

Protecting Against Labour Market Risk: Employment Protection or Unemployment Benefits?

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Abstract

This paper represents a first attempt to apply a multidimensional voting approach to the labor market institutions in order to explain the observed trade-off between unemployment benefits (UB) and employment protection legislation (EPL). In our model, voters are required to cast a ballot over the strictness of EPL and over the generosity of UB. Agents are heterogeneous along two dimensions: employment status – there are insiders and outsiders – and skills – low and high ability. We show that if there exists a majority of low-ability insiders, the voting game has a politico-economic equilibrium with low UB and high EPL. If, on the other hand, there are enough high ability types (either employed or unemployed) and low-ability outsiders, the politico-economic equilibrium displays a high level of UB and low EPL. Another testable implication of the model is that a larger share of elderly workers increases the demand for EPL. Combining cross-sectional and time-series observations on the strictness of EPL and generosity of unemployment benefits in OECD countries, we show that a higher proportion of low-educated employees and an ageing population induce more demand for employment protection. Micro evidence on dismissals by level of education is also in line with the substantive hypotheses of our model.

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1. Introduction

Two common ways of protecting individuals against the risks of being unemployed are to provide unemployment benefits (UB) and to impose legal restrictions against dismissals, i.e., to adopt an employment protective legislation (EPL). While EPL protects those who already have a job, and does not impose any explicit tax burden, UB generally provide insurance to a large portion of the labour force and are typically financed by a tax imposed on labour income.

Most industrialized countries use both institutions, but differences in degree are substantial (Buti, Pench and Sestito, 1998; Boeri, Boersch-Supan and Tabellini, 1999). In a cross-section of European countries there exists a clear trade-off between the use of employment protective legislation and the use of unemployment insurance. Those countries, as Italy, Greece, Portugal and Spain, which adopt stronger dismissal restrictions, tend to enjoy smaller unemployment insurance programs, and viceversa.

It is frequently suggested that Southern European countries should move along this trade-off phasing out the most rigid employment protection regulations and extending the coverage of more mobility-friendly institutions, such as unemployment benefits. Job-security oriented labour market institutions, which are focused on protection of primary breadwinners' labour income, are indeed ill-suited to accommodate new demands for mobility and, more broadly, microeconomic adjustment, as those arising in the context of EMU and of the Eastern Enlargement of the European Union.

However, moving along this trade-off is proving very difficult. Reforms of EPL are generally marginal and confined to introducing "at the margin" more flexible contractual types, rather than modifying rules for workers who already have a permanent contract. As a result, labour market segmentation and dualism among protected and unprotected jobs arises, with undesirable consequences in terms both of efficiency and equity.

The aim of this paper is to provide a politico-economic explanation of the observed trade-off between these two institutions. Why do countries resort to different combinations of firing protection and unemployment insurance to protect the individuals against the risk of being unemployed? To our knowledge, this paper represents the first attempt to apply a multidimensional voting approach to the labour market institutions in order to explain the observed trade-off between UB and EPL. To this purpose, we construct a model which brings together two streams of the existing literature in the political economy of labour markets. We adopt an environment which is close to those introduced by Wright (1986) to examine the unemployment insurance program and by Saint-Paul (1996) to analyze the EPL. The focus is therefore on the conflict of interest between employed (insiders) and unemployed (outsiders). The transition between these two states – employment and unemployment – is regulated by the unemployment inflow and outflow rates, which are affected by the degree of EPL. The model is further enriched by introducing a second degree of heterogeneity, and thus an additional conflict of interest. As in Acemoglu et al. (2000), workers differ in their ability level. In our model, ability affects the productivity of the agents and the unemployment inflow and outflow rates. In absence of restrictions, high ability types would earn higher wages and face respectively a lower unemployment inflow

rate, due mainly to a higher job-to-job mobility, and a higher outflow rate than the low ability types.

In our political economy model, voters are required to cast a ballot over the strictness of EPL and over the generosity of unemployment benefits. Because of the multidimensionality of the issue space, the existence of a Condorcet winner of the majority voting game is not guaranteed. To overcome this problem, we concentrate on political equilibria induced by institutional restrictions, or structure-induced equilibria (see Shepsle ,1979 and Persson and Tabellini, 2000). In our political system, the entire electorate votes over the two issues (i.e., the payroll tax financing unemployment benefits and the strictness of employment protection), and policy decisions are taken issue-by-issue.

We show that if there exists a majority of low-ability insiders, the voting game has a politico-economic steady state equilibrium with positive unemployment benefits and a high degree of EPL. If, on the other hand, there are enough high ability types (either employed or unemployed) and low-ability outsiders, the politico-economic equilibrium displays some level of unemployment benefit and a relatively low degree of EPL. When is the level of unemployment insurance higher in the latter equilibrium? In other words, when do we have a trade-off between UB and EPL? For sensible specifications of the parameters of the model, the decision over the unemployment insurance rests in the hands of the low-ability insiders. In taking their decision, they consider the current employment status, and thus the unemployment inflow rate, and the future employment status, i.e., the average unemployment rate. If they expect to face a high degree of EPL, which pushes the unemployment rate at high levels, the low ability insiders will demand more protection against the risk of future unemployment and will prefer a higher level of UB. Two elements are crucial in this decision: (i) the subjective rate of time discount, which measures the relevance of the current employment status as opposed to the future ones; and (ii) the sensitiveness of the unemployment inflow and outflow rates of the low ability worker to the strictness of EPL.

The paper proceeds as follows: Section 2 documents the trade-off and reviews the related literature, Section 3 presents the model and the economic environment. Section 4 develops the political system, and introduces the equilibrium concept. In section 5, we characterize the equilibria of the voting game. In sections 6 and 7, we discuss the results and conclude.

2. The trade-off

Figure ?? documents the aggregate trade-off between UB and EPL over a cross-country of European countries. It displays, on the vertical axis, a common measure of the strictness of employment protection defined by the OECD (OECD, 1999) on the basis of an assessment of national legislations. The horizontal axis indicates the average net replacement rate offered by unemployment insurance and unemployment assistance in the first four years of an unemployment spell multiplied by the coverage of UBs, that is, the fraction of unemployed individuals who receive unemployment benefits. The charts hints at a negative relation between the two schemes: the correlation coefficient is -0.71 and is significant at 99 per cent. The Southern European

countries, in particular, exhibit comparatively high costs of dismissals and a low generosity and coverage of UBs.

Economic theory, notably the literature on labour market institutions, provides a rationale for the substitutability between EPL and UB. They both protect workers against labour market risks. Models assigning a welfare-enhancing role to these institutions (e.g., Pissarides, 2001) show that – when severance payments and notice periods in case of dismissals are chosen optimally – there is no role for unemployment insurance. The two institutions may have many design features in common. For instance, when EPL involves only transfers from the employer to the employee (i.e., it is a severance cum notice period scheme), it may collapse to an experience-rated unemployment insurance scheme. Usually, job security provisions explicitly or implicitly require payments directly from the employer to departing employees, in addition to judicial or administrative costs that are deadweight from the point of view of the individual employment relationship.

There are second-best arguments in favour of different combinations of the two schemes. Both UB and EPL trade-off lower productive efficiency against ex ante distributional equity. Provision of insurance in the presence of asymmetric information unavoidably decreases productive efficiency. Workers have no less incentive to decrease their job-seeking effort when covered by social rather than private insurance, and protection from "unfair" developments unavoidably decreases the labour market's speed of adjustment. In presence of stronger competitive pressures – e.g., those associated with price transparency under EMU or with the enlargement of the EU to low-cost of labour countries – EPL is deemed to have a worse performance than unemployment insurance as the initial adjustment to new conditions is expected to require significantly more labour reallocation. Unemployment insurance is also preferable to EPL on the grounds that it allows workers to seek for jobs that are hard to get because they require more specialised skills (Acemoglu and Shimer, 1999).

Overall, there are theoretical arguments suggesting that there may be efficiency gains in substituting EPL with UB. It has been often advocated that Southern European countries (located in the North-West of Figure ??), in particular, should move towards configurations allowing for a more balanced mix of unemployment insurance and protection against dismissals. However, moving along this trade-off is proving extremely difficult. An inventory of reforms in this area carried out by Fondazione Rodolfo De Benedetti¹ suggest that reforms have been parametric, involving only marginal groups of the workforce. This is confirmed by the updating of the OECD index of the strictness of employment protection for regular workers, displayed in Figure 2.2 (drawn from OECD, 1999): the EPL for "regular" workers has hardly changed at all in OECD countries over the decade.

The location of the different countries along the UB-EPL trade-off would seem to be a stable politico-economic equilibrium. Characterising these equilibria is the task setup for the next section. In future work we plan to assess the stability of equilibria and analyse adjustments along the UB-EPL trade-off.

¹See Bertola, Boeri and Nicoletti (2000) for details.

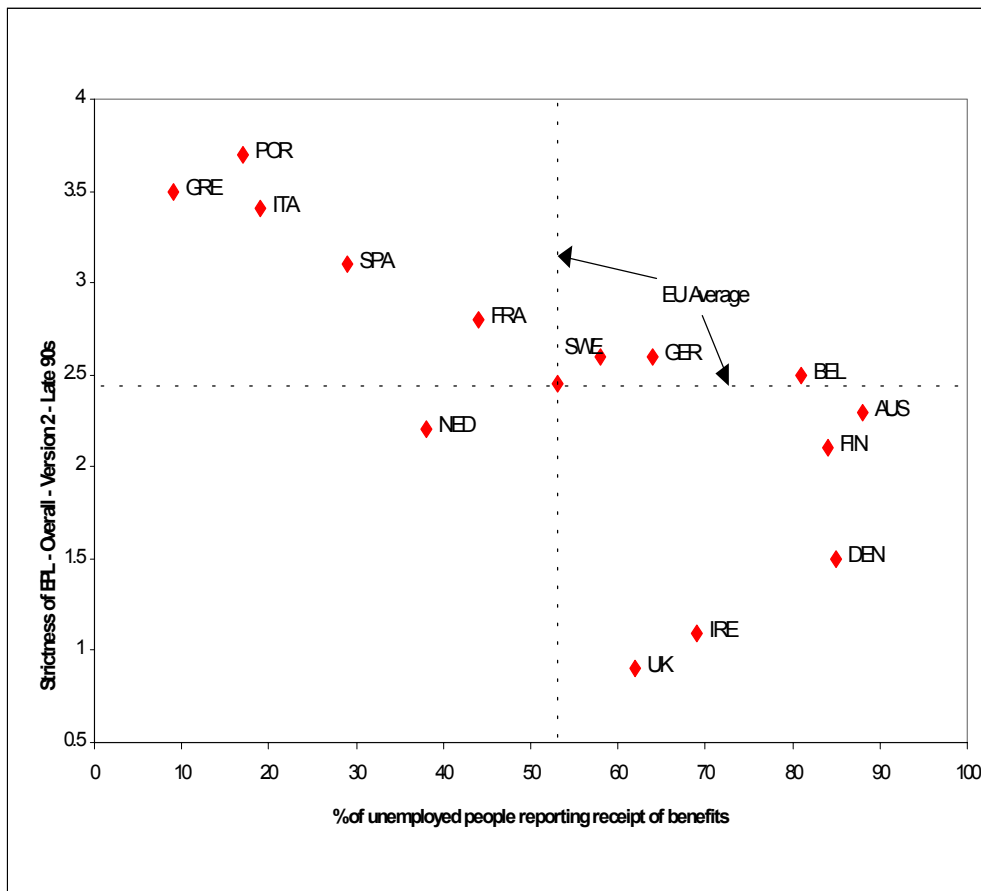


Figure 2.1: The trade-off between overall epl and unemployment benefits coverage

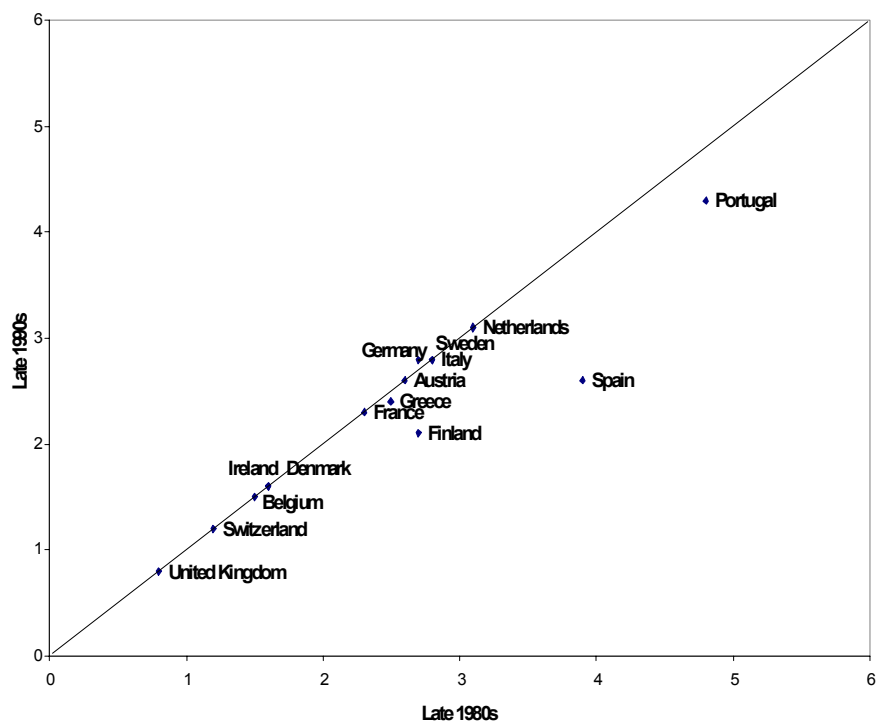


Figure 2.2: EPL for regular workers: late 1990s vs. late 1980s

3. The Economic Model

In our economy, agents are infinitely long lived. In every period, they consume their current income, since, as in Wright (1986), we assume that no saving technology is available². Their preferences are defined over the infinite stream of consumption, c , through the following utility function:

$$\Phi(c_t, c_{t+1}, \dots) = \sum_{k=t}^{\infty} \beta^{k-t} v(c_k)$$

where β represents the individual time discount, and the instant utility function is assumed to be logarithmic: $v(c) = \ln(c)$.

Agents differ in their ability level. There are low and high ability types, l and h , and ρ_j is the fraction of the type- j workers in the population. Clearly, $\rho_l + \rho_h = 1$. Moreover, we assume that there exist more low than high ability types, $\rho_l > \rho_h$. If employed, low ability workers earn a pre-tax real wage equal to w^l , while high ability workers earn w^h , with $w^h > w^l$. In every period, agents may be either employed or unemployed. According to the existing literature, we refer to the employed as “insider” and to the unemployed as “outsiders”. The transition between these two states is regulated by a Markov process, with type specific probability of transitions. In particular, $F^j \in (0, 1)$ is the probability that a type- j employed worker becomes unemployed (the unemployment inflow rate); and $H^j \in (0, 1)$ is the probability that a type- j unemployed worker finds a job (the unemployment outflow rate).

Our analysis concentrates on steady states. Thus, for each group of agents the unemployment rate is $u^j = F^j / (H^j + F^j)$, while the total unemployment rate is $u = u^l \rho^l + u^h \rho^h$. Clearly, we have that $\partial u^j / \partial F^j \geq 0$ and $\partial u^j / \partial H^j \leq 0$. Moreover, stability conditions for the unemployment rate require that $F^j < H^j \forall j$.

3.1. Labor Market Institutions

We consider two types of labor market institutions: i) an unemployment benefit (UB) program, which in every period taxes the employed and provides a transfer to the unemployed; and ii) an employment protection legislation (EPL) scheme, which affects labor market dynamics through its impact on the unemployment inflow and outflow rates.

Unemployment Benefits We consider a simple insurance program, which imposes a proportional tax, τ , on the labor income of the workers and awards to any type- j unemployed agent a transfer, b^j , that is proportional to her previous wage, and hence to her type: $b^j = \alpha^j w^j$, where α^j is a replacement rate that measures the generosity of the scheme for each type. The system is budget balanced and thus the total amount of transfers to the unemployed equals the total contributions:

$$b^l u^l \rho_l + b^h u^h \rho_h = \tau \left[w^l \rho_l (1 - u^l) + w^h \rho_h (1 - u^h) \right].$$

²This assumption greatly simplifies the analysis. Notice that the existence of perfect capital markets would be analogous to have risk neutral agents. A discussion of the effects of this assumption on the results is in section 4.

To fully characterize this unemployment benefit system, we make the following two assumptions. First, the tax rate on the labor income has to be lower than the unemployment rate of both types: $\tau < \text{Min}(u^l, u^h)$. This condition guarantees that agents have an incentive to work, although in our model agents are not given an explicit labor-leisure decision. Second, we assume that $\alpha^j = \tau(1 - u^j)/w^j$. The generosity of the UB system may differ across types, according to their unemployment rate. For instance, if high ability types have a lower unemployment rate – for a given tax rate – than low ability types, they will obtain a higher transfer when unemployed. Notice that under this characterization, the UB system constitutes a pure unemployment insurance scheme which – for a given premium, the tax rate τ – provides a larger benefit to those types who are less likely to become unemployed. In fact, by setting these different replacement rates, we abstract from any redistributive element between types. In section 4, we discuss how our result would be affected by using a unique replacement rate, thereby allowing for some redistribution, typically from high to low ability types. Finally, let $z^j = (1 - u^j)/w^j = H^j/F^j$ be the ratio of type- j employed to unemployed agents. Then, we have that $b^j = \tau w^j z^j$.

Employment Protection Legislation Labor markets may be regulated by a legislation that aims at protecting the workers against the risk of becoming unemployed. This legislation may take different forms. According to the OECD (1994) the measure of EPL can be classified as: (1) procedural inconveniences, which characterize the complexity of the procedures needed to issue a dismissal notice; (2) notice and severance payments requirements, that assess the time between the decision to layoff a worker and its effective dismissal, as well as the cost of dismissal; and (3) difficulty of dismissal, which measures the relevance of litigation costs and any possible bias in the judicial enforcement process.³

Cazes, Boeri and Bertola (1999) suggest that the third component of EPL – the difficulty of dismissal – accounts for most of the reduction in the dismissal rate associated with a more strict EPL. Accordingly, in our stylized framework, we simply characterize the EPL as a deadweight cost – such as litigation cost – which affects the unemployment inflow and outflow rates of the low and high ability type agents, while we disregard the existence of severance payments, and their possible role of insurance against the unemployment risk. As shown by Lazear (1990), under flexible wages, severance payments can be “undone” by wage contracts “bonding” the duration of a job.

In our model, the degree of EPL is thus measured by a parameter $s \in [0, 1]$, where $s = 0$ means no protection and $s = 1$ denotes maximum protection. As in Saint-Paul (1996 and 2000), we assume that the EPL decreases the unemployment inflow rate of the low-ability types, $F_1^l(s) \leq 0$. The impact of the EPL on the inflow rate of the high-ability types is instead lower. This is because the difficulty of dismissal, e.g., the litigation cost, is independent of the worker’s type, and thus an employee will be more willing to incur in such costs to layoff a high ability type, who earns a higher wage, than a low ability one. In other words, high ability agents are less protected than low ability ones by the EPL. For analytical simplicity, we take

³To this respect, see Ichino, Polo and Rettore (2001).

the rather extreme view that EPL only reduces the unemployment inflow rate of the low-ability types, while leaving the high types unaffected, i.e., F^h is a constant in our model. Moreover, we assume that the unemployment inflow rate of the low ability workers is always higher than the inflow rate of the high ability ones, $F^l(s=0) \geq F^h$. This is meant to capture the difference in the job-to-job reallocation between low and high ability types. In fact, high ability types have more job-to-job mobility and a lower unemployment inflow rate than the low-ability types. Additionally, high-ability workers have more firm specific human capital, and thus employers are less willing to fire them in downturns.

For every skill type, the unemployment inflow rate is negatively related to the strictness of EPL as measured by s : $H_1^l(s) < 0$ and $H_1^h(s) < 0$. This effect captures the idea that, for high degrees of EPL, employers are less willing to hire workers in upturns, since they will not be able to dismiss them during downturns. As in Saint-Paul (1996), who draws on earlier results by Pissarides (1990), hirings are assumed to be concave in the strictness of EPL. This is because the impact on the outflow rate of an increase in the degree of EPL is larger when the labor market is already very rigid than when it is still flexible. Finally, we assume that, for any degree of EPL, the unemployment outflow rate of the high ability workers is higher than the outflow rate of the low ability ones, $H^l(s) \leq H^h(s) \forall s$.

With this characterization of the transition process in and out of the employment status, a trade-off arises between the inflow and the outflow rates of the low ability types as the degree of EPL changes: more EPL decreases their inflow into unemployment, while reducing their outflow. The overall effect on the low-ability unemployment rate is thus ambiguous. As Persson and Tabellini (2000), we explicitly assume that the unemployment rate is first decreasing and then increasing in the degree of EPL⁴, and has a minimum at $\hat{s}^l > 0$.

Finally, notice that under our characterization, the EPL may only damages the high ability workers, since it reduces their outflow rate, while leaving their inflow rate unaffected. Thus, the degree of EPL that minimizes the unemployment rate of the high ability types is zero, $\hat{s}^h = 0$.

3.2. Individual Preferences

As in Wright (1986) and Pissarides (2001), in our model individuals cannot save to insure against the risk of becoming unemployed. Thus, in every period, the level of consumption for each skill type is directly determined by her employment status. If employed, a type j agent consumes $(1 - \tau)w^j$; if unemployed, she consumes b^j . It is useful to denote the difference in utility between the two labor market status for a type- j agent as $\Delta v^j = v((1 - \tau)w^j) - v(b^j)$.

We can now characterize the indirect utility function with respect to the degree of EPL and UB. Let $V_i^j(s, \tau)$ denote the expected lifetime utility of a type- j agent

⁴This U shape can easily be obtained by imposing some restrictions on the inflow and outflow rate functions, $F(s)$ and $H(s)$. In particular, it is sufficient to assume that the inflow rate is a linear, non-positive function of the EPL, $F_1^l \leq 0$ and $F_1^h = 0$, and that the outflow rate is decreasing and concave in the degree of EPL, $H_1^l \leq 0$, $H_{11}^l \leq 0$, and moreover that $H_1^l(s=0) = 0$, $H_1^l(s=1) \rightarrow -\infty$, and $H_{11}^l = 0$.

when she is currently in state i . Then $V_O^j(s, \tau)$ is the expected lifetime utility of a type- j agent who is currently unemployed – an outsider – and $V_I^j(s, \tau)$ is the utility of a currently employed agent – an insider.

We can thus write

$$\begin{aligned} V_O^j(s, \tau) &= v(b^j) + \beta[(1 - H^j)V_O^j(s, \tau) + H^jV_I^j(s, \tau)] \\ V_I^j(s, \tau) &= v((1 - \tau)w^j) + \beta[F^jV_O^j(s, \tau) + (1 - F^j)V_I^j(s, \tau)] \end{aligned}$$

where $j = h, l$. It is straightforward to see that the expected utility depends only on the state, and not on the date. Solving the system of equations we find that, for a type- j agent, who is currently in the employment status i , the indirect utility function is

$$V_i^j(s, \tau) = \frac{(1 - \theta_i^j(s))v((1 - \tau)w^j) + \theta_i^j(s)v(b^j)}{(1 - \beta)} \quad (3.1)$$

where

$$\theta_O^j(s) = \frac{1 - \beta + \beta F^j}{1 - \beta + \beta(F^j + H^j)} \quad (3.2)$$

represents the proportion of time that a type- j agent who is currently an outsider spent unemployed, while

$$\theta_I^j(s) = \frac{\beta F^j}{1 - \beta + \beta(F^j + H^j)} \quad (3.3)$$

represents the proportion of time that a type- j agent who is currently an insider spent unemployed, and again $j = h, l$. Clearly, $\theta_O^j(s) > \theta_I^j(s) \forall j$. It is useful at this point to define the degree of EPL that minimizes the time spent unemployed by a low-ability insider: $\tilde{s} = \arg \min \theta_I^l(s)$. It is easy to see that $\tilde{s} > \hat{s}^l$ – the degree of EPL that minimizes the low-ability average unemployment – since \tilde{s} takes into account the current employment status. Finally, notice that as β approaches 1, current employment conditions lose their relevance and the indirect utilities of a type- j insider or outsider coincide.

4. The Political Game

The degree of EPL and the level of unemployment benefits are decided at majority voting. When the election takes place, all persons alive, employed and unemployed, cast a ballot over $\tau \in [0, 1]$, the income tax which finances the unemployment insurance, and $s \in [0, 1]$, the degree of EPL. Individual preferences over the two issues are represented by the indirect utility functions at equation 3.1, further characterized at equations 3.2 and 3.3, respectively for the outsiders and the insiders. Notice that every agent has zero mass, and thus no individual vote could change the outcome of the election. As usual this problem is solved by assuming that individuals vote sincerely.

This majoritarian voting game shares an important features with the games analyzed in Conde-Ruiz and Galasso (1999 and 2002). The issue space is bidimensional, (τ, s) , and thus a Nash equilibrium typically fails to exist. To overcome

this well-known problem, we follow Shepsle (1979), and more recently Persson and Tabellini (2000), in analyzing voting equilibria induced by institutional restrictions, i.e., structure-induced equilibria. Conde-Ruiz and Galasso (1999 and 2002) discuss the set of institutional restrictions, which are needed to convert a two-dimensional election into a (dynamic) simultaneous *issue-by-issue* voting game, in which a (structure induced) equilibrium exists⁵.

The concept of structure induced equilibrium – or issue-by-issue voting – applied to our political game can be summarized as follows. For every value of s , the degree of EPL, each voter determines her most preferred value of τ , the level of UB, and viceversa. In other words, every agent votes two reaction functions: $\tau(s)$ and $s(\tau)$. A pair (τ^*, s^*) is an equilibrium of this voting game if τ^* represents the outcome of a majority voting over the jurisdiction τ – the level of employment benefit – when the other dimension is fixed at its level s^* , and viceversa.

Finally, we restrict ourselves to a steady state analysis and assume that the voting game takes place once and for all. Re-voting, as in Conde-Ruiz and Galasso (1999 and 2002), would allow to capture some dynamic aspects of the game, but at the cost of further complicating the analysis of the political equilibrium.

We now turn to the voting game by examining the agents' decisions over the EPL for a given τ and then the decisions over the UB for a given s .

4.1. Voting over the degree of Employment Protection Legislation

EPL affects the utility of the agents through its effects on the unemployment inflow and outflow rates. As discussed in the previous section, high ability agents – insiders and outsiders – are against any positive level of EPL, which decreases their unemployment outflow rate but does not decrease their inflow rate. The choice of a low-ability insider – originally in Saint Paul (1996) – is more complex, since the EPL creates a trade-off between her inflow and outflow rates, and can be understood by analyzing the three effects that EPL has on her indirect utility function. Substituting eq. 3.3 in eq. 3.1, for $j = L$, and deriving with respect to s , we obtain the following expression:

$$\underbrace{\beta (H_1^l F^l - F_1^l H^l)}_A \Delta v^l - \underbrace{(1 - \beta) F_1^l \Delta v^l}_B + \underbrace{F^l \eta_{b,s}^l (1 - \beta + \beta (F^l + H^l)) / s}_C \quad (4.1)$$

where $\eta_{b,s}^l = \frac{\partial b^l}{\partial s} \frac{s}{b^l}$ represents the elasticity of the unemployment benefit for a low ability agent to the degree of EPL, and captures the effects of EPL on the unemployment benefits due to the changes in the proportions of low ability employed and unemployed agents⁶. The first component, A , represents the effect that an increase

⁵As originally proposed by Shepsle (1979), this institutional arrangement does not directly apply to elections, but rather describes the process of policy making decision by representatives in a legislature. Therefore, in adopting these institutional restrictions in our voting game, we are implicitly assuming that the elections select a group of representatives whose preferences exactly match the voters' preferences. All these representatives then form a committee with jurisdiction over unemployment insurance and a committee with jurisdiction over the degree of EPL, which separately, but simultaneously, decide over the two issues at stake.

⁶Recall that in our unemployment benefit program – as in a pure insurance scheme – the replacement rate, α^j , depends on the agent's unemployment rate, u^j .

in the strictness of EPL has on the average unemployment rate, and thereby on the difference between the utility in the two states. Since the utility is larger when employed, this effect is positive for $s < \hat{s}^l$ – since the average unemployment decreases – becomes zero at $s = \hat{s}^l$, and then turns negative. The second term, B , measures the impact, in terms of utility, of an increase in the EPL on the unemployment inflow rate of the current insider. This is always positive. Finally, the last term, C , represents the effect of an increase in the strictness of EPL on the unemployment benefit, which takes place through changes in the ratio of low ability employed to unemployed agents. As for the first component, this is positive for $s < \hat{s}^l$ and weakly negative thereafter. Therefore, this discussion suggests that a low-ability insider sets a degree of EPL which is higher than \hat{s}^l , in order to benefit from the current positive effect of a decrease in the unemployment inflow rate (indicated by the term B in eq. 4.1).

Finally, a low ability outsider will choose a lower level of EPL than \hat{s}^l , since she trades off the decrease in the average unemployment rate with the reduction in the current probability of being hired.

The next proposition summarizes the ordering of the degree of EPL chosen by every agent.

Proposition 4.1. $s_I^l(\tau) \geq \hat{s}^l \geq s_O^l(\tau) \geq s_I^h = s_O^h = 0 \forall \tau$.

We have now ordered the votes over the level of EPL, s , for a given level of unemployment benefit, τ , and may characterize the decision of the median voter, $s^m(\tau)$.

Proposition 4.2. *If $u^l(s_I^l) \leq \frac{1}{2} \left(1 - \frac{\rho^h}{\rho^l}\right)$, the median voter over the jurisdiction s is a low skilled insider, and the corresponding degree of EPL is $s^m(\tau) = s_I^l(\tau)$. If $u^l(s_O^l) > \frac{1}{2} \left(1 - \frac{\rho^h}{\rho^l}\right)$, the median voter over the jurisdiction s is a low skilled outsider, and the corresponding degree of EPL is $s^m(\tau) = s_O^l(\tau)$.*

Given the ordering of the votes over s , this proposition is quite intuitive. If – for the (high) degree of EPL chosen by a low-ability insider – enough agents are employed, the median voter over s is a low-ability insider; whereas if – for the (low) degree of EPL chosen by a low-ability outsider – enough agents are unemployed, the median voter over s is a low-ability outsider⁷. The latter case is interesting, because it suggests that the low ability outsiders play a pivotal role in deciding over the degree of EPL, although they do not benefit from it, at least in their current state.

How does the degree of EPL chosen by the median voter depend on the level of UB? If the median voter is a low-ability insider, there is a negative relation between EPL and UB, as shown at Lemma A.1 in the appendix. In other words, for this median voter the reaction function of s with respect to τ is negatively sloped. This result hints at some substitutability between EPL and UB as instruments to protect against labor market risk. In fact, a higher level of unemployment insurance reduces

⁷Notice that both equilibria may fail to exist if – in the former case – the degree of EPL is too high and leads to large unemployment or if – in the latter case – it is too low and does not create enough unemployment.

the cost, in terms of consumption, of being unemployed, and thus a low-ability insider will require a lower degree of EPL.

Finally, notice that in the case of perfect capital markets, agents would only care about the net present value of their income. This may lead to a polarization of the low-ability agents' voting decisions. In fact, the insiders would choose an even larger degree of EPL, $s > s_I^l$, provided that the effect on the probability of being unemployed dominates the negative effect on the unemployment benefit; and viceversa for the low-ability outsiders, $s < s_O^l$.

4.2. Voting over Unemployment Benefits

The two types of agents – low and high ability – according to their current employment status – employed or unemployed – determine their most preferred level of UB. For a given s , they maximize their indirect utility function, eq. 3.1, further characterized at equations 3.2 and 3.3, respectively for the outsiders and the insiders, with respect to the tax rate, τ , which finances the unemployment benefit. As in Wright (1986), the most preferred tax rate for a type- j insider is $\tau_I^j(s) = \theta_I^j(s)$, see eq. 3.3, and for a type- j outsider is $\tau_O^j(s) = \theta_O^j(s)$, see eq. 3.2, where $j = l, h$. Notice that these tax rates are decreasing in the unemployment outflow rate and increasing in the inflow rate, since a lower (higher) probability of being unemployed induces a lower (higher) demand for unemployment insurance.

We can now compare these tax rates⁸. Among the insiders, the low ability have a higher probability of becoming unemployed and a lower outflow rate. Thus, they prefer a higher tax rate than the high ability workers, $\tau_I^l(s) \geq \tau_I^h(s)$. A similar reasoning applies to the outsiders, and thus $\tau_O^l(s) \geq \tau_O^h(s)$. Additionally, for a given ability type j , the outsiders prefer a higher tax rate than the insiders, due to their current status of recipients of the unemployment insurance system, and thus $\tau_O^j(s) > \tau_I^j(s)$. Although we are not able to provide a complete ordering of the preferences of the agents over the unemployment benefit tax rate, the next proposition characterizes the median voter over τ , and thus the tax rate that she prefers for a given s .

Proposition 4.3. *If $u \leq 1/2$, the median voter over the unemployment tax rate is a low ability insider, and the corresponding tax rate is $\tau^m(s) = \tau_I^l(s) = \theta_I^l(s)$.*

This proposition shows that, except in the extreme case in which the unemployed constitute a majority of the population, the low ability insiders are pivotal in determining the level of unemployment insurance. Taken together with the previous results on the degree of EPL, this insight suggests that most of the political power rests in the hands of the low ability insiders, who set the unemployment insurance and are likely to decide over the degree of EPL.

How does their choice over the unemployment insurance depend on the degree of EPL? The level of UB is first decreasing and then increasing in the degree of EPL

⁸Clearly, if the UB scheme entails some element of redistribution across types – such as in a Beveridgean system, where the benefits are flat, or in an “unfair” insurance scheme, where the replacement rate is constant across types, regardless of their unemployment risk – the voting behavior would change. In particular, low ability agents – insiders and outsiders – would prefer larger benefits, since they gain from the redistributive element, and viceversa for high ability individuals.

(see Lemma A.2 in the appendix for a proof). Thus the reaction function of τ with respect to s is U-shaped. The intuition is straightforward. For low degrees of EPL, an increase in s reduces the average unemployment rate of a low-ability agent as well as her unemployment inflow rate. Thus, a low ability insider is more protected against the risk of being unemployed, requires less unemployment insurance, and τ decreases. Once the degree of EPL is larger than \hat{s}^l , any additional increase of employment protection raises the average unemployment rate, but this effect is compensated by a reduction in the unemployment inflow rate, and thus the demand for unemployment insurance decreases. However, for some higher level of EPL – higher than the degree of EPL that minimizes the probability of being unemployed conditional on the current status of employed worker, \tilde{s} – the negative effect on the unemployment rate becomes dominant, a low ability insider is more likely to become unemployed and her demand for unemployment insurance begins to increase.

Notice that also for the UB, the existence of perfect capital markets would polarize the voting decision. In particular, the insiders, who have a below-average unemployment risk would prefer to self-insure through savings and vote for $\tau = 0$. A type- j outsider, whom unemployment risk is above average, would demand full insurance through the UB, and thus $\tau = u^j$.

4.3. The Political Equilibria

To find the political equilibria of our voting game over the degree of EPL, s , and the level of UB, τ , we need to bring together the voting behavior over s and τ in our issue-by-issue voting game. In particular, the reaction functions of the median voter over s and τ – described respectively in sections 4.1 and 4.2 – have to be analyzed. The (structure-induced) equilibrium outcomes of this voting game correspond to the points where these functions cross, and are described in the next proposition:

Proposition 4.4. (I) If $u^l(s_I^l) \leq \frac{1}{2} \left(1 - \frac{\rho^h}{\rho^l}\right)$, there exists a structure-induced equilibrium (SIE) of the voting game (τ^*, s^*) , such that $\tau^* = \tau_I^l(s_I^l)$ and $s^* = s_I^l(\tau_I^l) \in (\hat{s}^l, \tilde{s})$;

(II) If $u^l(s_O^l) > \frac{1}{2} \left(1 - \frac{\rho^h}{\rho^l}\right)$, there typically exists a structure-induced equilibrium (SIE) of the voting game (τ^{**}, s^{**}) , such that $\tau^{**} = \tau_I^l(s_O^l)$ and $s^{**} = s_O^l(\tau_I^l) < \hat{s}^l$.

(III) If (τ^{**}, s^{**}) exists, then $s^{**} < s^*$ and $\tau^{**} > \tau^*$.

This proposition contains the crucial theoretical result of the paper. If the low ability insiders constitute a majority of the voters, they determine the degree of EPL and the level of unemployment benefits. This case is depicted in figure 1, where the two reaction functions, $\tau_I^l(s)$ and $s_I^l(\tau)$, are displayed. If, on the other hand, they do not represent a majority, the low-ability are still pivotal in choosing the generosity of unemployment benefits, and thus the relevant reaction function is still $\tau_I^l(s)$. In this case and if there are enough unemployed individuals, the low-ability outsiders

are pivotal and the relevant reaction function becomes $s_O^l(\tau)$. Figure 1 displays the equilibrium in the case this reaction function is continuous.

The last part of this proposition accounts for the existence of a trade-off between UB and EPL, which it relates to the skill composition in the economy. A large fraction of low-ability types creates a large support in favor of measures of employment protection, but then, this large degree of EPL decreases the demand for UB. In economies with a large share of high ability individuals (case II), the support for EPL is reduced. Lower degrees of EPL in turn induce – among the low ability insiders, who are still pivotal in the UB decision – a higher demand for UB. In the next section, we assess empirically the link between this trade-off and the skill composition in the economy.

Could a trade-off emerge even among countries with a majority of low-ability insiders? The next proposition addresses this question by examining how the equilibrium outcome in case I at proposition 4.4 is affected by a change in the subjective rate of time discount.

Proposition 4.5. *For $u^l(s_I^l) \leq \frac{1}{2} \left(1 - \frac{\rho^h}{\rho^l}\right)$, a decrease in β induces a change in an equilibrium outcome from (τ^*, s^*) to $(\tau^{*'}, s^{*'})$, such that $\tau^{*'} < \tau^*$ and $s^{*'} > s^*$.*

This proposition indicates that if the low-ability insiders assign greater weight to their present status (as β decreases), they will require less unemployment insurance, but more employment protection. This insight carries a powerful testable implication, which we address in the next section. It suggests that in countries where the population of low-ability insiders is older, and therefore discounts the future employment status more heavily, we should observe high degree of employment protection and a relatively low generosity of UB. Analogously, the existence of early retirement provisions, which guarantee an early exit from the labor market to middle-aged workers, reduces the relevance of the future employment opportunities, and thus puts more pressure on increasing restrictions on dismissals.

5. Empirical Relevance

The purpose of this section is to assess the empirical relevance of i) the substantive hypotheses of the model, and ii) its implications.

5.1. Does EPL reduce unemployment inflow rates?

A key assumption of the model is that EPL decreases the inflow rate, notably among low-skilled types. OECD (1999) documents over a cross-section of OECD countries that stricter EPL is associated with lower inflow rates into unemployment. More insights on the relationship between EPL and the incidence of unemployment can be drawn by having access to micro data on employment-unemployment histories and drawing on differences in the enforcement of employment protection regulations across firms.

Units with less than 15 employees in Italy are exempted from the application of the strictest EPL regulations, those involving the compulsory reinstatement of a worker who was unfairly dismissed. Fixed-term contract workers are also uncovered

by these provisions insofar as their contract can just not be renewed by the employer at expiration. Thus, Boeri and Jimeno (2002) used the 15 employee threshold and the fixed-term/permanent contract divide to test – within a differences-in-differences approach – the impact of EPL on the probability of being dismissed. They found significant effects of EPL on the likelihood of being laidoff. Here, we extend their analysis by focusing on unskilled workers.

Table 1 displays regressions of the probability of being laid-off on a number of personal characteristics (gender, tenure, educational attainment, region of residence and industry of affiliation) plus a dummy capturing firms with less than 15 employees. Data are drawn from matched records across different waves of the Italian Labour Force Survey, a quarterly survey with a large rotating panel allowing, at yearly frequencies, to track histories of about 40 per cent of the LFS sample, that is, about 80,000 individuals. The size of the firm is stated by the employees. Matched records across LFS waves (enabling us to identify separations) as well as contemporaneous and retrospective information in the initial and the final period allow to capture the nature of the separations, that is, whether it is a layoff or a voluntary quit⁹.

Table 1.
Effects of EPL on unemployment inflows
DProbit estimates (1). Italy , 1994-1996

Dependent variable: dummy 1 if unempl or out-of-LF in '95 after empl in '94			
variables	coefficient	significance	standard error
dummy 1 if employees <=15	0.003	**	0.002
# empl in the firm	-0.00001	**	0.000
primary edu	0.024	***	0.002
primary edu*dummy <=15	0.004		0.004
dummy northern Italy	-0.004	***	0.001
dummy central Italy	-0.002	***	0.000
prev job less than 1 year	0.013	***	0.004
prev job 1 year	0.007	***	0.002
prev job 3_5 years	0.006	***	0.002
1 manufacturing, 0 service	0.004	***	0.001
male	-0.003	***	0.001
Pseudo R ²	0.12	nobs	13676
(1) Coefficients are % variation of the baseline probability			

Boeri and Jimeno observed a statistically significant and positive effect on the probability of dismissal of the dummy capturing firms below the threshold scale exempting small firms from the domain of application of the most stringent EPL provisions. This effect is present even when we introduce additional dummies, at higher threshold scale (e.g., 20 or 25 employees¹⁰). It is not present, however, when we focus on temporary workers. Thus, applying a difference-in-difference (above vs. below the threshold scale and permanent vs. temporary workers) one finds support to the presence of a negative effect of EPL on layoff probabilities.

⁹Unfortunately the information provided by the survey is not sufficient to disentangle disciplinary from economic layoffs.

¹⁰We also tried with dummies located at the 30,35,40 and 45 thresholds obtaining the same results.

As shown by Table 1, individuals with only primary or lower educational attainments have a higher probability of being dismissed than individuals with higher levels of education. The interaction term capturing the effects of the 15-employees threshold on low-skilled workers is positive but not significant at conventional levels. While it is true that low-skilled types face a higher risk of dismissal, we cannot rule out that EPL may also affect medium and highly-skilled individuals. From the standpoint of our model what is essential is that the reduction of dismissal probability associated with EPL is larger in size for the low skilled individuals and this is consistent with our data.

5.2. Estimating the UB/EPL trade-off

Tables 5.1 and ?? display estimates of the UB/EPL tradeoff across a panel of European countries. In particular, the dependent variable is the logarithm of the ratio of the measure of generosity of unemployment benefits and the OECD index of the strictness of employment protection discussed in Section 1. Table 5.1 focuses on the characteristics of insiders. In particular, it evaluates the effects on the UB/EPL configuration of a different skill composition of the workforce. The regression results suggest that a larger share of workers with secondary (the middle edu variable) and tertiary educational attainments (high edu) are associated with configurations assigning a larger weight to UB vs. EPL. The age structure of employment is also important: larger proportions of young people in employment yield institutional configurations attributing more importance to unemployment insurance with respect to employment protection. The scope of capital markets (which provides an alternative way to protect against labour market risk) also induces more request for employment protection, while the effect of union density (which tentatively captures obstacles to wage adjustment) is not statistically significant.

A problem with this specification is that the skill and age composition of employment are endogenous to the particular institutional configuration adopted by the various countries. This means that Table 5.1 may simply capture reverse causality, e.g., the fact that countries with stricter EPL have lower employment rates among young people. Thus, in Table ?? we focus on the characteristics of the population in working age (the voters in our model) rather than of employed individuals only. The results are still in line with the implications of the model: a distribution of skill types more skewed towards highly or medium-skilled individuals yields equilibria assigning more weight to UB vs EPL. Interestingly, in this case we find a significant effect also of the ageing variable: a larger share of individuals aged 55-to-64 involves stricter EPL and/or lower generosity of UB.

6. Voting for EPL

Finally a survey carried out by Fondazione Rodolfo Debenedetti in April 2002 on a representative sample of Italians yields insights as to the characteristics of those voting for stricter employment protection. All individuals aged 16 to 80 were asked whether they preferred a flexible "labour market in which it is relatively easy to find a job, but it is likewise easy to loose a job" or a rigid labour market in which jobs are

Number of obs = 121			
Prob > F = 0.0000			
Adj R2 = 0.4851			
Log(ub/epl)	Coefficient	Significance	Standard-Error
market capitalisation	0,003	**	0,002
share middle edu	1,216	***	0,451
share high edu	5,563	***	0,662
share of emp15_24	6,268	***	2,011
share of emp55_64	-2,954		2,532
union density	0,002		0,002
dummy data	2,683	***	0,433
cons	-5,218	***	0,559
Note: One asterisk denotes significance at 90%, two asterisks at 95%, three at 99%.			

Figure 5.1: The trade-off and the characteristics of insiders

Number of obs = 115			
Prob > F = 0.0000			
Adj R2 = 0.5384			
Log(ub/epl)	Coefficient	Significance	Standard-Error
market capitalisation	0,004	**	0,002
share middle edu	1,310	***	0,492
share high edu	4,196	***	0,855
pop15_24/total	0,009		0,006
pop55_64/total	-0,019	***	0,006
union density	0,004		0,002
dummy data	1,902	***	0,483
cons	-3,194		1,924
Note: One asterisk denotes significance at 90%, two asterisks at 95%, three at 99%.			

Figure 5.2: The Trade-off and the Characteristics of Outsiders

Dprobit estimates			
Dependent variable: Probability of preferring a rigid labour market, active population			
Variable	dF/dx	Standard Error	Significance (for the underlying coefficients)
Old (>55)	0.1376	0.0748	*
Young (< 25)	0.0123	0.0705	
Male	-0.0300	0.0462	
Third Level Education	-0.0936	0.0522	*
Secondary Education	-0.0623	0.0514	
Self-employed, managers and professionals	-0.1558	0.0830	*
Blue collar	0.0455	0.0604	
Unemployed	-0.1409	0.1130	
Low Income (<560 Euros)	0.0852	0.0878	
High Income (>1549 Euros)	-0.0491	0.0679	
N. of observations	517		
Pseudo R-squared	0.0301		

Figure 6.1: The trade-off at the individual level.

difficult but last longer. Table 6.1 displays the dprobit estimates of the probability of being in favour of a rigid labour market over a sample of active individuals (excluding pensioners, housewives and students). As can be seen from the table, the fact of being aged more than 55 yields a 15 per cent higher probability (than the baseline) to vote in favour of employment protection. Higher educational attainments, instead, play in the opposite direction, just in line with the predictions of our model.

7. Conclusions

European countries provide different types of insurance to workers against labour market risks, by combining different degrees of employment protection and unemployment insurance. A heated debate has been taking place over the need to reform some of the existing labour market institutions, and some form of consensus has emerged even among academics that Southern European countries should adopt institutional configurations assigning a greater weight to UB and less importance to EPL in protecting workers against labour market risk. However, reforming institutions along these lines is proving difficult and politically costly.

In this paper we have shown that different institutional configurations can be interpreted as politico-economic equilibria, corresponding to different skill and age

compositions of insiders and outsiders. Our empirical results are encouragingly in line with the implications of the model. Its key assumptions, concerning the relation between EPL and labour market flows, are not falsified by facts.

In future work, we plan to extend the model dynamically and empirically assess the adjustment path along the UB/EPL policy trade-off.

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A. Appendix

Proof of Proposition 4.1: (i) Proof of $s_I^l \geq \hat{s}^l$. The derivative of the indirect utility function of a low-skilled insider w.r.t. s is at eq. 4.1. It can be shown that the preferences $V_I^l(s, \tau)$ are single peaked in s . If we evaluate them in \hat{s}^l , the first and the third terms, i.e., A and C , are equal to zero, since $\frac{\partial b^l}{\partial s} = \tau w^l \frac{\partial z^l}{\partial s} = \tau w^l (F_1^l H^l - H_1^l F^l) / (F^l)^2$. Moreover, $F_1^l < 0$ and thus the second term and the entire first order condition is positive at $s = \hat{s}^l$. Therefore, $s_I^l > \hat{s}^l$. (ii) Proof of $\hat{s}^l \geq s_O^l$. It can be shown that $V_O^l(s, \tau)$ is increasing in the interval $0 \leq s \leq s_O^{l*} \leq \hat{s}^l$ and decreasing in the interval $s \geq \hat{s}^l$, where $s_O^{l*} \in \arg \min \theta_O^l$. Therefore $s_O^l \leq \hat{s}^l$. (iii) Proof of $s_I^h = 0$. For a high ability insider, the FOC w.r.t. s is $\beta H_1^h F^h \Delta v^h + (1 - \beta + \beta (F^h + H^h)) H_1^h (\partial v^h / \partial s)$, which is negative $\forall s$ since $H_1^h < 0$. (iv) Proof of $s_O^h = 0$. For a high ability outsider, we have the following FOC: $\beta H_1^h \Delta v^h + (1 - \beta + \beta (F^h + H^h)) H_1^h (\partial v^h / \partial s) < 0 \forall s$. Thus, $s_I^h = s_O^h = 0$. **q.e.d.**

Proof of Proposition 4.2: i) Notice that, for a given level of EPL, s , the low-ability insiders are a majority if and only if $u^l(s) < 1 - \rho^h / \rho^l$. Therefore, they are a majority if this condition holds for the degree of EPL that they would choose, $s = s_I^l$, that is if $u^l(s_I^l) \leq \frac{1}{2} (1 - \frac{\rho^h}{\rho^l})$. ii) Suppose that the low-ability insiders are not a majority for $s = s_O^l$, that is $u^l(s_O^l) > \frac{1}{2} (1 - \frac{\rho^h}{\rho^l})$. It can be shown that $V_O^l(s, \tau)$ is increasing in the interval $0 \leq s \leq s_O^{l*} \leq \hat{s}^l$ and decreasing in the interval $s \geq \hat{s}^l$, however, we can not guarantee that preferences are single peaked in s . Nevertheless, we can prove that the median vote is the most prefer level of EPL for a low-ability outsider, s_O^l . Let $s' > s_O^l$. All high type individuals (insider and outsiders) prefer s_O^l to s' and since $u^l(s_O^l) > \frac{1}{2} (1 - \frac{\rho^h}{\rho^l})$, a majority of individuals prefer s_O^l to s' . Let $s'' < s_O^l$. All low-type insiders prefer s_O^l to s'' and since $\rho^l > \rho^h$, a majority of individuals prefer s_O^l to s'' . Thus, s_O^l is the majority winner in this case. **q.e.d.**

Lemma A.1. $s_I^l(\tau)$ is decreasing in τ , and is bounded below by \hat{s}^l and above by \tilde{s} , where $\tilde{s} = \arg \min \theta_I^l(s)$

Proof of Lemma A.1: We derive the indirect utility function of a low-skilled insider w.r.t. s , (as in eq. ??) and multiply both sides of the FOC by H^l :

$$\left(H^l \beta (H_1^l F^l - F_1^l H^l) - F_1^l H^l (1 - \beta) \right) \Delta v^l + v' (b^l) \underbrace{\frac{H^l}{F^l} \tau w^l (H_1^l F^l - F_1^l H^l)}_{b^l} \left((1 - \beta) + \beta (F^l + H^l) \right) = 0$$

after some algebra we can rewrite the FOC as:

$$\frac{(H_1^l F^l - F_1^l H^l)}{-F_1^l H^l} \left[H^l \beta + \frac{1}{\Delta v^l} \left((1 - \beta) + \beta (F^l + H^l) \right) \right] + (1 - \beta) = 0$$

Applying the implicit function theorem, we obtain

$$\frac{ds_I^l}{d\tau} = -\frac{1}{SOC(s_I^l)} \frac{\overbrace{(H_1^l F^l - F_1^l H^l)}^{\leq 0}}{\underbrace{-F_1^l H^l}_{\geq 0}} \frac{\left((1-\beta) + \beta(F^l + H^l)\right) \left(\frac{1}{(1-\tau)} + \frac{1}{\tau}\right)}{(\Delta v^l)^2}.$$

Thus, $s_I^l(\tau)$ is decreasing in τ , $ds_I^l/d\tau \leq 0$, since $SOC(s_I^l)$ is negative (s_I^l is a maximum); $\frac{dH^l}{ds}F^l - \frac{dF^l}{ds}H^l \leq 0$ for $s \geq \hat{s}^l$ and $F_1^l \leq 0$. By Proposition 4.1, $s_I^l(\tau) \geq \hat{s}^l$. Finally, to prove that $s_I^l(\tau) \leq \tilde{s}$, we only need to show that $\lim_{\tau \rightarrow 0} s_I^l(\tau) \leq \tilde{s}$. Notice that as τ approaches zero, terms A and B in eq. ?? become predominant with respect to term C , and thus the FOC is equal to zero, when the first two terms are zero. But these terms can be written as $-\Delta v^l (\partial \theta_I^l(s) / \partial s)$, which is equal to zero for $s = \tilde{s}$. **q.e.d.**

Proof of Proposition 4.3: Recall that $\tau_O^l \geq \tau_I^l \geq \tau_I^h$. Thus, we may have that either i) $\tau_O^l \geq \tau_O^h \geq \tau_I^l \geq \tau_I^h$, in which case τ_I^l is the median over the distribution of the preferred tax rates only if the outsiders are less than half population, $u < 1/2$; or ii) $\tau_O^l \geq \tau_I^l \geq \tau_O^h \geq \tau_I^h$, in which case τ_I^l is the median over the distribution of the preferred tax rates if the low ability outsiders are not a majority of the population, which is implied by $u < 1/2$, since $\rho^l u^l \leq u$. **q.e.d.**

Lemma A.2. $\tau_I^l(s)$ is convex function of s with a minimum in \tilde{s} .

Lemma A.2: Recall that $\tau_I^l(s) = \theta_I^l(s)$. Thus, $\tilde{s} = \arg \min \tau_I^l(s)$. Moreover, it is easy to show that $\theta_I^l(s)$ is convex, given that u^l is convex. **q.e.d.**

Proof of Proposition 4.4: (I) For $u^l(s_I^l) \leq \frac{1}{2} \left(1 - \frac{\rho^h}{\rho^l}\right)$, a low-ability insider is the median voter in both dimensions. her reaction functions are $\tau_I^l(s)$ and $s_I^l(\tau)$. To need to show that these reaction functions cross – at least – once for $s^* \in (\hat{s}^l, \tilde{s})$ and $\tau^* > 0$. To see this, recall that, by lemma A.1, $s_I^l(\tau)$ is continuous and decreasing, and, by lemma A.2, $\tau_I^l(s)$ is convex. Moreover, $s_I^l(\tau)$ approaches the vertical axis – see figure 1 – above $\tau_I^l(s)$. In fact, by evaluating the FOC w.r.t. to s , eq. 4.1, at $s = 0$, it can be shown that τ such that $s_I^l(\tau) = 0$ is greater than $F(0) / [F(0) + H(0)] > \tau_I^l(s=0) = \beta F(0) / [1 - \beta + \beta[F(0) + H(0)]] \forall \beta < 1$. To complete the proof, notice that $s_I^l(\tau)$ tends to \tilde{s} as τ approaches zero; whereas at $s = \tilde{s}$, $\tau_I^l(\tilde{s})$ is at its minimum, but is positive. Thus, $s_I^l(\tau)$ begins above $\tau_I^l(s)$ for low s and is below $\tau_I^l(s)$ for $s = \tilde{s}$.

(II) For $u^l(s_O^l) > \frac{1}{2} \left(1 - \frac{\rho^h}{\rho^l}\right)$, the reaction function $\tau_I^l(s)$ does not change, while the median voter over s becomes a low-ability outsiders, with reaction function $s_O^l(\tau)$. Notice that by Proposition 4.1, $s_O^l(\tau) < \hat{s}^l$. Moreover, by applying the reasoning in lemma A.1, it is easy to see that this function is decreasing in τ . However, $s_O^l(\tau)$ may not be continuous, if the preferences of the low-ability outsiders are not single-peaked. Let us first consider a continuous function. As in part (I) of this proposition, it can be shown that τ such that $s_O^l(\tau) = 0$ is greater than

$F(0)/[F(0) + H(0)] > \tau_I^l(s=0) = \beta F(0)/[1 - \beta + \beta[F(0) + H(0)]] \forall \beta < 1$, and thus that $s_O^l(\tau)$ approaches the vertical axis above $\tau_I^l(s)$. Finally, notice that as $s_O^l(\tau)$ tends to $s_O^{l*} = \arg \min \theta_O^l$ as τ approaches zero; whereas for $s = s_O^{l*} < \hat{s}^l$, $\tau_I^l(s_O^{l*}) = \theta_I^l(s_O^{l*}) > \theta_I^l(\hat{s}) > 0$. Thus, if the function $s_O^l(\tau)$ is continuous, it crosses $\tau_I^l(s)$ at least once for $s^{**} < \hat{s}^l$. and $\tau^{**} > 0$. If the function is not continuous, a (Structure Induced) equilibrium may fail to exist, since the crossing may not occur.

(III) If an equilibrium exists in case (II), then $s^{**} < \hat{s}^l < s^* < \tilde{s}$. Moreover, since both (τ^*, s^*) and (τ^{**}, s^{**}) occur on the decreasing portion of $\tau_I^l(s)$, then $\tau^* = \tau_I^l(s^*) < \tau^{**} = \tau_I^l(s^{**})$, since $s^{**} < s^*$. **q.e.d.**

Proof of Proposition 4.5: For $u^l(s_I^l) \leq \frac{1}{2} \left(1 - \frac{\rho^h}{\rho^l}\right)$, an equilibrium outcome (τ^*, s^*) is represented by the point in which the two reaction functions $\tau^m(s)$ and $s^m(\tau)$ cross. Suppose that, for a given β , there exists a unique crossing, and thus a unique equilibrium outcome (τ^*, s^*) . A decrease in β shifts the reaction function $\tau^m(s)$ downward. In fact, $\partial \tau^m(s) / \partial \beta = F^l / (1 - \beta + \beta F^l + \beta H^l)^2 > 0$. Notice that the other reaction function, $s^m(\tau)$, is implicitly defined by the derivative of the indirect utility function of a low-ability insider w.r.t. s :

$$FOC(s) = -\frac{\partial \theta^l(s, \beta)}{\partial s} \left(v \left((1 - \tau) w^l \right) - v \left(b^l \right) \right) + \theta^l(s, \beta) v' \left(b^l \right) \frac{\partial b^l}{\partial s} = 0 \quad (\text{A.1})$$

where

$$\frac{\partial \theta^l(s, \beta)}{\partial s} = \frac{\beta \left[F_1^l (1 - \beta) + \beta \left(H^l F_1^l - F^l H_1^l \right) \right]}{(1 - \beta + \beta (F^l + H^l))^2}$$

To calculate the effect of a change in β on $s^m(\tau)$, we need to total differentiate eq.A.1. Thus, $\frac{ds}{d\beta} = -\frac{dFOC(s)/d\beta}{soc(s)}$, and $sign\left(\frac{ds}{d\beta}\right) = sign\left(\frac{dFOC(s)}{d\beta}\right)$, since $soc(s^m) < 0$. By differentiating eq.A.1 w.r.t. β , after some algebra, we obtain that $\frac{dFOC(s)}{d\beta} = \frac{F^l(F_1^l + H_1^l)}{(1 - \beta + \beta(F^l + H^l))^2} \leq 0$. Thus, $ds/d\beta \leq 0$, a decrease in β moves the reaction function $s^m(\tau)$ upward. Finally, notice that $s^m(\tau) = s_I^l(\tau) < \tilde{s} \forall \tau$, and thus the reaction function $s^m(\tau)$ crosses $\tau^m(s)$ on its decreasing portion. By putting together the downward shift in $\tau^m(s)$ and the upward movement in $s^m(\tau)$, it is easy to see that a decrease in β leads to a new equilibrium outcome $(\tau^{*'}, s^{*'})$, with $\tau^{*'} < \tau^*$ and $s^{*'} > s^*$. **q.e.d.**

Figure 1

