

A Positive Theory of Unemployment Insurance and Employment Protection¹

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Abstract

The objective of this paper is to provide a political economy explanation of the empirically observed negative correlation between employment protection and insurance. We study an economy composed of four groups of agents (capitalists, unemployed people, low- and high-skilled workers), each one represented by a politician. Politicians first form political parties and then compete in a winner-takes-all election by simultaneously proposing policy bundles composed of an employment protection level and an unemployment benefit. We first show that, in the absence of parties (i.e., in a citizen-candidate model), low-skilled workers are decisive and support a maximum employment protection level together with some unemployment benefit. We then obtain that, under some conditions, allowing for party formation results in all policy equilibria being in the Pareto set of the coalition formed by high-skilled workers together with unemployed people. Policies in this Pareto set exhibit a negative correlation between employment protection and unemployment benefit.

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1 Introduction

In most countries, labor markets institutions such as employment protection, unemployment benefits and minimum wage legislations prevent private parties from freely setting prices or quantities, creating rigidities. These rigidities may be at least in part socially efficient in a second-best sense. For instance, in a world where workers could be hired and fired at a hat's drop and at no cost for the employer, workers would have little incentive to acquire firm-specific skills. Employment protection could then provide incentives for workers to increase their productivity. Similarly, unemployment benefits provide insurance for risk-averse workers affected by random employability shocks.

Making the point that some rigidities may be optimal (see Blanchard and Tirole, 2007, among others) of course does not mean that the current level of rigidities is the optimal one, or that it is determined by a social planner maximizing some measure of welfare. As for the first point, many economists blame rigidities for high (long term) unemployment, especially in Europe, and have been advocating for a long time making the labor market more flexible (see for instance OECD Job Study, 1995). Despite these recommendations, many governments have failed to successfully implement such plans (see Section 5.1 in Boeri et al., 2006, or Saint-Paul, 1996). Part of the literature has then taken a turn towards political economy explanations of both the emergence of labor market institutions and resistance against moves towards more flexibility.

The seminal paper in the political economy literature is Wright (1986). He assumes that workers differ both intrinsically (they exhibit different probabilities to become unemployed and different durations of unemployment) and by the “luck of the draw,” in the sense that at any point in time they are either employed or not. He shows how current employment conditions, future employment opportunities and risk aversion affect the outcome of a vote on the size of the unemployment benefit. He shows, e.g., that “even in an economy with complete private markets the provision of unemployment insurance may be socialized via the electoral process. (p 379)”

The same type of approach has been adopted by most papers studying the political economy of labor market institutions. These papers have in common that they adopt an insider-outsider view of the labor market, pitting currently employed workers against currently unemployed agents, and that they build a unidimensional model which focuses on a single institution. In these models, the decisive voter is usually a (low-skilled) worker. If the institution studied is employment protection (as in Saint-Paul (1999, 2000, 2002)), the decisive voter favors a generous protection regime because he is currently employed while, if the institution studied is unemployment insurance (as in Wright (1986), Persson and Tabellini (2000) or Pallage and Zimmermann (2001)), the decisive voter favors a rather small program (because his probability of incurring the damage is lower than the economy's average). Put to-

gether, these results suggest that we should *only* observe equilibria with both large employment protection levels and low unemployment benefits.

While certain countries (such as Italy) conform to this equilibrium, not all countries do. There is a large heterogeneity among OECD countries in terms of how generous unemployment insurance is and how much jobs are protected. Boeri et al. (2006) and Chung and Jeong (2008) show that there exists a negative correlation between both dimensions, with countries exhibiting low employment protection and large insurance programs, and vice versa. The objective of our paper is to provide a political economy explanation of this negative correlation between employment protection and insurance.

Addressing this question requires building a bidimensional voting model. Moreover, it is our opinion that a meaningful depiction of labor markets must allow voters to differ in more than one dimension. We wish to distinguish three ways in which voters may differ from each other. First, they differ in their main source of income (workers vs capitalists). Second, at any point in time, workers may be employed or not (the insider-outsider conflict). Third, employed workers may differ in their ability. Given that agents differ on more than one dimension, the decision making process should put a lot of emphasis on the political alliances that these different groups of voters may strike with each others. This in turn means that we wish to depart from the usual two party approach adopted in a large part of the political economy literature. It seems to us very difficult to state *ex ante* which party represents which voters. Saint-Paul (1996, p.281) discusses this point at length, criticizing the idea that left wing parties represent “labor” while right-wing parties are biased against it. We consider it much more fruitful to allow voters to be represented by politicians who decide which alliances to strike with each other and which political parties to form. In such a framework, both the number of parties and their constituents are endogenous at equilibrium.

We adapt the economic model from Pagano and Volpin (2005) to fit our purpose. The economy is populated with capitalists and workers. A subset of workers are hired in the initial stage and can invest in firm-specific human capital in order to increase their productivity. They differ in their ability to become more productive, which can be either low or high. Productivity is observable by all but non contractible. The firm then tries to fire low-productivity workers (those who have not invested or for whom the investment has not paid off) in order to replace them with lower-paid currently unemployed workers. This attempt to fire people may be voided in court with a probability that increases with the degree of employment protection. The public policy consists of both this employment protection level (EPL thereafter) and a tax which finances an unemployment benefit (UB thereafter). The vote is taken at an interim stage, when workers have already invested in human capital but before the investment has proved fruitful or not. We assume that no group forms a majority by itself, that unemployed workers form the largest group, and that they

form a majority when they join forces with either the high-skilled workers or the unemployed.

Our modelling of political competition is based on Levy (2004). Her approach is particularly well suited to our problem, since (i) unlike the traditional Downsian model, equilibria in pure strategies do exist with multidimensional policy spaces and (ii) both the number and the constituency of political parties are endogenous. At the voting stage, there are four groups of citizens (capitalists, unemployed agents, low- and high-skilled workers), each represented by one politician. These politicians first form coalitions (parties) and then compete in a winner-takes-all election by simultaneously proposing policy bundles composed of an EPL and an UB. The incentive to form a party resides in the ability to enlarge the set of credible proposals: while individual politicians are restricted to proposing their most-favored policy (no other proposal would be considered as credible by voters), parties can propose any policy that is in the Pareto set of their constituents (i.e., any policy that may be the result of efficient bargaining between party members is deemed credible by voters). The equilibrium of this game is then composed of a partition of politicians into parties and of the vector of policies proposed by these parties.

Our results run as follows. Both capitalists and unemployed agents prefer no EPL while workers (both low- and high-skilled) prefer maximum EPL. In terms of UB, capitalists want none while unemployed agents would like a very large one. Employed workers are in between, with low risk workers preferring a larger benefit than high risk workers. Preferences of unemployed and (especially high-skilled) workers are thus very much opposed. As a result, the Pareto set of these two groups trades-off a lower protection level against a larger employment benefit – i.e., it exhibits a negative correlation between those two dimensions.

In the absence of political parties (i.e., when each group is represented by a citizen-candidate restricted to either running with his most-favored policy or not running in the elections), the unique equilibrium policy consists of the most-preferred package of the low-skilled workers: a very large EPL together with a moderate UB. We then show that allowing for the formation of political parties drastically changes the set of equilibrium policies. We obtain that, provided that high-ability workers and unemployed agents can agree on some policy that both strictly prefer to the most-favored policy of the low-ability workers, there exists an equilibrium where high-ability workers and unemployed coalesce in a party and win by proposing a policy with some positive UB and EPL. We then state two other conditions (on the preferences of agents) that, if satisfied, jointly insure that the *only* policies that are proposed in *all* equilibria belong to the Pareto set of the coalition made of high-ability workers together with unemployed agents. Our model does not allow us to make a specific prediction as to which point of the Pareto set will emerge (we typically have multiple equilibria), but is precise enough to tell us that equilibria exhibit a negative correlation between job protection and insurance, which is what

we observe empirically. In particular, our model is consistent with the emergence of policies that contradict the intuition from standard median voter approaches.

Before embarking on the description and solving of the model, let us briefly review the related literature. To the best of our knowledge, there are only two papers dealing with the political economy of job market institutions in a multidimensional setting. Pagano and Volpin (2005) analyze the political determinants of investor and employment protection. We have simplified the part of their model that deals with the capital financing of the firm while we have introduced an UB. Observe that, in our model, the UB is driven by two competing logics (see saint-Paul (1996), p.274): an “insurance logic” (since the benefit provides income in case workers are fired) and a “wage formation logic” (the UB is the outside option of workers – increasing their outside option also increases the competitive wage paid by the firm). We differ totally from Pagano and Volpin (2005) in the setting of the political choice mechanism, since they adopt a probabilistic voting setting with two parties and obtain results that crucially depend (as always within the probabilistic voting approach) on assumptions regarding the distribution of ideological bias among the different categories of voters.

The other close paper is Boeri et al. (2006), whose objective is the same as ours: explaining why political-economy equilibria exhibit a negative correlation between UB and EPL. While we share the same objective, we differ in both the economic and the political modelling. Their economic model is an extension of Wright (1986), with workers varying in their skill levels. Both EPL and UB are set up in such a way that they redistribute in favor of low-skilled workers. The modelling of the public decision making process assumes that people vote separately on the two dimensions, and a (so-called Shepsle or induced) equilibrium is such that each instrument is set at its majority-favored level given the other instrument. Low-skilled voters are decisive in both votes and there is substitution between EP and UB since “a higher level of unemployment insurance for the low-skills reduces the cost, in terms of consumption, of being unemployed; thus leading a low-skill insider to require a lower degree of EPL (p. 15)”. Whether low-skilled voters prefer a large EPL or UB very much depends on the amount of redistribution associated to each instrument. The authors show that “more earning inequality or a more progressive UB system involve more cross-skill redistribution (...) thereby making unemployment benefits more appealing to low skill types (p.15)”. The driving force for the negative relationship between UB and EPL in our model is different and comes from the fact that the Pareto set for high-skilled workers and unemployed exhibits such a relationship, with unemployed preferring a large UB and a small EPL while (high-skilled) employed have opposite preferences.

We now turn to our model.

2 The Economic Environment

2.1 Basic Setting

We consider an economy populated by a continuum of citizens of measure $1 + \kappa$, $\kappa \in (0, 1)$, which is partitioned into two economic classes: workers and capitalists. Workers own labor and no capital; capitalists own capital, but no labor. The measure of workers is one, so that the measure of capitalists is κ .

There are three goods in the economy: labor, capital, and a consumption good (the numeraire) produced by a single firm using labor and capital as inputs. Its Leontieff production technology exhibits a labor-capital ratio equal to $\tilde{\ell}$. All workers have the same labor endowment, normalized to 1, that they rent to the firm in exchange of a wage. Each capitalist has the same capital endowment, k , which is offered to the firm in exchange for a share in its ownership. Capitalists then share equally the profit (revenue minus wage bill) of the firm.

The total stock of capital is κk so that the firm initially hires a mass $\ell \equiv \kappa k \tilde{\ell}$ of workers in exchange of a promise of a wage w_I (where the subscript I stands for initial). We assume that $\ell < 1$ so that there is some unemployment in the economy. Workers hired at this stage can make a costly effort in order to improve their productivity (such as investing in firm-specific human capital for instance). If they choose not to make this effort, their productivity is y . If they choose to make the effort, they incur a disutility cost $\gamma > 0$ but have a probability x_i of increasing their productivity to $y + \Delta$ (if the effort fails to prove fruitful, their productivity remains y). There are two groups of workers differing in their ability to transform effort into higher productivity: $0 < x_L < x_H < 1$. The proportion of high-ability workers is denoted by λ , with a majority of low-ability people among workers ($\lambda \in (0, 1/2)$).¹ Individual productivity is observable, but not contractible.²

After having observed individual productivities, the firm may try to fire some workers in order to replace them with cheaper unemployed individuals, who are offered a wage w_R (where R stands for restructuring). However, every attempt to lay off a worker can be voided by a court with probability $\pi(\mu) \in (0, 1)$, where $\pi' > 0$, $\pi(0) = 0$ and $\pi(1) < 1$. We assume that it is too late at this stage for unemployed people joining the firm to invest in specific human capital, so that their

¹Saint-Paul (1996) reckons that “unskilled and semi-skilled workers (...), including workers without a college degree, make up more than 70% of the workforce in most European countries.” (p.275)

²The noncontractibility of individual productivity may be viewed as a characteristic of the production technology. We refer the reader to Pagano et al. (2005, footnote 10) for further justifications of this assumption.

productivity is y .

At the end of the game, payoffs are distributed according to the status of individuals at that time. The individuals who are unemployed at the end of the game receive an unemployment benefit, denoted by β . The wage paid to people working in the firm depends upon their seniority: people employed since the initial stage are paid w_I (irrespective of their –non contractible– productivity) while people hired at the restructuring stage are paid w_R . Capitalists share equally the profit of the firm. Everybody pays the same lump sum tax $\tau \geq 0$, whose proceeds finance the unemployment benefit. The unemployment benefit β is obtained using the government budget constraint

$$(1 - \ell)\beta = \tau(1 + \kappa). \quad (1)$$

The tax τ forms the first component of the public policy. The second component is the degree of employment protection, $\mu \in [0, 1]$. Public policy is decided, by majority voting, after the workers hired at the initial stage have invested in specific human capital, but before the result of this investment is observed (by workers and the firm). Observe that the unemployment level $1 - \ell$ does not depend on the unemployment benefit β nor on the job protection policy μ in our model.

We now summarize the timing of the game:

Stage 1 (Initial hiring) Capitalists invest all their capital in the firm. The firm hires a measure $\ell \equiv \kappa k \tilde{\ell} < 1$ of workers in exchange of the promise of a wage w_I .

Stage 2 (Workers' investment) Employed workers decide whether to invest in firm-specific human capital.

Stage 3 (Voting) A government is democratically elected to implement a policy vector (τ, μ) , with the unemployment benefit β determined by the budget constraint (1).

Stage 4 (Restructuring) Employed workers and the firm learn about employees' individual productivities. The firm may try to replace some of them with currently unemployed agents in exchange of a wage w_R . However, every attempt to lay off a worker can be voided by a court with probability $\pi(\mu) \in (0, 1)$.

Stage 5 (Production and consumption) Output is produced, capitalists receive the firm's profit, employed workers are paid their wage (w_I or w_R depending on their seniority), and unemployed workers obtain the unemployment benefit. All pay the lump sum tax τ .

All agents care only for the amount of consumption good consumed (they derive no benefit from leisure and so no disutility from working) and use their entire after-tax income to purchase that good. They all have the same preferences over private

consumption, which are represented by a von-Neumann-Morgenstern utility function $U : \mathbb{R}_+ \rightarrow \mathbb{R}$, with $U(0) = 0$, $U' > 0$, $U'' < 0$, and $\lim_{c \rightarrow 0} U'(c) = \infty$.

2.2 Wage setting

The firm is a monopsonist on the market for labor. In the absence of any trade union, the firm would offer the smallest wage that is acceptable to the workers (the competitive wage). We rather assume, as in Lee and Roemer (2005), that workers' interests are defended by a trade union that bargains for a higher wage than the competitive one. Let $\rho \geq 1$ stand for the gross mark-up on the competitive wage that the union is able to enforce for all workers.

We now solve the game backward, starting with the restructuring stage (since there is no decision to be taken at the last stage). Agents have no disutility from working, so that the competitive wage for newly hired workers is equal to their outside option, the unemployment benefit β . After (unmodelled) bargaining between the firm and the union, the wage offered to new workers at this stage is

$$w_R = \rho\beta = \rho\tau \frac{1 + \kappa}{1 - \ell} \quad (2)$$

where the second equality is obtained from the budget constraint (1). The after-tax income of these workers is

$$\rho\beta - \tau = \rho\tau \frac{1 + \kappa}{1 - \ell} - \tau.$$

The before-tax income of unemployed agents is the unemployment benefit $\beta = \tau \frac{1 + \kappa}{1 - \ell}$ with the corresponding after-tax income $\beta - \tau = \tau \frac{\ell + \kappa}{1 - \ell}$. Observe that a consequence of (2) is that the firm has an incentive to fire low productivity workers (in order to replace them with unemployed agents) as soon as the competitive wage in the first stage is larger than the unemployment benefit (i.e., as soon as $w_I > \rho\beta$).

The rest of the paper will be devoted to the study of the third, majority voting, stage. In order to solve that stage, we need to construct individuals' preferences for the policy options τ and μ . This in turn requires to solve for workers' decision to invest or not in human capital, and for the wage w_I that is offered to them in the first stage. To do this, we assume for the moment that a policy pair (τ, μ) has been chosen and we move to the second stage, where voters choose whether to invest or not in human capital.

Making the effort of investing in human capital has a sure cost, γ , and an uncertain return. This return takes the form not of a higher wage (because productivity is not contractible), but rather of a larger probability of remaining employed. Hence, for workers to choose to make this effort, it must be the case that (i) their wage if

they remain employed is larger than the employment benefit they would receive if fired, and (ii) the firm tries to fire workers of low productivity, and only them (if the firm's decision to fire did not depend on the productivity of the worker, then no worker would have an incentive to make the effort, and thus no one would exhibit a high productivity at equilibrium).

We then look at the case where the firm's owners (the capitalists) benefit when the workers of type i choose to make the effort of trying to be more productive. This in turn means that the firm tries to fire all workers with low productivity (and only them). Anticipating this, workers of type i make this effort only if the expected payoff from making the effort is larger than the expected payoff if they do not make the effort:

$$\begin{aligned} [x_i + (1 - x_i)\pi(\mu)]U(w_I - \tau) &+ (1 - x_i)[1 - \pi(\mu)]U(\beta - \tau) - \gamma & (3) \\ &\geq \pi(\mu)U(w_I - \tau) + [1 - \pi(\mu)]U(\beta - \tau). \end{aligned}$$

The payoff when investing (the left-hand side of (3)) increases with ability (because the investment has a larger chance to succeed) while the payoff when not investing (the right-hand side of (3)) does not depend on ability, so that if the constraint is satisfied for low ability workers, it is also satisfied for high ability workers. We assume that the firm's profit is larger when all workers are induced to invest in human capital.³ We then solve for w_I in (3) and we obtain the competitive wage w_c — the minimum wage offered in the initial stage that would induce all employed workers to invest in human capital — as

$$w_c = \tau + U^{-1}\left(U(\beta - \tau) + \frac{\gamma}{[1 - \pi(\mu)]x_L}\right) > \beta. \quad (4)$$

Let us now move to the first stage and to the setting of the wage w_I . The firm's owners (the capitalists) set the wage just high enough to induce workers to invest. This wage level is given by (4) and would be offered by the firm in the absence of trade union. Thanks to the (unmodelled) intervention of the trade union, a worker hired in the initial stage and keeping his job until the end of the game will receive a wage of $w_I = \rho w_c$. His final after-tax income is then $\rho w_c - \tau$. Finally, we assume that individuals have a larger expected payoff if they get hired in the initial stage than if they were to remain unemployed at that stage. We show in the next section that this assumption is satisfied provided that the effort cost γ is low enough.

We are now in a position to study the preferences of agents at the voting stage.

³This assumption is satisfied when Δ is large enough, as this leaves sufficient room for the firm to pay a large wage (enticing even low ability workers to make an effort) while leaving more profit to the firm than if it did not entice all workers to be more productive. Observe also that a large value of Δ guarantees that the payoff of capitalists is strictly positive at equilibrium.

2.3 Voter preferences

Policy preferences in the third stage depend upon voters' type θ . Voters can be i -ability employed workers ($\theta = e_i, i \in \{L, H\}$), unemployed ($\theta = u$), or capitalists ($\theta = c$). Recall that, at the voting stage, all currently employed agents have already incurred the cost associated to their effort to be more productive, but are yet to know whether this effort will prove fruitful. Workers as well as currently unemployed individuals form expectations as to their status in the final stage of the game, and thus as to their final payoff.

Let $p : [0, 1] \times \{e_L, e_H, u\} \rightarrow (0, 1)$ be the probability for a voter of type $\theta \in \{e_L, e_H, u\}$ to be employed at the production phase when the EPL is μ . This probability is given by

$$p(\mu, \theta) \equiv \begin{cases} x_i + (1 - x_i)\pi(\mu) & \text{if } \theta = e_i, i \in \{L, H\} \\ \frac{(1-x)[1-\pi(\mu)]^\ell}{1-\ell} & \text{if } \theta = u, \end{cases}$$

where $x \equiv \lambda x_H + (1 - \lambda)x_L$ is the average proportion of high productivity workers (equal to the expected proportion by the law of large numbers). We define the policy space as $P \equiv [0, \bar{\tau}] \times [0, 1]$ for some exogenous value of $\bar{\tau}$.⁴

Voters' policy preferences over P are then given by:⁵

$$\mathbf{V}(\tau, \mu, \theta) \equiv \begin{cases} p(\mu, \theta)U(\rho w_c - \tau) + [1 - p(\mu, \theta)]U\left(\tau \frac{\ell + \kappa}{1 - \ell}\right) & \text{if } \theta \in \{e_L, e_H\}, \\ p(\mu, \theta)U\left(\rho \tau \frac{1 + \kappa}{1 - \ell} - \tau\right) + [1 - p(\mu, \theta)]U\left(\tau \frac{\ell + \kappa}{1 - \ell}\right) & \text{if } \theta = u, \\ U\left([y + x\Delta - \bar{w}(\mu, \beta)] \frac{\ell}{\kappa} - \tau\right) & \text{if } \theta = c, \end{cases} \quad (5)$$

where $\bar{w}(\mu, \beta)$ denotes the average wage paid in the production stage and is given by

$$\bar{w}(\mu, \beta) \equiv \rho \{ [x + (1 - x)\pi(\mu)] w_c + (1 - x) [1 - \pi(\mu)] \beta \}.$$

We make the following reasonable assumptions on the distribution of voters' types:

Assumption 1 (a) $\frac{1 + \kappa}{2} > (1 - \lambda)\ell > \max \{ \kappa, 1 - \ell + \frac{\kappa}{2} \}$.

(b) $1 + \kappa < 2 \min \{ \ell, 1 - \lambda\ell \}$.

⁴We need to impose an exogenous value of τ as upperbound because tax proceeds are increasing with τ in the absence of preference for leisure.

⁵Recall that the effort cost γ has already been sunk at that stage, and thus does not appear in policy preferences. Also, the wage w_I has already been set by the firm in the initial stage. As we focus on subgame perfect equilibria, we assume in the rest of the paper that w_c is given by (4) where μ and τ are set at their equilibrium value (i.e., the value that the firm has anticipated at the initial stage of the game).

$$(c) \ell < \frac{x_L}{1-\lambda(x_H-x_L)}.$$

Assumption 1(a) guarantees that the low-ability employed form the largest group but fall short of the majority. It also implies that the capitalists form an electorally small group of voters.⁶ Assumption 1(b) states that employed people constitute a majority of voters, as well as low-ability employed together with unemployed. Observe that we make no assumption on whether low-ability workers together with capitalists form a majority, or whether the complement made of high ability workers together with unemployed forms a majority – i.e., we allow for $\kappa + (1 - \lambda)\ell \leq \lambda\ell + 1 - \ell$. As for Assumption 1(c), it guarantees that the probability for an individual unemployed (at the voting stage) of finding a job is lower than the probability for a worker employed (at the same stage) of remaining so (given that s/he has invested in human capital):

$$p(\mu, \theta) > p(\mu, u) \text{ for } \theta \in \{e_L, e_H\} \text{ and any } (\tau, \mu) \in P.$$

Observe that this inequality, together with $w_c > \beta$, implies that, at the third stage, employed workers are better off (in expectation) than unemployed workers:

$$\mathbf{V}(\tau, \mu, \theta) > \mathbf{V}(\tau, \mu, u) \text{ for } \theta \in \{e_L, e_H\} \text{ and any } (\tau, \mu) \in P.$$

This does not imply that the initial stage expected welfare is larger for employed workers than for unemployed agents, since employed workers anticipate that they will have to subtract the effort cost γ from $\mathbf{V}(\tau, \mu, \theta)$. We then assume that γ is low enough that individuals have a larger expected payoff in the initial stage if get hired than if they were unemployed at that initial stage.⁷

We now introduce our definition of the political equilibrium concept.

3 Voting

The main difficulty when voting over multidimensional policy spaces is the absence of Condorcet winner (i.e., of a policy bundle that is preferred by a majority of voters to any other feasible bundle). This in turn means that a classical Downsian political competition model with two parties interesting only in winning elections has no

⁶The addition of half the capitalists to the unemployed on the right hand side of assumption 1(a) is not strictly necessary to obtain our results, but it allows to simplify the proof of Proposition 1 below. It does not imply that capitalists play no role in the election, as will be clear in section 4.

⁷It is straightforward to see that agents are better off when employed in the initial stage if $\gamma = 0$. By continuity this is also true for small values of γ .

equilibrium in pure strategies. We propose to adapt the model of Levy (2004), which has two extremely nice features. First, equilibria in pure strategies exist even with multidimensional policy spaces. Second, both the number and the constituency of political parties are endogenous. We present that approach in the context of our paper, but refer the reader to Levy’s paper for an in-depth discussion of the basic assumptions.

Each group of voters is represented by a single politician who is a perfect representative of her group, in that her policy preferences are given by (5). Politicians running alone are unable to commit to any proposal differing from their ideal policy. The key assumption of Levy (2004) is, however, that politicians can credibly commit to a larger set of policies by forming political parties (or alliances): the set of policies a party can commit to is the Pareto set of its members. Formally, a *politician* is an element θ of Θ while a *party* is a non-empty subset S of Θ . A policy $(\tau, \mu) \in P$ is in the Pareto set of party S , denoted by P_S , if there is no other policy (τ', μ') such that $\mathbf{V}(\tau', \mu', \theta) \geq \mathbf{V}(\tau, \mu, \theta)$ for all $\theta \in S$ and $\mathbf{V}(\tau', \mu', \hat{\theta}) > \mathbf{V}(\tau, \mu, \hat{\theta})$ for some $\hat{\theta} \in S$.

The political game we study has two stages. The first stage is one of party formation, while the second stage encompasses electoral competition, where all parties simultaneously choose a feasible policy and compete in a winner-takes-all election. We now describe how each stage takes place, beginning with the electoral competition game.

A party structure is a partition of Θ into parties. Let Π be the set of party structures. We assume that the result of the party formation stage is some arbitrary party structure $\pi \in \Pi$. Elections then proceed as follows. Every party $S \in \pi$ chooses an *electoral strategy* (or *platform*), namely a policy $(\tau_S, \mu_S) \in P_S \cup \{\emptyset\}$, where \emptyset means that the party proposes no policy (we say that it does not run). In the case where no party runs for election, every politician receives a zero payoff. If at least one party runs, we assume that voters record their preferences sincerely over any list of candidate platforms, $\mathbf{p} \equiv \{(\tau_S, \mu_S)\}_{S \in \pi}$, and that the election is by plurality rule with no abstention.⁸ The election outcome is then a fair lottery between the policies that get the highest vote share. Members of the winning party equally share an (arbitrarily small) non-policy benefit $b > 0$ (ego-rents, perks of office...). In line with Levy (2004), we assume that if a party is indifferent between running and not running, it chooses not to run. Given a party structure $\pi \in \Pi$, a vector of electoral strategies $\mathbf{p} = \{(\tau_S, \mu_S)\}_{S \in \pi}$ is a π -*equilibrium* of the electoral-competition game⁹ if no party $S \in \pi$ can make all its members better-off by deviating to another platform $(\tau'_S, \mu'_S) \in P_S \cup \{\emptyset\}$. Let $\delta(\pi)$ be the set of π -equilibrium policy outcomes.

Up to this point, we have taken the party structure π as given. We now turn to

⁸Voters who are indifferent between several policies use a fair mixing device.

⁹The formal definition of a π -equilibrium is relegated to Appendix 1.

the party formation stage and ask whether π is a stable party structure. First of all, note that there may exist multiple π -equilibria, and therefore multiple equilibrium outcomes ($\delta(\pi)$ may not be a singleton). Thus, π may satisfy stability conditions for one electoral outcome but not for others. As a consequence, we will not study the stability of π alone, but the stability of pairs (π, \mathbf{p}) where \mathbf{p} is a π -equilibrium. We will refer to them as *political states*. Which of these should be considered as the set of equilibrium outcomes for the present model? The answer to this question depends on the stability requirements imposed on party structures. Relegating a formal presentation of the concept used in this paper to the appendix, we provide here the basic intuitions.

Let π and π' be two party structures. π' is said to be *induced* from π if π' is formed by breaking a party in π into two or by merging two existing parties in π (forming a new party made up of subsets of current parties is excluded on the basis that nobody would trust a politician who is willing to betray her current partners). Now, we say that the political state (π, \mathbf{p}) is *blocked* by another state (π', \mathbf{p}') if π' is induced from π and the deviating politicians are all strictly better-off in (π', \mathbf{p}') than in (π, \mathbf{p}) . We thus define equilibrium political states as follows.

Definition 1 *Let $\pi^* \in \Pi$, and let \mathbf{p}^* be a profile of electoral strategies. The pair (π^*, \mathbf{p}^*) is an equilibrium political state (EPS) if it satisfies the following conditions:*

- \mathbf{p}^* is a π^* -equilibrium, and
- there is no political state (π, \mathbf{p}) that blocks (π^*, \mathbf{p}^*) .

Thus, an equilibrium situation is defined as one that meets two requirements: first, the policy platforms result from the electoral competition between existing political parties; second, in every existing party, politicians have no incentive to break up their party or form a new party in order to favor different electoral outcomes.

We are now in a position to apply this political equilibrium concept to the economic environment described in the previous section.

4 Analysis of Equilibrium Political States

4.1 Policy Preferences

This section describes voters' objectives and sources of conflict. The following lemma describes the voters' most-preferred policy bundles.¹⁰

Lemma 1 *Let $(\hat{\tau}(\theta), \hat{\mu}(\theta))$ be the ideal policy of a voter of type θ . Then*

$$\bar{\tau} = \hat{\tau}(u) \geq \hat{\tau}(e_L) > \hat{\tau}(e_H) > \hat{\tau}(c) = 0,$$

and, for every $i = L, H$,

$$\hat{\mu}(e_i) = 1 > \hat{\mu}(c) = \hat{\mu}(u) = 0.$$

The preferences in terms of protection policy μ are easy to establish. Unemployed individuals' utility is decreasing in employment protection, since it prevents them from working and earning the wage w_R that they prefer to the unemployment benefit β . Capitalists also dislike any increase in the protection level because it increases the average wage they have to pay to workers by making it more difficult to replace low productivity workers by lower-paid unemployed. Employed workers's utility is increasing in μ (whatever their ability) because a larger protection level increases their probability to stay on the job and they are better-off employed than unemployed.

The tax τ is paid by everyone. For capitalists, taxation is an especially bad deal because it increases the wage they have to offer to previously unemployed people. They thus oppose any increase in τ . Unemployed people favor any increase in τ since it raises both the unemployment benefit and the wage they would receive if hired later on. The optimal tax for employed people trades off two concerns: on the one hand, they dislike paying taxes but, on the other hand, a larger tax increases the unemployment benefit they would get if fired. The optimal tax is positive since the marginal benefit of taxation grows arbitrarily large as the tax (and thus the unemployment benefit) tends towards zero. The optimal tax is higher for low-ability people because their probability of losing their job is higher than for high-ability workers.

Figure 1 represents both the four categories of voters' most-preferred policy bundles and their indifference curves in the P space. Capitalists favor no taxation and no job protection. The slope of their indifference curves is everywhere

¹⁰Proofs are relegated to Appendices.

negative, since they have to be compensated for a higher tax by a lower protection level. The arrow labelled “ c ” depicts the direction of increasing utility. Unemployed workers favor no protection together with a maximum value of the tax. The slope of their indifference curves is always positive. The slope of the worker’s indifference curve is negative for low values of τ (where the individual would like to increase both μ and τ) and positive for larger values of τ (where the tax is too large given the protection level). A similar analysis applies to the low-ability employed.

Insert Figure 1 around here

The Pareto set for the group composed of high-ability workers and unemployed will play a crucial role in our results and is thus represented on Figure 1. At any interior point along this set, the indifference curves of both types are positively sloped. For the high-skilled workers, this is due to the substitutability between UB and EPL. There is no such substitutability for the unemployed, who always prefer a larger UB and a lower EPL. Under mild conditions on preferences (see condition C1 below), the Pareto set is interior to P and downward sloping,¹¹ with the unemployed’s utility increasing (and high-skilled workers’s utility decreasing) as one moves in the southeast direction along that curve –i.e., as one increases the UB and decreases the EPL.

4.2 Unemployment Benefit vs. Employment Protection

We are now in a position to determine the political equilibrium values of UB and EPL. A straightforward intuition would suggest that, as the low-ability employed form the largest group and are median voters in both dimensions of the policy space (taken separately), equilibrium policies should reflect their preferences (relatively low UB and very high EPL). This intuition is confirmed by Proposition 1 below, which characterizes the unique political equilibrium in the standard citizen-candidate model without party formation –i.e., when we do *not* allow candidates to coalesce so that their only choice is whether to run (with their most-preferred policy bundle) or not. This means that the party formation stage is a necessary ingredient, in our model, to explain the emergence of the other equilibria empirically observed (such as those with low EPL and large UB).

Proposition 1 *Let $\pi^0 \equiv \{\{e_H\}, \{e_L\}, \{u\}, \{c\}\}$. Then, $\delta(\pi^0) = \{(\hat{\tau}(e_L), \hat{\mu}(e_L))\}$.*

¹¹Proof available upon request to the authors.

With the citizen-candidate approach (corresponding to the partition of candidates labelled as π^0 in the statement of Proposition 1), the set of admissible policy bundles is restricted to those most-preferred by the four types of candidates. Proposition 1 follows from the fact that the most-preferred policy of low-ability workers is preferred by a majority of voters to any of the most-preferred policies of the three other types. From Assumption 1(b), the low-ability workers together with either the high-ability workers or the unemployed form a majority. We show that high-ability workers prefer $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ to $(\hat{\tau}(u), \hat{\mu}(u))$ because they dislike both the high tax and the absence of protection favored by the unemployed. Unemployed individuals prefer $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ with its positive unemployment benefit and wage to the zero unemployment benefit and wage favored by the capitalists at $(\hat{\tau}(c), \hat{\mu}(c))$, even if the former policy gives them a smaller chance of finding a job than the latter. Unemployed agents also prefer $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ to $(\hat{\tau}(e_H), \hat{\mu}(e_H))$ because of the low tax favored by high-ability workers (both policies share the same employment protection level). Hence, the unique one-candidate π^0 -equilibrium has the e_L -candidate running alone and implementing her ideal policy. The rest of the proof of the Proposition shows that low-ability workers are powerful enough that there is no π^0 -equilibrium with more than one candidate running for office.

Proposition 1 implies that, in the absence of parties, low-skilled workers are decisive and support a maximum employment protection level together with some unemployment benefit. We now show that equilibria more consistent with empirical evidence emerge in the more realistic framework where politicians are allowed to coalesce into parties. We proceed in two steps. We first show in Proposition 2 that there exists an equilibrium with parties (an EPS as defined in the previous section) where the policy bundle implemented at the equilibrium belongs to the Pareto set of high-ability workers and unemployed. We then present and discuss two assumptions that together guarantee that the only policies proposed in all equilibria with parties belong to the same set (Proposition 3).

Proposition 2 makes use of the following condition:¹²

$$\mathbf{C1} \quad \exists(\tau, \mu) \in P_{\{e_H, u\}} : \mathbf{V}(\tau, \mu, \theta) > \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), \theta), \forall \theta \in \{e_H, u\}.$$

Condition C1 states that high-ability workers and unemployed agents can agree on some policy that both strictly prefer to the most-favored policy of the low-ability workers. This will be the case if, for instance, x_H is large enough that high-ability workers have a very low chance of losing their job and so are concerned mainly with

¹²For the sake of generality, we state formally conditions C1 to C3 in terms of endogenous policy preferences, and we give in the text an intuitive example of constraints on exogenous variables that would ensure that these conditions hold. Formally, there exist threshold values $\bar{\pi}_H \in (0, 1)$ and $\bar{x}_H \in (0, 1)$ such that conditions C1 to C3 are simultaneously satisfied if $\pi(1) > \bar{\pi}_H$ and $x_H > \bar{x}_H$.

the tax. In that case, high-ability indifference curves through point $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ are close to vertical (see Figure 1) and both types e_H and u would benefit from a decrease in tax accompanied with a large decrease in employment protection.

Proposition 2 *If C1 holds, then there exists an EPS (π^*, \mathbf{p}^*) such that*

$$\pi^* = \{\{e_H, u\}, \{e_L\}, \{c\}\}, \text{ and } \delta(\pi^*) \subset P_{\{e_H, u\}}.$$

Proposition 2 states that there exists an EPS where high-ability workers and unemployed coalesce in a party and compete in elections with the low-ability workers and capitalists running separately. The party formed by types e_H and u wins the election by proposing a policy with some positive tax τ^* and employment protection level μ^* that they both prefer to the most-preferred policy of low-ability workers. Assumption C1 is crucial since it guarantees the existence of such a policy. We show in the proof that (τ^*, μ^*) is preferred by a majority of voters to both $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ and $(\hat{\tau}(c), \hat{\mu}(c))$ and constitutes an equilibrium of the partition. It forms an equilibrium political state because, on the one hand, types e_H and u do not want to split their party since this would result in the most-preferred policy of low-ability workers (see Proposition 1) and, on the other hand, types e_L and c have no incentive to form a party together because such a party would have no chance of winning the election. Observe that this last statement holds even in the case where e_L and c together represent a majority of the electorate. The reason is that, for any policy x in the Pareto set of e_L and c , there always exists a policy y in the Pareto set of e_H and u that is preferred to x by either e_L or c (in addition to e_H and u). Policy y then beats x with a majority constituted of 3 out of the 4 types of voters.

In order to prove that the *only* policies that are proposed in *all* EPS belong to the Pareto set of the coalition made of high-ability workers together with unemployed agents, we need to impose two further conditions:

$$\mathbf{C2} \quad \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), u) > \max_{(\tau, \mu) \in P_{\{e_H, c\}}} \mathbf{V}(\tau, \mu, u).$$

$$\mathbf{C3} \quad \forall \tau > \hat{\tau}(e_H), \mathbf{V}(\hat{\tau}(e_H), \hat{\mu}(e_H), e_L) > \mathbf{V}(\tau, 0, e_L).$$

Condition C2 states that unemployed agents prefer the most-favored policy of low-ability workers to any policy in the Pareto set of the coalition of capitalists and high-quality workers. As for the previous condition, C2 is satisfied if x_H is large enough, so that high-ability workers favor a very low value of the tax. In that case, all policies in the Pareto set of the coalition made of high-ability workers and capitalists exhibit low values of the tax rates, which are very detrimental to unemployed workers.

Condition C3 states that low-ability workers prefer the most-favored policy of high-ability workers to any policy with no employment protection. This will be the case if, for instance, $\pi(1)$ is close to one, since in that case the most-preferred policy of low-ability and high-ability workers do not differ much from each other.

We are now in a position to prove the following Proposition:

Proposition 3 *If C1-C3 hold then, in every EPS (π^*, \mathbf{p}^*) , $(\tau^*, \mu^*) \in \delta(\pi^*)$ implies that:*

- (i) $(\tau^*, \mu^*) \in P_{\{e_H, u\}}$, and
- (ii) $\mathbf{V}(\tau^*, \mu^*, \theta) \geq \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), \theta)$, $\forall \theta \in \{e_H, u\}$.

We already know from Proposition 2 that, if C1 holds, there exists at least one EPS where the equilibrium policy belongs to the Pareto set of types e_H and u . The role played by C3 in the proof of Proposition 3 is easy to ascertain: it prevents the formation a coalition made of unemployed individuals and of capitalists, since any such coalition, by proposing no employment protection, would induce the formation of a coalition of (low- and high-ability) workers which would win the elections by proposing the most-preferred policy of the high-ability workers.

The role played by C2 is more subtle, since this condition, which seems on the face of it to favor the low-ability workers, ends up being detrimental to them. Under C2, low-ability workers are powerful enough to obtain their most-preferred policy when running against both an unemployed candidate and a coalition made of high-ability workers and capitalists. As a consequence, there is no EPS with a partition from which low-ability workers can induce (either by forming or splitting a party) this specific partition. At the same type, this partition is not part of an EPS, since the three other types of agents have an incentive to form a party together in order to implement a policy that is in the Pareto set of the unemployed together with the high-ability workers. In other words, C2 makes low-ability workers powerful enough to resist a party made of high-ability and capitalists, but not powerful enough to fend off a grand party made of all other types.

Finally, observe that part (ii) of Proposition 3 puts lower- and upper-bounds on the values of τ and of μ that emerge at equilibrium. These bounds are determined by the e_H - and u -politicians' utility levels at the low-ability workers' ideal policy. This policy plays the role of an "outside option" in the platform choice of parties involving those politicians, since they can threaten to break up any party they belong to and induce party structures in which the low-ability workers' ideal policy emerges as the political outcome.

5 Concluding Remarks

In this paper, we develop a theoretical model consistent with the empirical observation of a negative correlation between EPL and UB across countries. The crucial ingredient in our model is that politicians are allowed to coalesce and form political parties. They then propose policy bundles composed of an UB and EPL and compete in a winner-takes-all election. The importance of party formation can be seen by comparing Propositions 1 and 3. Proposition 1 shows that, when candidates are *not* allowed to form parties and are restricted to choosing between running on their own or not running at all, the unique equilibrium is the most-preferred policy bundle of low-ability workers –i.e., large EPL together with some UB. Proposition 3 shows that this policy bundle is not an equilibrium anymore when candidates are allowed to form parties. In that case (and under certain assumptions whose relevance is discussed below), the “decisive” party is the one made of high-ability workers together with unemployed. The set of policies proposed at equilibrium by this party exhibits a negative relationship between UB and EPL.

The rationale we provide for the empirically observed negative relationship between UB and EPL differs from the one provided by Boeri et al. (2003). In their model, low-ability workers are decisive in both the choice of UB and EPL. The negative correlation between UB and EPL is due to their substitutability for the decisive group. Although this substitutability also holds in our model, it is not the main driving force being our results. Rather, the negative relationship is driven by the fact the decisive coalition is made of high-ability workers and unemployed, whose contract curve has precisely this feature.

This result is all the more interesting (and surprising) that our model is biased in favor of low-ability workers: we assume that they represent the largest group, and that they constitute a majority when they join forces with either high-ability workers or unemployed (and even may be with capitalists – we make no assumption on the size of this coalition). Our results illustrate that size is not all that matters when political parties are allowed to form. They also emphasize the importance of not fixing the number and constituency of parties from the outset. It is tempting to assume (as in Pagano et al. (2005) for instance) that the left parties represent “labor” (or alternatively, low-ability workers and unemployed) while right parties represent “capital” (or alternatively high-ability workers and capitalists). None of these parties do materialize at equilibrium in our model, justifying the reluctance of Saint-Paul (1996) in setting exogenous constituencies for parties.

Our main result, Proposition 3, requires that three conditions on preferences be satisfied. We have shown in the text that this will be the case if (i) high-ability workers have a low probability of getting fired even when EPL is low and (ii) the probability that a court voids layoff decisions is close to one when EPL is maximum. The second condition is rather innocuous, as we are at liberty to construct the set

of admissible policies as we wish. Also, some extreme-left European politicians such as Olivier Besancenot in France clearly advocate such policies, where firing workers would be made illegal except in very extreme circumstances. As for the first condition, it has large empirical support (see Saint-Paul, 2007, Table 5, for the US and for France, for instance).

The main difficulty when voting over multidimensional policy spaces is the absence of Condorcet winner (i.e., of a policy bundle that is preferred by a majority of voters to any other feasible bundle). With our approach, equilibria do exist but are typically multiple : while Proposition 3 restricts the set of equilibrium policies to a subset of the contract curve of high-ability workers and unemployed, it does not pinpoint which equilibrium will emerge. More precisely, we are agnostic as to the relative bargaining weight of the two types who constitute this party. Explaining why certain countries end up at a precise location on this contract curve would require to refine the equilibrium concept and to endogenize bargaining weights. We leave this worthwhile but very complex question for future research.

Appendix 1: The Model of Party Formation

We first define formally the equilibrium concept used for the electoral-competition game, and then the notion of blocking in the context of our paper.

π -equilibria

Let $\pi \in \Pi$ be the party structure. Given any party S' and any profile of electoral strategies $\mathbf{p} \equiv \{(\tau_S, \mu_S)\}_{S \in \pi}$, let $v_{S'}(\mathbf{p})$ denote that party's realized vote share. The election outcome is then a fair lottery between the policies in $W(\mathbf{p}) \equiv \{(\tau_S, \mu_S) : S \in \arg \max_{S' \in \pi} v_{S'}(\mathbf{p})\}$. Let $\psi_\theta(S)$ be the indicator function on 2^Θ taking the value of 1 if $\theta \in S$ and 0 otherwise. Recall that b is a non-policy benefit. As a consequence, the expected utility of politician θ resulting from a profile of strategies \mathbf{p} is given by

$$\mathcal{U}(\mathbf{p}, \theta) \equiv \frac{1}{|W(\mathbf{p})|} \sum_{(t_S, e_S) \in W(\mathbf{p})} \left[\mathbf{V}(\tau_S, \mu_S, \theta) + \psi_\theta(S) \frac{b}{|S|} \right]$$

if there is at least one party $S \in \pi$ such that $(\tau_S, \mu_S) \neq \emptyset$, and $\mathcal{U}(\mathbf{p}, \theta) = 0$ otherwise.

Given a party structure $\pi \in \Pi$, a vector of electoral strategies $\mathbf{p} = \{(\tau_S, \mu_S)\}_{S \in \pi}$ is a π -equilibrium of the electoral-competition game if, for all $S \in \pi$, there is no $(\tau'_S, \mu'_S) \in P_S$, $(\tau'_S, \mu'_S) \neq (\tau_S, \mu_S)$, that satisfies

$$\mathcal{U}((\tau'_S, \mu'_S), \mathbf{p}_{-S}; \theta) \geq \mathcal{U}((\tau_S, \mu_S), \mathbf{p}_{-S}; \theta)$$

for all $\theta \in S$, with at least one strict inequality. In line with Levy (2004), we restrict ourselves to *partisan equilibria*, where voters strictly prefer their party's platform (if their party proposes one) to any other party's platform. And to avoid repeatedly having to include the relevant qualification, we leave it as understood that any reference to π -equilibria is actually to partisan π -equilibria. We also adopt the rule that if a party is indifferent between running and not running, it chooses not to run.

Blocking

Let (π, \mathbf{p}) be a political state; that is $\pi \in \Pi$ and \mathbf{p} is a π -equilibrium. We say that (π, \mathbf{p}) is *blocked* by another political state (π', \mathbf{p}') if there exists $S \in \Theta$ such that (i) S can induce π' from π , and (ii) for every $\theta \in S$: $\mathcal{U}(\mathbf{p}', \theta) > \mathcal{U}(\mathbf{p}, \theta)$. Then Definition 1 applies.

Appendix 2: Proof of Lemma 1

A brief observation of policy preferences reveals that, for every $\tau \in [0, \bar{\tau}]$, $\mathbf{V}(\tau, \mu, \theta)$ is strictly increasing everywhere in μ if $\theta \in \{e_L, e_H\}$, and strictly decreasing everywhere if $\theta \in \{u, c\}$. This directly establishes the second statement in the lemma.

Let us turn to ideal tax rates. By strict concavity of $\mathbf{V}(\tau, 1, e_i)$ in τ , $\hat{\tau}(e_i)$ is implicitly defined as the unique solution to the following equation (assuming an interior solution):

$$\frac{\partial \mathbf{V}(\tau, 1, e_i)}{\partial \tau} = -p(1, e_i)U'(\rho w_c - \tau) + [1 - p(1, e_i)]U'\left(\tau \frac{\ell + \kappa}{1 - \ell}\right) \frac{\ell + \kappa}{1 - \ell} = 0.$$

Using the implicit function theorem together with curvature conditions on U , we obtain that $0 < \hat{\tau}(e_H) < \hat{\tau}(e_L)$.

As $\rho \geq 1$, $\ell \in (0, 1)$, and $U' > 0$, we also have

$$\frac{\partial \mathbf{V}(\tau, 0, u)}{\partial \tau} = p(0, u) \left(\rho \frac{1 + \kappa}{1 - \ell} - 1 \right) U' \left(\rho \tau \frac{1 + \kappa}{1 - \ell} - \tau \right) + [1 - p(0, u)] \frac{\ell + \kappa}{1 - \ell} U' \left(\tau \frac{\ell + \kappa}{1 - \ell} \right) > 0,$$

which implies that $\hat{\tau}(u) = \bar{\tau}$.

Finally, capitalists favor a zero tax. Indeed the average wage \bar{w} is strictly increasing in τ , so that income taxation reduces both their pre- and after-tax incomes.

Appendix 3: Proof of Proposition 1

The proof of Proposition 1 hinges on the following result.

Lemma 2 $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ is a strict Condorcet winner in $\{\hat{\tau}(\theta), \hat{\mu}(\theta)\}_{\theta \in \Theta}$.

Proof: To prove Lemma 2, it suffices to check that the following inequalities hold:

$$\mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), e_H) > \mathbf{V}(\hat{\tau}(u), \hat{\mu}(u), e_H), \quad (6)$$

$$\mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), u) > \mathbf{V}(\hat{\tau}(e_H), \hat{\mu}(e_H), u), \quad (7)$$

$$\mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), u) > \mathbf{V}(\hat{\tau}(c), \hat{\mu}(c), u). \quad (8)$$

To establish (6), note first that

$$\begin{aligned} \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), e_H) - \mathbf{V}(\hat{\tau}(u), \hat{\mu}(u), e_H) &= [\mathbf{V}(\hat{\tau}(e_L), 1, e_H) - \mathbf{V}(\hat{\tau}(u), 1, e_H)] \\ &\quad + [\mathbf{V}(\hat{\tau}(u), 1, e_H) - \mathbf{V}(\hat{\tau}(u), 0, e_H)]. \end{aligned}$$

As $\mathbf{V}(\tau, \mu, e_H)$ is strictly increasing in μ , the second bracketed term on the right-hand side of the above equality is positive. By the strict concavity of $\mathbf{V}(\cdot, 1, e_H)$, $\mathbf{V}(\cdot, 1, e_H)$ is single-peaked with its peak at $\hat{\tau}(e_H) < \hat{\tau}(e_L) < \hat{\tau}(u)$. This shows that the first bracketed term is also positive, thus proving that the e_H -politician strictly prefers $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ to $(\hat{\tau}(u), \hat{\mu}(u))$.

Inequality (7) results from the facts that $\hat{\mu}(e_L) = \hat{\mu}(e_H)$, $\hat{\tau}(e_L) > \hat{\tau}(e_H)$ (Lemma 1) and that $\mathbf{V}(\tau, \mu, u)$ is strictly increasing in τ for any value of μ .

Finally, inequality (8) follows from the observation that $U' > 0$ and that

$$\mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), u) = p(1, u) U\left(\hat{\tau}(e_L) \left(\rho \frac{1+\kappa}{1-\ell} - 1\right)\right) + [1 - p(1, u)] U\left(\hat{\tau}(e_L) \frac{\ell + \kappa}{1 - \ell}\right),$$

where the arguments in both utility functions U are positive, while

$$\mathbf{V}(\hat{\tau}(c), \hat{\mu}(c), u) = U(0).$$

This ends the proof of Lemma 2. □

Proof of Proposition 1:

• *One-candidate equilibria*

An immediate consequence of Lemma 2 is that there is a unique one-candidate π^0 -equilibrium, in which the e_L -politician runs alone and implements her ideal policy.

• *Two-candidate equilibria*

By assumption, parties who are indifferent between running and not running choose not to run. As a consequence, a situation in which a candidate loses with a probability of one cannot be an equilibrium. Combined with Lemma 2, this

observation implies that there is no two-candidate π^0 -equilibrium in which the e_L -politician runs.

The e_H - and c -politicians running against each other cannot be an equilibrium, since $\ell > (1+\kappa)/2$ and an argument similar to the one made in the proof of inequality (6) in Lemma 1 establishes that voters of type e_L strictly prefer $(\hat{\tau}(e_H), \hat{\mu}(e_H))$ to $(\hat{\tau}(c), \hat{\mu}(c))$.

Suppose now that the two running candidates are the u - and c -politicians. If the voters of type e_L strictly prefer $(\hat{\tau}(u), \hat{\mu}(u))$ to $(\hat{\tau}(c), \hat{\mu}(c))$, then the u -politician wins for sure since, by assumption, $1 - \lambda\ell > (1 + \kappa)/2$. If they instead (weakly) prefer $(\hat{\tau}(c), \hat{\mu}(c))$ to $(\hat{\tau}(u), \hat{\mu}(u))$, then the e_H -politician has a profitable deviation. Indeed, the latter could run and get the votes of voters of type e_L who strictly prefer $(\hat{\tau}(e_H), \hat{\mu}(e_H))$ to $(\hat{\tau}(c), \hat{\mu}(c))$ and therefore to $(\hat{\tau}(u), \hat{\mu}(u))$. This would thus enable her to implement her ideal policy with a probability of 1.

Finally, the e_H - and u -politicians running against each other cannot be a π_0 -equilibrium either. To see this, note first that a tie between these two candidates requires that voters of type e_L to be indifferent between $(\hat{\tau}(u), \hat{\mu}(u))$ and $(\hat{\tau}(e_H), \hat{\mu}(e_H))$. If type- c voters prefer $(\hat{\tau}(u), \hat{\mu}(u))$ to $(\hat{\tau}(e_H), \hat{\mu}(e_H))$, then the e_L -politician has a profitable deviation. She can indeed enter the electoral competition and implement her ideal policy since $(1-\lambda)\ell > \lambda\ell = \kappa+1-\ell$. If type- c voters are indifferent between $(\hat{\tau}(u), \hat{\mu}(u))$ and $(\hat{\tau}(e_H), \hat{\mu}(e_H))$, then the e_L -politician enters and wins since $(1-\lambda)\ell > 1-\ell + \frac{\kappa}{2} = \lambda\ell + \frac{\kappa}{2}$. If type- c voters strictly prefer $(\hat{\tau}(e_H), \hat{\mu}(e_H))$ to $(\hat{\tau}(u), \hat{\mu}(u))$, then the e_L -politician can also profitably enter since, in that case, $(1-\lambda)\ell > 1-\ell = \kappa + \lambda\ell$ (Assumption 1(a)).

- *Three-candidate equilibria*

From our assumptions on the distribution of types, three-candidate elections in which the e_L -politician runs cannot be equilibrium situations (at least one running candidate would loose for sure).

Consider now the case where the e_H -, u -, and c -politicians run against each other. It must be the case that the three politicians tie for winning. But then the e_L -politician should enter the contest and win for sure since the low-ability employed outnumber all the other types of voters.

- *Four-candidate equilibria*

There cannot be a four-candidate equilibrium, for some candidates would loose for sure in such an equilibrium (Assumption 1(a)).

□

Appendix 4: Proof of Proposition 2

Hereafter, we use the following notation:

$$\begin{aligned}
\pi^1 &\equiv \{\{e_H, e_L\}, \{u\}, \{c\}\} & \pi^2 &\equiv \{\{e_H\}, \{e_L, u\}, \{c\}\} \\
\pi^3 &\equiv \{\{e_H\}, \{e_L, c\}, \{u\}\} & \pi^4 &\equiv \{\{e_H, u\}, \{e_L\}, \{c\}\} \\
\pi^5 &\equiv \{\{e_H, c\}, \{e_L\}, \{u\}\} & \pi^6 &\equiv \{\{e_H\}, \{e_L\}, \{u, c\}\} \\
\pi^7 &\equiv \{\{e_H, e_L\}, \{u, c\}\} & \pi^8 &\equiv \{\{e_H, c\}, \{e_L, u\}\} \\
\pi^9 &\equiv \{\{e_H, u\}, \{e_L, c\}\} & \pi^{10} &\equiv \{\{e_H, e_L, u\}, \{c\}\} \\
\pi^{11} &\equiv \{\{e_H, e_L, c\}, \{u\}\} & \pi^{12} &\equiv \{\{e_H, u, c\}, \{e_L\}\} \\
\pi^{13} &\equiv \{\{e_H\}, \{e_L, u, c\}\} & \pi^{14} &\equiv \{\{e_H, e_L, u, c\}\}
\end{aligned}$$

The following two lemmas are used in the proofs of both Proposition 2 and Proposition 3:

Lemma 3 *Suppose C1 holds. Then the following statements are true:*

- (i) $P_{\{e_H, u\}} \supseteq \delta(\pi^4) \neq \emptyset$.
- (ii) For any $j \in \{4, 12\}$, $(\tau, \mu) \in \delta(\pi^j)$ only if

$$\mathbf{V}(\tau, \mu, \theta) \geq \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), \theta), \forall \theta \in \{e_H, u\}. \quad (9)$$

- (iii) If (9) holds with a strict inequality, then $(\tau, \mu) \in \delta(\pi^4) \cap \delta(\pi^{12})$.
- (iv) There is no EPS involving π^{12} .

Proof: Note first that, since $(1 - \lambda)\ell > \kappa$, there cannot be three-candidate π^4 -equilibria. To prove the first part of the lemma, therefore, it suffices to show that there exists $(\tau_1, \mu_1) \in P_{\{e_H, u\}}$ that is a strict Condorcet winner in $\{(\tau_1, \mu_1), (\hat{\tau}(e_L), \hat{\mu}(e_L)), (\hat{\tau}(c), \hat{\mu}(c))\}$.

From C1, there exists $(\tau_1, \mu_1) \in P_{\{e_H, u\}}$, which is preferred to $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ by voters of type e_H and u . As a consequence, (τ_1, μ_1) must satisfy

$$0 < \tau_1 < \hat{\tau}(e_L) \text{ and } 0 \leq \mu_1 < \hat{\mu}(e_L). \quad (10)$$

This implies that voters of type c also strictly prefer (τ_1, μ_1) to $(\hat{\tau}(e_L), \hat{\mu}(e_L))$, thus proving that the former is majority-preferred to the latter. Furthermore, the inequalities in (10) also guarantee that voters of type e_L strictly prefer (τ_1, μ_1) to $(\hat{\tau}(c), \hat{\mu}(c))$. Inequality (8) shows that type u prefers $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ to $(\hat{\tau}(c), \hat{\mu}(c))$, and since they also prefer (τ_1, μ_1) to $(\hat{\tau}(e_L), \hat{\mu}(e_L))$, we obtain that a majority formed of types e_L and u prefer (τ_1, μ_1) to $(\hat{\tau}(c), \hat{\mu}(c))$. This establishes part (i).

Part (ii) follows directly from part (i) and from the fact that $\{e_H, e_L\}$ and $\{u, e_L\}$ are majority coalitions.

If (9) holds with a strict inequality, then we can apply to (τ, μ) the same argument as in the proof of part (i) to show that (τ, μ) is both a π^4 - and a π^{12} -equilibrium policy, proving part (iii).

Finally, consider party structure π^{12} and a political state in which party $\{e_H, u, c\}$ offers a policy (τ, μ) . From part (ii), this implies that (τ, μ) must satisfy (9). From part (iii) and (C1), this in turn implies that, by definition of $P_{\{e_H, u\}}$, there exists $(\tau', \mu') \in \delta(\pi^4)$ and a sufficiently small $\varepsilon \in (0, b/6)$ such that:

$$\mathbf{V}(\tau', \mu', \theta) > \mathbf{V}(\tau, \mu, \theta) - \varepsilon$$

for each $\theta \in \{e_H, u\}$. As a consequence, coalition $\{e_H, u\}$ can profitably deviate by inducing π^4 and then (τ', μ') . This indeed makes all its members strictly better-off as they thereby increase their non-policy benefit by $(b/2) - (b/3) = b/6 > \varepsilon$.

□

Lemma 4 $\delta(\pi^9) = \emptyset$.

Proof: We first establish that if $(\tau, \mu) \in \delta(\pi^9)$, then $(\tau, \mu) \in P_{\{e_H, u\}}$. Suppose that party $\{e_L, c\}$ offers a policy (τ, μ) in $P_{\{e_L, c\}} \setminus P_{\{e_H, u\}}$. Hence, either $(\tau, \mu) \in P_1 \equiv P_{\{e_L, c\}} \setminus P_{\{e_H, e_L, u\}}$ or $(\tau, \mu) \in P_2 \equiv P_{\{e_L, c\}} \setminus P_{\{e_H, c, u\}}$. In both cases, there is consequently a policy (τ', μ') that makes a majority better-off than under (τ, μ) . It is easy to check that there is always such a policy in $P_{\{e_H, u\}}$. This implies that party $\{e_H, u\}$ has a profitable deviation whenever party $\{e_L, c\}$ runs alone and offers a policy that does not belong to $P_{\{e_H, u\}}$.

A tie between the two parties in π^9 is impossible when party $\{e_L, c\}$ offers a policy (τ, μ) in $P_{\{e_L, c\}} \setminus P_{\{e_H, u\}}$. From our assumptions on the distribution of types, a tie would indeed imply that each politician (and then each type of voter) strictly prefers her party's platform to the rival's platform. Let (τ_1, μ_1) and (τ_2, μ_2) be parties $\{e_H, u\}$ ' and $\{e_L, c\}$'s platforms, respectively. If $(\tau_2, \mu_2) \in P_2$, this implies that

$$\tau_1 < \tau_2, \text{ and } \mu_1 < \mu_2,$$

which in turn implies that type- c voters strictly prefer (τ_1, μ_1) to (τ_2, μ_2) ; a contradiction. Instead, if $(\tau_2, \mu_2) \in P_1$, then $\tau_2 < \tau_1$, and $\mu_1 > \mu_2$. As the marginal benefits of τ and μ are lower for e_H than for e_L , $\mathbf{V}(\tau_1, \mu_1, e_H) > \mathbf{V}(\tau_2, \mu_2, e_H)$ implies $\mathbf{V}(\tau_1, \mu_1, e_L) > \mathbf{V}(\tau_2, \mu_2, e_L)$; a contradiction. As a consequence, a tie must involve the two parties offering $\{(\check{\tau}, \check{\mu})\} \equiv P_{\{e_H, u\}} \cap P_{\{e_L, c\}}$ and is therefore inconsistent with the partisan-equilibrium restriction.

Finally, if party $\{e_H, u\}$ runs alone and offers a policy $(\tau, \mu) \neq (\check{\tau}, \check{\mu})$, then party $\{e_L, c\}$ can defeat it by offering $(\check{\tau}, \check{\mu})$. If $\{e_H, u\}$ runs alone and offers $(\check{\tau}, \check{\mu})$, then $\{e_L, c\}$ can again profitably deviate by offering $(\check{\tau}, \check{\mu})$. This does not change the electoral outcome but raises its members' non-policy benefit by $b/4$.

□

Proof of Proposition 2: Note first that by condition C1 and Lemma 3 (iii) there exists a π^4 -equilibrium in which the e_H - and u -politicians are strictly better-off than under $(\hat{\tau}(e_L), \hat{\mu}(e_L))$. This implies that none of them has an incentive to induce π^0 . Further, since the policy they implement in the π^4 -equilibrium must belong to their Pareto set, they cannot profitably induce a party structure in which they would have coalesced with other politicians. This would indeed make at least one of them as well- or worse-off and would also reduce their non-policy benefits.

What remains to be proved, therefore, is that $\{e_L, c\}$ cannot profitably induce π^9 . This is a direct consequence of Lemma 4.

□

Appendix 5: Proof of Proposition 3

We start with the following lemma:

Lemma 5 *If C2 holds, then $\delta(\pi^5) = \{(\hat{\tau}(e_L), \hat{\mu}(e_L))\}$.*

Proof: First of all, note that there cannot be a three-candidate π^5 -equilibrium since $(1 - \lambda)\ell > 1 - \ell$. Neither can there be a π^5 -equilibrium of the form $\{(\tau, \mu), \emptyset, (\hat{\tau}(u), \hat{\mu}(u))\}$. This would indeed require voters of type e_L to be indifferent between the platforms offered by $\{e_H, c\}$ and $\{u\}$, and therefore that $\lambda\ell + \kappa = 1 - \ell$. As $(1 - \lambda)\ell > 1 - \ell$, $\{e_L\}$ would consequently have a profitable deviation.

Condition C2 guarantees that $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ is strict a Condorcet winner in $P_{\{e_H, c\}} \cup \{(\hat{\tau}(e_L), \hat{\mu}(e_L))\} \cup \{(\hat{\tau}(u), \hat{\mu}(u))\}$. This implies that $\{e_L\}$ running alone and implementing her ideal policy is the unique π^5 -equilibrium, thus completing the proof of the lemma.

□

Proof of Proposition 3: We proceed by proving that conditions C1-C3 imply that the following statement is true for every $j = 0, \dots, 14$:

(S^j) If (τ^*, μ^*) is a policy that emerges with a positive probability in an EPS (π^j, \mathbf{p}^*) , then $(\tau^*, \mu^*) \in P_{\{e_H, u\}}$, and

$$\mathbf{V}(\tau^*, \mu^*, \theta) \geq \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), \theta), \forall \theta \in \{e_H, u\} .$$

(S^j) is evidently true for $j = 1, 2, 3$ since we know from Proposition 1 that the e_L -politician can always profitably induce π^0 . Let us now study the other party structures.

- $j = 0$

By condition C1 and part (iii) in Lemma 3, coalition $\{e_H, u\}$ can profitably induce π^4 . This proves that there is no EPS involving π^0 .

- $j = 4$

(S⁴) is a direct corollary of part (i) in Lemma 3.

- $j = 5$

Suppose (π^5, \mathbf{p}) is an EPS. We know from Lemma 5 that this implies that $\mathbf{p} = \{\emptyset, (\hat{\tau}(e_L), \hat{\mu}(e_L)), \emptyset\}$. By Lemma 3 (iii) and condition C1, therefore, $\{e_H, u, c\}$ can profitably induce π^{12} ; a contradiction with (π^5, \mathbf{p}) being an EPS.

- $j = 6$

A tie between the three parties in π^6 is impossible since the low-ability workers outnumber the high-ability workers.

Suppose that $\{e_H\}$ and $\{e_L\}$ run against each other. This cannot be an equilibrium situation since voters of type u strictly prefer $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ to $(\hat{\tau}(e_H), \hat{\mu}(e_H))$ and $(1 - \lambda)\ell + 1 - \ell > (1 + \kappa)/2$. Moreover, this also proves that $\{e_H\}$ running alone cannot be a π^6 -equilibrium.

Condition C3 ensures that voters of type e_L strictly prefer $(\hat{\tau}(e_H), \hat{\mu}(e_H))$ to any policy in $P_{\{u, c\}}$. As a consequence, there cannot be equilibria of the form $\{\emptyset, \emptyset, (\tau, \mu)\}$, or $\{(\hat{\tau}(e_H), \hat{\mu}(e_H)), \emptyset, (\tau, \mu)\}$, $(\tau, \mu) \in P_{\{u, c\}}$.

Consider now a political state of the form (π^6, \mathbf{p}) . An immediate consequence of the previous paragraphs is that either $\mathbf{p} = \{\emptyset, (\hat{\tau}(e_L), \hat{\mu}(e_L)), \emptyset\}$ or $\mathbf{p} = \{\emptyset, (\hat{\tau}(e_L), \hat{\mu}(e_L)), (\tau, 0)\}$, $(\tau, 0) \in P_{\{u, c\}}$. In the former case, (π^6, \mathbf{p}) cannot be an EPS as coalition $\{e_H, u, c\}$ can profitably induce π^{12} (Lemma 3 (iii) and condition C1).

In the latter case, voters of type e_H must be indifferent between $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ and $(\tau, 0)$ (otherwise one of the two candidates would win for sure), and voters of types u and c must strictly prefer $(\tau, 0)$ to $(\hat{\tau}(e_L), \hat{\mu}(e_L))$. By continuity, there consequently exists a sufficiently small $\varepsilon > 0$ such that

$$\mathbf{V}(\tau, \varepsilon, \theta) \approx \mathbf{V}(\tau, 0, \theta) > \frac{1}{2}\mathbf{V}(\tau, 0, \theta) + \frac{1}{2}\mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), \theta) > \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), \theta)$$

for each $\theta \in \{u, c\}$, and

$$\mathbf{V}(\tau, \varepsilon, e_H) > \mathbf{V}(\tau, 0, e_H) = \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), e_H) .$$

If $(\tau, \varepsilon) \in P_{\{e_H, u, c\}}$, then $(\tau, \varepsilon) \in \delta(\pi^{12})$. Otherwise, by continuity of \mathbf{V} and compactness of P , there exists $(\tau', \mu') \in P_{\{e_H, u, c\}}$ which is weakly preferred to (τ, ε) by all members of $\{e_H, u, c\}$ and therefore belongs to $\delta(\pi^{12})$.

Coalition $\{e_H, u, c\}$ can thus profitably induce π^{12} . Indeed, this makes all its members better-off in utility terms and also raises their non-policy benefits (by $b/3 - b/4$ for the u - and c -politicians and by $b/3$ for the e_H -politician).

- $j = 7$

A π^7 -equilibrium must involve $\{e_H, e_L\}$ running alone: if $\{u, c\}$ offers a policy $(\tau, 0)$, then $\{e_H, e_L\}$ can win for sure by offering $(\max\{\tau, \hat{\tau}(e_H)\}, 1)$ if $\tau \leq \hat{\tau}(e_L)$, and $(\hat{\tau}(e_L), 1)$ otherwise. Hence, $\delta(\pi^7) \subseteq P_{\{e_H, e_L\}}$.

Suppose first that party $\{e_H, e_L\}$ implements a policy $(\tau, 1)$ with $\tau < \hat{\tau}(e_L)$. Given that $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ is the u -politician's ideal policy in $P_{\{e_H, e_L\}}$, the latter should induce π^1 since a direct consequence of Lemma 2 is that party $\{e_H, e_L\}$ running alone and implementing $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ is a π^1 -equilibrium.

Furthermore, there exists by continuity a sufficiently small $\epsilon > 0$ such that $(\hat{\tau}(e_L) - \epsilon, \hat{\mu}(e_L)) \in P_{\{e_H, e_L\}}$ also defeats u' and c 's ideal policies in a pairwise vote. This implies that $(\hat{\tau}(e_L) - \epsilon, \hat{\mu}(e_L)) \in \delta(\pi^1)$. Suppose now that $\{e_H, e_L\}$ implements $(\hat{\tau}(e_L), \hat{\mu}(e_L))$ in a π^7 -equilibrium. The c -politician can profitably induce π^1 , for she strictly prefers $(\hat{\tau}(e_L) - \epsilon, \hat{\mu}(e_L))$ to $(\hat{\tau}(e_L), \hat{\mu}(e_L))$.

- $j = 8$

From Lemma 5, there cannot be an EPS involving π^8 since the e_L -politician is always better-off inducing π^5 .

- $j = 9$

(S⁹) is a trivial consequence of Lemma 4.

- $j = 10$

In a π^{10} -equilibrium, $\{e_H, e_L, u\}$ must win for sure. For $(\pi^{10}, ((\tau, \mu), \emptyset))$ to be an EPS, however, the following must hold:

$$\mathbf{V}(\tau, \mu, e_H) > \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), e_H)$$

(otherwise $\{e_H, e_L\}$ can induce π^1 and get $b/2$ instead of $b/3$) and

$$\mathbf{V}(\tau, \mu, u) > \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), u)$$

(otherwise $\{u, e_L\}$ can induce π^2 and get $b/2$ instead of $b/3$).

Now, suppose that $(\tau, \mu) \notin P_{\{e_H, u\}}$. Then $\{e_H, u\}$ should induce π^4 in order to implement a policy in $P_{\{e_H, u\}}$, which all its members prefer to (τ, μ) (Lemma 3 (iii)). This would also allow them to get $b/2$ instead of $b/3$.

- $j = 11$

There is no EPS involving π^{11} as the e_L -politician can induce π^5 , thus implementing her ideal policy and getting $b > b/3$ (Lemma 5).

- $j = 12$

(S¹²) is a direct corollary of part (iv) in Lemma 3.

• $j = 13$

Suppose party $\{e_L, u, c\}$ offers a policy (τ, μ) in an EPS involving structure π^{13} . This implies that voters of type e_L must prefer (τ, μ) to $(\hat{\tau}(e_H), \hat{\mu}(e_H))$ (otherwise party $\{e_H\}$ could win the election by offering her ideal policy). Since

$$\{(\tau, \mu) \in P_{\{e_L, u\}} : \mathbf{V}(\tau, \mu, e_L) > \mathbf{V}(\hat{\tau}(e_H), \hat{\mu}(e_H), e_L)\} \subseteq \delta(\pi^2),$$

it is profitable for $\{e_L, u\}$ to induce π^2 . Doing so, it can implement a policy that makes its members at least as well-off than (τ, μ) and increase their non-policy benefit by $b/2 - b/3 > 0$. This proves that there is no EPS involving π^{13} .

• $j = 14$

Let $(\tilde{\tau}, \tilde{\mu}) \in \delta(\pi^{14})$, and assume that $(\tilde{\tau}, \tilde{\mu}) \notin P_{\{e_H, u\}} = P_{\{e_H, e_L, u\}} \cap P_{\{e_H, u, c\}}$. This implies that either $(\tilde{\tau}, \tilde{\mu}) \in P_{\{e_H, e_L, u\}} \setminus P_{\{e_H, u\}}$ or $(\tilde{\tau}, \tilde{\mu}) \in P_{\{e_H, u, c\}} \setminus P_{\{e_H, u\}}$.

If $(\tilde{\tau}, \tilde{\mu}) \in P_{\{e_H, e_L, u\}} \setminus P_{\{e_H, u\}}$, then coalition $\{e_H, u, c\}$ can profitably induce π^{12} . This indeed allows its members to implement a policy they all prefer to $(\tilde{\tau}, \tilde{\mu})$ and to raise their non-policy benefit by $b/3 - b/4$. If $(\tilde{\tau}, \tilde{\mu}) \in P_{\{e_H, u, c\}} \setminus P_{\{e_H, u\}}$, then coalition $\{e_H, e_L, u\}$ can similarly raise its members' payoffs by inducing π^{10} . Thus, $(\tilde{\tau}, \tilde{\mu})$ must belong to $P_{\{e_H, u\}}$ for $(\pi^{14}, (\tilde{\tau}, \tilde{\mu}))$ to be an EPS.

Now suppose $(\tilde{\tau}, \tilde{\mu}) \in P_{\{e_H, u\}}$ but

$$\mathbf{V}(\tilde{\tau}, \tilde{\mu}, u) < \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), u) .$$

Coalition $\{e_L, u\}$ can then profitably induce π^8 . Enforcing $(\hat{\tau}(e_L), \hat{\mu}(e_L))$, it can thus raise its members' policy and non-policy benefits.

Finally, coalition $\{e_H, e_L\}$ can similarly induce π^7 if $(\tilde{\tau}, \tilde{\mu}) \in P_{\{e_H, u\}}$ but

$$\mathbf{V}(\tilde{\tau}, \tilde{\mu}, e_H) < \mathbf{V}(\hat{\tau}(e_L), \hat{\mu}(e_L), e_H) ,$$

thus raising its members' policy and non-policy benefits.

□

References

- Blanchard, O., Tirole, J., 2007. The Optimal Design of Unemployment Insurance and Employment Protection: A First Pass. *Journal of the European Economic Association* 6, 45-77.
- Boeri, T., Conde-Ruiz, J.I., Galasso, V., 2003. The Political Economy of Flexicurity. FEDEA Working Paper 2006-15.

- Buti, M., Pench, L., Sestito, P., 1998. European Unemployment: contending theories and institutional complexities. Policy Paper 98/1, The Robert Schuman Centre, European University Institute.
- Chung, Y.-K., Jeong, J., 2008. Analysis of Employment Protection Laws and Unemployment Benefits. *Economics Letters* 99, 144-146.
- Hassler, J., Rodríguez Mora, J.V., 1999. Employment Turnover and the Public Allocation of Unemployment Insurance. *Journal of Public Economics* 73, pp. 55-83.
- Lee, W., Roemer, J.E., 2005. The Rise and Fall of Unionised Labour Markets: A Political Economy Approach. *Economic Journal* 115, 28-67.
- Levy, G., 2004. A Model of Political Parties. *Journal of Economic Theory* 115, 250-277.
- Pagano, M., Volpin, P.F., 2005. The Political Economy of Corporate Governance. *American Economic Review* 95, 1005-1030.
- Pallage, S., Zimmermann, C., 2001. Voting on Unemployment Insurance. *International Economic Review* 42, pp. 903-923.
- Persson, T., Tabellini, G., 2000. *Political Economics. Explaining Economic Policy*. MIT Press, Cambridge, Massachusetts, London, England.
- Saint-Paul, G., 1996. Exploring the Political Economy of Labor Market Institutions. *Economic Policy* 23, 265-315.
- Saint-Paul, G., 1997. French Unemployment: a Transatlantic Perspective. *Economic Policy* 25, 265-292.
- Saint-Paul, G., 1998. A framework for analyzing the political support for active labor market policy. *Journal of Public Economics* 67, pp. 151-165.
- Saint-Paul, G., 1999. Assessing the Political Viability of Labor Market Reform: The Case of Employment Protection. CEPR Discussion Paper, No. 2136.
- Saint-Paul, G., 2000. *The Political Economy of Labor Market Institutions*. Oxford University Press.
- Saint-Paul, G., 2002. The Political Economy of Employment Protection. *Journal of Political Economy* 110, pp. 672-704.
- Smeets, V., Warzynski, F., 2006. Job Creation, Job Destruction and Voting Behavior in Poland. *European Journal of Political Economy* 22, pp. 503-519

Wright, R., 1996. The Redistributive Role of Unemployment Insurance and the Dynamics of Voting. *Journal of Public Economics* 31, pp. 377-399.

