. Specifically, indirect utility can be written as the sum of income and consumer surplus V_i from consumption of good i where i goes from 1 to n. While utility functions are identical across agents, endowments are not. I divide the population into two groups: laborers and capitalists. Laborers own 1 unit of labor each, while capital owners possess 1 unit of specific capital per person which they supply inelastically.

Each non-numeraire industry $i = 1, \ldots, n$ consists of a unionized sector A and a non-unionized sector B which share an identical production function F^i. In sector A of industry i, wage w_{iA} and/or employment are determined by union-firm negotiations, whereas in sector B, wage w_{iB} and employment are in principle determined by market forces, but I leave open the possibility that the country introduces a binding minimum wage for the non-unionized sectors of the economy. Capital employed in the sectors of industry i, namely, K_{iA} in sector A and $K_{iB} = K_i - K_{iA}$ in sector B, is immobile in the short run and is thus industry- as well as sector-specific. Industries $i = 1, \ldots, n$ and their sectors use labor and capital to produce output according to a linearly homogeneous and weakly concave production function F^i where $F^i_{LL} < 0$, $F^i_{KK} < 0$, and $F^i_{KL} > 0$. The numeraire industry ($i = 0$) only uses labor and is not divided into sectors. The world price of the numeraire good is fixed at 1, and one unit of labor produces one unit of output F^0 with a one-to-one production technology, which ties down the wage in the numeraire industry at one.

In the unionized sector A of industry i, wage w_{iA} and possibly also employment is determined by union-firm bargaining. For the general analysis, the mode of bargaining does not have to be specified: An illustration with efficient union-firm bargaining can be found in Matschke and Sherlund (2006). The negotiated union wage w_{iA} has to be uniformly applied to all employees in sector A, who can be union workers or non-union workers. In sector A of industry i, $\alpha_{iU} L_{iU}$ workers are union members and $\alpha_{iN} L_N$ are non-union workers, where L_{iU} denotes the number of union members in industry i and L_N the number of non-union members. Thus, the number of workers employed in sector A of industry i is $L_{iA} = \alpha_{iU} L_{iU} + \alpha_{iN} L_N$.[6] For the scope of the present analysis, it is not important to know how exactly the employment shares are determined, as long as we acknowledge that they will depend on the price of good i and thus on trade policy.

2.1.1. *Case 1: Full employment.* In this section, it is assumed that non-union labor is mobile between industries, so that the wages in the non-unionized sectors of the economy will all

[5] It is assumed each individual has enough income to consume all goods; i.e., corner solutions are excluded.

[6] In the U.S., approximately 1.5% of non-union workers were covered by collective bargaining agreements in 2001. In many European countries, however, union wages apply to a much higher percentage of non-union workers as table 1 shows. Only in the case of a closed shop would α_{iN} be equal to zero.

be equal to the wage in the numeraire industry 0, i.e. $w_{iB} = 1$. Employment in the non-unionized sectors is then chosen by firms to maximize profits, which leads to the standard rule that the marginal value product of labor should equal the wage, i.e., $p_i F_L^i(L_{iB}) = 1$ for $i = 1, ..., n$. Of the labor force employed in sector B of industry i, there are $\beta_{iU} L_{iU}$ union workers and $\beta_{iN} L_N$ non-union workers. Thus $L_{iB} = \beta_{iU} L_{iU} + \beta_{iN} L_N$.[7] As with the employment shares in the unionized sector, we can keep the analysis general enough so as not to worry about how exactly β_{iN} and β_{iU} are determined. It is reasonable, however, to assume that these shares will depend on the price of good i.

It is important to realize that labor will always be fully employed since the numeraire industry 0 acts like a sponge that absorbs any additional labor needed in other industries without creating any changes in the non-union wage. At the same time, the numeraire industry can also release labor needed in other industries without changes in wage. Therefore, without the existence of unions, labor issues would not matter for trade policy in this setting because the competitive wage is independent of trade policy and there is always full employment. However, since union wage and employment in the unionized part of industry i usually do depend on the price of good i, the equilibrium trade policy will be influenced by labor market considerations once we allow for union activity. This will be investigated further after discussing case 2.

2.1.2. *Case 2: Unemployment.* A straightforward way to create unemployment in our model is to introduce a minimum wage $w_B > 1$ which lies above the world market price of the numeraire good. This shuts down the numeraire industry at home and induces unemployment, so that in general the employment shares of the different worker categories do no longer sum up to 1; i.e., $\alpha_{iU} + \beta_{iU} < 1$ and $\sum_{i=1}^{n} (\alpha_{iN} + \beta_{iN}) < 1$. The workers who cannot find employment receive a uniform unemployment benefit u which is financed via taxes.[8]

2.2. **Lobbying and Trade Policy Determination.** In some industries, but not the numeraire industry 0, either capital owners or the trade union or both are active lobbyists who solicit trade protection from the domestic government. Each lobby offers the government a schedule that lists its contributions as a function of the domestic price vector p. The price vector p may differ from the world price vector p^* if the domestic government imposes a vector t of specific import or export tariffs or subsidies. Hence, if p_i^* denotes the world market price of good i, then the domestic price is $p_i = p_i^* + t_i$. Suppose good i is an import good. Then $t_i > 0$ ($t_i < 0$) means that an import tariff (subsidy) is imposed. By contrast,

[7] In the U.S., the β_{iU} shares of union workers not covered by collective bargaining are relatively small, but not zero. Information obtained from the BLS indicated that in 2001, about 15% of union workers were not covered by collective bargaining agreements.

[8] Considering a different financing scheme is very straightforward and thus left to the interested reader.

if good i is an export good, then $t_i > 0$ ($t_i < 0$) implies an export subsidy (tax). To facilitate description, I henceforth focus on import goods when describing the determination of the equilibrium trade policy. The reader should note, though, that with the information given above, the interpretation of the trade policy outcome can readily accommodate export goods as well. The tariff revenue (or the cost of subsidies) is rebated equally among (or collected costlessly from) the population. The government maximizes the weighted sum of total contributions and aggregate welfare where the weight on aggregate welfare is denoted by a. Contributions C receive a weight of 1. The solution to the lobbying game follows the findings in GH. The arising tariff structure is defined by the following set of conditions, where the number of conditions equals the number of lobbies plus one: First, the equilibrium tariff maximizes the government's utility function. This must be true because the domestic government chooses the tariff to maximize its own utility. Second, the equilibrium tariff maximizes the sum of governmental utility and the utility of any lobby. To understand this requirement, suppose this condition were not fulfilled for a certain lobby. Then, the lobby could propose a different contribution schedule that left governmental welfare unchanged and assigned the surplus payoff to itself. This would clearly be better for the lobby and hence, the lobby could not have been utility-maximizing in the first place.

3. Group Interests and Tariff Determinants

3.1. **General relationship between equilibrium tariff and lobby group interests.** I first show that the equilibrium tariff "in its structure"[9] for any industry $i = 1, \ldots, n$ can be expressed as the weighted sum of tariffs that the lobby groups and the government would set unilaterally. This is a very useful result because it ties the equilibrium tariff vector directly to the interests of the different players in the lobbying game. Henceforth, the percentage of the population organized into lobby groups is denoted by

$$\Theta = \sum_{K_i \in \Omega} \theta_{K_i} + \sum_{U_i \in \Omega} \theta_{U_i},$$

where Ω is the set of all organized lobby groups, consisting of trade unions and capital owner groups. θ_{K_i} (θ_{U_i}) stands for the population share of industry i capital owners (trade unionists). The summation in the formula of Θ is over all capital owner and trade union interest groups in all non-numeraire industries $i = 1, \ldots, n$, provided that these groups have formed a lobby. By definition, Θ only takes on values between 0 and 1.

[9]The GH model does not yield a closed-form solution for the equilibrium tariff t_i^*. Instead, we obtain a structural equation that depends implicitly on t_i^*. The unilaterally optimal tariffs I derive for the different groups of the lobbying game are similarly implicitly defined structural forms. When I say that the equilibrium tariff "in its structure" is a weighted average of these tariffs, then I mean that t_i^* is a weighted average of the unilaterally optimal tariff forms which are themselves functions of t_i^*.

Because every lobby member is assumed to consume each good and receive a tariff revenue share, I model tariff revenue and consumer surplus effects explicitly, while all other effects that may influence the choice of the tariff are lumped together in an "other effects" category (E). The symbol $E_i^{K_j}$ ($E_i^{U_j}$) denotes the other effects a tariff on industry i has for the utility of group K_j (U_j). These effects are discussed in detail in the next section. The equilibrium tariff does not only reflect the interests of the lobby groups, but also the impact on domestic welfare. Here, I denote by t_i^G the welfare-maximizing tariff and by E_i^G the other effects (apart from consumer surplus and tariff revenue considerations) that a tariff has on domestic welfare. In the original (small economy) GH setup, the welfare-maximizing tariff t_i^G equals zero and $E_i^G = F^i$. However, with labor market distortions, this is not necessarily the case. More precisely, $t_i^G = (F^i - E_i^G)/M_i'$, where[10]

$$E_i^G = F^i + F_L^0 \frac{dL_0}{dp_i} + \sum_{j=1}^{n} \left[p_j F_L^{jA} \frac{dL_{jA}}{dp_i} + p_j F_L^{jB} \frac{dL_{jB}}{dp_i} \right]$$

maximizes domestic welfare

$$W_G = \sum_{j=1}^{n} t_j M_j(p_j) + \sum_{j=0}^{n} p_j F^j(p_j) + (L + \sum_{j=1}^{n} K_j) \sum_{j=1}^{n} V_j(p_j).$$

Domestic welfare W_G is the sum of tariff revenue, the value of domestic production, and consumer surplus. Hence, by the definition of "other effects", E_i^G equals the derivative of the domestic production value with respect to the tariff. The following lemma proved in the appendix links the tariffs the players would unilaterally set to the equilibrium tariff of the lobbying game.

Lemma 3.1. *The equilibrium tariff for industry i is given by*

$$t_i^* = \frac{F^i(t_i^*)}{M_i'(t_i^*)} - \frac{a E_i^G(t_i^*)}{a + \Theta} \frac{1}{M_i'(t_i^*)} - \frac{\sum_{U_j \in \Omega} E_i^{U_j}(t_i^*) + \sum_{K_j \in \Omega} E_i^{K_j}(t_i^*)}{a + \Theta} \frac{1}{M_i'(t_i^*)}. \tag{3.1}$$

Alternatively, we can write the equilibrium tariff as an implicit solution to

$$t_i^* = \frac{a}{a + \Theta} t_i^G(t_i^*) + \sum_{K_j \in \Omega} \frac{\theta_{K_j}}{a + \Theta} t_i^{K_j}(t_i^*) + \sum_{U_j \in \Omega} \frac{\theta_{U_j}}{a + \Theta} t_i^{U_j}(t_i^*), \tag{3.2}$$

where t_i^G is the welfare maximizing tariff on good i and $t_i^{K_j}$ ($t_i^{U_j}$) denotes the unilaterally optimal tariff for lobby group K_j (U_j).

Equation (3.1) shows that the interests of different lobby groups enter the optimal tariff equation additively. Changes in the equilibrium tariff cannot be caused by simple income redistribution among lobbies; i.e., if the other effects for one lobby group are increased and the other effects for a different lobby group are decreased by the same amount, then

[10] The L subscript stands for the partial derivative with respect to labor.

by (3.1), t_i^* does not change. It can also be seen that neither the total number of lobbies nor the number of lobbies per industry affects the equilibrium tariff as long as the added marginal benefits or costs of a tariff as represented by the other effects stay the same[11].

Equation (3.2) is even more useful because it shows that the equilibrium tariff is basically a weighted average of the unilaterally optimal tariffs for the different player groups of the lobbying game.[12] Hence, in order to get intuition about the effects of labor market rigidities on the equilibrium tariff, it is sufficient to analyze how labor market rigidities affect the interests of lobby groups and government. Readers familiar with the original GH model will recognize that Lemma 3.1 is closely linked to the result established in Grossman and Helpman (1994) that the optimal tariff maximizes a weighted social welfare function and can thus be reinterpreted as the outcome of a political support function model with endogenized welfare weights. Using (3.2), it is now possible to make meaningful statements about how labor market rigidities affect the direction that lobbying takes; e.g., what does it mean that a certain group lobbies for or against a certain tariff, given that in the subgame-perfect Nash equilibrium all players ask for the same tariff vector? The answer to this question lies in the tariffs the lobby groups would set unilaterally if they could do so.

3.2. **Labor market rigidities and lobby group interests.** To see how labor market rigidities affect the lobby interests, I first discuss the effects of labor market rigidities on the unilateral tariffs in order to better understand the equilibrium tariff outcome which will be discussed in the next section.

3.2.1. *Case 1: Full employment.* I start with the welfare-maximizing tariff t_i^G as the natural benchmark, i.e., the tariff that would be set if no interest group influences were present. Leaving out welfare components that are independent of the price of good i, t_i^G maximizes domestic welfare

$$W_G = p_i F^i + F^0 + t_i M_i + (L + \sum_{j=1}^{n} K_j) V_i, \tag{3.3}$$

where $p_i F^i$ is the value of domestic production in industry i, F^0 the value of domestic production in industry 0, $t_i M_i$ the tariff revenue from imports of good i, and $(L+\sum_{j=1}^{n} K_j)V_i$ the consumer surplus from consuming good i. The following result, as well as the other propositions about unilaterally optimal tariffs henceforth, can be easily obtained by taking the first-order condition of welfare maximization for a particular player by choice of t_i and then solving for t_i. Therefore, their proofs are omitted.

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[11] This assumes that the share of lobbies in the population is fixed.

[12] The reader should note, though, that the unilaterally optimal tariffs are all functions of t_i^*, so the relationship between the equilibrium tariff and the unilaterally optimal tariffs is not as simple as it might appear. This is not surprising because GH also never obtain a closed form solution for the equilibrium tariff, but only derive the solution as an implicit function of t_i^* itself.

Proposition 3.1. *The tariff the government would set unilaterally is*

$$t_i^G = -\frac{1}{M_i'}(p_i F_L^{iA} - 1)\frac{dL_{iA}}{dp_i}. \tag{3.4}$$

where F_L^{iA} denotes the partial derivative of F^{iA} with respect to labor.

This result is easily obtained, given that $dL_{iA}/dp_i + dL_{iB}/dp_i + dL_0/dp_i = 0$ and $p_i F_L^{iB} = F_L^0 = 1$. An educated guess would be that an increase in the price of good i will increase employment in the unionized sector, although this in general will depend upon the exact bargaining structure. Such an increase alone, however, does not necessarily entail a strictly positive t_i^G. Only if the marginal value product of labor in sector A of industry i exceeds the marginal value product 1 in the non-unionized sectors and industry 0 will t_i^G be positive. The intuition is simple: The government maximizes domestic welfare and will use active trade policy in case that the overall production value can be increased by reallocating labor across industries and sectors. Whether or not this is possible depends on the specific assumptions about collective bargaining: For instance, if we assume efficient bargaining (joint bargaining over wage and employment), the marginal value products of labor will be the same in all sectors and industries and the domestic government will thus have no incentive to use active trade policy.

Next, consider the interests of lobby groups g_j, where $g_j \in \{U_j, K_j\}, j \neq i$, outside industry i. If g_j could unilaterally set the tariff rate for industry i, it would do so to maximize

$$W_{g_j} = \theta_{g_j} t_i M_i + \theta_{g_j}(L + \sum_{j=1}^{n} K_j)V_i. \tag{3.5}$$

As before, all components that do not depend on t_i are omitted. This leads to the following result:

Proposition 3.2. *The tariff lobby groups g_j outside industry i would set unilaterally is*

$$t_i^{g_j} = \frac{F^i}{M_i'}, \quad j \neq i. \tag{3.6}$$

As in the original GH model, other industries lobby for an import subsidy for industry i as the negative consumer surplus effect from an increased tariff is stronger than the tariff revenue effect.

Now I turn to the interests of industry i lobby groups, starting with the capital owners. Contrary to the original GH model, the capital owners of sector A now have to share their profits with workers. This will necessarily decrease their interest in trade protection. If capital owners could set the tariff unilaterally, they would maximize

$$W_{K_i} = p_i F^i - w_{iA} L_{iA} - L_{iB} + \theta_{K_i} t_i M_i + \theta_{K_i}(L + \sum_{j=1}^{n} K_j)V_i. \tag{3.7}$$

Proposition 3.3. *The tariff capital owners of industry i would set unilaterally is*

$$t_i^{K_i} = -\frac{1}{\theta_{K_i} M_i'} \left[(1-\theta_{K_i}) F^i - (w_{iA} - p_i F_L^{iA}) \frac{dL_{iA}}{dp_i} - L_{iA} \frac{dw_{iA}}{dp_i} \right]. \tag{3.8}$$

Without union activity, an increase in the product price would increase firm profits by F^i according to Hotelling's Lemma. Also taking into account consumer surplus and tariff revenue effects, the unilaterally optimal tariff for capital owners would be strictly positive and equal to $-(1-\theta_{K_i})/(\theta_{K_i} M_i') F^i$. However, due to union activity, workers will share in the protection rents. In many cases, both the union wage and employment in the unionized sector will rise when the price of product i increases. The increase in wage will necessarily lower the capital owners' unilaterally optimal tariff. Whether the increase in employment will have a similar effect depends on whether workers in the unionized sector are paid their marginal value product. For instance, under the assumptions of the right-to-manage model where capital owners and union only bargain over wages and the firm then chooses employment such that marginal value product of labor and union wage are equalized, the increase in employment does not have an additional negative effect on $t_i^{K_i}$, although the wage effect is magnified. If workers are paid more than their marginal value product, which would for example be the case with efficient bargaining, there will be a negative effect.

Finally, we also have to consider the unilaterally optimal tariff for union workers in industry i. Assuming that the union maximizes the utility of its members, the unilaterally optimal tariff $t_i^{U_i}$ maximizes

$$W_{U_i} = w_{iA} \alpha_{iU} L_{iU} + (1-\alpha_{iU}) L_{iU} + \theta_{U_i} t_i M_i + \theta_{U_i} (L + \sum_{j=1}^{n} K_j) V_i. \tag{3.9}$$

Proposition 3.4. *The tariff the trade union of industry i would set unilaterally is*

$$t_i^{U_i} = -\frac{1}{\theta_{U_i} M_i'} \left[-\theta_{U_i} F^i + \alpha_{iU} L_{iU} \frac{dw_{iA}}{dp_i} + (w_{iA} - 1) \frac{d\alpha_{iU}}{dp_i} L_{iU} \right]. \tag{3.10}$$

Without collective bargaining, union workers would have exactly the same interests in trade policy as groups outside industry i; namely, as consumers, they would want an import subsidy equal to F^i/M_i'. With bargaining, however, union workers participate in protection rents via a higher union wage w_{iA} and also possibly higher employment at wages above their marginal value product, and therefore union workers may very well be interested in a strictly positive tariff for their own industry.

In general, we cannot say whether the trade union and the capital owners of an industry will agree on a positive import tariff. This is a consequence of the consumer surplus and tariff revenue effects. If we exclude tariff revenue and consumer surplus effects for industry i lobbyists as is often done in partial equilibrium studies, we would indeed find that both lobbies want a tariff (Matsuyama 1990), provided that employment and wage in the unionized sector rise. But if tariff revenue effects and consumer surplus effects are

included, it is well possible that trade unions would lobby for protection ($t_i^{U_i} > 0$) whereas capital owners would lobby against it ($t_i^{K_i} < 0$) as in Baldwin and Magee (2000). This outcome is especially likely if labor rents are substantially higher than capital rents (Katz and Summers 1989).

3.2.2. *Case 2: Unemployment.* Once again I start with the welfare-maximizing tariff as the natural benchmark. This tariff t_i^G maximizes domestic welfare given by

$$W_G = p_i F^i + t_i M_i + (L + \sum_{j=1}^{n} K_j) V_i. \tag{3.11}$$

Proposition 3.5. *The tariff the government would set unilaterally is*

$$t_i^G = -\frac{1}{M_i'} \left[p_i F_L^{iA} \frac{dL^{iA}}{dp_i} + w_B \frac{dL^{iB}}{dp_i} \right]. \tag{3.12}$$

As p_i increases with the tariff, employment in industry i and thus overall employment typically increases. This raises the production value and domestic welfare. The case for a strictly positive tariff from the government's perspective is thus more clear-cut than under full employment,[13] where a strictly positive tariff t_i^G only results if the marginal value product of labor differs between the unionized and non-unionized sectors of the economy.

Next let us look at the interests of lobby groups g_j, where $g_j \in \{U_j, K_j\}, j \neq i$, outside industry i. If g_j could set the tariff rate for industry i unilaterally, it would do so to maximize

$$W_{g_j} = \theta_{g_j} t_i M_i + \theta_{g_j} (L + \sum_{j=1}^{n} K_j) V_i - \theta_{g_j} [L - \sum_{j=1}^{n} L_j] u, \tag{3.13}$$

where $\theta_{g_j}[L - \sum_{j=1}^{n} L_j]u$ is the tax paid by the lobby group for unemployment benefits.

Proposition 3.6. *The tariff lobby groups g_j outside industry i would set unilaterally is*

$$t_i^{g_j} = -\frac{1}{M_i'} \left[-F^i + u \frac{dL_i}{dp_i} \right], \; j \neq i. \tag{3.14}$$

With full employment, lobby groups outside industry i lobby for an import subsidy on good i. With unemployment, the lobby group also takes into account that it will have to pay less taxes when unemployment is lower, and therefore the desired import subsidy will be lower or may even change to an import tariff.

If capital owners in industry i could set the tariff unilaterally, they would maximize

$$W_{K_i} = p_i F^i - w_{iA} L_{iA} - w_B L_{iB} + \theta_{K_i} t_i M_i + \theta_{K_i} (L + \sum_{j=1}^{n} K_j) V_i - \theta_{K_i} [L - \sum_{j=1}^{n} L_j] u. \tag{3.15}$$

[13] The result that welfare is maximized by a strictly positive tariff when a binding minimum wage is in place can also be found in Hill (1984).

Proposition 3.7. *The tariff capital owners of industry i would set unilaterally is*

$$t_i^{K_i} = -\frac{1}{\theta_{K_i} M_i'}[(1-\theta_{K_i})F^i - (w_{iA} - p_i F_L^{iA})\frac{dL_{iA}}{dp_i} + \theta_{K_i} u \frac{dL_i}{dp_i} - \frac{dw_{iA}}{dp_i} L_{iA}]. \tag{3.16}$$

Not surprisingly, the tax savings considerations now enter the tariff equation and increase the unilaterally optimal tariff for capital owners compared to (3.8).

We still need to calculate the unilaterally optimal tariff for union workers in industry i. Assuming that the union maximizes the utility of its members, the unilaterally optimal tariff $t_i^{U_i}$ maximizes

$$W_{U_i} = w_{iA}\alpha_{iU}L_{iU} + w_B\beta_U L_{iU} + (1-\alpha_{iU}-\beta_U)uL_{iU} + \theta_{U_i}t_i M_i + \theta_{U_i}(L + \sum_{j=1}^{n} K_j)V_i - \theta_{U_i}[L - \sum_{j=1}^{n} L_j]u, \tag{3.17}$$

where $\beta_U = \sum_{i=1}^{n} \beta_{iU}$.

Proposition 3.8. *The tariff the trade union of industry i would set unilaterally is*

$$t_i^{U_i} = -\frac{1}{\theta_{U_i} M_i'}[-\theta_{U_i}F^i + \alpha_{iU}L_{iU}\frac{dw_{iA}}{dp_i} + (w_{iA}-u)\frac{d\alpha_{iU}}{dp_i}L_{iU} + (w_B - u)\frac{d\beta_U}{dp_i}L_{iU} + \theta_{U_i}u\frac{dL_i}{dp_i}]. \tag{3.18}$$

The reduced tax payment used for unemployment compensation increases the tariff desired by the union. In addition, increases in employment in sectors A and B of industry i are now both valued (the weight being the difference between the wage paid in this sector and the unemployment benefit), whereas in the full-employment case, an increase in sector B employment for union workers (and the corresponding reduction in industry 0 employment) did not lead to an additional tariff-raising component in $t_i^{U_i}$ because wages in the non-unionized sectors and industry 0 were equal.

4. Equilibrium Tariff Structure

Using Lemma 3.1 and the unilaterally optimal tariffs for the different player groups, the optimal tariff of the lobbying game can be easily determined. As before, let Θ be defined as the percentage of the population that is represented by lobbies.

Proposition 4.1. *Consider the full employment case. Let t_i^G be defined as in (3.4). The equilibrium tariff t_i^* in industry i can be characterized as follows depending on who lobbies:*

(a) If both labor and capital in i lobby, then

$$t_i^* = \frac{a}{a+\Theta}t_i^G(t_i^*) - \frac{1}{(a+\Theta)M_i'}[(1-\Theta)F^i - (w_{iA} - p_i F_L^{iA})\frac{dL_{iA}}{dp_i} + (w_{iA}-1)\frac{d\alpha_{iU}}{dp_i}L_{iU} - (L_{iA} - \alpha_{iU}L_{iU})\frac{dw_{iA}}{dp_i}].$$

(*b*) *If nobody in i lobbies, then*

$$t_i^* = \frac{a}{a+\Theta} t_i^G(t_i^*) + \frac{\Theta}{(a+\Theta)M_i'} F^i.$$

(*c*) *If only the trade union in i lobbies, then*

$$t_i^* = \frac{a}{a+\Theta} t_i^G(t_i^*) - \frac{1}{(a+\Theta)M_i'}[-\Theta F^i + (w_{iA}-1)\frac{d\alpha_{iU}}{dp_i} L_{iU} + \alpha_{iU} L_{iU} \frac{dw_{iA}}{dp_i}].$$

(*d*) *Finally, if only capital owners in i lobby, then*

$$t_i^* = \frac{a}{a+\Theta} t_i^G(t_i^*) - \frac{1}{(a+\Theta)M_i'}[(1-\Theta)F^i - (w_{iA} - p_i F_L^{iA})\frac{dL_{iA}}{dp_i} - L_{iA}\frac{dw_{iA}}{dp_i}].$$

In a world without lobbies and without trade union activity, the equilibrium tariff would be equal to the tariff that maximizes domestic welfare. In fact, without labor market rigidities and lobby influence, the welfare-maximizing tariff (and thus the equilibrium tariff) is zero, which reflects standard theory that a small open economy should abstain from active trade policy. When capital owner lobbying is considered, the equilibrium tariff becomes positive or negative depending on whether or not capital owners in the industry under consideration lobby. The equilibrium tariff in this basic GH setup without labor market rigidities is completely independent of any labor market variables. Once we allow for trade union activity, this result changes considerably. Assuming that both the union wage and overall and union employment in the unionized sector of industry i are increasing in p_i, the exact results now depend not only on whether or not capital owners of industry i lobby, but they also depend on the lobbying behavior of the trade union in industry i. Compared to the case without trade union activity, capital owners are less interested in a tariff for their industry because they have to share protection rents to the extent that union wages increase and more workers are employed at wages above the marginal value product of labor. Union workers, on the other hand, are interested in higher trade protection to the extent that their employment in the unionized sector at wages above the ones in the competitive sector rises and the union wage increases. When both union and capital owners of an industry lobby, these effects partly, but not completely offset each other. The main reason why these effects do not completely outbalance each other lies in the fact that some non-union workers are covered by collective bargaining agreements. For continental European countries such as Germany and France, where collective bargaining coverage of non-union workers is substantial, the predicted equilibrium tariff would thus be considerably different from the equilibrium tariff predicted by the basic GH model.

Let us now consider the case of an effective minimum wage that applies to all the non-unionized sectors of the economy.

Proposition 4.2. *Consider the unemployment case. Let t_i^G be defined as in (3.12). The equilibrium tariff t_i^* in industry i can be characterized as follows depending on who lobbies:*

(*a*) *If both labor and capital in i lobby, then*

$$t_i^* = \frac{a}{a+\Theta} t_i^G(t_i^*) - \frac{1}{(a+\Theta)M_i'}[(1-\Theta)F^i + \Theta u \frac{dL_i}{dp_i} - (w_{iA} - p_i F_L^{iA})\frac{dL_{iA}}{dp_i} + (w_{iA} - u)\frac{d\alpha_{iU}}{dp_i} L_{iU} + (w_B - u)\frac{d\beta_U}{dp_i} L_{iU} - (L_{iA} - \alpha_{iU} L_{iU})\frac{dw_{iA}}{dp_i}].$$

(*b*) *If nobody in i lobbies, then*

$$t_i^* = \frac{a}{a+\Theta} t_i^G(t_i^*) + \frac{\Theta}{(a+\Theta)M_i'}(F^i - u\frac{dL_i}{dp_i}).$$

(*c*) *If only the trade union in i lobbies, then*

$$t_i^* = \frac{a}{a+\Theta} t_i^G(t_i^*) - \frac{1}{(a+\Theta)M_i'}[-\Theta F^i + \Theta u \frac{dL_i}{dp_i} + (w_{iA} - u)\frac{d\alpha_{iU}}{dp_i} L_{iU} + (w_B - u)\frac{d\beta_U}{dp_i} L_{iU} + \alpha_{iU} L_{iU}\frac{dw_{iA}}{dp_i}].$$

(*d*) *Finally, if only capital owners in i lobby, then*

$$t_i^* = \frac{a}{a+\Theta} t_i^G(t_i^*) - \frac{1}{(a+\Theta)M_i'}[(1-\Theta)F^i + \Theta u \frac{dL_i}{dp_i} - (w_{iA} - p_i F_L^{iA})\frac{dL_{iA}}{dp_i} - L_{iA}\frac{dw_{iA}}{dp_i}].$$

Most of the results of the full employment case still apply. One major change occurs because the binding minimum wage and the unemployment caused by it lead to a strictly positive welfare-maximizing tariff which depends on the price elasticity of employment. Moreover, the minimum wage in the otherwise competitive sectors of the economy also has an impact on the interests of the various lobby groups. Regardless of who lobbies, all lobbies are in favor of a higher tariff because it reduces unemployment and thus the resulting tax burden. In addition, the union is interested in a higher tariff because higher employment of otherwise unemployed union workers in the non-unionized sector leads to increased union worker income. In contrast, firms in sector B of industry i still hire workers until the marginal value product of labor equals wage, hence the increase in sector B employment does not constitute an additional reason for capital owners to lower their desired tariff.

In summary, labor market rigidities lead to additional components in the equilibrium tariff equation compared to the basic protection for sale framework. Binding minimum wages introduce an additional, tariff-raising component, whereas collective bargaining in parts of the economy can either lead to a positive or negative additional component in the equilibrium tariff equation, depending on who in an industry is lobbying. Labor market variables, such as employment and wage elasticities, unionization and collective bargaining coverage rates, influence the equilibrium trade policy in an intuitive way, but they do so in a non-additive manner.

5. Conclusion

In this paper, I show that augmenting the GH model by trade union activity and a binding minimum wage introduces labor market variables into the equilibrium tariff equation in a natural manner. In particular, it is shown that contrary to the basic GH model, industry- and sector-specific employment and wage elasticities do matter for trade policy. Therefore, any empirical study that wants to estimate and test the GH model for an economy with considerable labor market rigidities either needs such elasticity estimates or has to impose additional structure on the model in order to replace these elasticities by wage and employment data.[14]

One might expect that higher labor market distortions, commonly assumed to be a distinguishing feature between the United States and the continental European labor market, increase trade protection. In this paper, however, I show that this expectation is only partly supported by theory. Binding minimum wages increase the equilibrium tariff level, since tariffs can be used not only to shift employment to the protected industry, but also to increase overall employment. Since the resulting increase in production is beneficial for the domestic country, the government (even without lobbying) would levy a strictly positive tariff on imports and subsidize exports. Moreover, higher employment lowers taxes necessary to finance unemployment benefits. Tax reduction considerations create some common interest between lobbies to increase employment in industries other than their own.

The effect of trade union activity depends on who takes part in the lobbying game. Suppose first that the trade union, but not capital owners of an industry lobby. The trade union captures part of the protection rents from the firms via collective bargaining. Moreover, these protectionist interests are represented in the lobbying game. Compared to the case when trade unions and capital owners of industry i do not lobby, the equilibrium tariff in this industry thus increases. The opposite is true, however, when capital owners lobby but the trade union does not. Since part of the protection benefits goes to workers via collective bargaining, the capital owners' interest in protection (and thus the equilibrium tariff) is reduced as compared to a model where no profit sharing between capital owners and workers occurs. A similar result holds if both the trade union and capital owners of industry i lobby. In this case, capital owners and workers share the rents accruing from trade protection. In conclusion, under the assumption that not all unions or all capital owner groups participate in lobbying for trade policy, economic theory does not provide any clear-cut predictions that the existence of trade unions leads to higher trade protection, so any attempts to empirically test such a prediction would be ill-advised.

[14]The latter approach is employed in Matschke and Sherlund (2006) for the U.S. economy.

In contrast, the coverage of non-union workers by collective bargaining outcomes, which is substantial in many European countries, lowers equilibrium trade protection if the capital bound in the unionized sector is constant. This result stems from the fact that the coverage of non-union workers dissipates part of the protection rents to workers who are not represented by lobbies.

In conclusion, this paper presents a very general theoretical framework to test the increasingly popular protection for sale model for economies with labor market rigidities. A practical test implementation will require information not only on who lobbies and on import demand elasticities, but also on wage and employment elasticities by industry and sector. Carrying out such an empirical test is beyond the scope of this paper and is left for future research.

Appendix A. Proofs

Proof of Lemma 3.1. Let $g_j \in \{U_j, K_j\}$ denote a lobby group in industry j. From Grossman and Helpman (1994), we know that the equilibrium tariff for any industry i fulfills the following conditions: (i) It maximizes the governmental welfare function

$$\sum_{g_j \in \Omega} C_{g_j} + a \left[\sum_{j=1}^{n} t_j M_j(p_j) + \sum_{j=0}^{n} p_j F^j + (L + \sum_{j=1}^{n} K_j) \sum_{j=1}^{n} V_j(p_j) \right].$$

This implies the FOC (after multiplying by $(\ell - 1)$, where ℓ is the number of lobbies)

$$(\ell - 1) \sum_{g_j \in \Omega} \frac{\partial C_{g_j}}{\partial p_i} + (\ell - 1)\, a E_i^G - (\ell - 1)\, a F^i + (\ell - 1)\, a t_i M_i^{'} = 0, \tag{A.1}$$

where E_i^G denotes the sum of changes in the value of domestic production caused by a tariff on good i. (ii) For all $g_k \in \Omega$, the equilibrium tariff also maximizes the sum of lobby g_k's and the government's welfare

$$\sum_{g_j \in \Omega, g_j \neq g_k} C_{g_j} + a \left[\sum_{j=1}^{n} t_j M_j(p_j) + \sum_{j=0}^{n} p_j F^j + (L + \sum_{j=1}^{n} K_j) \sum_{j=1}^{n} V_j(p_j) \right] + W_{g_k},$$

where W_{g_k} denotes lobby g_k's welfare before the contribution is subtracted. This implies the FOC

$$\sum_{g_j \in \Omega, g_j \neq g_k} \frac{\partial C_{g_j}}{\partial p_i} = -\left(a + \theta_{g_k}\right) t_i M_i^{'} + \left(a + \theta_{g_k}\right) F^i - a E_i^G - E_i^{g_k}.$$

Summing over the g_k, we obtain

$$(\ell - 1) \sum_{g_j \in \Omega} \frac{\partial C_{g_j}}{\partial p_i} = -(\ell a + \sum_{g_j \in \Omega} \theta_{g_j}) t_i M_i^{'} + (\ell a + \sum_{g_j \in \Omega} \theta_{g_j}) F^i - \ell a E_i^G - \sum_{g_j \in \Omega} E_i^{g_j}. \tag{A.2}$$

Substituting (A.2) into (A.1) and solving for t_i^* yields (3.1). To verify (3.2), note that the unilateral tariff that lobby g_j would want to impose on industry i is determined by

$\theta_{g_j} t_i M_i' - \theta_{g_j} F^i + E_i^{g_j} = 0$, which yields $t_i^{g_j} = [F^i - E_i^{g_j}/\theta_{g_j}]/M_i'$. The structural form of $E_i^{g_j}$ is the same as in the previous equation, except that it is here a function of $t_i^{g_j}$ instead of t_i^*. It is possible to substitute from this equation for $E_i^{g_j}$ if we keep in mind that then $t_i^{g_j}$ will be a function of the equilibrium tariff t_i^* and as such, in general, does no longer solve the original maximization problem of population group g_j. The desired result follows. $\square$

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Department of Economics, University of Connecticut, Storrs, CT-06269, USA.

E-mail address: xenia.matschke@uconn.edu

URL: http://web.uconn.edu/matschke