Self-Interested Governments, Labor Unions, and Immigration Policy

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Abstract

This paper constructs a political equilibrium in which firms and unions bargain over wages and workers and capitalists lobby the government for taxation, labor market regulation and immigration policy. The main findings are the following. It is in the native workers' interests to ban firms' direct recruitment from abroad. Otherwise, the ruling elite captures the surplus of the labor unions by threatening to allow such recruitment. Legal and illegal immigration coexist and do not undermine union bargaining power. Because native workers prefer illegal to legal immigration in lobbying, the government tolerates a higher public-sector marginal cost for illegal than legal immigrants.

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1 Introduction

Does immigration eventually lead to de-unionization? How does it affect the government's behavior in a unionized economy? Immigrants benefit the country through higher output, but cause a financial burden through their demand for subsidies and public services. It is also widely recognized that immigration causes political lobbying for the number of foreigners that are permitted to enter the domestic labor market, in particular when wages are non-competitively determined.[1] To answer the questions, it is instructive to examine the case in which lobbies representing employers and workers are able to influence a self-interested government for the exercise of taxation, labor market regulation and immigration policy.

In many countries, illegal immigration is in fact an institution. Workers enter the country illegally and surreptitiously, by evading immigration service inspection. In the country, they are not easily detected and in the case of detection not deported. On the other hand, illegal immigration is an expensive institution. When legal and illegal immigrants can work more or less on the same conditions in the informal or competitive sector and illegal immigration involves the implementation of border control and cover-up activities in the country, it would be cheaper for the country as a whole to import the same amount of labor legally than illegally. This raises the question of why illegal immigration is at all tolerated. In this study, this problem is explained by workers' and employers' lobbying activity.

According to Berry and Soligo's (1969) classical result, immigration is welfare enhancing if all markets are competitive and all agents are homogeneous. Borgas (1995) shows that if the native population is heterogeneous in terms of wealth distribution, then immigration reduces wages, transfers wealth to domestic capital owners and enhances welfare for households with relatively much capital. Schmidt et al. (1994) assume that a nationwide monopoly

[1] See e.g. Benhabib (1996), Borjas (1994) and Amegashie (2004).

union of both skilled and unskilled workers sets the wage for unskilled workers, immigrants are unskilled, and the government pays unemployment benefits to both natives and migrants. They show that (*i*) immigrants replace native workers and raise unemployment among these, (*ii*) unemployment benefits for jobless immigrants strain the government budget, and (*iii*) the supply of unskilled labor and the real wages of skilled labor increase. Because effects (*i*) and (*ii*) are negative but (*iii*) is positive, the overall welfare effect of immigration is ambiguous. In this study, I assume that the government can affect union bargaining power through labor market regulation.

Benhabib (1996) constructs a political equilibrium for an economy in which the natives vote for policies that impose requirements on the immigrants. Hillman and Weiss (1999) examine an economy with legal and illegal immigrants by the specific-factors model where resident population earns income either as mobile labor or from the ownership of sector-specific capital. They show that if illegal immigrants consume relatively less non-traded goods than natives, then the median voter tolerates them but confines them to the sectors producing non-traded rather than traded goods. In this study, I assume that the natives vote for whether immigration should be permitted, before the government chooses immigration quotas.

Myers and Papageorgiou (2000) consider a rich country with a benevolent government, costly immigration control and a redistributive public sector. They show that if illegal immigrants have access to the public sector, then some immigration is permitted, but if they are excluded from the public sector, then no border controls are enforced. In this study, I introduce a self-interested government. Fuerst and Thum (2001) construct a model in which each individual decides first whether it acquires human capital to become an entrepreneur or remains as a low-skilled worker who competes with immigrates, and then the population decides whether to allow immigration. In such a model, immigration encourages natives to acquire skills. If union coverage is constant, then skilled and unskilled labor increase in the same proportion and immigration remains neutral with respect to domestic welfare. If union coverage falls with immigration, then union wages fall and total output and welfare increases. In this atudy, I assume that the government can decide whether union bargaining power should at all be allowed.

Lobbying can examined either by the *all-pay auction model* in which the lobbyist with the higher effort wins with certainty, or the *menu-auction model* in which the lobbyists announce their bids contingent on the politician's actions..[2] Amegashie (2004) uses the all-pay auction model for the case in which the union and the firm first lobby the government for the immigration quota and then bargain over the wage of natives. He shows how the reservation wage of immigrants, the cost of lobbying and the output price of the firm affect the permissible number of immigrants. Bellettini and Ceroni (2005) use the menu-auction model for the same purpose as Amegashie. They show that union power may hurt the workers. In the presence of the union, the government presses wages down by immigration policy, possibly so much that equilibrium wages are lower than in the absence of the union. In this study, I assume that the workers as voters decide whether immigration is permitted. The government cannot then use immigration policy as a credible threat.

Palokangas (2003) examines lobbying in an economy with union-employer bargaining by using the menu-auction model, but in a framework of public finance. He assumes that the workers and employers first agree *ex ante* on the type of bargaining, then lobby the government for taxation and labor market regulation and finally bargain over labor contracts. He shows that workers and capitalists rule out any bargain over employment, because otherwise the government would capture all the gain, and the political equilibrium is characterized by strong union power and right-to-manage bargaining. This paper

[2] In the menu-auction model, it is not possible for a lobbyist to spend money and effort on lobbying without getting what he lobbied for. In the all-pay auction model, lobbying expenditures are incurred by all the lobbyists before the politician takes an action. Hence, there will be winners and losers in this model. Also, if one were to use the many auction model, one would have to assume that each lobbyist announces a contribution schedule.

extends that closed-economy model for an open economy with immigration.

The plan of this study is the following. Section 2 presents the institutional background of the model. Section 3 constructs the models of the firms and the households. Section 4 introduces collective bargaining. The government's behaviour is endogenized in section 5. The political equilibrium of the economy is constructed in section 6. Finally, section 7 presents policy rules that explain immigration, taxation and labor market regulation.

2 The setting

In the open economy under consideration, the relative prices of all traded goods are given from abroad. These goods can therefore be aggregated into a single good the price of which is normalized at unity. The economy consists of two sectors. In the *formal sector*, traded output y is produced from labor l with decreasing returns to scale, the wage is determined by union-firm bargaining, income can be taxed and the government observes employment. In the *informal sector*, one unit of non-traded output is produced from one labor unit, income cannot be taxed and firms can hide employment from the government. The informal-sector wage is then equal to the price p of the informal-sector good. I assume that the workers consume the outputs of both sectors but the capitalists only the formal-sector good, for simplicity.[3]

In the economy, there is a fixed number n of native workers. Immigration is divided into three categories as follows:

(i) *Legal immigration* consists workers who enter the country to start competing with native workers for jobs in the formal sector.

(ii) *Illegal immigration* is comprised of workers who enter the informal sector from abroad and cannot take a job in the formal sector.

[3]In this way, the profits do not affect the demand for the informal-sector good which simplifies aggregation.

(iii) *Direct recruitment* from abroad consists of workers who are employed in the formal sector passing native workers.

I assume that the government permits m legal immigrants, s illegal immigrants and k directly recruited workers to enter the country. I assume furthermore that foreign reservation wages are so low relative to domestic wages that the supply of immigrants always exceeds these government quotas.

In the formal sector, all workers belong to a labor union which bargains with the employers over the wage. I assume that the government is able to regulate union bargaining power e.g. by the use of compulsory arbitration.

Government expenditures consist of transfers and public services and they are financed by the tax $t \in (-\infty, 1)$ on labor income and the tax $\theta \in (-\infty, 1)$ on profits. In the theory of optimal taxation it is widely known that if the government had the opportunity to tax pure profits at no cost, it would optimally impose a 100% tax on profits. To eliminate such an unrealistic case from the model, I assume that the capitalists can conceal their profits, at some cost. Because all workers (native and immigrant) use public services, illegal immigration involves border control and workers in the formal and informal sectors may need different public services, I assume that government expenditures increase with immigration of all types $(i) - (iii)$ and also depend on formal-sector employment. For the reason that the native workers comprise a vast majority of population, the median voter is a native worker.

I specify the households' utilities as linear functions of income. This means that without losing any generality, we can consider the economy as if there were only one firm and one labor union. The agents acts as players in the following extensive game:

1. The representative native worker (= the median voter) decides whether there can be positive quotas for immigration of all types $(i) - (iii)$.

2. The labor union and the capitalist lobby the government for taxation, labor market regulation (i.e. union power) and immigration quotas.

3. The government decides on taxation, labor market regulation and immigration quotas.

4. The union and the firm bargain over the wage.[4]

5. The firm chooses its output and employment.

3 Production and income

The formal sector makes its output y with the thrice differentiable function[5]

$$y = f(l), \quad f' > 0, \quad f'' < 0, \quad f(0) = 0. \tag{1}$$

The profit is given by $\Pi = f(l) - (1+t)wl$, where w is the formal-sector wage and t the labor-income tax. Profit maximization yields

$$w = f'(l)/(1+t), \quad \Pi(l) = f(l) - lf'(l), \quad \Pi' = -lf'' > 0. \tag{2}$$

Each worker supplies one labor unit and is employed either in the formal or informal sector. His utility function is linear in the formal-sector good but quadratic in the informal-sector good, for simplicity:[6]

$$u = I - pr + \eta r - (\delta/2)r^2, \tag{3}$$

where I is his income, r is his consumption of the informal-sector good, $I - pr$ his consumption of the formal-sector good (= his income I minus his expenditure pr on the informal-sector good) and δ and η are positive

[4] Palokangas (2003) showed by a model rather similar to the one in this paper that right-to-manage bargaining is the only stable type of bargaining, for the union and the firm have every incentive to agree *ex ante* that no bargaining over employment is used. On the basis of this result, I ignore here the bargaining over employment, for simplicity.

[5] Alternatively, one could assume that there are constant returns to scale but capital is fixed. Thrice differentiability is needed for the deduction of the employment function (16) from the equilibrium condition (14) of wage bargaining.

[6] In this way, utility is a linear function of income I and the demand for the informal-sector good does not depend on a worker's income but depends on the numbers of the workers of each category.

constants. In equilibrium, the price p of the informal-sector good is equal to the marginal utility for the informal-sector good:

$$p(r) = \partial u / \partial r = \eta - \delta r. \tag{4}$$

Because the utility function (3) is linear in the consumption of the formal-sector good, all native workers behave as if in the economy there were only a single native worker the expected wage w^e. Because, by the equilibrium condition (4), all $n+m+s+k$ workers (both native or immigrant) consume the same amount r of the informal-sector good, the demand for that good is equal to $(n+m+s+k)r$. The informal sector employs all $n+m+s+k-l$ workers not employed in the formal sector and produces $n+m+s+k-l$ units of the informal-sector good. The equilibrium condition for the market for the informal-sector good is therefore $(n+m+s+k)r = n+m+s+k-l$. Solving for a worker's demand for the informal-sector good, r, yields

$$r = 1 - l/(n+m+s+k). \tag{5}$$

A native worker's probability of being employed in the formal sector is

$$q \doteq \frac{l-k}{n+m}, \tag{6}$$

where $l-k$ the number of formal-sector jobs available for the native workers and $n+m+k$ the total number of native workers and legal immigrants. Noting this probability, a native worker's expected wage can be written as

$$w^e = qw + (1-q)p, \tag{7}$$

where w (p) is the wage and q $(1-q)$ his probability of being employed in the formal (informal) sector.

The capitalist conceals proportion a of his profit Π and reveals the rest, $1-a$, to the government. We suppose furthermore that the scale of profits does not affect the ability to conceal profits, but that such activity is subject to increasing cost. The administrative cost of hiding profit, Φ, is therefore linearly homogeneous with respect to total profit Π but increasing and strictly convex with respect to the ratio a of hidden to total profit. It is obvious that with all profits revealed, $a = 0$, there is no cost, $\Phi = 0$. Given these assumptions and (2), we obtain the cost function

$$\Phi = \phi(a)\Pi(l), \quad \phi' > 0, \quad \phi'' > 0, \quad \phi(0) = 0, \tag{8}$$

where ϕ is the ratio of administrative cost to total profit Π. The government can only tax observed profit $(1-a)\Pi$. By duality, we can define

$$g(\theta) \doteq \max_a [1 - (1-a)\theta - \phi(a)], \quad g' = a - 1, \quad g'' > 0. \tag{9}$$

Subtracting profit taxes $\theta(1-a)\Pi$ and administrative cost (8) from profit Π and noting (2) and (9), we obtain the capitalist's income

$$\begin{aligned} &\pi(l,\theta) \doteq \Pi - \theta(1-a)\Pi - \phi\Pi = g(\theta)\Pi(l) \ \text{ with} \\ &g' = a - 1 < 0, \ \ g'' > 0, \ \ a(\theta) \ \text{ and } \ a' \doteq 1/\phi'' > 0. \end{aligned} \tag{10}$$

4 Collective bargaining

I assume the following:

(a) All n native workers belong to a labor union which has an utilitarian social welfare function with respect to its members.

(b) Employment in the informal sector is so flexible that formal-sector workers can work there even during disputes. This means that the reference income for the union is equal to the informal-sector wage p.[7]

[7] Some papers assume that the expected wage outside the firm is the union's reference point, but this is not quite in line with the microfoundations of the alternating offers game. Binmore, Rubinstein and Wolinsky (1986, pp. 177, 185-6) state that the the reference income should not be identified with the outside option point. Rather, despite the availability of these options, it remains appropriate to identify the reference income with the income streams accruing to the parties in the course of the dispute. For example, if the dispute involves a strike, these income streams are the employee's income from temporary work, union strike funds, and similar sources, while the employer's income might derive from temporary arrangements that keeps the business running.

Given the utility function (3), the equilibrium condition (4) and the assumptions (a) and (b) above, the union maximizes its members' additional utility of being employed in the formal sector:

$$v = n\big(u\big|_{I=w^e} - u\big|_{I=p}\big), \tag{11}$$

where w^e is the expected wage in the formal sector and p the informal-sector wage. Inserting (2)-(7) into (11), the union's utility function takes the form

$$\begin{aligned} v(l,m,k,s,t) &= n(w^e - p) = nq(w-p) = n\frac{l-k}{n+m}\left[\frac{f'(l)}{1+t} - \eta + \delta r\right] \\ &= \frac{(l-k)n}{n+m}\left[\frac{f'(l)}{1+t} - \eta + \delta - \frac{\delta l}{n+m+s+k}\right] \end{aligned} \tag{12}$$

with the properties

$$\frac{\partial v}{\partial s} > 0, \quad \frac{\partial v}{\partial t} = \frac{(k-l)n}{n+m}\frac{f'}{(1+t)^2} < 0, \quad \frac{\partial v}{\partial m} = \frac{\partial v}{\partial s} - \frac{v}{n+m} < \frac{\partial v}{\partial s}. \tag{13}$$

The labor union maximizes its utility (12), while the capitalist maximizes the profit (10) in asymmetric Nash bargaining over the wage w. The outcome of such bargaining is obtained through maximizing the Generalized Nash product $v^\alpha \pi^{1-\alpha}$ by w, where constant $\alpha \in [0,1]$ is the union's relative bargaining power. Because the left-hand equation in (2) defines a one-to-one correspondence from l to w, in the maximization the wage w is replaced by unionized-sector employment l as the control variable. One can then equivalently maximize an increasing transformation of the product $v^\alpha \pi^{1-\alpha}$,

$$\begin{aligned} \Delta(l,m,k,s,t,\theta,\alpha) &\doteq \log\big[v^\alpha \pi^{1-\alpha}\big]/\alpha = \log\, v(l,m,k,s) + (1/\alpha - 1)\log\, \pi(l,\theta) \\ &= \log(l-k) + \log\left[\frac{f'(l)}{1+t} - \eta + \delta - \frac{\delta l}{n+m+s+k}\right] + \Big(\frac{1}{\alpha} - 1\Big)\log \Pi(l) + \nabla, \end{aligned}$$

by l, where ∇ consists of terms independent of l. This yields

$$\begin{aligned}\frac{\partial\Delta}{\partial l} &= \Big(\frac{1}{\alpha}-1\Big)\frac{\Pi'}{\Pi}+\frac{1}{v}\frac{\partial v}{\partial l} = \Big(\frac{1}{\alpha}-1\Big)\frac{\Pi'(l)}{\Pi(l)}+\frac{1}{l-k} \\ &\quad + \frac{f''(l)/(1+t)-\delta/(n+m+s+k)}{f'(l)/(1+t)-\eta+\delta-\delta l/(n+m+s+k)} \\ &= \Big(\frac{1}{\alpha}-1\Big)\frac{\Pi'(l)}{\Pi(l)}+\frac{1}{l-k}+\frac{1}{l} \\ &\quad + \frac{[f''(l)-f'(l)/l]/(1+t)+(\eta-\delta)/l}{f'(l)/(1+t)-\eta+\delta-\delta l/(n+m+s+k)} = 0. \end{aligned} \tag{14}$$

Given (2) and (14), the increase in employment l raises the capitalist's income but lowers the worker's:

$$\frac{\partial v}{\partial l} = \Big(1-\frac{1}{\alpha}\Big)\frac{\Pi'}{\Pi}v < 0. \tag{15}$$

Furthermore, from (2), (4), (5) and (14) it follows that

$$\frac{f''-f'/l}{1+t}+\frac{\eta-\delta}{l} = \underbrace{(p-w)}_{-}\underbrace{\Big[\Big(\frac{1}{\alpha}-1\Big)\frac{\Pi'}{\Pi}+\frac{1}{l-k}+\frac{1}{l}\Big]}_{+} < 0,$$

$$\frac{\partial^2\Delta}{\partial l\partial m} = \frac{\partial^2\Delta}{\partial l\partial s} > 0, \quad \frac{\partial^2\Delta}{\partial l\partial\theta} = 0, \quad \frac{\partial^2\Delta}{\partial l\partial\alpha} < 0.$$

Noting these inequalities and the second-order condition $\partial^2\Delta/\partial l^2 < 0$, and differentiating (14) totally, we obtain the employment function

$$l(m,k,s,t,\alpha), \quad \frac{\partial l}{\partial s} = \frac{\partial l}{\partial m} \doteq -\frac{\partial^2\Delta}{\partial l\partial s}\Big/\frac{\partial^2\Delta}{\partial l^2} > 0, \quad \frac{\partial l}{\partial\alpha} < 0. \tag{16}$$

If union power α decreases or legal and illegal immigration $m+s$ increases, then in the formal sector the wage w falls and employment l increases.

5 Public policy

We denote the native worker's and the capitalist's contributions by R^w and R^c respectively. Subtracting R^c from the profit π yields the capitalist's consumption C^c. Subtracting R^w from the labor union's welfare in terms of income, v, yields the worker's consumption C^w. Inserting (7), (10) and (16) into these definitions, we can specify the differentiable functions

$$C^w(m,k,s,t,\alpha,R^w) \doteq v\big(l(m,k,s,t,\alpha),m,k,s,t\big) - R^w, \ \frac{\partial C^w}{\partial R^w} = -1,$$
$$C^c(m,k,s,t,\theta,\alpha,R^c) \doteq \pi\big(l(m,k,s,t,\alpha),\theta\big) - R^c, \ \frac{\partial C^c}{\partial R^c} = -1. \quad (17)$$

Following Grossman and Helpman (1994), and given (17), we can define the government's objective function as follows:

$$G(m,k,s,t,\theta,\alpha,R^w,R^c) = R^w + R^c + \beta U^c(C^c) + \gamma U^w(C^w), \quad (18)$$

where parameters $\beta \geq 0$ and $\gamma \geq 0$ are the weights given to the welfare of the capitalist and the native worker, respectively. One might claim that there is a wholly labor government for $\beta = 0$, and a wholly capitalist government for $\gamma = 0$, but even in these extreme cases both classes can maintain their influence by their contributions, R^w and R^c, to the ruling elite.

Given (2), (10) and (16), we define total tax revenue X, which is the sum of the labor-income taxes twl and the profit taxes $\theta\Pi$, as follows:

$$X(l,t,\theta) \doteq twl + \theta\Pi = (1+t)^{-1}tf'(l)l + \theta\Pi(l). \quad (19)$$

I assumed earlier (section 2) that public expenditures E are an increasing differentiable function of formal-sector employment l, the number of native workers n, legal immigrants m, illegal immigrants s and directly recruited immigrants k. Since these expenditures must be covered by taxes, the government's budget constraint is $X \geq E$.[8] The representative native worker decide *ex ante* on whether there will be legal or illegal immigration or direct recruitment from abroad. To model this, I define the sets of the feasible values $\mathcal{J}_i \in \big\{\{0\},[0,\infty)\big\}$ for parameters $i = m,s,k$. The government then

[8]Since $E < X$ would be a complete waste, any rational government will choose $E = X$. We define the budget constraint in the form of inequality to obtain $\lambda \geq 0$ in (28).

chooses its policy parameters from the set

$$\Gamma \doteq \big\{(m,k,s,t,\theta,\alpha)\big|\; X\big(l(m,k,s,t,\alpha),t,\theta\big) \geq E(l,n,m,s,k),$$
$$m \in \mathcal{J}_m,\;\; s \in \mathcal{J}_s,\;\; k \in \mathcal{J}_k\big\}. \quad (20)$$

Now we explore the effects of lobbying by the capitalist and the native worker on immigration, taxation and labor market regulation, i.e. on variables (m,k,s,t,θ,α). Following the common practice in the literature on labor market regulation, I assume that the government can make smooth and continuous changes in union power.[9] The contribution schedule of the native worker is given by $R^w(m,k,s,t,\theta,\alpha)$, and that of the capitalist by $R^c(m,k,s,t,\theta,\alpha)$. The government maximizes its welfare (18) by choosing $(m,k,s,t,\theta,\alpha) \in \Gamma$. Following proposition 1 of Dixit, Grossman and Helpman (1997), a subgame perfect Nash equilibrium for this game is a set of contribution schedules $R^{w*}(m,k,s,t,\theta,\alpha)$ and $R^{c*}(m,k,s,t,\theta,\alpha)$ and public policy $(m^*,k^*,s^*,t^*,\theta^*,\alpha^*)$ such that the following conditions are satisfied:

(i) Contributions are non-negative but less than the income of the contributing lobby.

(ii) The policy $(m^*,k^*,s^*,t^*,\theta^*,\alpha^*)$ maximizes the government's welfare (18) taking the contribution schedules as given,

$$(m^*,k^*,s^*,t^*,\theta^*,\alpha^*) \in$$
$$\underset{(m,k,s,t,\theta,\alpha)\in\Gamma}{\operatorname{argmax}} \big\{G\big(m,k,s,t,\theta,\alpha,R^w(m,k,s,t,\alpha),R^c(m,k,s,t,\theta,\alpha)\big)\big\}. \quad (21)$$

(iii) The native worker (capitalist) cannot have a feasible strategy

$$R^w(m,k,s,t,\theta,\alpha) \quad \big(R^c(m,k,s,t,\theta,\alpha)\big)$$

that yields him a higher level of utility than in equilibrium, given the gov-

[9] Cf. Blanchard and Giavazzi (2003).

ernment's anticipated decision rule,[10]

$$\begin{aligned}&\big(m^*,k^*,s^*,t^*,\theta^*,\alpha^*,R^i(m^*,k^*,s^*,t^*,\alpha^*)\big)\\&\in \underset{(m,k,s,t,\theta,\alpha)\in\Gamma}{\operatorname{argmax}} U^i\big(C^i\big(m,k,s,t,\theta,\alpha,R^i(m,k,s,t,\theta,\alpha)\big)\big) \text{ for } i=w,c. \qquad (22)\end{aligned}$$

(iv) The native worker (capitalist) provides the government at least with the level of utility that it could get when the native worker (capitalist) offers nothing $R^w = 0$ ($R^c = 0$) and the government responds optimally given the capitalist's (native worker's) contribution function,

$$\begin{aligned}&G(m,k,s,t,\theta,\alpha,R^w(m,k,s,t,\theta,\alpha),R^c(m,k,s,t,\theta,\alpha))\\&\quad\geq \sup_{(\tilde{m},\tilde{k},\tilde{s},\tilde{t},\tilde{\theta},\tilde{\alpha})\in\Gamma} G(\tilde{m},\tilde{k},\tilde{s},\tilde{t},\tilde{\theta},\tilde{\alpha},R^w(\tilde{m},\tilde{k},\tilde{s},\tilde{t},\tilde{\theta},\tilde{\alpha}),0)),\\&G(m,k,s,t,\theta,\alpha,R^w(m,k,s,t,\alpha),R^c(m,k,s,t,\theta,\alpha))\\&\quad\geq \sup_{(\tilde{m},\tilde{k},\tilde{s},\tilde{t},\tilde{\theta},\tilde{\alpha})\in\Gamma} G(\tilde{m},\tilde{k},\tilde{s},\tilde{t},\tilde{\theta},\tilde{\alpha},0,R^c(\tilde{m},\tilde{k},\tilde{s},\tilde{t},\tilde{\theta},\tilde{\alpha})). \qquad (23)\end{aligned}$$

6 The political equilibrium

Given differentiable functions (17), conditions (22) take the form

$$\begin{aligned}&\big(m^*,k^*,s^*,t^*,\theta^*,\alpha^*,R^i(m^*,k^*,s^*,t^*,\theta^*,\alpha^*)\big)\\&\in \underset{(m,k,s,t,\theta,\alpha)\in\Gamma}{\operatorname{argmax}} C^i\big(m,k,s,t,\theta,\alpha,R^i(m,k,s,t,\theta,\alpha)\big) \text{ for } i=w,c \qquad (24)\end{aligned}$$

and

$$\partial C^w/\partial i = \partial R^w/\partial i \text{ and } \partial C^c/\partial i = \partial R^c/\partial i \text{ for } i=m,k,s,t,\theta,\alpha, \qquad (25)$$

which says that in equilibrium the change in the worker's (capitalist's) contribution due to a change in the instrument equals the effect of the instrument on the worker's (capitalist's) consumption. Thus the contribution schedules are locally truthful. As in Bernheim and Whinston (1986) or in Grossman

[10] In this model, the utility of the native worker (capitalist) is independent of his contribution schedule.

and Helpman (1994), this concept can be extended to a globally truthful contribution schedule. This type of schedule represents the preferences of the worker (capitalist) at all policy points. From (17), (23) and (25) it follows that the truthful contribution functions take the form

$$R^w = \max[0, v - v_0], \quad R^c = \max[0, \pi - \pi_0], \tag{26}$$

where v_0 (π_0) is the worker's (capitalist's) income when he does not pay contributions but the government chooses its best response given the capitalist's (worker's) contribution schedule.

The representative native worker is the median voter who chooses the sets $\mathcal{J}_i \in \big\{\{0\}, [0,\infty)\big\}$ for variables $i = m, s, k$. To prove that $\mathcal{J}_k = \{0\}$ holds for direct recruitment from abroad, k, we assume on the contrary $\mathcal{J}_k = [0,\infty)$. The government can then choose any positive quota k for direct recruitment from abroad. If the union does not pay contributions, $R^w = 0$, then, the government sets $k = l$ by k to obtain $v_0 = v|_{k=l} = 0$ [Cf. (12)]. Inserting this into (26) shows that the union pays all its surplus to the government as contributions, $R^w = v - v_0 = v$. The native worker then as the member of the union prefers $\mathcal{J}_k = \{0\}$.

Proposition 1 *In the political equilibrium, there is no direct recruitment from abroad,* $\mathcal{J}_k = \{0\}$ *and* $k = 0$.

Because direct recruitment from abroad would be a non-distorting vehicle for the ruling elite to capture the whole surplus of the labor union, the workers vote for its abolishment.

7 Policy rules

Given $k = 0$, the government's choice set (20) becomes

$$\Gamma \doteq \Big\{(m,s,t,\theta,\alpha)\Big|\ X\big(l(m,0,s,t,\alpha),t,\theta\big) \geq E\big(l(m,0,s,t,\alpha),n,m,s,0\big)\Big\}. \tag{27}$$

The conditions (21) take the form that the government's objective function (18) must be maximized by $(m, s, t, \theta, \alpha)$ subject to the set (27). Given (24), this is equivalent to maximizing by $(m, s, t, \theta, \alpha)$ the function

$$\begin{aligned}\mathcal{L} =& R^w(m, 0, s, t, \alpha) + R^c(m, 0, s, t, \theta, \alpha) + \beta U^c(C_*^c) + \gamma U^w(C_*^w) \\ &+ \lambda\big[X\big(l(m, 0, s, t, \alpha), t, \theta\big) - E\big(l(m, 0, s, t, \alpha), n, m, s, 0\big)\big],\end{aligned} \tag{28}$$

where, by envelope theorem, C_*^w and C_*^c can be taken to be independent of t, θ and α. The multiplier λ satisfies the Kuhn-Tucker conditions

$$\lambda\big[X\big(l(m, 0, s, t, \alpha), t, \theta\big) - E\big(l(m, 0, s, t, \alpha), n, m, s, 0\big)\big] = 0, \;\; \lambda \geq 0.$$

In equilibrium, the government's budget constraint must be binding, $X = E$, which implies $\lambda > 0$.

Noting (17), (25) and (28), we obtain the first-order conditions:

$$\begin{aligned}\frac{\partial \mathcal{L}}{\partial i} &= \frac{\partial R^w}{\partial i} + \frac{\partial R^c}{\partial i} + \lambda\left[\frac{\partial X}{\partial i} + \frac{\partial (X - E)}{\partial l}\frac{\partial l}{\partial i}\right] \\ &= \frac{\partial C^w}{\partial i} + \frac{\partial C^c}{\partial i} + \lambda\left[\frac{\partial X}{\partial i} + \frac{\partial (X - E)}{\partial l}\frac{\partial l}{\partial i}\right] \\ &= \frac{\partial v}{\partial i} + \frac{\partial v}{\partial l}\frac{\partial l}{\partial i} + \frac{\partial \pi}{\partial i} + \frac{\partial \pi}{\partial l}\frac{\partial l}{\partial i} + \lambda\left[\frac{\partial X}{\partial i} + \frac{\partial (X - E)}{\partial l}\frac{\partial l}{\partial i}\right] = 0 \;\; (i = \alpha, t, \theta),\end{aligned} \tag{29}$$

$$\frac{\partial \mathcal{L}}{\partial i} = \frac{\partial v}{\partial i} + \frac{\partial v}{\partial l}\frac{\partial l}{\partial i} + \frac{\partial \pi}{\partial i} + \frac{\partial \pi}{\partial l}\frac{\partial l}{\partial i} + \lambda\left[\frac{\partial X}{\partial i} + \frac{\partial (X - E)}{\partial l}\frac{\partial l}{\partial i} - \frac{\partial E}{\partial i}\right] = 0 \quad (i = m, s). \tag{30}$$

Noting (17), the condition (29) for union power α are equivalent to

$$\frac{\partial \mathcal{L}}{\partial \alpha} = \left[\frac{\partial v}{\partial l} + \frac{\partial \pi}{\partial l} + \lambda\frac{\partial (X - E)}{\partial l}\right]\frac{\partial l}{\partial \alpha} = 0,$$

which yields

$$\frac{\partial v}{\partial l} + \frac{\partial \pi}{\partial l} + \lambda\frac{\partial (X - E)}{\partial l} = 0. \tag{31}$$

Noting $k = 0$, (10), (13), (16), (17), (19), (20) and (31), the conditions (29) for taxation (t, θ) are equivalent to

$$\frac{\partial \mathcal{L}}{\partial t} = \frac{\partial v}{\partial t} + \lambda \frac{\partial X}{\partial t} = \frac{(k-l)nf'}{(n+m)(1+t)^2} + \frac{\lambda f' l}{(1+t)^2} = \frac{f' l}{(1+t)^2}\Big[\lambda - \frac{n}{n+m}\Big] = 0,$$
$$\frac{\partial \mathcal{L}}{\partial \theta} = \frac{\partial \pi}{\partial \theta} + \lambda \frac{\partial X}{\partial \theta} = \Pi[g' + \lambda] = \Pi[a(\theta) - 1 + \lambda] = 0.$$

From these equations and (13) it follows that

$$\lambda = \frac{n}{n+m}, \quad a(\theta) = 1 - \lambda = \frac{m}{n+m}, \quad \theta(m) \text{ with } \frac{d\theta}{dm} = \frac{n/a'}{(n+m)^2} > 0. \quad (32)$$

These results can be rephrased as follows:

Proposition 2 *The capital-income tax θ is an increasing function of legal immigration m. The labor-income tax t balances the government budget.*

Legal immigration decreases the formal-sector wage w, the proportion of labor income in the tax base and total tax revenue. To compensate this loss of finance, the government has to increase the capital-income tax θ.

Noting $k = 0$, (17), (31) and (32), the conditions (29) for immigration (s, m) are equivalent to

$$\frac{\partial \mathcal{L}}{\partial i} = \frac{\partial v}{\partial i} - \lambda \frac{\partial E}{\partial i} = \frac{\partial v}{\partial i} - \frac{n}{n+m}\frac{\partial E}{\partial i} = 0 \text{ for } i = s, m.$$

These equations mean that immigration quotas (m, s) are chosen to minimize the deadweight loss in public finance as follows:

Proposition 3 *The government increases legal (illegal) immigration up to the level at which the marginal increase in the union's utility due to the employment of one more legal (illegal) immigrant, $\partial v/\partial m$ ($\partial v/\partial s$), is in the fixed proportion $\frac{n}{n+m}$ to the marginal public expenditure for a legal (illegal) immigrant, $\partial E/\partial m$ ($\partial E/\partial s$).*

Given (13), this proposition has the following corollary:

Proposition 4 *The government tolerates higher marginal public expenditure for illegal than legal immigration,* $\partial E/\partial m = \partial v/\partial m < \partial v/\partial s = \partial E/\partial s$*.*

Legal immigration decreases the informal-sector wage, while illegal immigration increases a native worker's real income through a lower price p for the informal-sector good. This provides the labor unions every incentive to lobby the government for shifting from legal into illegal immigration. Because of such lobbying, the government tolerates higher marginal cost for illegal than legal immigrant.

Finally, given (31) and (32), relative union bargaining power α is chosen to minimize the deadweight loss in public finance as follows:

Proposition 5 *The government decreases formal-sector employment* l *through labor market regulation (i.e. a higher* α*) up to the level at which the marginal increase in the sum of the union's and the employer's utilities due to the employment of one more worker in the formal sector,* $\partial(v+\pi)/\partial l$*, is in the fixed proportion* $\frac{n}{n+m}$ *to the marginal deficit of the government budget due to it,* $\partial(E-X)/\partial l$*.*

8 Conclusions

This paper examines the political economy of an open economy with immigration in the following five-stage game. First, the native workers decide as voters whether or not immigration quotas are permitted. Second, the lobbies representing the native workers and the capitalists offer contributions to the government to influence taxation, labor market regulation and immigration quotas. Third, the government decides on taxation, labor market regulation and immigration quotas and collects the corresponding contributions. Fourth, the unions and firms bargain over wages. Fifth, the firms decide on production. The results are as follows.

If firms' direct recruitment from abroad passing native workers is possible, then the ruling elite supports the unions but captures all union rent by threatening to remove recruitment restrictions. Therefore, the native workers as voters ban such a case and presume that they can equally compete for the same jobs with immigrants. There are both legal immigrants who can search a job and work in the formal sector, and illegal immigrants who can work only in the informal sector. The government determines the optimal levels for both of these groups as well as relative union bargaining power together with taxation to even out the deadweight loss in public finance.

Legal immigration tends to increase the capital-income tax as follows. It decreases the formal-sector wage, the proportion of labor income in the tax base and total tax revenue. To compensative this, the government must increase the capital-income tax. Because the illegal immigrants do not compete with native workers in the formal sector and their supply decreases the price for the informal-sector products and raises the real formal-sector wage, the native workers benefit from illegal immigration and prefer illegal to legal immigration in lobbying. For this reason, the government tolerates higher public-sector marginal cost for illegal than legal immigrants.

While a great deal of caution should be exercised when a highly stylized game-theoretical model is used to draw conclusions about the political process concerning labor market regulation and immigration quotas, the following judgement nevertheless seems to be justified. Lobbying explains why *(i)* the native workers and the government seem to permit illegal immigration as an institution, *(ii)* legal and illegal immigration coexist and do not undermine the bargaining power of the labor unions, and *(iii)* the government even accepts a higher marginal cost for illegal than legal immigrants.

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