

JOBS, JOBS, JOBS: A “NEW” PERSPECTIVE ON PROTECTIONISM

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Abstract

This paper analyzes the determinants of protectionism in a small open economy with search frictions. In this environment, jobs generate rents whose access depends on the level of trade protection. By raising the domestic price of a good, a government may attract more firms in a particular industry. This raises the probability that workers will find jobs in this sector, and in turn, will benefit from the associated rents. Though simple, this channel may help explain a variety of stylized facts on the structure of trade protection and individual trade-policy preferences. (JEL: F130, F160)

1. Introduction

One very robust finding of the empirical literature on trade protection is the positive impact of unemployment on the level of trade barriers. The same pattern can be observed across industries, among countries, and over time; see, for example, Trefler (1993), Mansfield and Busch (1995), and Bohara and Kaempfer (1991), respectively. These findings are echoed by recent empirical studies of individual trade-policy preferences emphasizing the prevalence of labor market concerns; see, for example, Scheve and Slaughter (2004).

Motivated by the previous evidence, we develop a simple theory of endogenous trade protection with search frictions and relate it to various stylized facts on protectionism across countries, industries, and individuals. In particular, we show that the introduction of search frictions may offer a strong rationalization of the positive correlation between unemployment and trade protection. In our model, any parameter which increases (respectively, decreases) unemployment also increases (respectively, decreases) the equilibrium trade tax. The

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same logic may also help explain why trade barriers tend to be higher in all low-productivity industries—in contrast to the Grossman and Helpman (1994) predictions—and why both high- and low-skilled workers tend to be less protectionist in more developed countries—in contrast to the Heckscher–Ohlin predictions.

We start with a small open economy with multiple sectors, each of them subject to search frictions à la Pissarides (2000). There is a continuum of workers, each endowed with one unit of sector-specific human capital,¹ and a continuum of firms, each free to choose the sector in which they want to post a vacancy. Workers and firms come together randomly. Once a worker and a firm are matched, wages are determined by Nash bargaining. In equilibrium, jobs generate rents whose magnitude—the *intensive margin*—may depend on the level of trade protection. This is reminiscent of the impact of trade taxes on the price of sector-specific factors in the Ricardo–Viner model. The distinct feature of our model, on which the rest of our analysis focuses, is that trade protection may also affect the access to those rents—the *extensive margin*. By raising the domestic price of a good, a government may attract more firms in a particular industry. This raises the probability that workers will find jobs in this sector, and in turn, will benefit from the associated rents.

The first part of our paper investigates how the extensive margin of trade protection may affect the structure of trade protection. We assume that governments aim to maximize aggregate social welfare, but restrict the set of available policy instruments to specific trade taxes. We view this assumption as a natural and tractable benchmark. We do not deny the existence of political–economy motives in practice, but note that they are not necessary for our argument. In our model, the chance of a worker to find a job in a given industry depends on the total number of vacant firms and unemployed workers present in this industry, which creates trading externalities. There is a priori no reason why wages, determined by Nash bargaining, would internalize these externalities. As a result, a government may increase social welfare by imposing a small trade tax or subsidy.²

Of course, we do not aim to suggest that trade protection should be used to correct this distortion. Bhagwati's (1971) classical argument applies to our environment. Here, trade policies are at most a second-best policy and the optimal policy intervention should involve a tax-cum-subsidy addressed directly to offsetting the source of the distortion. In this paper, we adopt a purely positive

1. See, for example, Neal (1995) and Parent (2000) for evidence pointing to the importance of sector-specific human capital in practice.

2. See Davidson, Martin, & Matusz (1994) for a general discussion of the possibility for Pareto improvements in dynamic models of unemployment.

perspective. Conditional on trade taxes being the only policy instruments available,³ we investigate how variations in the magnitude of search frictions affect protectionist incentives across countries and industries.

Our main findings regarding the structure of trade protection can be summarized as follows. In a cross-section of industries, parameters which are positively correlated with unemployment—workers’ bargaining power, sector size, and turnover rate—should also be positively correlated with trade taxes. The converse is true for parameters which are negatively correlated with unemployment—world price and workers’ productivity. These predictions accord well with various empirical studies reviewed by Rodrik (1995). For example, our finding regarding workers’ productivity is consistent with the observation that trade barriers tend to be higher in labor-intensive, low-skill, low-wage industries. It may also help explain why protection is higher in periods of recession and in poor countries.

Intuitively, an increase in the probability of finding jobs creates more jobs if the pool of unemployed workers is initially large. This explains why the marginal benefits from raising trade taxes are higher in sectors with more unemployment, and in turn, why their trade taxes are higher in equilibrium. Although the intuition behind our predictions is simple, they stand in sharp contrast to those of standard trade models. In the Grossman and Helpman (1994) model, which has become the workhorse of the profession, the level of trade barriers for organized sectors increases with the level of domestic output. Alternative political economy approaches based on the Ricardo–Viner model, for example, Findlay and Wellisz (1982) and Hillman (1982), lead to the same prediction. By focusing on the extensive rather than the intensive margin of trade protection, our theory is able to generate the opposite result.

The second part of our paper analyzes how the extensive margin of trade protection may affect individual trade-policy preferences. To this end, we extend our model by allowing workers to vary by skills. We assume that skills depend on the level and specificity of workers’ human capital, that they are perfectly observable by firms, and that firms may only search for one type of workers. Because high-skilled workers generate larger amounts of output, a larger number of firms search for them, which increases their chances of finding jobs. We then consider a hypothetical episode of trade liberalization where trade taxes are uniformly decreased across sectors. Whether or not an individual should favor this policy change depends on the trade-off between the benefits from freer trade—higher consumer surplus net of changes in trade revenues—and the associated costs—destruction of existing jobs and difficulty of finding new jobs once unemployed.

3. Although this is admittedly an ad hoc assumption, this is not an unusual one. As Rodrik (1995, p. 1476) already put it a decade ago: “A sufficiently general and convincing explanation for this phenomenon [the use of trade policy over more efficient instruments] has yet to be formulated.” Offering this explanation is beyond the scope of the present paper.

Our model predicts that workers with less general human capital are more likely to be protectionist, as in the Ricardo–Viner model, but more so in comparative disadvantage industries. In addition, our model predicts that if workers mostly care about their current incomes, then less productive workers are more likely to be protectionist. In this situation, the main determinant of workers’ trade-policy preferences is the probability of losing their jobs. Hence, less productive workers—who are more likely to become unemployed—also are more likely to be protectionist. This prediction, in contrast to those of the Heckscher–Ohlin model, may help explain why (i) low-skilled workers tend to be more protectionist than high-skilled workers, irrespective of their countries of origin; and why (ii) workers in less developed countries tend to be more protectionist, irrespective of their skill level (see, e.g., Beaulieu, Benarroch, and Gaisford 2001; O’Rourke and Sinott 2001; Scheve and Slaughter 2004; Mayda and Rodrik 2005).

The rest of the paper is organized as follows. Section 2 discusses the relationship between our paper and the previous literature. Section 3 describes our model. Section 4 and 5 analyze the structure of trade protection and individual trade-policy preferences. Section 6 offers some concluding remarks. All proofs can be found in Appendix A.

2. Relation to the Previous Literature

Our paper contributes to two branches of the trade policy literature.

The structure of trade protection. Although there is a large *normative* literature analyzing the impact of various market imperfections on the optimal trade policy—from Bhagwati (1971) to Helpman and Krugman (1989)—the *positive* literature has, for the most part, focused on the “political” incentives of governments in a perfectly competitive environment; see Helpman (1998) for an overview. The first contribution of our paper derives from a simple observation: There is a priori no reason why the “economic” incentives emphasized by the normative literature shall have no effect on the variations of trade policies across countries and industries in practice. Our paper carefully analyzes how search frictions may affect governments’ incentives and shows that, even in the absence of political-economy considerations, they may help explain a variety of stylized facts regarding the structure of trade protection.

Among previous political-economy papers, Bradford (2006) and Matschke and Sherlund (2006) are most closely related to ours. Both papers introduce labor market imperfections into standard political-economy models. Like us, Bradford starts from a Pissarides (2000) model which he combines with a polity where governments maximize votes. The theoretical model then motivates an empirical analysis that aims to uncover the impact of unionization and turnover rates on

the structure of trade protection. Unlike our paper, Bradford does not offer clear theoretical predictions relating the exogenous parameters of the Pissarides model to the equilibrium trade taxes.

Matschke and Sherlund (2006) emphasize labor market considerations by introducing trade-union lobbying in the Grossman and Helpman (1994) model. Their model predicts that the level of trade protection should be higher if the trade union lobbies, but capital owners do not; and conversely, that the level of trade protection should be lower if capital owners lobby, but the trade union does not. Compared to our paper, their main focus remains on political incentives. In particular, the authors do not try to relate in a systematic manner the level of trade protection to the magnitude of labor market imperfections.

Finally, our results on productivity and trade protection are related to recent work by Baldwin and Robert-Nicoud (2007). Using a dynamic version of the Grossman and Helpman (1994) model, the authors provide an intuitive explanation for the “loser’s paradox.” In expanding industries, policy-created rents attract new entry that erodes the rents. By contrast, sunk market-entry costs protect these rents in declining industries. As a result, firms in the latter industries lobby harder, which explains why a *decrease* in productivity leads to more protection. Though our model shares the same focus on economic rents, it provides an alternative explanation of the “loser’s paradox” based on labor market imperfections. In our model, *low* productivity leads to more protection because it increases the unemployment rate, which makes the number of jobs more responsive to changes in trade taxes.⁴

Individual trade-policy preferences. The second contribution of our paper is to show that search frictions may also shed a new light on the determinants of individual trade-policy preferences. The previous literature on this topic is mainly empirical (see, e.g., Magee 1980; Rogowski 1987; Beaulieu, Benarroch, and Gaisford 2001; O’Rourke and Sinott 2001; Scheve and Slaughter 2001, 2004; Mayda and Rodrik 2005; Magee, Davidson, and Matusz 2005). The typical paper compares the attitudes toward free trade of different groups of individuals: If preferences tend to vary by industry, then the authors conclude in favor of the Ricardo–Viner model; if they tend to vary by other individual characteristics, capital versus labor or skilled versus unskilled, then the authors conclude in favor of the $2 \times 2 \times 2$ Heckscher–Ohlin model. Although this is definitely a valuable exercise, the “Ricardo–Viner versus Heckscher–Ohlin” dichotomy does not speak to one salient feature of the survey data: the prevalence of labor market concerns. In order to address this issue, one needs a theoretical framework without full employment. By introducing search frictions, we are able to rationalize these

4. Bagwell and Staiger (2003) offer an alternative theory of the countercyclical nature of trade protection based on the role of self-enforcement in trade agreements.

concerns and, more importantly, to offer a simple and intuitive explanation for the relationship between human capital and protectionist attitudes observed in the data.

From a theoretical standpoint, our analysis is closely related to Davidson, Martin, and Matusz (1999) who consider an economy with search frictions and two factors, capital and labor.⁵ They demonstrate how the turnover rate of an industry may affect preferences toward trade liberalization across factors of production. In sectors where turnover is large, their model predicts that capital-owners and workers should have opposite preferences, as in the Heckscher–Ohlin model; whereas in sectors where turnover is low, they should have similar preferences, as in the Ricardo–Viner model. Unlike our paper, the “Ricardo–Viner versus Hecksche–Ohlin” dichotomy is still at the heart of their analysis. In particular, they do not investigate the relationship between human capital and protectionism, which is our main focus.

3. The Model

We consider a small open economy with $i = 0, \dots, n$ sectors, each of them subject to search frictions à la Pissarides (2000).

3.1. Workers

There is a mass 1 of workers. Each worker is endowed with 1 unit of sector-specific human capital, which is the only factor of production.⁶ We denote by l_i the proportion of workers with human capital specific to sector i . Each worker is in one of two states, employed or unemployed, and aims to maximize her expected lifetime utility

$$E \left[\sum_{t=0}^{+\infty} \delta^t u(\mathbf{c}^t) \right],$$

where δ is the common discount factor, $\mathbf{c}^t = (c_0^t, \dots, c_n^t)$ is the vector of consumptions at time t , and $u(\mathbf{c}^t) = c_0^t + \sum_{i=1}^n \varphi_i(c_i^t)$ is a quasilinear utility function. We assume that the sub-utility functions $\varphi_i(\cdot)$ satisfy standard regularity conditions: $\varphi_i' > 0$ and $\varphi_i'' < 0$. Good 0 is used as the numéraire good with world and

5. Our paper is also related, though less closely, to recent models analyzing the labor market impact of exogenous episodes of trade liberalization in environments with costly mobility (see, e.g., Chaudhuri and McLaren 2007), or firm heterogeneity (see, e.g., Davis and Harrigan 2007; Egger and Kreickemeier 2006; Helpman and Itskhoki 2007; Janiak 2006).

6. One could extend our model to include physical capital; see Pissarides (2000), Section 1.6. As long as there are constant returns to scale and a perfect second-hand market for capital goods, this extension would leave our results unchanged.

domestic price equal to one. We call p_i^* the exogenous world price of good i , and p_i its domestic price.⁷ The demand for good i is denoted by $d_i(p_i) \equiv (\varphi'_i)^{-1}(p_i)$. In turn, the indirect utility of a worker is given by

$$E \left[\sum_{t=0}^{+\infty} \delta^t [x^t + s(\mathbf{p})] \right],$$

where x^t is the worker’s income at date t , $\mathbf{p} = (p_1, \dots, p_n)$ is the vector of domestic prices, and $s(\mathbf{p}) = \sum_{i=1}^n \varphi_i[d_i(p_i)] - \sum_{i=1}^n p_i d_i(p_i)$ is the surplus derived from the consumption of these goods. We assume that $x^t = w_i + \tau + \omega$ if the worker is employed in sector i at date t , and $x^t = \tau + \omega$ if she is unemployed. w_i corresponds to the wages paid by firms in sector i ; $\tau + \omega$ corresponds to the income that each worker, employed or not, derives from government transfers τ and firms’ dividends ω .

3.2. Firms

There is a large mass of firms with access to the same constant return to scale technology. Each firm can employ at most 1 worker⁸ and is in one of three states: inactive, unfilled vacancy, and filled job. In any period, a firm with a filled job in sector i generates revenues equal to $p_i a_i$. We refer to a_i as workers’ productivity in sector i . A firm with an unfilled vacancy does not generate any revenues and must pay a recruiting cost k per period.⁹ An inactive firm obtains a pay-off of zero. Each firm chooses in which industry to post a vacancy (if any) in order to maximize its expected discounted profits

$$E \left[\sum_{t=0}^{+\infty} \delta^t (\pi^t - k n^t) \right],$$

where π^t are the firm’s net revenues at date t and $n^t \in \{0, 1\}$ is the number of its unfilled vacancies. By definition, $\pi^t = p_i a_i - w_i$ if the firm employs a worker in sector i , and zero otherwise.

7. Because of quasilinear preferences, specific factors, and exogenous world prices, there are no general equilibrium effects in our model. This guarantees the separability of the government’s maximization program. In our model, as in Grossman and Helpman (1994) and many others in the trade policy literature, the equilibrium levels of trade protection will be independent across sectors; see equation (14).

8. Under constant returns to scale, this assumption is without any loss of generality.

9. It is worth emphasizing that k does not vary by industry. In particular, recruiting costs are not proportional to revenues, $p_i a_i$. This is an important feature of the model. If recruiting costs were always proportional to $p_i a_i$, then trade policy and productivity would have no effect on sectoral unemployment; see equation (8).

3.3. Labor Market

Firms and workers come together randomly. At the beginning of each period, the number of matches taking place is given by

$$m(l_i v_i, l_i u_i) = \min\{l_i v_i, l_i u_i\},$$

where v_i and u_i are the vacancy and unemployment rates in sector i , respectively. Throughout this paper, we assume that $v_i < u_i$ for all i .¹⁰ Hence, firms with unfilled vacancies find workers with probability one, and unemployed workers “wait at the gate” and find jobs with probability $\theta_i = v_i/u_i$. We further discuss this assumption and its implications in the next section. When a firm and a worker are matched, wages are determined by Nash bargaining

$$w_i = \arg \max (W_i - U_i)^{\beta_i} (J_i - V_i)^{1-\beta_i},$$

where U_i and W_i are the expected lifetime utility of, respectively, an unemployed and an employed worker in sector i ; V_i and J_i are the expected discounted profits of, respectively, a firm with an unfilled vacancy and a filled job; and $\beta_i \in (0, 1)$ is workers’ bargaining power in sector i . Finally, we assume that existing jobs are randomly destroyed following a Poisson process. At the beginning of each period, workers may move from employment to unemployment with probability λ_i to which we refer as the turnover rate in sector i .¹¹

3.4. Steady-State Equilibrium

We focus on the steady-state equilibrium of this economy.¹² For each industry, this equilibrium includes the four value functions (U_i, W_i, V_i, J_i) , the wage w_i , the unemployment rate u_i , and the vacancy rate v_i . The expected lifetime utilities of unemployed and employed workers satisfy the following Bellman equations:

$$U_i = \tau + \omega + s(\mathbf{p}) + \delta[\theta_i W_i + (1 - \theta_i)U_i], \quad (1)$$

$$W_i = w_i + \tau + \omega + s(\mathbf{p}) + \delta[\lambda_i U_i + (1 - \lambda_i)W_i]. \quad (2)$$

10. We provide sufficient conditions such that this inequality is satisfied in Section 4.

11. Because job creation and job destruction occur simultaneously, unemployment rates before and after matching takes place are equal in a steady-state equilibrium.

12. The obvious benefit of this approach is its tractability; its cost is that it does not allow us to disentangle the short-term from the long-term effects of trade liberalization on unemployment (see, e.g., Treffer 2004). Because we are mostly interested in cross-industry and cross-country evidence, we believe that the benefit outweighs the cost. Focusing on the steady state equilibrium is admittedly more problematic when we discuss evidence related to trade protection over time (see Bohara and Kaempfer 1991).

In each period, unemployed workers receive utility $\tau + \omega + s(\mathbf{p})$ and become employed with probability θ_i , whereas employed workers receive utility $w_i + \tau + \omega + s(\mathbf{p})$ and become unemployed with probability λ_i . Similarly, the expected discounted profits of firms with unfilled vacancies and filled jobs are given by

$$V_i = -k + \delta J_i, \tag{3}$$

$$J_i = \pi_i + \delta[\lambda_i V_i + (1 - \lambda_i)J_i]. \tag{4}$$

Firms with vacancies pay recruiting costs equal to k and find workers with probability one. Meanwhile, firms with filled jobs receive profits π_i and have to search for new workers with probability λ_i next period. Because of Nash bargaining, we have

$$W_i - U_i = \beta_i \Omega_i, \tag{5}$$

where $\Omega_i = W_i + J_i - U_i - V_i$ is the total surplus generated by a job. Free entry of firms implies

$$V_i = 0. \tag{6}$$

Finally, the sectoral unemployment rate in the steady-state satisfies

$$u_i = \frac{\lambda_i}{\lambda_i + \theta_i}. \tag{7}$$

We have a system of seven equations with seven unknowns. We can directly solve for the equilibrium values of Ω_i and θ_i . This leads to

$$\theta_i = \frac{p_i a_i (1 - \beta_i) - k \tilde{\lambda}_i}{k \beta_i}, \tag{8}$$

$$\Omega_i = \frac{k}{\delta(1 - \beta_i)}, \tag{9}$$

where $\tilde{\lambda}_i = 1/\delta - 1 + \lambda_i$. Equations (8) and (9) completely characterize the steady-state equilibrium; $U_i, W_i, V_i, J_i, w_i, u_i$, and v_i can be computed by simple substitutions.

From equation (8), we see that the domestic price of good i affects the tightness of the labor market in industry i . As p_i goes up, more firms enter,¹³ which raises the probability θ_i that workers find jobs in sector i , and in turn, increases total employment in that industry.¹⁴ This is what we call the *exten-*

13. We refer to “firm entry” as the source of new jobs, but it should be clear that we do not necessarily mean the creation of new legal entities or plants in practice. “Firm entry” in the model refers to new vacancies being posted; whether or not these vacancies are actually posted by new or existing firms is irrelevant for our purposes.

14. The formal mechanism through which p_i increases θ_i is slightly more subtle. Because of free entry, the value of a vacant firm must be zero. Because firms find workers with probability one, the value of a firm with a filled job is in turn determined by recruiting costs alone. Hence, any increase in p_i must be offset by an equal increase in w_i , which can only be consistent with Nash bargaining if θ_i —and hence workers’ outside option—goes up.

sive margin of trade protection. Equation (8) also implies that θ_i increases with workers' productivity, a_i , and decreases with workers' bargaining power, β_i , and the turnover rate, λ_i . Although the exact functional form clearly depends on our particular matching function, it is worth emphasizing that these qualitative insights do not. With any other matching function with constant returns to scale, the monotonicity of θ_i with respect to p_i , a_i , β_i , and λ_i would be the same.

By contrast, our predictions on Ω_i are very specific to the Leontief matching function. According to equation (9), the domestic price of good i has no effect on the surplus generated by a job in sector i . With any other matching function with constant returns to scale, this would not be true. Generically, trade protection raises the magnitude of the rents of the factors employed in a given industry. Assuming that workers wait at the gate shuts down the *intensive margin* of trade protection.

The Leontief matching function is admittedly a strong assumption. We view it as a useful expositional device that allows us to focus on a channel largely ignored by the previous literature: the extensive margin of trade protection. Because of our Leontief matching function, trade policy can affect the number of jobs in a given industry, but it cannot affect the rents associated with these jobs, as in a standard Ricardo–Viner model. This stark feature of our model admittedly narrows the scope of our analysis, but leads to a clear and intuitive picture of what we believe is a new and robust determinant of trade protection in an open economy with search frictions: the ability to create new jobs (or save old ones). Of course, the Leontief matching function presents another advantage. Unlike general matching functions, it provides closed form solutions for the steady-state equilibrium, which greatly improves the tractability of the model.

4. The Structure of Trade Protection

The previous section describes the equilibrium of the economy, taking domestic prices as given. We now analyze how the government's trade taxes endogenously determine these prices.

4.1. The Government's Maximization Program

We restrict the set of policy instruments available to the government to specific trade taxes: $t_i = p_i - p_i^*$ for $i = 1, \dots, n$. If good i is imported, t_i represents a specific import tariff; if good i is exported, it represents an export subsidy. Throughout this paper, we assume that the government may only choose t_i in $[\underline{t}, \bar{t}]$ such that

$$\max_{i=0, \dots, n} \left\{ \frac{k\tilde{\lambda}_i}{a_i(1 - \beta_i)} - p_i^* \right\} \leq \underline{t} < 0 < \bar{t} \leq \min_{i=0, \dots, n} \left\{ \frac{k(\tilde{\lambda}_i + \beta_i)}{a_i(1 - \beta_i)} - p_i^* \right\}.$$

This series of inequalities guarantees that θ_i is between 0 and 1 in all sectors $i = 0, \dots, n$. We further assume that the government chooses trade taxes in order to maximize aggregate social welfare

$$G = \sum_{i=0}^n G_i, \tag{10}$$

where $G_i = l_i u_i U_i + l_i(1 - u_i)W_i$ is the welfare associated with the workers of sector i . Because all trade revenues are redistributed uniformly to workers, the net lump-sum transfer to each worker is given by

$$\tau = \sum_{i=1}^n t_i m_i(p_i), \tag{11}$$

where $m_i(p_i) = d_i(p_i) - y_i(p_i)$ and $y_i(p_i) = l_i(1 - u_i)a_i$ are the net imports and domestic output of good i . The lifetime income that each worker derives from firms’ dividends is given by

$$\frac{\omega}{1 - \delta} = \sum_{i=0}^n [l_i u_i V_i + (1 - u_i)l_i J_i]. \tag{12}$$

Using equations (1), (5), (6), (10), and (12), and the definition of Ω_i , we can rearrange the government’s objective function as

$$G = \frac{\tau + s(\mathbf{p})}{1 - \delta} + \sum_{i=0}^n \frac{l_i}{1 - \delta} \left(p_i a_i - \frac{k\tilde{\lambda}_i}{1 - \beta_i} \right) + \sum_{i=0}^n l_i \Omega_i (1 - u_i). \tag{13}$$

4.2. Equilibrium Policies

Let us consider a marginal increase in the trade tax of sector $i = 1, \dots, n$. By differentiating equation (13) with respect to t_i , we obtain

$$\frac{\partial G}{\partial t_i} = \left(\frac{1}{1 - \delta} \right) \left(\frac{\partial \tau}{\partial t_i} + \frac{\partial s}{\partial t_i} \right) + \frac{l_i a_i}{1 - \delta} - l_i \Omega_i \frac{\partial u_i}{\partial t_i}. \tag{14}$$

The first two terms are fairly standard. $\partial \tau / \partial t_i = t_i m'_i(p_i) + m_i(p_i)$ and $\partial s / \partial t_i = -d_i(p_i)$ correspond to the marginal changes in trade revenues and consumer surplus, respectively. It is easy to check that $\partial \tau / \partial t_i + \partial s / \partial t_i = t_i m'_i(p_i) -$

$y_i(p_i) < 0$. In other words, increasing trade taxes always reduces the sum of trade revenues and consumer surplus. The second term, $l_i a_i$, captures the marginal increase in total wages in sector i .

The most novel feature of the model is the third term, $-l_i \Omega_i (\partial u_i / \partial t_i)$. In an economy without search frictions, Ω_i would be equal to zero, $l_i a_i$ would be equal to total output in sector i , and free trade would always be optimal: $\partial G / \partial t_i = t_i m'_i(p_i) < 0$. In an economy with search frictions, however, imposing trade taxes has one extra benefit: creating jobs in the targeted industry. By raising the level of trade protection in sector i , a government may reduce unemployment,

$$\partial u_i / \partial t_i = -[\lambda_i / (\lambda_i + \theta_i)^2] (\partial \theta_i / \partial t_i) < 0,$$

and in turn increase workers' expected income. Lemma 1 formally describes the determinants of trade policies in our model.

LEMMA 1. *Suppose that $\phi_i''' \leq 0$ and $k(1/\delta - 1)/a_i(1 - \beta_i) > \bar{t}$ for all $i = 1, \dots, n$. Then there exists a unique vector of equilibrium policies (t_1^0, \dots, t_n^0) such that, if t_i^0 is interior ($\underline{t} < t_i^0 < \bar{t}$), then it is a unique solution to*

$$\underbrace{\frac{a_i l_i \lambda_i}{\lambda_i + \theta_i} + \frac{a_i l_i \lambda_i}{(\lambda_i + \theta_i)^2 \beta_i} \left[\frac{1}{\delta} - 1 - \frac{a_i t_i (1 - \beta_i)}{k} \right]}_{MB(t_i)} = \underbrace{-t_i d'_i(p_i^* + t_i)}_{MC(t_i)}. \quad (15)$$

The two inequalities, $\phi_i''' \leq 0$ and $k(1/\delta - 1)/a_i(1 - \beta_i) > \bar{t}$, are sufficient to derive the strict concavity of $G(\cdot)$ with respect to t_i . The first one implies that the right-hand side—the marginal cost $MC(t_i)$ associated with distorting demand—is increasing in t_i . The second one implies that $1/\delta - 1 - a_i t_i (1 - \beta_i)/k > 0$,¹⁵ and so that the left-hand side—the marginal benefit $MB(t_i)$ associated with improving labor market conditions—is decreasing in t_i .

In the rest of this paper, we restrict ourselves to interior equilibria and assume that the two previous inequalities hold in every industry. Hence, the equilibrium policy in sector i can be described as in Figure 1. Note that our theory always predicts import tariffs or export subsidies. Because $d'_i < 0$, equation (15) implies $t_i^0 > 0$ for all $i = 1, \dots, n$. This result derives from the particular nature of the labor market imperfections in our economy. Whereas unemployed workers exert negative search externalities on other unemployed workers, vacant firms do not exert any externality on other vacant firms (they always find workers with probability one). Therefore, the unemployment rate is too high and a small import tariff or export subsidy that raises the level of employment also raises social welfare.

15. Economically speaking, this inequality guarantees that the positive rent effect, $-l_i \Omega_i (\partial u_i / \partial t_i)$, outweighs the negative trade revenues effect, $-t_i y'_i(p_i^* + t_i)/(1 - \delta)$.

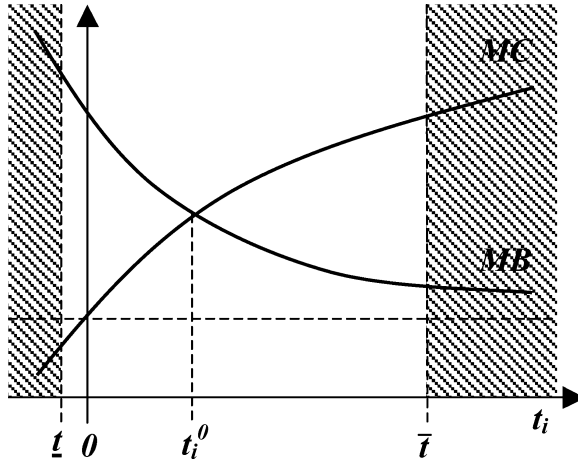


FIGURE 1. Equilibrium policy.

This feature of our model shall *not* be interpreted as a normative case in favor of trade protection. First, different matching functions may lead to different predictions on the overall level of trade protection: $t_i^o > 0$ is a direct consequence of our Leontief matching function. Second, trade taxes in this environment are at most a second-best policy. For example, output subsidies at the rate t_i^o would achieve the same level of employment in sector i without distorting consumers’ behavior (see Helpman and Krugman 1989, pp. 20–22). Our focus in this paper is purely positive. Conditional on trade taxes being the only policy instruments available, we simply want to ask when, according to our theory, governments shall have “bigger” incentives to impose trade taxes; use this insight to derive predictions on the cross-sectional variations of trade protection; and finally, relate these predictions to available empirical evidence.

4.3. Comparative Statics

We now use equation (15) to analyze the impact of five exogenous parameters of the model, $z_i \in \{a_i, \beta_i, l_i, \lambda_i, p_i^*\}$, on the equilibrium policy t_i^o . Proposition 1 presents the main findings of our paper on the structure of trade protection.

PROPOSITION 1. *Ceteris paribus, equilibrium trade taxes t_i^o are higher if*

- (i) *output per worker a_i is low;*
- (ii) *workers’ bargaining power β_i is high;*
- (iii) *sector size l_i is high;*
- (iv) *the world price p_i^* is low; or*
- (v) *job turnover λ_i is high.*

Proposition 1 crucially relies on one key feature of our model: the absence of the intensive margin of trade protection. In the standard Ricardo–Viner model, factors are fully employed and trade taxes can only affect their rents. In our model, it is the contrary: Factors are not fully employed and trade taxes can only affect the level of employment.

To understand the role of the extensive margin of trade protection, it is useful to decompose the impact of our five exogenous parameters on the marginal benefit of a trade tax, MB , into a direct effect and an indirect effect on sectoral unemployment

$$\frac{dMB}{dz_i} = \frac{\partial MB}{\partial z_i} + \frac{\partial MB}{\partial l_i u_i} \frac{\partial l_i u_i}{\partial z_i}.$$

Let us first focus on the indirect effect. By equations (7) and (15), we have

$$\frac{\partial MB}{\partial l_i u_i} = a_i + \frac{2u_i a_i}{\beta_i \lambda_i} \left(\frac{1}{\delta} - 1 - \frac{a_i t_i^0 (1 - \beta_i)}{k} \right) > 0. \quad (16)$$

Inequality (16) states that the marginal benefits from raising trade taxes tend to be higher in sectors with more unemployment. The reason is twofold and does not depend on our functional form assumptions. First, there is a mechanical tax-base effect. Holding demand constant, a higher unemployment rate increases the level of imports, which raises the marginal change in tariff revenues. Second, there is a more subtle job creation effect. In a steady-state equilibrium, a given increase in the probability of finding jobs, θ_i , always has a bigger effect on the level of employment—and so, on the number of workers benefiting from rents—if the total number of unemployed workers is initially large. Intuitively, more job creation, $\theta_i l_i u_i$, must be compensated by more job destruction, $\lambda_i l_i (1 - u_i)$, which requires a higher level of employment.¹⁶

According to inequality (16), factors raising sectoral unemployment, $\partial l_i u_i / \partial z_i > 0$, should tend to increase the marginal benefit of a trade tax, $(\partial MB / \partial l_i u_i)(\partial l_i u_i / \partial z_i) > 0$, while the opposite should be true for factors lowering it. Using equations (7) and (8), we can compute the signs of $\partial l_i u_i / \partial z_i$ for $z_i \in \{a_i, \beta_i, l_i, \lambda_i, p_i^*\}$. We find that sectoral unemployment increases with workers' bargaining power, sector size, and the turnover rate, whereas it decreases with output per worker and the world price.¹⁷ Because higher marginal benefits call for higher trade taxes in equilibrium, the previous mechanism suggests a positive

16. Formally, u_i is a convex function of θ_i ; see equation (7).

17. These are fairly intuitive predictions: an increase in a_i or p_i^* raises profits, which leads to more entry and a decrease in unemployment; an increase in β_i raises wages, lowers profits, and increases unemployment; an increase in λ_i implies more job destruction, so unemployment must increase for job creation to catch up; finally, an increase in l_i mechanically increases sectoral unemployment. As mentioned in section 3.4, these predictions are robust to changes in the matching function.

correlation between t_i^o and β_i , l_i , and λ_i ; and a negative correlation between t_i^o and a_i and p_i^* . This is exactly what Proposition 1 predicts.

What about the direct effect, $\partial MB/\partial z_i$? For $z_i \in \{l_i, p_i^*\}$, the situation is simple, $\partial MB/\partial z_i = 0$; for $z_i \in \{a_i, \beta_i, \lambda_i\}$, unfortunately, it is more complex. For example, we have $\partial MB/\partial \lambda_i < 0$, which goes in the opposite direction as the indirect effect, $\partial l_i u_i/\partial \lambda_i > 0$.¹⁸ For those factors, the fact that the indirect effect always dominates is naturally influenced by our functional form assumptions. Notwithstanding, our analysis demonstrates that the introduction of search frictions à la Pissarides (2000) can provide a strong rationalization of the stylized facts offered in the introduction. In a simple version of the Pissarides model—where only the extensive margin of trade protection is active—any parameter which increases (respectively, decreases) unemployment also increases (respectively, decreases) the equilibrium trade tax. Hence, large low-skill industries which are heavily unionized and face tough competition from abroad accumulate reasons to receive more protection.

A few comments are in order. First, Proposition 1 shows that search frictions can offer a strong rationalization of the positive correlation between trade protection and unemployment, not that they necessarily do. Although the extensive margin of trade protection would remain active in more general environments, the introduction of an intensive margin under different matching functions may blur the sharpness of our predictions. To see this, note that an extra term, $l_i(1 - u_i)(\partial \Omega_i/\partial t_i)$, would appear in equation (14). Accordingly, the marginal benefit from increasing rents would be higher in sectors where the number of jobs, $l_i(1 - u_i)$, is high. This effect, which is reminiscent of the impact of trade taxes on the price of sector-specific factors in the Ricardo–Viner model, would go against the main mechanism in our model.

Second, it is worth pointing out that Proposition 1 does not rely on the existence of tariffs revenues.¹⁹ Without tariffs revenues, equation (15) would become

$$a_i l_i \lambda_i (1/\delta - 1)/(\lambda_i + \theta_i)^2 \beta_i = d_i (p_i^* + t_i^0).$$

Compared to the previous case, the marginal cost of trade protection would be equal to the decrease in consumer surplus, which would no longer be compensated by a change in revenues. Similarly, the marginal benefit of trade protection would no longer include the tax-base effect. Yet, the job creation effect—which is the main focus of our analysis—would still be present. As a result, the amount of trade protection would still be increasing in β_i , l_i , and λ_i , and decreasing in a_i and p_i^* .

18. In order to maintain the equality between job creation and job destruction after an increase in the probability of finding jobs, the level of employment needs to rise less if the turnover rate is high. This explains why the marginal benefit from increasing trade taxes decreases with the turnover rate.

19. I am grateful to an anonymous referee for bringing this to my attention.

Finally, we want to acknowledge that one could imagine alternative theories leading to similar insights regarding the relationship between unemployment and trade protection. Suppose, for example, that governments mostly care about the “poor.” Then, one should observe more protection in industries with more poor which, presumably, tend to have higher unemployment as well. However, we believe that our approach presents one crucial advantage over such theories: It recognizes the endogeneity of the unemployment rate. As equation (15) shows, most factors affecting the unemployment rate also have direct effects on the government’s objective function. In principle, the latter effects may overturn the positive relationship between unemployment and trade protection. To assess whether or not this is the case, one needs an explicit model of labor market imperfections which our paper provides.

4.4. A Raw Look at the Evidence

We conclude this section by discussing how the five predictions of Proposition 1 relate to available empirical evidence. Our goal is not to offer a formal test of a stylized model, but rather to assess whether the channel emphasized in our paper—the extensive margin of trade protection—appears to be consistent with existing “stylized facts” on the structure of protection. Whenever possible, our “stylized facts” are taken from the chapter by Rodrik (1995) in the *Handbook of International Economics*.²⁰

Prediction (i) states that, *ceteris paribus*, equilibrium trade taxes are higher if output per worker is low. This prediction accords well with a large body of empirical work. In line with our theory, trade protection tends to be higher in labor-intensive, low-skill, low-wage industry (see Caves 1976; Saunders 1980; Anderson 1980; Ray 1981; Marvel and Ray 1983; Baldwin 1985; Anderson and Baldwin 1987; Ray 1991; Finger and Harrison 1994). If we reinterpret the previous comparative statics exercise in terms of changes over time or across countries, prediction (i) also is consistent with the fact that trade protection tends to be higher in periods of recession (see Ray 1987; Hansen 1990; O’Halloran 1994) and in poor countries.²¹

20. While we believe that there is valuable information to be gained from such an exercise, it presents some obvious limitations. As mentioned in Rodrik (1995), many studies are not directly comparable: “they use different measures of protection, cover different countries and time periods, and include different sets of right-hand-side variables.” In particular, they may control for variables that are not indicated by our model, the most problematic of all being unemployment. In our model, the indirect impact of a_i , β_i , l_i , λ_i , and p_i^* on unemployment is key to derive Proposition 1.

21. Though we have no intention to delve into the empirical debate on country growth and openness to trade (see, e.g., Rodriguez and Rodrik 1999), our result highlights the potential importance of reverse causality when interpreting the evidence. In our model, when output per worker goes up, the government’s incentives to be protectionist go down.

Predictions (ii) and (iii) are consistent with the empirical findings of Matschke and Sherlund (2006) and Goldberg and Maggi (1999), respectively. After controlling for the Grossman and Helpman (1994) determinants of trade protection, these papers find that the unionization rates of industries as well as their size remain positively correlated with the level of their trade barriers. Similarly, prediction (iv) is consistent with the fact that trade protection tends to increase with the level of import-penetration in a given industry (see Anderson 1980; Finger and Harrison 1994).

To the best of our knowledge, Bradford (2006) is the only empirical study investigating the relationship between the cross-sectoral variations in job turnover and trade barriers. After controlling for unemployment, the author finds that higher turnover rates lead to lower trade protection. Although this is certainly not direct evidence in favor of prediction (v), this does not contradict it either. Since $\partial MB/\partial \lambda_i < 0$, our model indeed predicts that, holding unemployment constant, higher turnover rates should decrease the equilibrium trade taxes.²²

5. Individual Trade-Policy Preferences

In Sections 3 and 4, we described a small open economy with search frictions and characterized the structure of trade protection in this environment. We now investigate the impact of these frictions on individual trade-policy preferences. To this end, we extend our analysis by allowing workers’ human capital to vary in terms of both level and specificity.

5.1. Human Capital and Labor Market Outcomes

We index workers by $j \in [0, 1]$ and assume that workers are endowed with h^j units of human capital, out of which $(1 - \sigma^j)h^j$ are general and $\sigma^j h^j$ are sector-specific.²³ The parameters $h^j > 0$ and $1 \geq \sigma^j \geq 0$ measure the level and specificity of worker j ’s human capital, respectively. Section 3 corresponds to the case where $h^j = 1$ and $\sigma^j = 1$ for all $j \in [0, 1]$. We denote by $a_i^j = a_i h^j (1 - \sigma_i^j)$ the output per period of worker j when matched with a firm in

22. For the same reason, the fact that the United Kingdom has a higher job turnover and is less reluctant to trade than many continental European countries cannot be taken as evidence against prediction (v). According to our model, higher turnover rates only lead to more protection if they are associated with more unemployment. This is not the case for the United Kingdom.

23. We still ignore issues related to the existence of firm-specific human capital. To maintain the general structure of our model unchanged, we abstract from match-specific productivity differences that may lead to job rejections and from investments in firm-specific skills (see, e.g., Pissarides 2000, Chapter 6; Wasmer 2006).

sector i . By definition, $\sigma_i^j = 0$ if worker j has human capital specific to sector i , and $\sigma_i^j = \sigma^j$ otherwise. With a slight abuse of notations, a_i now represents the productivity of human capital in sector i . In the spirit of Hall and Jones (1999), one may interpret a_i as a measure of physical capital per worker and the quality of social infrastructure, which may vary across countries and industries. We refer to $h^j(1 - \sigma_i^j)$ as the skill level of worker j in sector i . Finally, we assume that unemployed workers search for jobs in the sector that maximizes their expected lifetime utility, that workers' skill levels are perfectly observable, and that firms can only search for one type of workers.

Under these assumptions, we can solve for the steady-state equilibrium as we did in Section 3. Labor markets are segmented by skill levels. Free entry guarantees that firms are indifferent between searching for high- or low-skilled workers: $V_i^j = 0$ for all $j \in [0, 1]$. Irrespective of the mass of workers per industry, which now is endogenous, the labor market equilibrium for each type of workers is determined by equations (1) to (7). In turn, the total surplus and the labor market tightness associated with each worker and industry are given by

$$\Omega_i^j = \frac{k}{\delta(1 - \beta_i)}, \quad (17)$$

$$\theta_i^j = \frac{p_i a_i^j (1 - \beta_i) - k \tilde{\lambda}_i}{k \beta_i}. \quad (18)$$

Equation (17) implies that total surplus Ω_i^j is independent of worker j 's skill level. As in Section 3, this feature of the equilibrium is an artifact of our particular matching function. More importantly, equation (18) implies that the tightness of the labor market θ_i^j is increasing in the skill level of worker j . Ceteris paribus, high-skilled workers generate higher surplus when matched with a firm, which increases the number of firms searching for them, and in turn, their probabilities of finding jobs.²⁴ This feature of our model captures in a stylized way the well-known fact that unemployment rates are higher for less-educated workers (see, e.g., Mincer 1993).

Using equations (5), (17), (18), and (1), we can express the expected lifetime utility of worker j when unemployed in sector i by

$$U_i^j = \frac{1}{1 - \delta} \left[\tau + \omega + s(\mathbf{p}) + p_i a_i^j - \frac{k \tilde{\lambda}_i}{1 - \beta_i} \right] \quad (19)$$

24. Again, it is worth emphasizing that this prediction relies on the fact that recruiting costs, k , are not proportional to output per worker, a_i^j .

and her expected lifetime utility when employed in sector i by

$$W_i^j = \frac{1}{1 - \delta} \left[\tau + \omega + s(\mathbf{p}) + p_i a_i^j - \frac{k \tilde{\lambda}_i}{1 - \beta_i} \right] + \frac{\beta_i k}{\delta(1 - \beta_i)}. \quad (20)$$

Finally, we can compute the mass of workers per industry by solving $\max_{0 \leq i \leq n} U_i^j$ for all $j \in [0, 1]$.

5.2. Why Are Some People (and Countries) more Protectionist than Others?²⁵

In order to answer this question, we consider a hypothetical episode of trade liberalization, $dt_1 = \dots = dt_n = dt < 0$. We then compare the expected lifetime utility of a worker j employed in sector i in the steady states before and after trade liberalization.²⁶

We denote by \widehat{W}_i^j (respectively \widehat{U}_i^j) the expected lifetime utility of worker j when employed (respectively, unemployed) in sector i after trade liberalization. In order to avoid a taxonomic exercise, we restrict our attention to situations where: (i) workers never quit their jobs after trade liberalization, $\widehat{W}_i^j > \max_{0 \leq i' \leq n} \widehat{U}_{i'}^j = \widehat{U}^j$ for all $i = 0, \dots, n$ and $j \in [0, 1]$; and (ii) workers always work in sectors where they have sector-specific human capital before trade liberalization.²⁷ The change in the expected lifetime utility of a worker j employed in sector i is given by

$$dW_i^j = \left(\frac{du_i^j}{1 - u_i^j} \right) (\widehat{U}^j - W_i^j) + \left(1 - \frac{du_i^j}{1 - u_i^j} \right) (\widehat{W}_i^j - W_i^j), \quad (21)$$

where

$$du_i^j = - \frac{a_i^j (1 - \beta_i) \lambda_i dt}{k \beta_i (\lambda_i + \theta_i^j)^2} > 0$$

is the change in the unemployment rate induced by trade liberalization. If worker j loses her job, which occurs with probability $du_i^j / (1 - u_i^j)$, the change in her expected lifetime utility is equal to $\widehat{U}^j - W_i^j$. If she keeps her job, it is equal

25. The title of this section is borrowed from Mayda and Rodrik (2005).

26. Though we always refer to “trade liberalization,” it should be clear that our analysis equally applies to foreign productivity gains, $dp_1^* = \dots = dp_n^* = dt$.

27. Assumption (i) guarantees that changes in unemployment rates are the main determinants of trade-policy preferences; it requires employment rents $\Omega_i^j = k / \delta (1 - \beta_i)$ to be large enough. Assumption (ii) merely is a normalization of σ_i^j .

to $\widehat{W}_i^j - W_i^j$ instead. According to our theory, a worker j employed in sector i should declare herself in favor of trade liberalization if and only if $dW_i^j \geq 0$.

The next proposition describes the impact of human capital specificity on individual trade-policy preferences.

PROPOSITION 2. *Ceteris paribus, workers are more likely to be protectionist if the specificity of their human capital σ^j is high.*

The proof is straightforward. By definition, workers with more general human capital lose less when switching sectors. This implies better outside options once unemployed, which reduces their incentives to be protectionist. Though simple, this idea may help explain the negative impact of age on attitudes toward free trade (see, e.g., O'Rourke and Sinott 2001; Mayda and Rodrik 2005). Over time, human capital becomes more specific. As a result, workers become less mobile across sectors, and so more likely to oppose trade liberalization.

Note that the Ricardo–Viner model, absent of any search frictions, leads to a similar prediction. Namely, the owners of the specific factors should be more protectionist than the owners of the mobile factor. However, the insights of our search model are finer. According to our theory, the specificity of human capital *only* matters if the decrease in the trade tax is large enough to trigger a reallocation of workers across sectors. This suggests that the impact of specificity on trade-policy preferences should be stronger in industries where trade liberalization leads to a larger decline in domestic prices.

If we reinterpret the specificity of workers' human capital more generally in terms of "mobility," this prediction accords well with the results of Scheve and Slaughter (2001). Using data from the 1992 National Election Studies survey, the authors find a positive correlation between home ownership in counties with a manufacturing mix concentrated in comparative-disadvantage industries and the support for trade barriers. They interpret this result as evidence of the impact of asset values, in addition to current factor incomes, on trade-policy preferences. An alternative interpretation offered by our theory is that: (i) workers in these counties are more likely to lose their jobs; and that: (ii) once unemployed, home ownership increases the costs of moving to another sector.

Finally, we can use equations (7), (12), (17), (18), and (20) in order to rearrange equation (21) as

$$(1 - \delta)dW_i^j = d[\tau + s(\mathbf{p})] + dt \left[a_i^j + \frac{(1 - \delta)\lambda_i a_i^j (1 - \beta_i)}{k\beta_i \theta_i^j (\lambda_i + \theta_i^j)} (\widehat{W}_i^j - \widehat{U}^j) \right].$$

The first term, $d[\tau + s(\mathbf{p})] = \sum_{i=1}^n [t_i m'_i(p_i) - y_i(p_i)] dt > 0$, captures the gains from trade liberalization: higher consumer surplus net of changes in trade

revenues. The second term captures the losses: difficulty of finding new jobs once unemployed, $a_i^j dt$; and destruction of existing jobs,

$$\frac{(1 - \delta)\lambda_i a_i^j (1 - \beta_i)}{k\beta_i \theta_i^j (\lambda_i + \theta_i^j)} (\widehat{W}_i^j - \widehat{U}^j) dt.$$

Our next prediction on the determinants of individual trade-policy preferences can be stated as follows.

PROPOSITION 3. *If δ is small enough, then workers are more likely to be protectionist if their productivity a_i^j is low.*

When δ is small enough, workers mostly care about their current incomes. Whether they have general or sector-specific human capital, the main determinant of their trade-policy preferences is the probability of losing their jobs. As a result, less-productive workers—who are more likely to become unemployed²⁸—also are more likely to be protectionist.

Proposition 3 directly implies the following.

COROLLARY 1. *If workers mostly care about their current incomes, then the prevalence of protectionism decreases with:*

- (i) *countries’ level of development a_i ;*
- (ii) *workers’ level of human capital h^j .*

These two predictions are in line with the recent empirical studies by Beaulieu, Benarroch, & Gaisford (2001), O’Rourke and Sinott (2001), Scheve and Slaughter (2004), and Mayda and Rodrik (2005). Using data from the 1995–1997 World Values Survey and the 1995 International Social Survey Programme, they find that (i) workers in less-developed countries tend to be more protectionist, irrespective of their skill level; and that (ii) low-skilled workers tend to be more protectionist than high-skilled workers, irrespective of their countries of origin (though less so in less-developed countries). This can easily be seen in Table 1 which is constructed from the World Values Survey 1994–1999; see Appendix B for details.

The second finding has been interpreted as evidence in favor of the Heckscher–Ohlin model by O’Rourke and Sinott (2001), Scheve and Slaughter (2004), and Mayda and Rodrik (2005); and as evidence against it by Beaulieu, Benarroch, and Gaisford (2001). The latter focus on the first part (low-skilled

28. This crucial feature of our model is consistent with the evidence that less-educated workers are much more likely to be displaced in practice (see, e.g., Kletzer 1998).

TABLE 1. Proportion of protectionist opinions.

Education	Country	
	High income	Rest of the world
Upper	50%	63%
Middle	63%	69%
Lower	70%	76%

Source: World Values Survey 1994–1999.

workers are more protectionist almost everywhere) and the former on the second part (less so in less-developed countries) while arguing that the least developed countries, for which low-skilled workers tend to be less protectionist, are not in the sample. We have little to add to this debate. To us, the first finding is the most problematic for the Heckscher–Ohlin model: Why would low-skilled workers in a less-developed country—who win more, or at least lose less, from free trade according to this theory—ever be more protectionist than their counterparts in a more developed country? We believe that the introduction of labor market imperfections may provide a simple and intuitive answer to this question.

6. Concluding Remarks

This paper analyzes the determinants of protectionism in a small open economy with search frictions à la Pissarides (2000). By focusing on the extensive margin of trade protection, our theory generates a rich set of predictions on the structure of protection and individual trade-policy preferences. First, our model predicts that in a cross-section of industries, parameters which are positively correlated with unemployment—workers' bargaining power, sector size, and turnover rate—should also be positively correlated with trade taxes. The converse is true for parameters which are negatively correlated with unemployment—world price and workers' productivity. Second, our model predicts that workers with less general human capital are more likely to be protectionist, and more so in comparative disadvantage industries. In addition, our model predicts that if workers mostly care about their current incomes, then more productive workers are less likely to be protectionist, irrespective of the countries and industries where they are located. Though distinct from the predictions of standard trade models, these findings appear to accord well with various empirical studies. To us, this illustrates one key idea: The extensive margin of trade protection (whether or not workers keep their jobs and the associated rents) may matter as much in practice as its intensive margin (by how much these rents vary).

Appendix A: Proofs

A.1. Proof of Lemma 1

Using equations (7), (9), (8), and the definition of $y_i(\cdot)$, equation (14) can be rearranged as

$$(1 - \delta) \frac{\partial G}{\partial t_i} = t_i d'_i(p_i^* + t_i) + \frac{a_i l_i \lambda_i}{\lambda_i + \theta_i} + \frac{a_i l_i \lambda_i}{(\lambda_i + \theta_i)^2 \beta_i} \left(\frac{1}{\delta} - 1 - \frac{a_i t_i (1 - \beta_i)}{k} \right).$$

First note that if $t_i \leq 0$, then the upcoming equation (A.1) implies $\partial G / \partial t_i > 0$. Because $\bar{t} > 0$, any equilibrium trade tax must be strictly positive. We now focus on $t_i > 0$. Consider the second derivative of G with respect to t_i :

$$(1 - \delta) \frac{\partial^2 G}{\partial t_i^2} = d'_i(p_i^* + t_i) + t_i d''_i(p_i^* + t_i) - \frac{a_i^2 l_i \lambda_i (1 - \beta_i)}{(\lambda_i + \theta_i)^2 k \beta_i} - \frac{\partial \theta_i}{\partial t_i} \frac{a_i l_i \lambda_i}{(\lambda_i + \theta_i)^2 \beta_i} \left[\beta_i + \left(\frac{2}{\lambda_i + \theta_i} \right) \left(\frac{1}{\delta} - 1 - \frac{a_i t_i (1 - \beta_i)}{k} \right) \right].$$

By definition, we have $d_i(p_i) \equiv \phi_i'^{-1}(p_i)$. Thus, $\phi_i'' < 0$ implies that

$$d'_i(p_i) = 1 / \phi_i'' [\phi_i'^{-1}(p_i)] < 0,$$

and $\phi_i''' \leq 0$ implies that

$$d''_i(p_i) = - \frac{\phi_i''' [\phi_i'^{-1}(p_i)]}{\{\phi_i'' [\phi_i'^{-1}(p_i)]\}^3} \leq 0.$$

So, we get

$$d'_i(p_i^* + t_i) + t_i d''_i(p_i^* + t_i) < 0.$$

The third term, $-a_i^2 l_i \lambda_i (1 - \beta_i) / (\lambda_i + \theta_i)^2 k \beta_i$, clearly is negative. Similarly, $t_i < \bar{t} < k(1/\delta - 1) / a_i (1 - \beta_i)$ implies $1/\delta - 1 - a_i t_i (1 - \beta_i) / k > 0$, which means that the last term is negative as well. Combining the previous observations, we get $\partial^2 G / \partial t_i^2 < 0$ for all $t_i > 0$. Because $\partial^2 G / \partial t_i \partial t_j = 0$ for all $j \neq i$ and $[t, \bar{t}]$ is a compact set, there exists a unique vector of equilibrium policies (t_1^0, \dots, t_n^0) . In particular, any interior equilibrium policy $t_i < t_i^0 < \bar{t}$ satisfies $(\partial G / \partial t_i)_{t_i}^0 = 0$ which is equivalent to condition (15).

A.2. Proof of Proposition 1

By definition, the interior equilibrium policy satisfies $(\partial G/\partial t_i)_{t_i^0} = 0$. Hence, the implicit function theorem implies

$$\frac{\partial t_i^o}{\partial z_i} = - \left[\left(\frac{\partial^2 G}{\partial z_i \partial t_i} \right)_{t_i^o} \right] / \left(\frac{\partial^2 G}{\partial t_i^2} \right)_{t_i^o} \tag{A.1}$$

for all $z_i \in \{a_i, \beta_i, l_i, \lambda_i, p_i^*\}$. From the proof of Lemma 1, we already know that $(\partial^2 G/\partial t_i^2)_{t_i^o} < 0$. Thus, $\partial t_i^o/\partial z_i$ must have the same sign as $(\partial^2 G/\partial z_i \partial t_i)_{t_i^o}$. We now compute the signs of the cross-derivatives associated with our five exogenous parameters.

CLAIM (i). $(\partial^2 G/\partial a_i \partial t_i)_{t_i^o} < 0$.

Proof. Consider equation (A.1). Because the first term of the sum does not depend on a_i , we only need to show that the last two terms are decreasing in a_i . By equation (8), we have

$$\frac{a_i}{\lambda_i + \theta_i} = \left(\frac{p_i(1 - \beta_i)}{k\beta_i} - \frac{r}{a_i\beta_i} - \left(\frac{1 - \beta_i}{a_i\beta_i} \right) \lambda_i \right)^{-1},$$

which, by inspection, is decreasing in a_i . Similarly, we have

$$\frac{a_i}{(\lambda_i + \theta_i)^2} = a_i^{-1} \left(\frac{p_i(1 - \beta_i)}{k\beta_i} - \frac{r}{a_i\beta_i} - \left(\frac{1 - \beta_i}{a_i\beta_i} \right) \lambda_i \right)^{-2},$$

which is positive and decreasing in a_i . Because $1/\delta - 1 - a_i t_i (1 - \beta_i)/k$ is positive and decreasing in a_i as well, the last term also is decreasing. \square

CLAIM (ii). $(\partial^2 G/\partial \beta_i \partial t_i)_{t_i^0} > 0$.

Proof. Consider equation (A.1). Following the same logic as in claim (i), we only need to show that $1/(\lambda_i + \theta_i)$, $1/(\lambda_i + \theta_i)^2 \beta_i$ and $1/\delta - 1 - a_i t_i (1 - \beta_i)/k$ are increasing in β_i . By equation (8), we have

$$\frac{1}{\lambda_i + \theta_i} = \left(\left(\frac{1 - \beta_i}{\beta_i} \right) \left(\frac{p_i a_i}{k} - \frac{r}{(1 - \beta_i)} - \lambda_i \right) \right)^{-1},$$

which, by inspection, is increasing in β_i . Similarly, we have

$$\frac{1}{(\lambda_i + \theta_i)^2 \beta_i} = \left(\frac{(1 - \beta_i)^2}{\beta_i} \right)^{-1} \left(\frac{p_i a_i}{k} - \frac{r}{(1 - \beta_i)} - \lambda_i \right)^{-2},$$

which is increasing in β_i as well. Finally, $1/\delta - 1 - a_i t_i (1 - \beta_i)/k$ also is increasing in β_i by inspection. \square

CLAIM (iii). $(\partial^2 G/\partial l_i \partial t_i)_{t_i^0} > 0$.

Proof. Consider equation (A.1). Because θ_i does not depend on l_i , we immediately get that $\partial G/\partial t_i$ is increasing in l_i . \square

CLAIM (iv). $(\partial^2 G/\partial \lambda_i \partial t_i)_{t_i^0} > 0$.

Proof. Consider equation (A.1). We only need to show that $\lambda_i/(\lambda_i + \theta_i)^2$ and $\lambda_i/(\lambda_i + \theta_i)$ are increasing in λ_i . By equation (8), we have

$$\frac{\lambda_i}{(\lambda_i + \theta_i)^2} = \lambda_i \left(\frac{p_i a_i (1 - \beta_i)}{k \beta_i} - \frac{r}{\beta_i} - \left(\frac{1 - \beta_i}{\beta_i} \right) \lambda_i \right)^{-2},$$

which, by inspection, is increasing in λ_i . Similarly, we have

$$\frac{\lambda_i}{\lambda_i + \theta_i} = \lambda_i \left(\frac{p_i a_i (1 - \beta_i)}{k \beta_i} - \frac{r}{\beta_i} - \left(\frac{1 - \beta_i}{\beta_i} \right) \lambda_i \right)^{-1},$$

which is increasing in λ_i as well. \square

CLAIM (v). $(\partial^2 G/\partial p_i^* \partial t_i)_{t_i^0} < 0$.

Proof. Consider equation (A.1). By equation (8), θ_i is increasing in p_i^* . So, $1/(\lambda_i + \theta_i)^2$ and $1/(\lambda_i + \theta_i)$ are decreasing in p_i^* . We also know that $t_i^0 > 0$ by equation (15). Thus, we only need to check that $d'_i(p_i)$ is decreasing in p_i^* , which is true by the proof of Lemma 1. \square

A.3. Proof of Proposition 2

Consider two workers, j_1 and j_2 , employed in sector i before trade liberalization such that $a_i^{j_1} = a_i^{j_2}$ and $\sigma^{j_1} \geq \sigma^{j_2}$. First, note that $a_i^{j_1} = a_i^{j_2}$ implies $u_i^{j_1} = u_i^{j_2}$, $du_i^{j_1} = du_i^{j_2}$, and $W_i^{j_1} = W_i^{j_2}$. Second, note that $\sigma^{j_1} \geq \sigma^{j_2}$ implies $\widehat{U}_i^{j_1} \leq \widehat{U}_i^{j_2}$ for all $i' = 0, \dots, n$, and so $\widehat{U}^{j_1} \leq \widehat{U}^{j_2}$. Combining these results with equation (21), we get: $dW_i^{j_1} \leq dW_i^{j_2}$.

A.4. Proof of Proposition 3

Let us first introduce some additional notations. We define $f(a_i^j)$ as

$$f(a_i^j) \equiv a_i^j + \frac{\lambda_i a_i^j (1 - \beta_i)}{k \beta_i \theta_i^j (\lambda_i + \theta_i^j)} \times \left[\frac{\left(\frac{1}{\delta} - 1\right) k \beta_{i(j)}}{1 - \beta_{i(j)}} - \hat{p}_{i(j)} a_{i(j)}^j + \hat{p}_i a_i^j - \frac{k \lambda_i}{1 - \beta_i} + \frac{k \lambda_{i(j)}}{1 - \beta_{i(j)}} \right],$$

where $i(j) = \arg \max_{0 \leq i' \leq n} U_{i'}^j$, and \hat{p}_i and $\hat{p}_{i(j)}$ are the domestic prices of goods i and $i(j)$ after trade liberalization, respectively. Using equation (18), we can express the derivative of f with respect to a_i^j as

$$\frac{\partial f}{\partial a_i^j} = 1 - g_1(a_i^j, \delta) \left\{ \hat{p}_{i(j)} \frac{a_{i(j)}^j}{a_i^j} - \hat{p}_i + g_2(a_i^j, \delta) \left[\frac{\left(\frac{1}{\delta} - 1\right) k \beta_{i(j)}}{1 - \beta_{i(j)}} + g_3(a_i^j) \right] \right\},$$

where the three functions g_1 , g_2 , and g_3 are given by

$$g_1(a_i^j, \delta) = \frac{\lambda_i (1 - \beta_i) a_i^j k \beta_i}{\left[p_i a_i^j (1 - \beta_i) - k \left(\frac{1}{\delta} - 1 + \lambda_i\right) \right] \left[p_i a_i^j (1 - \beta_i) - k \left(\frac{1}{\delta} - 1 + \lambda_i (1 - \beta_i)\right) \right]} > 0,$$

$$g_2(a_i^j, \delta) = \frac{p_i (1 - \beta_i)}{p_i a_i^j (1 - \beta_i) - k \left(\frac{1}{\delta} - 1 + \lambda_i\right)} + \frac{p_i (1 - \beta_i)}{p_i a_i^j (1 - \beta_i) - k \left(\frac{1}{\delta} - 1 + \lambda_i (1 - \beta_i)\right)} - \frac{1}{a_i^j} > 0,$$

$$g_3(a_i^j) = \hat{p}_i a_i^j - \hat{p}_{i(j)} a_{i(j)}^j + \frac{k \lambda_{i(j)}}{1 - \beta_{i(j)}} - \frac{k \lambda_i}{1 - \beta_i}.$$

We also define

$$\underline{g}_1 = \min_{i,j} \frac{\lambda_i (1 - \beta_i) a_i^j k \beta_i}{\left[p_i a_i^j (1 - \beta_i) - k \lambda_i \right] \left[p_i a_i^j (1 - \beta_i) - k \lambda_i (1 - \beta_i) \right]} > 0,$$

$$\underline{g}_2 = \min_{i,j} \left[\frac{p_i (1 - \beta_i)}{p_i a_i^j (1 - \beta_i) - k \lambda_i} + \frac{p_i (1 - \beta_i)}{p_i a_i^j (1 - \beta_i) - k \lambda_i (1 - \beta_i)} - \frac{1}{a_i^j} \right] > 0,$$

$$\underline{g}_3 = \min_{i,j} \hat{p}_i a_i^j - \max_{i,j} \hat{p}_i a_i^j + \min_i \frac{k \lambda_i}{1 - \beta_i} - \max_i \frac{k \lambda_i}{1 - \beta_i} < 0,$$

and

$$\underline{\delta} = \left\{ 1 + \max_i \left(\frac{1 - \beta_i}{\beta_i} \right) \cdot \left[\left(\frac{1}{\underline{g}_1} + \max_i \hat{p}_i \right) \frac{1}{\underline{g}_2} - \underline{g}_3 \right] \right\}^{-1} > 0. \quad (\text{A.2})$$

CLAIM (a.i). *If f is decreasing in a_i^j , then dW_i^j is increasing in a_i^j .*

Proof. The change in expected lifetime utility of a worker j employed in sector i is equal to

$$(1 - \delta)dW_i^j = d[\tau + s(\mathbf{p})] + a_i^j dt + \frac{(1 - \delta)\lambda_i a_i^j (1 - \beta_i)}{k\beta_i \theta_i^j (\lambda_i + \theta_i^j)} (\widehat{W}_i^j - \widehat{U}^j) dt. \quad (\text{A.3})$$

Using equations (19) and (20), we can express $\widehat{W}_i^j - \widehat{U}^j$ as

$$\widehat{W}_i^j - \widehat{U}^j = \frac{1}{(1 - \delta)} \left(\frac{(1/\delta - 1)k\beta_{i(j)}}{1 - \beta_{i(j)}} - \hat{p}_{i(j)} a_{i(j)}^j + \hat{p}_i a_i^j - \frac{k\lambda_i}{1 - \beta_i} + \frac{k\lambda_{i(j)}}{1 - \beta_{i(j)}} \right). \quad (\text{A.4})$$

Combining equations (A.3) and (A.4), we obtain

$$(1 - \delta)dW_i^j = d[\tau + s(\mathbf{p})] + dt \cdot \left\{ a_i^j + \frac{\lambda_i a_i^j (1 - \beta_i)}{k\beta_i \theta_i^j (\lambda_i + \theta_i^j)} \right. \\ \left. \times \left[\frac{(1/\delta - 1)k\beta_{i(j)}}{1 - \beta_{i(j)}} - \hat{p}_{i(j)} a_{i(j)}^j + \hat{p}_i a_i^j - \frac{k\lambda_i}{1 - \beta_i} + \frac{k\lambda_{i(j)}}{1 - \beta_{i(j)}} \right] \right\}.$$

Because $d[\tau + s(\mathbf{p})]$ does not depend on a_i^j and $dt < 0$, f decreasing in a_i^j implies dW_i^j increasing in a_i^j . □

CLAIM (a.ii). *If $\delta \leq \underline{\delta}$, then $\partial f / \partial a_i^j \leq 0$ for all a_i^j .*

Proof. Equation (A.2) implies

$$\underline{g}_1 \left\{ -\max_i \hat{p}_i + \underline{g}_2 \left[\left(\frac{1}{\underline{\delta}} - 1 \right) \min_i \left(\frac{\beta_i}{1 - \beta_i} \right) + \underline{g}_3 \right] \right\} = 1. \quad (\text{A.5})$$

By construction, we have: $\underline{g}_1 > 0$, $\underline{g}_2 > 0$, and $g_3(a_i^j) \geq \underline{g}_3$. Hence, equation (A.5) further implies

$$\underline{g}_1 \left\{ \hat{p}_{i(j)} (1 - \sigma_i^j) - \hat{p}_i + \underline{g}_2 \left[\frac{(1/\underline{\delta} - 1)k\beta_{i(j)}}{1 - \beta_{i(j)}} + g_3(a_i^j) \right] \right\} \geq 1$$

for all a_i^j , where $(\widehat{W}_i^j - \widehat{U}^j) > 0$ implies

$$\frac{(1/\underline{\delta} - 1)k\beta_{i(j)}}{1 - \beta_{i(j)}} + g_3(a_i^j) > 0.$$

Note that g_1 and g_2 are decreasing in δ . As a result, we have

$$g_1(a_i^j, \delta) \geq \frac{\lambda_i(1 - \beta_i)a_i^j k\beta_i}{[p_i a_i^j(1 - \beta_i) - k\lambda_i][p_i a_i^j(1 - \beta_i) - k\lambda_i(1 - \beta_i)]} \geq \underline{g}_1,$$

$$g_2(a_i^j, \delta) \geq \frac{p_i(1 - \beta_i)}{p_i a_i^j(1 - \beta_i) - k(r + \lambda_i)} + \frac{p_i(1 - \beta_i)}{p_i a_i^j(1 - \beta_i) - k(r + \lambda_i(1 - \beta_i))} - \frac{1}{a_i^j} \geq \underline{g}_2.$$

Combining the last series of inequalities, we get

$$g_1(a_i^j, \underline{\delta}) \left\{ \hat{p}_{i(j)}(1 - \sigma_i^j) - \hat{p}_i + g_2(a_i^j, \underline{\delta}) \left[\frac{(1/\underline{\delta} - 1)k\beta_{i(j)}}{1 - \beta_{i(j)}} + g_3(a_i^j) \right] \right\} \geq 1$$

for all a_i^j . If $\delta \leq \underline{\delta}$, we obtain in turn

$$g_1(a_i^j, \delta) \left\{ \hat{p}_{i(j)}(1 - \sigma_i^j) - \hat{p}_i + g_2(a_i^j, \delta) \left[\frac{(1/\delta - 1)k\beta_{i(j)}}{1 - \beta_{i(j)}} + g_3(a_i^j) \right] \right\} \geq 1$$

for all a_i^j . This is equivalent to $\partial f / \partial a_i^j \leq 0$ for all a_i^j . □

Claims (a.i) and (a.ii) imply that if δ is small enough, then workers are less likely to be protectionist if their productivity a_i^j is high.

Appendix B: Table 1

All data are from the World Values Survey 1994–1999. “High income” countries include: Australia, Finland, West Germany, New Zealand, Norway, Puerto Rico, Republic of Korea, Spain, Sweden, Switzerland, Taiwan, United States. “Rest of the world” includes: Albania, Argentina, Bangladesh, Bosnia and Herzegovina, Brazil, Bulgaria, Chile, China, Colombia, Czech Republic, Dominican Republic, Hungary, India, Macedonia, Mexico, Nigeria, Pakistan, Peru, Philippines, Romania, Serbia and Montenegro, Slovakia, Slovenia, South Africa, Turkey, Uruguay, Venezuela. “All Former Soviet Republics”—Armenia, Azerbaijan, Belarus, Estonia, Latvia, Lithuania, Russian Federation, and Ukraine—have been omitted from the sample. These countries were in the middle of their transition programs at the

time of the surveys; what may have determined their trade-policy preferences lies beyond the scope of our paper.

“Upper” levels of education include: some university without degree/higher education-lower-level tertiary certificate; and university with degree/higher education-upper-level tertiary certificate. “Middle” levels of education include: complete secondary school: technical/vocational type/secondary, intermediate vocational qualification; incomplete secondary: university-preparatory type/secondary, intermediate general qualification; and complete secondary: university-preparatory type/full secondary, maturity level certificate. “Lower” levels of education include: inadequately completed elementary education; completed (compulsory) elementary education; and incomplete secondary school: technical/vocational type/(compulsory) elementary education.

We consider the following question of the World Values Survey: “Do you think it is better if goods made in other countries can be imported and sold here if people want to buy them, or that there should be stricter limits on selling foreign goods here, to protect the jobs of people in this country?” The proportion of protectionist opinions is computed cell by cell as the number of employed respondents who think that “there should be stricter limits on selling foreign goods” divided by the total number of employed respondents.

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