The Political Economy of Labor Policy

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Abstract

In many countries, there is a size threshold above which stricter employment protection legislations (EPLs) apply. Thus EPLs are essentially S-shaped as a function of firm size. This article develops a political theory that rationalizes the existence of such policies. Citizens are heterogeneous in wealth and make an occupational choice that determines their voting preferences for EPLs. The equilibrium policy is S-shaped regardless of the political orientation of the government. Even if the government cares only about workers, it keeps workers in smaller firms unprotected. Conversely, even if it cares exclusively about entrepreneurs, it imposes stricter EPLs on larger firms.

Keywords: EPLs, interest groups, S-shaped EPLs.

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1 Introduction

Employment protection legislations (EPLs) are typically heterogeneous across firms. In many countries, in fact, there is a size threshold above which firms face stronger EPLs, so that EPLs are essentially S-shaped as a function of firm size. For instance, in France firms that have 50 employees or more face substantially stricter EPLs than those that have less than 50 (Gourio and Roys, 2014). The empirical evidence has shown that S-shaped EPLs distort labor markets, in terms of wages, dismissal decisions, and growth possibilities (Schivardi and Torrini, 2008; Leonardi and Pica, 2013). The welfare costs of these distortions have been estimated as large as 3.5% of GDP (Garicano et al., 2016). But if EPLs are so costly, why do they exist? Why are they S-shaped in many countries?

This article addresses these questions from a political economy perspective. I develop a macro model for the study of the scope of EPLs. In my model, citizens are heterogeneous in wealth and choose to become workers or entrepreneurs. Occupational choice determines agents' preferences for EPLs. I aggregate these interests through a probabilistic voting model à la Persson and Tabellini (2000). Initially, EPLs are weak and uniform across firms. The government chooses the EPLs design by making a binary decision for each firm: whether to keep the initially weak regulations or to apply stricter EPLs. Thus, the equilibrium EPLs can be size-contingent. Citizens vote for their preferred EPLs design by taking into account its overall impact on the economy. The main objective of this paper is to characterize the shape of the equilibrium policy and investigate whether a political theory can rationalize the existence of S-shaped EPLs.

The probabilistic-voting mechanism features a smooth mapping from group sizes to EPLs. Thus, the equilibrium labor policy maximizes a political objective function which is a weighted average of the welfare of workers and entrepreneurs. The political weights depend on the wealth distribution and a parameter governing the workers' responsiveness to EPLs relative to entrepreneurs. A high value of this parameter means that the government chooses a policy platform that favors relatively more workers (*pro-worker* government), whereas when this parameter is low the policy favors entrepreneurs (*pro-business*). Workers are randomly attached to firms, thus they all face the same ex-ante expected utility.[1] Firms are heterogeneous as their size is restricted by endogenous credit constraints that depend on entrepreneurs' wealth and the firm-specific strength of EPLs.

To find the equilibrium policy, I solve an equivalent version of the government's problem. In this version, the aggregate workers' welfare is written as the sum of the welfare of the group of workers attached to each firm. To solve the problem, I start by studying the impact of strengthen-

[1] While not stated explicitly, the macro literature studying S-shaped EPLs makes a similar assumption regarding how individual workers are attached to different firms (e.g Garicano et al., 2016)

ing EPLs on the welfare of the different groups of workers and entrepreneurs. Next, I characterize the equilibrium EPLs as a function of the governments' political orientation and depending on whether the wage responds to EPLs (*flexible* wages) or not (*sticky* wages).

The main results of the paper are as follows. First, there are diverging interests towards EPLs. EPLs hurt the group of workers in smaller firms, while they benefit those in larger firms. Entrepreneurs running larger firms suffer less from EPLs than those operating smaller firms. Secondly, when wages are flexible, the equilibrium EPLs design that accounts for these interests is S-shaped regardless of the political orientation of the government. That is, there exists an equilibrium size threshold above which stricter EPLs apply. This implies that even when the government cares only about workers, it keeps those in smaller firms unprotected. Conversely, even when the government cares exclusively about entrepreneurs, it subjects larger firms to stricter EPLs. More pro-worker governments choose a lower size threshold. These results are consistent with the empirical evidence presented in section 2.

Thirdly, when wages are sticky, S-shaped EPLs are implemented only by more pro-worker governments, otherwise, EPLs do not appear in equilibrium. Finally, the political weighted welfare of the equilibrium policy is achievable by allowing the different groups of workers to form unions and bargain on EPLs with their entrepreneurs. Under certain conditions, the government can attain the desired outcome by regulating the bargaining power of unions. In equilibrium unions never appear in smaller firms.

The recent empirical literature on labor and finance has shown that EPLs crowd out external finance (Simintzi et al., 2015; Serfling, 2016) and discourage firms' investment (Bai et al., 2020). I show that these distortions, which originate in the interaction between financial and labor frictions, have unexplored theoretical implications for the political economy of EPLs. In my model, EPLs increase firms' operating costs, crowding out external finance. Entrepreneurs adjust their operations by reducing leverage, investment, and hiring. This adjustment is greater in smaller firms for which credit constraints get significantly tighter after an improvement of EPLs. In contrast, larger firms have unused debt capacity and can more easily adapt to EPLs. As a result, EPLs decrease the welfare of workers and entrepreneurs from smaller firms, while larger entrepreneurs suffer less from EPLs and their workers benefit.

The diverging interests in the economy give a sense of why S-shaped EPLs are enacted in many countries. However, that is not the complete story. Why is the equilibrium policy S-shaped regardless of governments' political orientation? The explanation comes from the impact of such policies on the labor market. Improving EPLs in larger firms increases labor market competition, which reduces the equilibrium wage. Smaller firms substantially benefit from reduced wages, while larger firms can more easily absorb stricter EPLs. Thus, pro-business governments view S-shaped EPLs as a way to cross-subsidize the small-scale sector at a relatively low cost for larger firms. On the other hand, pro-worker governments would like to protect all workers. However, they anticipate that smaller firms would seriously struggle to accommodate stronger EPLs, which in turn would negatively affect their workers. In consequence, they also establish lighter EPLs in smaller firms.

The previous argument relies on having flexible wages, that adjust to changes in EPLs. When wages are sticky, pro-business governments keep weak EPLs across the board. In that case, only more leftist (pro-worker) governments choose to enact S-shaped EPLs. Thus, S-shaped EPLs are more likely to arise in countries where wages are flexible and under more leftist governments.

Finally, I study the equilibrium EPL design that arises from independent negotiations between unions and entrepreneurs. Under some conditions, the government can attain the outcome of the preferred size-contingent policy through a single-dimensional instrument: unions' bargaining power. The explanation for this result comes from the fact that in equilibrium there are no unions in smaller firms. Thus, the government chooses unions' bargaining power to control the outcome of negotiations in larger firms.

My model builds on the framework developed by Fischer and Huerta (2021), in which wealth inequality and financial constraints determine occupational choice. To study the scope of EPLs, I adapt their setting to i) introduce firm-specific EPLs, ii) distinguish between individual and collective dismissal regulations (EPLs), iii) study the impact of EPLs on the welfare of the different groups of workers and entrepreneurs, and iv) microfound a political process where the government may choose to implement size-contingent EPLs to account for heterogeneous interests. The model remains sufficiently tractable to allow for a sharp characterization of the political equilibrium. As shown in section 8.4.4 in the Appendix, the model can be adapted to accommodate other types of size-contingent regulations that are widespread worldwide, such as special tax treatments, credit subsidies, and restrictions on the expansion of businesses. The study of the political economy of these regulations is left for future work.

The literature studying size-contingent EPLs has relied on different extended versions of Lucas (1978) model to estimate the welfare costs of such regulations. However, the literature is silent on how these regulations come to exist. As far as I know, this is the first paper to develop a political theory that rationalizes the existence of S-shaped EPLs. My framework shares similarities with the kind of models used to study size-contingent regulations (e.g. Garicano et al., 2016; Guner et al., 2008). However, none of these frameworks include financial constraints.[2] In my model, the extent to which firms adapt to EPLs depends on their access to credit which is endogenously determined by their assets and the intensity of EPLs in each firm. This interac-

[2] Recently, Allub and Erosa (2019) incorporate financial frictions in a Lucas's model with occupational choice. However, as in Buera and Shin (2013) and Moll (2014), the amount of credit that a firm obtains is given by an exogenous fraction of its assets.

tion between EPLs and financial frictions determines the heterogeneous interests that give rise in equilibrium to S-shaped EPLs.

The paper is organized as follows. Section 2 presents motivating evidence. Section 3 introduces the model. Section 4 describes the conflicts of interest towards EPLs. Section 5 characterizes the equilibrium EPLs design. Section 6 presents some extensions. Section 7 concludes.

1.1 Related Literature

The empirical labor literature has shown that S-shaped EPLs create a wedge between firms' wages (Leonardi and Pica, 2013), growth (Martins, 2009) and employment stability (Boeri and Jimeno, 2005; Schivardi and Torrini, 2008). The model replicates many of these findings.

The quantitative macro literature has focused on estimating the costs of size-contingent regulations. Restuccia and Rogerson (2008) consider a broad and abstract set of policies that cause distortions at a firm level. Guner et al. (2008) focus on policies that target the size of establishments. Garicano et al. (2016) use S-shaped EPLs to calculate the welfare effects of labor regulations. The welfare costs of EPLs range from 1.3% to 3.5% of GDP. Gourio and Roys (2014) model S-shaped EPLs as sunk costs and find lower aggregative effects of these policies.

There is an important body of literature studying the political economy of EPLs. Saint-Paul (2000) provides a review of the early work on this topic (see also Saint-Paul, 2002). One strand of this literature rationalizes the existence of two-tier systems, where groups of workers *within* a firm coexist under flexible and rigid EPLs. These papers build on efficiency wage models along the lines of Shapiro and Stiglitz (1984) (e.g. Saint-Paul, 1996). However, much less work has been done to understand size-contingent EPLs, which create a wedge *between* groups of workers at different firms. Related to this paper, Boeri and Jimeno (2005) show that if monitoring effectiveness is decreasing in firm size, then stricter EPLs can be only accepted in large units.

Empirically, Botero et al. (2004) discuss the political power theories on labor regulations and provide evidence that the left is associated with stricter EPLs. This is consistent with the motivating evidence of section 2 and with the predictions of the model.

The government's problem is microfounded by a probabilistic voting model along the lines of Persson and Tabellini (2000). This approach links to a wide body of literature that studies the political support for different types of policies. Hassler et al. (2005) study income redistribution, Gonzalez-Eiras and Niepelt (2008) and Sleet and Yeltekin (2008) focus on public security, Farhi et al. (2012) analyze taxation and Song et al. (2012) study fiscal policy. More closely related to my paper, Pagano and Volpin (2005) and Fischer and Huerta (2021) study labor and financial regulations.

2 Motivating Evidence

Following the definition of the OECD (1999), the indicators of employment protection legislations (EPLs) evaluate the strength of regulations on the dismissal and hiring of workers. They include both individual and collective dismissal, which are the regulations studied in this paper. Importantly, the focus is on the extent of EPLs, but not on the intensity of regulations. Thus, the data presented is about the coverage of EPLs across countries.

Figures 1 and 2 serve as motivation for this paper.[3] The figures plot the firm size threshold (number of workers) at which dismissal regulations become stricter across different countries. The x-axis corresponds to the year in which the size threshold was defined or changed in a given country. The y-axis represents the size threshold from which EPLs become stricter. The left-hand side panel corresponds to instances in which the size threshold was enacted by a left-wing government (in red), while the right-hand side shows the years in which the regulation was defined by a right-wing government (in blue). The box plots represent the 95% confidence interval around the mean. The top and bottom horizontal lines are the 95th and 5th percentiles, respectively.

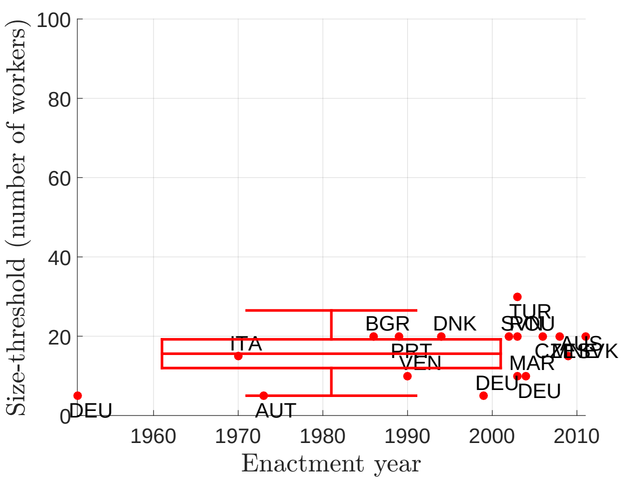

Figure 1: Size threshold, left-wing.

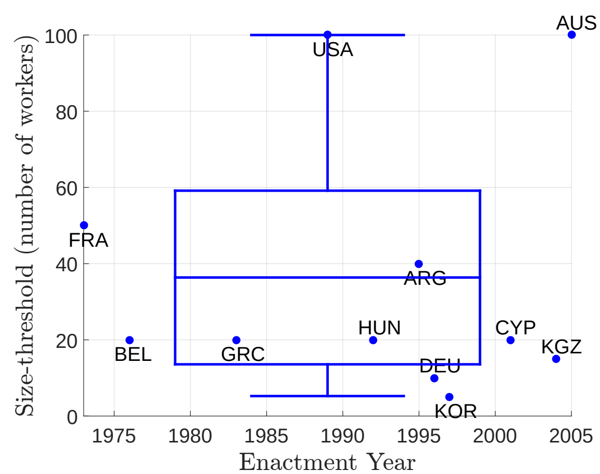

Figure 2: Size threshold, right-wing.

The figures provide three insights regarding EPLs. First, S-shaped EPLs are implemented in many countries and the size threshold from which EPLs become stricter varies significantly across countries. Secondly, once the size threshold is defined, it remains fixed over time for almost all

[3] Source: data collected from different sources, including countries' Labor Codes, the International Labor Organization (ILO) and studies regarding EPLs reforms in different countries. Left and right-wing governments are defined on the basis of the political orientation of the executive as measured by the World Bank Database of Political Institutions (WDPI), and defined in Beck et al. (2001). Section 8.3 in the Appendix provides more details of data construction.

countries.[4] Finally, the average size threshold is lower if it is enacted by a left-wing government, than if it is enacted by a right one.[5]

These facts beg the questions, if left-wing governments supposedly want to protect workers, why do they keep those in smaller firms unprotected? Conversely, if right-wing governments want to protect businesses, why do they impose stricter EPLs on larger firms? This paper provides a political economy explanation for these questions.

Additionally, these facts also guide the model. Since size thresholds remain relatively fixed over time, I study a one-time labor reform. Initially, EPLs are weak and homogeneous across firms. The government decides the strength of EPLs that apply to each firm.[6] It makes a binary decision: whether to increase EPLs to a certain level or to keep the initially weak EPLs. The preferred policy design may be size-contingent to account for the diverging interests in the economy. In other words, the government chooses the extent of labor regulations. In aggregating the political interests, it responds to its political orientation, either left-wing (pro-worker) or right-wing (pro-business).

This article focuses on the scope of EPLs. Thus, the government's policy intervention works on the extensive margin. That is, the government chooses which workers to protect, instead of choosing how much protection to give workers. Therefore, the objective of this paper is to explain the extensive margin of labor regulation, but not its intensive margin. The design of EPLs is analyzed from a positive perspective. The relevant question is, what is the EPLs design that arises as an equilibrium outcome of aggregating the endogenous political interests?

This view contrasts with the literature on the Ramsey optimal policy which takes a normative perspective. For instance, Itskhoki and Moll (2019) characterize the optimal tax policy in an environment with financial frictions that features a distributional conflict between workers and capitalists. In that case, the policy instrument works on the intensive margin. Under that approach, the government would decide how much protection workers should receive. This is a normative question that is not analyzed in this paper.

[4]There are some exceptions. For instance, Germany has changed the size threshold three times since it was enacted. Also Australia changed its size threshold once.

[5]The average size threshold for left-wing governments is lower than the average threshold for right-wing ones with a 95% level of confidence.

[6]The government's problem is rationalized by a probabilistic voting model à la Persson and Tabellini (2000). Thus, citizens vote to define the equilibrium regulations. Section 3.4 provides more details.

3 The Model

This section outlines the baseline model. I develop a tractable framework for the study of the scope of Employment Protection Legislations (EPLs). The model builds on Fischer and Huerta (2021, FH hereafter). Citizens are heterogeneous in wealth and decide between becoming workers or entrepreneurs. Financial and labor frictions interact to define occupational choice, which in turn determines political interests.

In this paper, I modify FH's model to incorporate four additional elements. First, I adapt the model to allow for firm's specific labor regulations. Secondly, I introduce individual and collective dismissal regulations (EPLs). Thirdly, I study the welfare effects of EPLs on the different groups of workers and entrepreneurs, giving rise to endogenous political interest groups. Finally, I introduce a political mechanism where governments choose the equilibrium labor policy design according to heterogeneous interests and their political orientation.

3.1 Timeline

Consider a three periods one-good open economy. Figure 3 illustrates the timeline. In what follows I describe the events of each period.

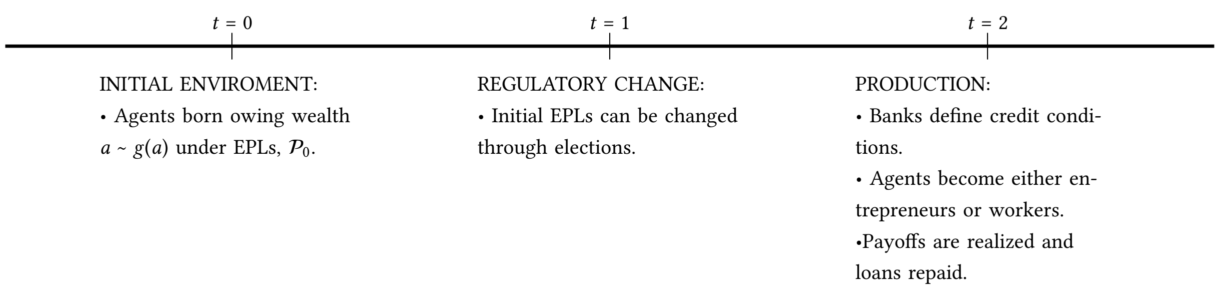

Figure 3: Timeline.

3.1.1 t=0

At $t = 0$, a continuum of risk neutral agents are born differentiated by wealth a. The cumulative wealth distribution $G(a)$ has support in $[0, a_M]$ and continuous density $g(a)$. Agents have access to a Cobb-Douglas production technology given by $f(k, l) = k^{\alpha} l^{\beta}$, $\alpha + \beta < 1$. They are price-takers in the labor and credit markets. The price of the single good is normalized to one. Initially, the strength of EPLs is given by $\mathcal{P}_0 = (\varphi_0, \theta_0)$, where $\varphi_0 \in [0, 1]$ measures the strictness of individual dismissal regulations and $\theta_0 \in [0, 1]$ the strength of collective dismissal laws. More details about the working of labor regulations are provided below.

3.1.2 t=1

At $t = 1$, citizens vote to change regulations. The equilibrium policy arises from a probabilistic voting mechanism à la Persson and Tabellini (2000). In section 3.4, I show that the equilibrium policy maximizes a weighted average of the welfare of workers and entrepreneurs (the *government's problem*). The equilibrium EPLs design responds to the government's political orientation, either *left-wing* (pro-worker) or *right-wing* (pro-business). The resulting policy can be size-contingent to account for the heterogeneous political interests to be described in section 4.

The government can increase the strength of individual dismissal regulations from φ_0 to $\varphi_1 = \varphi_0 + \Delta$ and collective dismissal regulations from θ_0 to $\theta_1 = \theta_0 + \Delta$, with $\Delta > 0$. It makes a binary decision for each firm: whether to keep weak EPLs or to impose stronger EPLs. Therefore, the resulting labor policy can depend on firm size. It is denoted by the function $\mathcal{P}$, which maps firm's assets to a specific strength of EPLs, i.e. $\mathcal{P}(a) = (\varphi, \theta)$. The resulting labor policy is then $\mathcal{P} : [0, a_M] \longrightarrow \Theta$, where $\Theta \equiv \{(\varphi_0, \theta_0), (\varphi_1, \theta_0), (\varphi_0, \theta_1), (\varphi_1, \theta_1)\}$ is the set of feasible policies that can be implemented at each firm.

In what follows, I assume that the government can enforce the chosen policy, $\mathcal{P}$. In section 6.2, I study the case in which firms can strategically adjust their size in response to the labor policy. In that case, the preferred policy is not enforceable. In section 6.1, I show that the outcome of the preferred policy can be implemented by independent negotiations between unions and entrepreneurs.

3.1.3 t=2

At $t = 2$, the economy operates in accordance with the chosen policy, $\mathcal{P}$. The single period is divided into four stages as illustrated by figure 4.

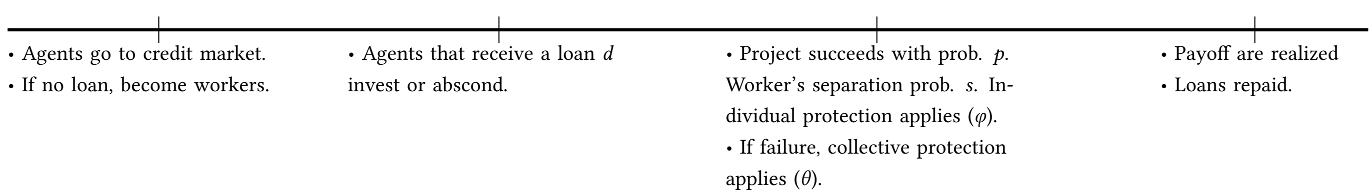

Figure 4: Timing at $t = 2$.

There is a competitive banking system that has unlimited access to funds from abroad at the international interest rate, ρ. Banks provide credit to entrepreneurs while facing a moral hazard problem: investment decisions are non contractible and banks are imperfectly protected against malicious default. In consequence, banks constraint access to credit. As detailed in section 3.3, given the labor policy $\mathcal{P}$, banks set a minimum wealth required to obtain a loan, $\underline{a} \equiv \underline{a}(\mathcal{P}) > 0$

and establish debt limits, $d \equiv d(a|\mathcal{P})$. Excluded agents may become workers ($a < \underline{a}$), the rest can become entrepreneurs ($a \geq \underline{a}$).

Agents receiving a loan ($a \geq \underline{a}$) have two options. First, they can invest their capital in a firm to produce output and become entrepreneurs. Secondly, they may decide to commit *ex-ante* fraud and abscond with the loan to finance private consumption. In this case, only a fraction $1 - \phi$ is recovered by the legal system. Thus, $1 - \phi$ is the loan recovery rate.[7] On the other hand, agents excluded from the credit market ($a < \underline{a}$) may become workers at $t = 2$ and supply l_s units of labor. They face a disutility cost of labor given by $\varsigma(l_s) = l_s^\gamma$ with $\gamma > 2$.

There is a fixed cost $F > 0$ of forming a firm, which is paid before payoffs are realized. Firms succeed with probability $p \in (0, 1)$. In that case, they produce output $f(k, (1 - s)l)$, where $k = a + d$ is the capital invested by an entrepreneur owning a who asks for a loan d and hires l units of labor. $s \in [0, 1]$ is the job separation probability. When an individual worker is fired, with probability s, entrepreneurs must pay him a fraction $\varphi \in [0, 1]$ of his labor income, given by φwl.[8] Thus, φ is interpreted as a firm-specific measure of firing costs or as the strictness of individual dismissal regulations.

With probability $1-p$, production fails and bankruptcy procedures take place. As in Balmaceda and Fischer (2009), the legal system recovers only a fraction $\eta \in [0, 1]$ of total invested capital which is distributed among creditors, i.e. banks and workers. First, a fraction $\theta \in [0, 1]$ of labor income wl is paid to workers, the remainder $\eta k - \theta wl$ goes to banks.[9] Hence, θ can be interpreted as the size-specific strength of employees' rights in bankruptcy or more broadly, as the strictness of collective dismissal regulations. Alternatively, it can be understood as a measure of seniority rights of employees of an insolvent firm. That is, when $\theta = 0$ the worker is junior to all creditors, while if $\theta = 1$ she is the most senior of the claimants.

In sum, the strength of EPLs in a given firm is represented by the pair (φ, θ), which measures the strictness of individual and collective dismissal regulations, respectively. Endogenous interest groups towards improvements of EPLs arise as result of the interaction between labor and financial frictions. Section 4 characterizes these groups and their political preferences.

[7] Fischer et al. (2019) build a model with a similar financial structure where collateral laws are represented by a more general functional form. The results of the model remain unchanged under that more general approach.

[8] This can be interpreted as in Saint-Paul (2002), firms are hit by a random shock that destroys the match between workers and entrepreneurs with probability s, in which case the firm pays a firing cost φwl.

[9] Along this paper it is assumed that $\eta k - \theta wl \geq 0$, which simplifies the exposition. If $\eta k - \theta wl < 0$, then all capital recovered goes to workers and banks receive nothing. In that case, the analysis becomes simpler and all results still hold.

3.2 Payoffs

At the end of period $t = 2$, loans are repaid and outcomes realized. The expected profits of a bank that lends d to an entrepreneur with wealth a, that operates a firm with EPLs given by (φ, θ), at the interest rate r is,

$$U^b(a, d, l|\varphi, \theta) = p(1 + r)d + (1 - p)[\eta k - \theta wl] - (1 + \rho)d. \quad (1)$$

The utility of an entrepreneur investing k and hiring l units of labor is,

$$U^e(a, d, l|\varphi, \theta) = p[f(k, (1 - s)l) - (1 - s)wl - s\varphi wl - (1 + r)d] - F. \quad (2)$$

The labor utility of an individual worker that supplies l_s units of labor to a firm with EPLs (φ, θ) is,[10]

$$u^w(l_s|\varphi, \theta) = p[(1 - s)wl_s + s\varphi wl_s] + (1 - p)\theta wl_s - \varsigma(l_s) = \bar{w}(\varphi, \theta) \cdot l_s - \varsigma(l_s), \quad (3)$$

where $\bar{w}(\varphi, \theta) \equiv [p((1 - s) + s\varphi) + (1 - p)\theta] \cdot w$ is the expected labor payment by unit of labor supplied.[11] Throughout the paper I refer to $\bar{w}$ as the 'expected wage'.

Finally, define the total utility of workers attached to a firm with labor regulations (φ, θ) that hires l units of labor,

$$U^w(l|\varphi, \theta) = n \cdot u^w \equiv \frac{l}{l_s} \cdot [\bar{w}(\varphi, \theta) \cdot l_s - \varsigma(l_s)] = \bar{w}(\varphi, \theta) \cdot l - \frac{l}{l_s}\varsigma(l_s), \quad (4)$$

where $n \equiv l/l_s$ is a measure of the 'number' of workers hired by the firm. Intuitively, this is the welfare measure that a union representing workers would maximize when bargaining on labor conditions. As will be clear later, studying the economic interests of the different groups of workers is key to characterize the equilibrium policy.

By exploiting the equilibrium labor market condition (equation (13) in next section), section 8.1.3 in the Appendix shows that U^w is an 'appropriate' measure of workers' utility in a given firm. I must highlight that U^w represents the utility of the group of workers in a firm hiring l units of labor (or total workers' welfare in a firm), but not the utility of an individual worker in a firm l. As in the macro literature studying size-contingent EPLs (Gourio and Roys, 2014; Garicano et al., 2016), I assume that individual workers are randomly attached to firms of different sizes. That is, there is not a matching mechanism through which individual workers are assigned to firms.

[10] She also obtains $(1 + \rho)a$ from depositing her wealth in the banking system. Thus, total worker's utility is $u^w + (1 + \rho)a$.

[11] Observe that this measure depends on the equilibrium wage w, which is a function of economy-wide labor regulations, $\mathcal{P}$.

Thus, the ex-ante expected utility of individual workers is the same. The following condition must be satisfied given any labor policy $\mathcal{P}$

$$\mathbb{E}u^w(\mathcal{P}) \cdot G(\underline{a}_0) = \mathbb{E}_G[U^w|\mathcal{P}], \tag{5}$$

where $\mathbb{E}u^w(\mathcal{P})$ is the expected utility of an individual worker.[12] Thus, $\mathbb{E}u^w(\mathcal{P}) \cdot G(\underline{a}_0)$ is the total worker's welfare. On the other hand, $\mathbb{E}_G[U^w|\mathcal{P}]$ is the weighted sum of the utilities of each group of workers at each firm. Hence, U^w indicates how the total workers' welfare is distributed across firms. In section 3.4, I characterize the government's problem in terms of U^w, which allows for a more insightful interpretation of the results.

3.3 Ex-ante competitive equilibrium

This section describes the competitive equilibrium that would arise if the economy operates under the initial EPLs given by $\mathcal{P}_0 = \{\varphi_0, \theta_0\}$. The political preferences of the different groups of agents are defined on the basis of this ex-ante competitive equilibrium. That is, given $\mathcal{P}_0$ and a, agents understand what their position in society would be and how an improvement of EPLs would affect them relative to this initial position. In section 4, I study in detail these political preferences.

To find the individual labor supply, l_s each worker maximizes (3) to obtain,

$$\varsigma'(l_s) = \bar{w}(\varphi_0, \theta_0) = [p((1-s) + s\varphi_0) + (1-p)]\theta_0] \cdot w. \tag{6}$$

Thus, l_s is defined as the level of labor that equalizes the marginal labor benefit $\bar{w}(\varphi_0, \theta_0)$ with the marginal effort cost $\varsigma'(l_s)$.[13] The banking system is assumed to be competitive. Imposing the zero-profits condition in (1) gives,

$$1 + r = \frac{1+\rho}{p} - \frac{1}{pd}(1-p)[\eta k - \theta_0 wl], \tag{7}$$

where $1 + r$ is the interest rate charged to an entrepreneur that operates a firm with debt d, investment $k = a + d$ and labor l. Replacing (7) in (2),

$$U^e(a, d, l|\varphi_0, \theta_0) = pf(k, (1-s)l) + (1-p)\eta k - \bar{w}(\varphi_0, \theta_0)l - (1+\rho)d - F. \tag{8}$$

Thus, expected entrepreneur's utility can be rewritten as the expected value of the firm $pf(k, (1-s)l) + (1-p)\eta k$ net of expected labor costs $\bar{w}(\varphi_0, \theta_0)l$, credit costs $(1+\rho)d$ and sunk costs F. The

[12] Note that the expectation comes from the fact that there is some endogenous probability of being attached to a firm with a given strength of EPLs. Section 8.1.4 provides an explicit expression for $\mathbb{E}u^w(\mathcal{P})$ when EPLs are S-shaped.

[13] Note that individual labor supply does not depend on a.

entrepreneur's problem is

$$
\begin{aligned}
&\max_{d,l} U^e(a, d, l|\varphi_0, \theta_0) \\
s.t. \quad & U^e(a, d, l|\varphi_0, \theta_0) \geq u^w(\varphi_0, \theta_0) + (1+\rho)a, && (9)\\
& U^e(a, d, l|\varphi_0, \theta_0) \geq \phi k, && (10)
\end{aligned}
$$

where (9) and (10) are the participation and incentive compatibility constraints, respectively. That is, condition (9) asks that the agent prefers to form a firm instead of becoming a worker and (10) states that the entrepreneur does not have incentives to abscond with the loan. Solving the unconstrained problem leads to the optimal firm size given by capital $k_0^* \equiv k^*(\varphi_0, \theta_0)$ and labor $l_0^* \equiv l^*(\varphi_0, \theta_0)$,

$$
\begin{aligned}
pf_k(k_0^*, (1-s)l_0^*) &= 1 + r^* \equiv 1 + \rho - (1-p)\eta, && (11)\\
p(1-s)f_l(k_0^*, (1-s)l_0^*) &= \bar{w}(\varphi_0, \theta_0). && (12)
\end{aligned}
$$

Note that (k_0^*, l_0^*) correspond to the efficient operation level if loans were not limited by financial frictions. In consequence, only sufficiently rich agents will attain the efficient operation scale. Section 8.1.1 in the Appendix describes the conditions of the optimal debt contract. Considering the non-absconding condition (10), banks define two critical wealth thresholds. First, a minimum wealth level needed to obtain a loan, $\underline{a}_0$. Secondly, a minimum level of wealth needed that allows the efficient level of operations, $\overline{a}_0$. Thus, agents with $[\underline{a}_0, \overline{a}_0)$ can obtain a loan which allows them to start a firm, but must operate at an inefficient scale, i.e. they invest $k < k_0^*$.

Additionally, note that restriction (9) defines a third critical wealth level, $\hat{a}_0$ from which agents prefer to establish a firm instead of becoming workers. Section 8.1.2 in the Appendix briefly describes the different arrangements that could arise in the model as a function of $\underline{a}_0$ and $\hat{a}_0$. For simplicity, I consider the case in which $\underline{a}_0 > \hat{a}_0$, that is agents excluded from the credit market prefer to become workers instead of forming a firm.[14]

Overall, the model sorts agents into four groups: i) workers ($a < \underline{a}_0$), ii) entrepreneurs operating inefficient firms ($a \in [\underline{a}_0, \overline{a}_0)$), iii) entrepreneurs obtaining credit to operate efficiently ($a \in [\overline{a}_0, k^*)$, and iv) entrepreneurs that self-finance an efficient firm ($a \geq k_0^*$). Figure 5 summarizes these features. As shown by equations (35) and (36) in the Appendix, the optimal decisions of entrepreneurs can be written in terms of wealth, i.e. $d = d(a)$ and $l = l(a)$. Hence, entrepreneurs' and workers' utilities can be simply denoted as $U^e(a|\mathcal{P})$ and $U^w(a|\mathcal{P})$, respectively.

[14]FH show that the features of the model remain qualitatively unchanged in the remaining cases.

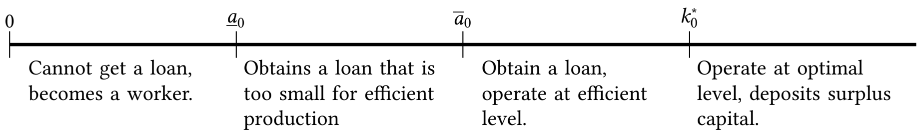

Figure 5: Ex-ante competitive equilibrium.

Finally, the labor market equilibrium wage w arises from

$$l_s \cdot G(\underline{a}_0) = \int_{\underline{a}_0}^{\overline{a}_0} l \, \partial G(a) + l^*(1 - G(\overline{a}_0)), \tag{13}$$

where the left-hand side is total labor supply and the right-hand side is labor demand. This condition uniquely defines the equilibrium wage w.

3.4 Government's problem

In this section, I start by presenting the government's problem. After I have described the problem, I explain how it can be microfounded through a political process.

Consider a government that chooses a policy design, $\mathcal{P}_{gp} = (\mathcal{P}_{gp}^{\varphi}, \mathcal{P}_{gp}^{\theta})$, where $\mathcal{P}_{gp}^{\varphi}$ and $\mathcal{P}_{gp}^{\theta}$ denote the individual and collective dismissal regulations, respectively. At $t = 1$, the government makes a binary decision for each firm with assets a: whether to keep weak EPLs or to increase the strength of EPLs. It can improve individual dismissal regulations from φ_0 to φ_1. In the case of collective regulations, it can increase them from θ_0 to θ_1. Thus, the 'political equilibrium' is given by the policy functions $\mathcal{P}_{gp}^{\varphi} : [0, a_M] \longrightarrow \{\varphi_0, \varphi_1\}$ and $\mathcal{P}_{gp}^{\theta} : [0, a_M] \longrightarrow \{\theta_0, \theta_1\}$, that map firms' assets to their specific strength of EPLs. Recall that $\varphi_1 = \varphi_0 + \Delta$ and $\theta_1 = \theta_0 + \Delta$, where $\Delta > 0$.

The government responds to its political orientation, either left-wing (pro-worker) or right-wing (pro-business). The relative importance of workers over entrepreneurs in the government's problem is measured by $\lambda \in [0, 1]$. Therefore, as λ increases, workers receive a larger weight relative to entrepreneurs. More leftist governments are represented by a larger λ, while right-wing ones by lower values of λ.

Importantly, this paper studies the scope of EPLs. Therefore, the government's policy intervention works on the extensive margin. The relevant question that must be asked is then: which workers receive protection? The answer to this question is going to be given by the equilibrium policy, $\mathcal{P}$. Since the focus is on the extent of EPLs, the government can choose between a low or a high strength of EPLs that are exogenously given.

This modelling approach contrasts with the one commonly used in the literature on the optimal Ramsey policy intervention. In that case, the policy instrument works on the intensive margin. The government's problem is usually about finding the optimal tax rate that maximizes welfare. In the context of this model, the question would be: how much protection should workers receive? That is, the government's problem would translate into finding Δ for each firm. This is not the question addressed in this paper. Moreover, the main question is not a normative one, in terms of giving an efficiency rationale to S-shaped EPLs. Instead, EPLs are analyzed from a positive perspective. Thus, the main goal is to characterize the political equilibrium which arises from aggregating economic interests according to the political orientation of the government.

The government chooses $\mathcal{P}$ to maximize the *political objective function* which corresponds to the ex-post weighted-welfare denoted by $\bar{U}(\mathcal{P})$, given $\mathcal{P}_0$ and subject to the labor market equilibrium condition,[15]

$$\begin{aligned} &\max_{\mathcal{P}=\{\mathcal{P}(a)\}_0^{a_M}} \{\bar{U}(\mathcal{P}) \equiv \lambda \cdot \mathbb{E}_G[U^w|\mathcal{P}] + (1-\lambda)\cdot \mathbb{E}_G[U^e|\mathcal{P}]\} \\ &s.t. \quad \mathbb{E}_G[l_s|\mathcal{P}] = \mathbb{E}_G[l|\mathcal{P}] \end{aligned} \quad , \tag{14}$$

where the constraint corresponds to the analogous of (13), but in this case the labor policy is allowed to depend on firm size.[16]

In section 8.4.1 in the Appendix, I provide an explicit microfoundation for this problem. I show that the problem can be rationalized as a probabilistic voting model along the lines of Persson and Tabellini (2000, pp. 52-58), where the political weight λ depends on the primitives of the model. The electoral competition takes place between two parties that simultaneously announce their electoral platforms, $\mathcal{P}$ to maximize their probability of wining the election.

Under a multidimensional policy, Downsian electoral competition is known to produce cycling problems that arise because parties' objective functions are discontinuous in the policy space. Probabilistic voting smooths the political objective function by introducing uncertainty about the political preferences of the voters (Lindbeck and Weibull, 1987). I show that the two parties' platforms converge in equilibrium to the same labor policy, $\mathcal{P}$ that maximizes a weighted welfare function of workers and entrepreneurs. The political weight of the objective function, λ, depends on $G(\underline{a}_0)$ and on a parameter governing the workers' responsiveness to EPLs relative to entrepreneurs. A high value of this parameter means that the government chooses a policy platform that favors relatively more workers (pro-worker), while when this parameter is low the

[15] The dependence on $\mathcal{P}_0$ comes from the fact that the government is deciding whether to increase individual and collective dismissal regulations of each firm from (φ_0, θ_0) to $(\varphi, \theta) \in \{(\varphi_0, \theta_0), (\varphi_1, \theta_0), (\varphi_0, \theta_1), (\varphi_1, \theta_1)\}$. In addition, the individual political preferences for EPLs are defined on the basis of the ex-ante equilibrium presented in section 3.3.

[16] Note that the political objective function is equivalent to $\bar{U}(\mathcal{P}) \equiv \lambda \cdot \mathbb{E}u^w(\mathcal{P}) \cdot G(\underline{a}_0) + (1-\lambda)\cdot \mathbb{E}_G[U^e|\mathcal{P}]$, where $\mathbb{E}u^w(\mathcal{P})$ is the expected utility of individual workers under $\mathcal{P}$, which is homogeneous across workers. Recall that: $\mathbb{E}u^w(\mathcal{P}) = \mathbb{E}_G[U^w|\mathcal{P}]$ (equation (5) in section 3.2). That is, the aggregate workers' welfare is equal to the sum of the welfare of workers in each firm.

policy favors entrepreneurs (pro-business). Thus, the problem can be interpreted as a representative government that maximizes a political objective function according to its political orientation measured by λ.

Several papers use probabilistic voting for the study of the political support for different types of policies. Hassler et al. (2005) study income redistribution, Gonzalez-Eiras and Niepelt (2008) and Sleet and Yeltekin (2008) focus on public security, Farhi et al. (2012) analyze taxation and Song et al. (2012) study fiscal policy. More closely related to my paper, Pagano and Volpin (2005) and Fischer and Huerta (2021) study labor and financial regulations.

I now turn back to the government's problem. Note that the expression for $\bar{U}$ is defined for any policy $\mathcal{P}$ as the weighted expected value of workers' and entrepreneurs' welfare. As it stands, the problem of the government is cumbersome. First, there is no restriction on the labor policy design that maximizes $\bar{U}$. In principle, it could exhibit any shape and trying to solve the problem implies checking all possible solutions. Secondly, because $\mathcal{P}$ can have any shape, one should keep track of what agents are subject to a given EPLs' regime. This complicates the expression for $\bar{U}(\mathcal{P})$, which takes different forms depending on the shape of $\mathcal{P}$. Moreover, the equilibrium condition must 'clear' the labor supplied and demanded by all subsets of agents subject to a given EPLs' regime.

In order to solve the problem, in next section I study the agents' political preferences towards EPLs. As will be clear in section 5, the solution of the government's problem is restricted to the set of functions that satisfy monotonicity at each component.

4 Political Preferences

This section describes the conflicts of interest that arise between the different groups of workers and entrepreneurs towards stronger EPLs. Given the initial policy, $\mathcal{P}_0$ I analyze the ex-post effect (at $t = 2$) of a marginal increase of EPLs at $t = 1$ on workers' and entrepreneurs' utilities.

First, impose the following assumption on the probability of success of a firm,

Assumption 1 $p > \frac{1}{\eta}\left[\frac{\alpha\phi}{\beta(1-s)^2(1-\alpha-\beta)} - (1+\rho) + \eta\right] \iff 1 + r^* > \frac{\alpha\phi}{\beta(1-s)^2(1-\alpha-\beta)}$.

This is a sufficient condition for propositions 1 and 2 to hold.[17]

Proposition 1 *Consider the initial labor regulation,* $\mathcal{P}_0 : [\underline{a}_0, a_M] \longrightarrow \{\varphi_0, \theta_0\}$*, then:*

1. *All entrepreneurs are worse off after a marginal increase of* φ *or* θ*.*
2. *This negative effect is strictly decreasing if* $a \in [\underline{a}_0, \overline{a}_0)$ *and becomes constant for* $a \geq \overline{a}_0$*.*

Proposition 1 shows that the ex-post (at $t = 2$) effect of increasing the strength of EPLs is negative for all entrepreneurs. First, raising φ means that firms face higher individual dismissal costs, i.e. higher expected wage, $\bar{w}(\varphi, \theta)$. Therefore, entrepreneurs have less capital to be pledged to banks and more incentives to behave maliciously. Secondly, higher θ implies that less capital is recovered by banks in case of bankruptcy. Thus, banks tighten credit requirements, limiting the operations of firms. For smaller firms this effect is more pronounced as their access to credit is substantially reduced. This leads to significantly lower investment and hiring in the small-scale sector. In contrast, credit capacity of better capitalized firms is less affected. Thus, they can more easily adapt to higher labor costs and continue operating at a relatively more efficient scale compared to poorer firms.

To sum up, all entrepreneurial groups oppose a marginal increase in EPLs. The strongest opposition to such policies comes from entrepreneurs running smallest firms, while large entrepreneurs are less reluctant to improve EPLs.

When EPLs increase for a non-negligible mass of firms there are also general equilibrium effects that occur due to a change in the equilibrium wage. Section 5.2 explores these effects. The discussion of this section only considers the impact of a marginal increase of EPLs on a given firm or a given group of workers, that is without taking into account the affects on wages.[18]

[17] This assumption is in general not very restrictive, as the lower bound for p is negative for a large set of 'reasonable' parameters. When it is binding, it does not limit p significantly. For instance, for $\rho = \frac{5}{12}\%$, $\phi = 15\%$, $\eta = 70\%$, $\alpha = 0.25$, $\beta = 0.6$, $s = 2.5\%$ it asks that $p > 0.192$.

[18] However, note that the proofs of propositions 1 and 2 are more general. They consider the possibility of having an indirect effect through wages ($\frac{dw}{dx}, x \in \{\varphi, \theta\}$), which would occur if a non-negligible mass of firms experienced an increase in EPLs. Both propositions hold as long as EPLs don't improve in all firms. In that case, the net effect on expected wages is zero (see lemma 2 in section 5.2.1).

Proposition 2 *Consider the initial labor regulation, $\mathcal{P}_0 : [\underline{a}_0, a_M] \longrightarrow \{\varphi_0, \theta_0\}$ and suppose a marginal increase of φ or θ. Then, there are cutoffs $\tilde{a}_0^{\varphi} \in (\underline{a}_0, \overline{a}_0)$ and $\tilde{a}_0^{\theta} \in (\underline{a}_0, \overline{a}_0)$ given by*

$$\frac{\partial U^w(\tilde{a}_0^x|\mathcal{P}_0)}{\partial x} = 0, \quad x \in \{\varphi, \theta\} \tag{15}$$

such that,

1. *Workers' welfare in firms with $a \in [\underline{a}_0, \tilde{a}_0^x)$ decreases.*
2. *Workers' welfare in firms with $a > \tilde{a}_0^x$ increases.*
3. *This marginal effect is strictly increasing in $a \in [\underline{a}_0, \overline{a}_0)$ and becomes constant for $a \geq \overline{a}_0$.*

Proposition 2 suggests the existence of interest groups of workers with diverging political preferences towards EPLs. Strengthening EPLs, which supposedly protect workers, has an ambiguous effect on their welfare depending on the firm they are attached to. Two opposing effects determine the direction of the effect of increased EPLs: i) higher expected labor payments, but ii) stricter credit constraints which force some firms to shrink and hire less labor.

The welfare of groups of workers in smaller firms ($a \in [\underline{a}_0, \tilde{a}_0^x)$) declines. In some cases firms close down, because the entrepreneur does not obtain financing under the new conditions. SMEs that survive have to shrink. Since they obtain smaller loans, less capital is invested and thus, less labor is hired. This negative effect is particularly pronounced in under-capitalized firms, for which banks severely constraint loans. Hence, workers in the small business sector are made worse off.

On the other hand, an improvement of EPLs increases the welfare of workers in larger firms ($a > \tilde{a}_0^x$). Despite the fact that some of these enterprises face tighter credit constraints and hire less labor, this is compensated by the increase in workers' payment in case of dismissal, leading to an increase of workers' welfare. Figure 6 illustrate propositions 1 and 2. It shows the marginal impact of increased EPLs on U^e and U^w as a function of firm assets, a. The blue dashed line corresponds to entrepreneurs and the red solid line to workers.

Overall, workers in under-capitalized firms are aligned with small entrepreneurs in opposing to higher EPLs. In contrast, those in larger firms are in favour of stronger EPLs and opposed to their employers' interests. Table 1 summarizes the political preferences of workers and firms across different business sectors.[19]

[19] '< 0' indicates opposition to EPLs, while '> 0' denotes support for EPLs. '<< 0' stands for strong opposition.

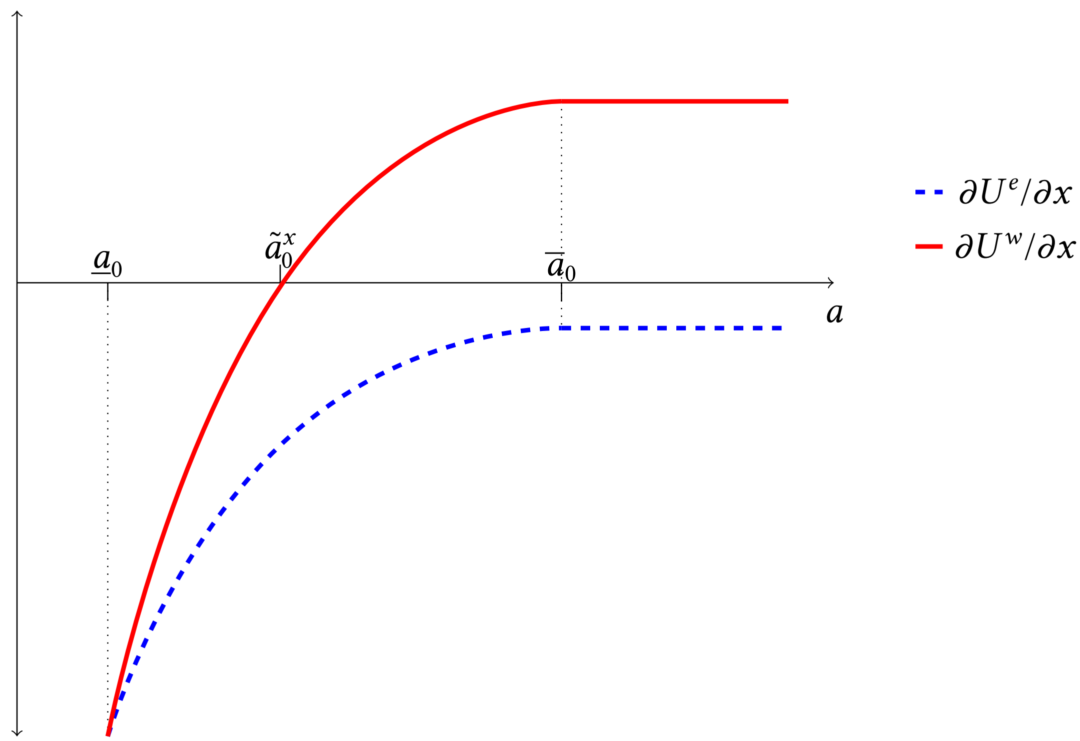

Figure 6: Effects of an increase of $x = \{\varphi, \theta\}$ on entrepreneurs' and workers' utility.

	Worker	Entrepreneur
Small-medium scale sector; $a \in [\underline{a}_0, \tilde{a}_0^x)$	< 0	$<< 0$
Large scale sector; $a > \tilde{a}_0^x$	> 0	< 0

Table 1: Political preferences towards higher EPLs ($\uparrow x \in \{\varphi, \theta\}$).

5 Political Equilibrium

This section characterizes the political equilibrium. That is, the labor policy that arises from aggregating agents' political preferences in accordance with the government's political orientation.

The next proposition exploits the properties of individual preferences studied in previous section to show that any equilibrium policy must satisfy monotonicity in each component. That is, there are two firm size thresholds, $a^\varphi \in [\underline{a}_0, a_M]$ and $a^\theta \in [\underline{a}_0, a_M]$, at which individual and collective dismissal protection become more stringent. This result allows to write $\bar{U}$ more explicitly and makes the government's problem tractable. Note that this result does not necessarily imply that the equilibrium policy is S-shaped. It restricts the solution of the government's problem to policies that are either flat or S-shaped.

Let x_i, with $i \in \{0, 1\}$ be defined as,

$$x_i = \begin{cases} \varphi_i & \text{if } x = \varphi, \\ \theta_i & \text{if } x = \theta. \end{cases}$$

Proposition 3 *Any labor regulation policy, $\mathcal{P}$ that solves* (14) *satisfies monotonicity at each component,*

$$\mathcal{P}^x(a) \, : \, \mathcal{P}^x(a') \leq \mathcal{P}^x(a'') \quad \forall a' < a'', x \in \{\varphi, \theta\}.$$

Moreover, there are size thresholds $a^\varphi \in [\underline{a}_0, a_M]$ and $a^\theta \in [\underline{a}_0, a_M]$ such that:

$$\mathcal{P}^x(a) = \begin{cases} x_0 \; if \, a < a^x, \\ x_1 \; if \, a \geq a^x. \end{cases} \tag{16}$$

To simplify the exposition, in the rest of the paper I work with the case in which the government performs a regulatory change in a single dimension. That is, the government considers increasing either individual or collective dismissal regulation, but not both at the same time. Section 8.4.2 in the Appendix deals with the two-dimensional case.

Using the result of proposition 3, the government's problem can be rewritten in terms of the size threshold, a^x as follows,

$$\begin{aligned} \max_{a^x \in [\underline{a}_0, a_M]} & \left\{ \bar{U}(a^x, \lambda) \equiv \lambda \left(\int_{\underline{a}_0}^{a^x} U^w(a|x_0) \partial G + \int_{a^x}^{a_M} U^w(a|x_1) \partial G \right) \right. \\ & \left. \qquad + (1 - \lambda) \left(\int_{\underline{a}_0}^{a^x} U^e(a|x_0) \partial G + \int_{a^x}^{a_M} U^e(a|x_1) \partial G \right) \right\} \end{aligned}$$

$$s.t \qquad m^0 \cdot l_s(x_0) = \int_{\underline{a}_0}^{a^x} l(a|x_0) \partial G, \tag{17}$$

$$m^1 \cdot l_s(x_1) = \int_{a^x}^{a_M} l(a|x_1) \partial G, \tag{18}$$

$$m^0 + m^1 = G(\underline{a}_0), \tag{19}$$

where $\bar{U}(a^x, \lambda)$ is the government weighted welfare given the size threshold, a^x and the government's political orientation, λ. Also, m^0 and m^1 are the endogenous masses of workers that supply $l_s(x_0)$ and $l_s(x_1)$, respectively. The three restrictions of the problem correspond to the labor market equilibrium conditions. The first two equations equalize labor supplied and demanded under the two different EPL regimes, x_0 and x_1. The last condition imposes that the sum of workers under x_0 and x_1 must be equal to the total mass of workers, $G(\underline{a}_0)$. Section 8.1.4 in the Appendix shows how to obtain the expected utility of individual workers under an S-shaped labor policy.

Note that equations (17) to (19) form a system of three equations and three unknowns: m^0, m^1 and w. The equilibrium wage w is uniquely defined by these conditions. Adding up (17) and (18) leads to an aggregate condition similar to the labor market equilibrium condition (13),

$$m^0 \cdot l_s(x_0) + m^1 \cdot l_s(x_1) = \int_{\underline{a}_0}^{a^x} l(a|x_0)\partial G + \int_{a^x}^{a_M} l(a|x_1)\partial G, \tag{20}$$

Next sections characterize the political equilibrium that arises from solving the government's problem.

5.1 Political equilibrium with sticky wages

I start by studying the case in which the equilibrium wage is sticky and equal to the value that solves (13) under the initial labor policy $\mathcal{P}_0$. Thus, the government maximizes the weighted welfare by taking the wage, $w^0 = w(\mathcal{P}_0)$ fixed. This is a useful starting point before analyzing the more complicated case in which the equilibrium wage responds to changes of the size threshold, a^x. Next section characterizes this more interesting situation. This section is divided into two subsections. Subsection 5.1.1 presents the political preferences under sticky wages. Subsection 5.1.2 characterizes the equilibrium policy.

5.1.1 Political preferences with sticky wages

This subsection describes the political preferences for the coverage of EPLs, that is towards the size threshold at which EPLs become stricter, a^x. Since wages are sticky, agents that are not affected by the regulatory change remain indifferent. In section 5.2.3, when wages are flexible all agents are affected by a change in regulations, even if they remain subject to the initially weak EPLs.

The political preferences can be inferred from propositions 1 and 2 of previous section. Figures 7 and 8 illustrate the change in workers and entrepreneurs utilities as function of the size threshold, a^x. The changes are relative to the utilities they would obtain under the initial labor policy, $\mathcal{P}_0$. All agents are indifferent when they are not affected by the change in regulations, i.e. when their firms' assets are such that $a < a^x$.

The red lines in figure 7 show that groups of workers in firms with assets $a < \tilde{a}_0^x$ are worse off whenever their firms are subject to stricter EPLs, i.e. whenever $a \geq a^x$. The figure also compares the utility losses of workers attached to firms of different sizes, a_1 and a_2 ($a_1 < a_2 < \tilde{a}_0^x$). The red solid line shows that workers in smaller firms (a_1) suffer more from EPLs than those in larger firms (a_2), represented by the red dashed line.

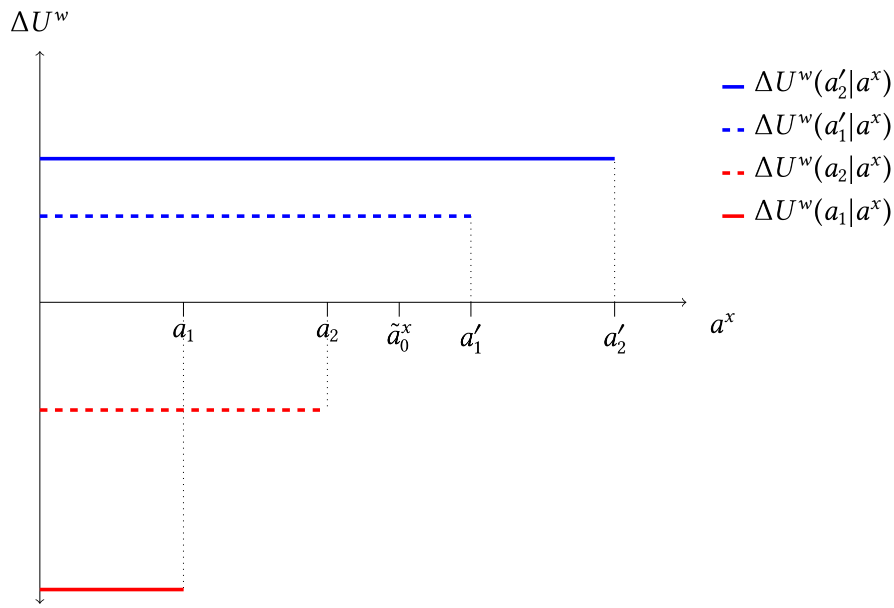

Figure 7: ΔU^w as function of a^x, sticky wage.

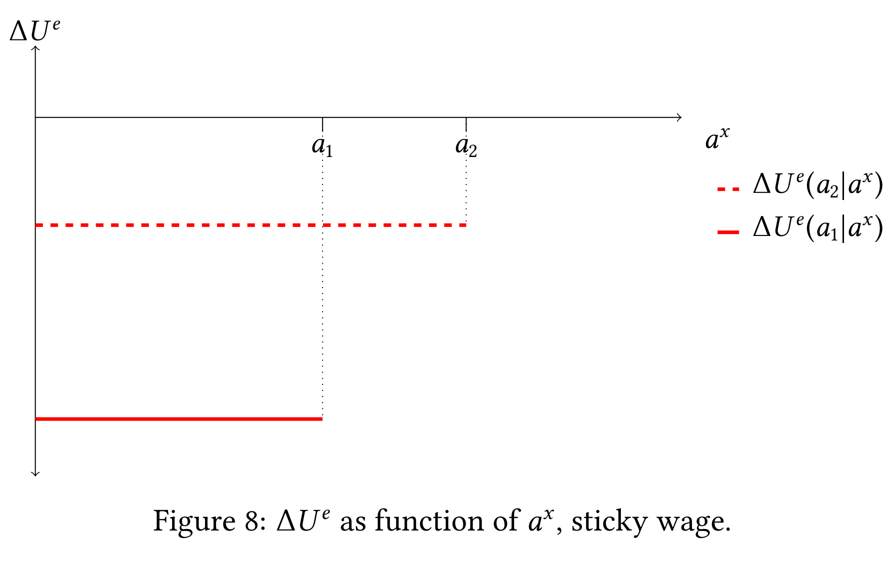

Figure 8: ΔU^e as function of a^x, sticky wage.

In contrast, as shown by the blue lines in figure 7, those workers in firms with $a > \tilde{a}_0^x$ benefit from a change in regulations as long as they are subject to stricter EPLs, i.e. if $a > a^x$. Moreover, those workers attached to larger firms (a_2') gain more from EPLs than those in smaller firms (a_1').

On the other hand, figure 8 shows that all entrepreneurs are worse off under stricter EPLs, i.e. when $a > a^x$. In addition, those running smaller firms (a_1) suffer more from EPLs than owners of larger firms (a_2).

What is the shape of the political objective function, $\bar{U}$ that results from aggregating these preferences? Figure 9 illustrates $\bar{U}$ as a function of a^x and λ. The value of $\bar{U}$ at $\mathcal{P}_0$ is normalized to zero in the figure. Thus, if the government does not implement any regulatory change, i.e. if it sets $a^x = a_M$, then $\bar{U} = 0$. As shown in the figure, the shape of $\bar{U}$ depends on λ.

First, when the government cares only about workers ($\lambda = 1$), then $\bar{U}$ is single-peaked at $\tilde{a}_0^x$, as shown by the continuous red line in the figure. Therefore, the political equilibrium when $\lambda = 1$ is $a^x = \tilde{a}_0^x$. Secondly, if the government cares only about entrepreneurs ($\lambda = 0$), then $\bar{U}$ is negative in $[0, a_M]$ and increasing in a^x, since poorer entrepreneurs suffer more from EPLs. This is shown by the dashed-blue line. In this case, the government chooses not to improve EPLs, i.e. $a^x = a_M$.

The question that remains is: what is the shape of $\bar{U}$ for $\lambda \in (0, 1)$? This situation is illustrated by the dotted line. Intuitively, for a relatively low λ, the weighted-welfare should remain negative for any size threshold, thus $a^x = a_M$. Conversely, for a relatively high λ, $\bar{U}$ should still have a single peak such that $\bar{U} > 0$. For intermediate values of λ, the function may have more than one peak depending on the shape of the wealth distribution. Moreover, the peak may give a negative value for $\bar{U}$. Next subsection defines the set of λ's for which a political equilibrium can be characterized.

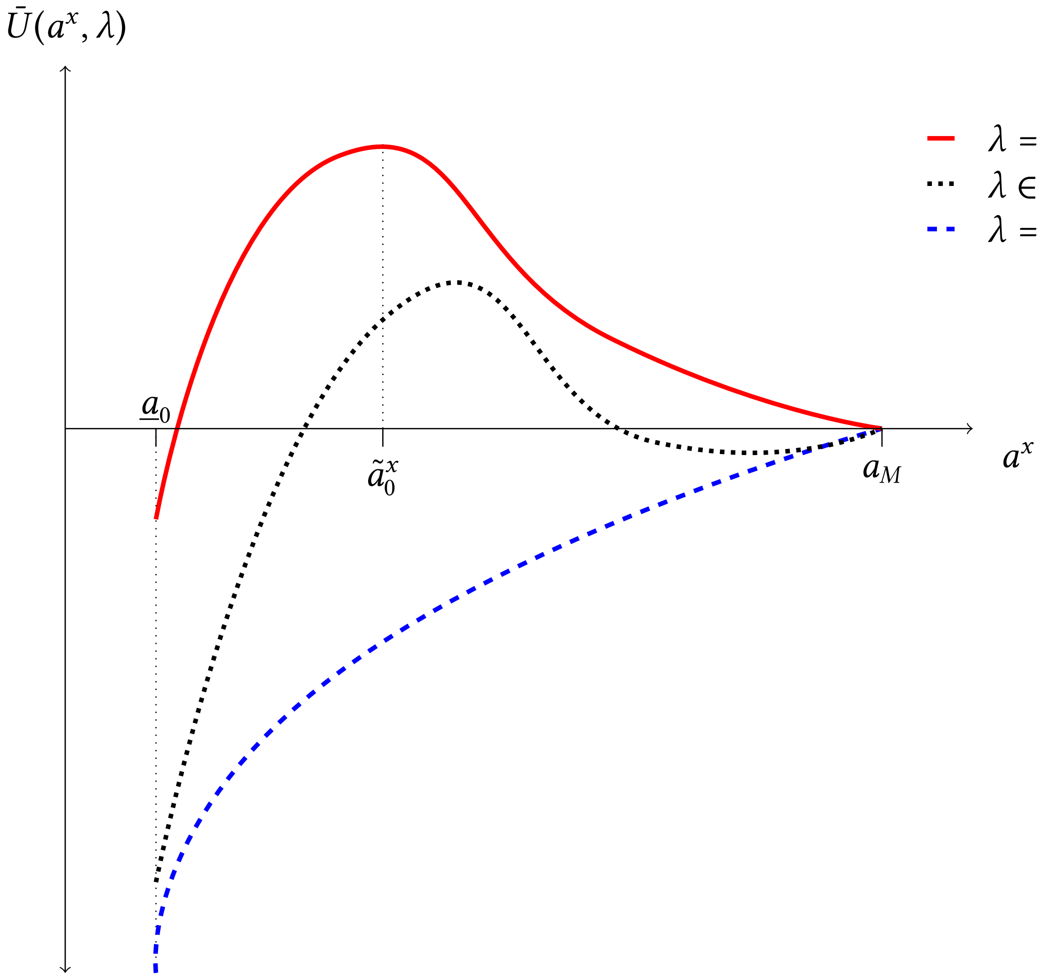

Figure 9: Weighted welfare ($\bar{U}$) as function of λ and a^x, sticky wage.

5.1.2 Equilibrium labor policy with sticky wages

The following proposition characterizes the political equilibrium, given by the size threshold, a_{gp}^x that maximizes the political objective function, $\bar{U}$.

Proposition 4 *The equilibrium size threshold, a_{gp}^x under sticky wages is as follows:*

1. *If $\lambda \leq \frac{1}{2+1/(\gamma-2)}$, then $a_{gp}^x = a_M$.*
2. *If $\lambda > \frac{1}{2-1/\gamma}$, then $a_{gp}^x \in [\tilde{a}_0^x, \overline{a}_0)$ satisfies,*

$$\lambda \frac{\partial U^w(a_{gp}^x | x_0)}{\partial x} = -(1-\lambda) \frac{\partial U^e(a_{gp}^x | x_0)}{\partial x}. \tag{21}$$

In particular, if $\lambda = 1$, then $a_{gp}^x = \tilde{a}_0^x$ and $a_{gp}^x > \tilde{a}_0^x$ if $\lambda < 1$.

The interpretation of proposition 4 is as follows: when the government cares relatively more about net output than workers' wellbeing ($\lambda \leq \frac{1}{2+1/(\gamma-2)}$) it is better not to change regulations and keep a low level of EPLs across the board. As discussed in previous section, improving EPLs only harms entrepreneurs. Since banks curtail credit after an improvement of EPLs, less capital is invested and less labor is hired, which negatively affects output. Therefore, it is not worthy from the point of view of a right-wing government to sacrifice production in exchange of increasing workers' welfare.

On the contrary, when the government cares relatively more about workers ($\lambda > \frac{1}{2-1/\gamma}$) the equilibrium EPLs design is S-shaped. That is, a regulatory scheme in which small firms operate under less protective EPLs, while larger firms are subject to stricter EPLs. This is consistent with the political preferences shown in figures 7 and 8. Since increasing EPLs harms significantly more the small business sector, a left-wing government keeps weak EPLs for those firms and workers. On the other hand, because larger firms can more easily adapt to higher labor costs, the government sets a stronger level of labor protection for that sector.

The equilibrium threshold, a^x_{gp} is such that it equalizes the weighted marginal workers' benefit and the weighted entrepreneurs' costs at the threshold, as shown by expression (21). Figure 10 illustrates proposition 4. It shows the equilibrium labor policy, $\mathcal{P}_{gp}$ as a function of firm's assets a and government's political orientation, λ. Pro-worker governments set an S-shaped policy as shown by the red dotted line in the figure, while pro-business are not willing to improve EPLs and keep low labor protection in all firms, as shown by the blue dashed line.

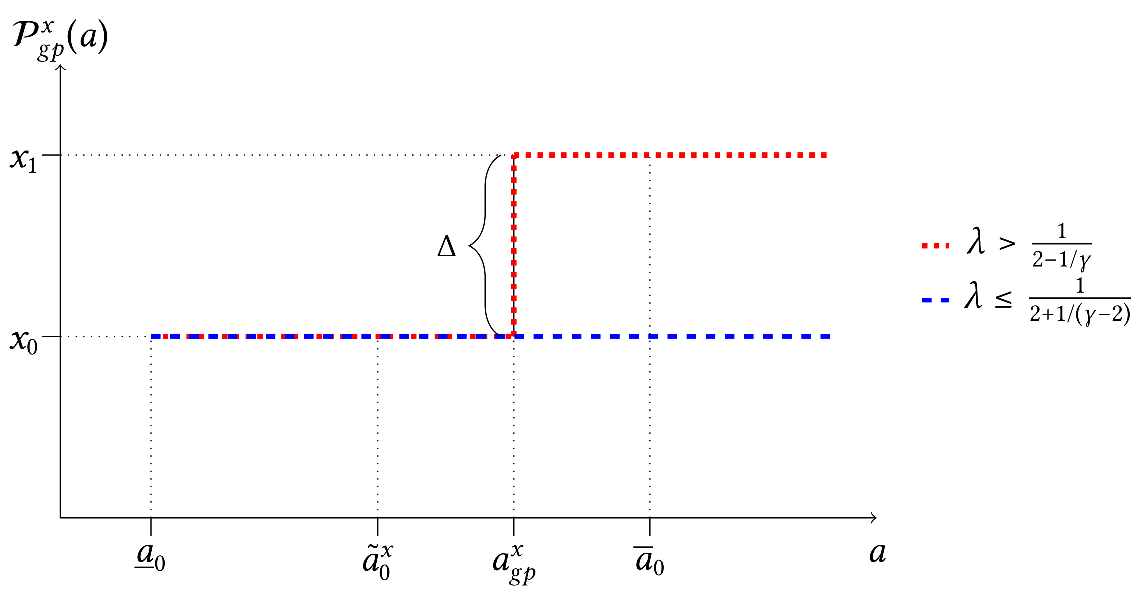

Figure 10: Equilibrium labor regulation policy $\mathcal{P}^x_{gp}$ for $x = \{\varphi, \theta\}$.

An important feature of proposition 4 is that the equilibrium size threshold is defined explicitly for $\lambda \le \frac{1}{2+1/(\gamma-2)}$ and $\lambda > \frac{1}{2-1/\gamma}$. However, there is no explicit expression for a^x_{gp} when $\lambda \in \left(\frac{1}{2-1/\gamma}, \frac{1}{2+1/(\gamma-2)}\right]$. As explained before, in this case $\bar{U}$ may have more than one peak and these peaks may occur at negative values. The proposition shows that the solution of the government's problem can be explicitly characterized as long as $\lambda \le \frac{1}{2+1/(\gamma-2)}$ or $\lambda > \frac{1}{2-1/\gamma}$, i.e., for non-centrist governments. Section 5.2 shows that when wages are flexible the equilibrium policy can be characterized for any $\lambda \in [0, 1]$.

A final question that should be asked is: what is the effect of λ on the equilibrium size threshold? Intuitively, figure 9 shows that as λ increases, i.e. as the government becomes more pro-worker, the red solid line receives a larger weight and the maximum of $\bar{U}$ shifts left. Thus, more leftist governments should implement a lower size threshold. That is, more leftist governments establish more protective EPLs. This prediction is consistent with the empirical evidence presented in figures 1 and 2 in section 2. The following lemma formalizes this result.

Lemma 1 *If $\lambda > \frac{1}{2-1/\gamma}$, the equilibrium size threshold, a^x_{gp} under sticky wages is strictly decreasing in λ.*

5.2 Political equilibrium with flexible wages

This section studies the political equilibrium when the equilibrium wage is flexible and responds to changes in the size threshold. This section is divided into three subsections. Subsection 5.2.1 explores the impact of the size threshold on the equilibrium wage. Then, subsection 5.2.2 investigates the political preferences of the different groups of agents when they take into account the effect of shifting the size threshold on the equilibrium wage. Finally, subsection 5.2.3 characterizes the political equilibrium under flexible wages which leads to the main result of the paper.

5.2.1 The size threshold and the equilibrium wage

To start with, the following lemma establishes the effect of a^x on w.

Lemma 2 *The equilibrium wage w is increasing in a^x. In particular, if $a^x = \underline{a}_0$, the change in w is such that $\frac{\partial \bar{w}}{\partial a^x} = 0$.*

The interpretation of lemma 2 is that a less protective labor policy, i.e. a larger a^x, leads to a higher equilibrium wage. The explanation of this result is as follows.

First, suppose that the government implements a flat labor reform, that is EPLs increase from x_0 to x_1 for all firms (i.e. $a^x = \underline{a}_0$). The direct effect of stronger EPLs is that the expected wage, $\bar{w}$ is larger. Thus, individual workers supply more labor. Moreover, stronger EPLs imply higher operating leverage which crowds out external finance. In consequence, less capital is invested and less labor is demanded. Higher labor supply and lower labor demand imply a lower equilibrium wage. Lemma 2 establishes that the effect of implementing a flat labor policy on the expected labor wage, $\bar{w}$ is exactly counteracted by the reduction in w, i.e. $\bar{w}$ does not change. The intuition is that as long as the net effect on $\bar{w}$ remains positive, workers and firms adjust their labor decisions by pushing down w. This process continues such that in equilibrium the net effect on $\bar{w}$ is zero. Thus, workers' and entrepreneurs' welfare remain unchanged relative to the initial case in which $\mathcal{P}_0 = \{\varphi_0, \theta_0\}$.

Secondly, suppose now that the government deviates from a flat reform ($a^x = \underline{a}_0$) and marginally increases the size threshold, a^x. Those workers in firms with $a < a^x$ are subject to weaker EPLs and thus face a lower expected wage, $\bar{w}$. As a result, such workers supply less labor. On the other hand, entrepreneurs operating firms with $a < a^x$ face lower labor costs and thus demand more labor. Increased labor demand and reduced labor supply in firms under weaker EPLs lead to a higher equilibrium wage relative to the case of a flat reform. As the size threshold increases, the mass of firms facing lower EPLs increases, which leads to a larger w. At the limit, when $a^x \longrightarrow a_M$, the equilibrium wage approaches to $w(\mathcal{P}_0)$, i.e., the wage before any regulatory change. In conclusion, increasing the size threshold increases the equilibrium wage. In particular, either passing a flat labor reform ($a^x = \underline{a}_0$) or keeping EPLs unchanged ($a^x = a_M$) will maintain economic outcomes unchanged.

Thus, when wages are flexible, the effect of a flat reform is the same as leaving EPLs unchanged. That is, $\bar{U}(a^x = \underline{a}_0) = \bar{U}(a^x = a_M)$. The question that must be asked is, can the government improve the political objective function, $\bar{U}$ by implementing a size-contingent labor policy?

To answer this question, I start by describing the individual political preferences under a flexible wage. Then, in proposition 5, I characterize the equilibrium labor policy that aggregates these interests.

5.2.2 Political preferences with flexible wages

What are the preferences of different workers and entrepreneurs towards improvements of EPLs? Figures 11 to 13 illustrate the change in utilities of the different groups as a function of the size threshold, a^x. The changes are relative to the initial regulation, $\mathcal{P}_0$.

First, figure 11 shows that workers in smaller firms ($a < \tilde{a}_0^x$) benefit from a reduction of the size threshold as long as their firm remain operating under weak EPLs (i.e. as long as $a < a^x$). Recall figure 6 in section 4, a lower equilibrium wage benefits those workers in smaller firms ($a < \tilde{a}_0^x$). The lower the wage the higher the increase in utility. Thus, as shown in figure 11, when $a < a^x$ the change in utility as a function of a^x is positive and increasing when the size threshold decreases. Since workers in smaller firms suffer from higher protection, when $a = a^x$ there a is a discrete fall in utility. As a^x declines towards $\underline{a}_0$ the change in utility goes back to zero.

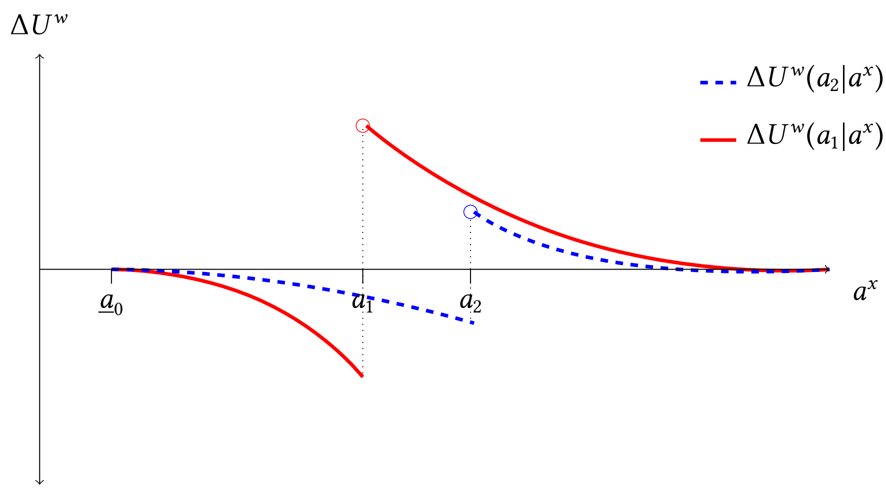

Figure 11: ΔU^w as function of a^x under flexible wages ($a_1 < a_2 < \tilde{a}_0^x$).

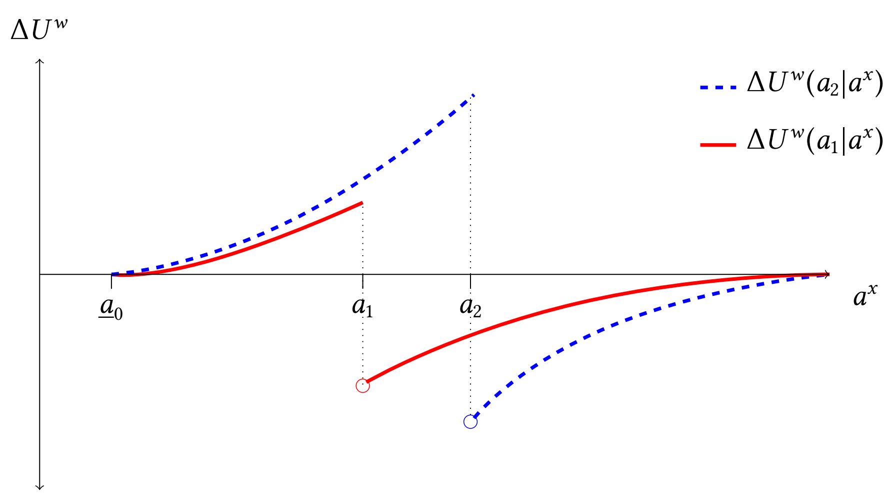

Figure 12: ΔU^w as function of a^x under flexible wages ($a_2 > a_1 > \tilde{a}_0^x$).

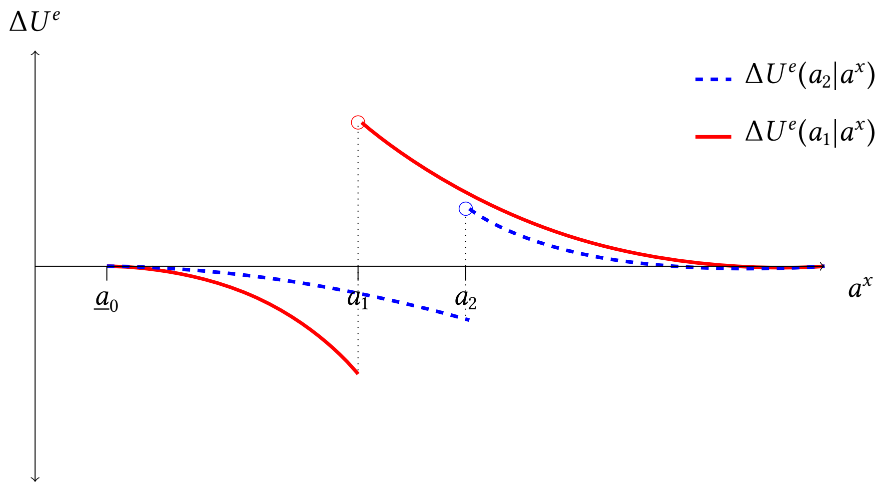

Figure 13: ΔU^e as function of a^x under flexible wages ($a_2 > a_1$).

Figure 11 also compares the utility gains of workers attached to firms of different sizes, a_1 and a_2 ($a_1 < a_2 < \tilde{a}_0^x$). The red solid line shows that workers in less capitalized firms (a_1) benefit more from a non-binding size threshold ($a_1 < a^x$). Conversely, the blue dashed line shows that workers in more capitalized firms (a_2) suffer less from being subject to stronger EPLs ($a_2 \geq a^x$).

Secondly, figure 12 shows the change in utility of workers attached to larger firms ($a > \tilde{a}_0^x$). The effects are reversed relative to figure 11. As explained in section 4, those workers benefit from a higher wage and better protection. Thus, when other workers receive more protection and they are excluded ($a < a^x$), they are worse off because the equilibrium wage goes down. Hence, when $a < a^x$, the change in their utilities is negative and increasing in a^x towards zero (because $\frac{\partial w}{\partial a^x} > 0$). Since workers in larger firms benefit from higher EPLs, there is discrete positive 'jump' in utilities when $a = a^x$. As a^x approaches to $\underline{a}_0$, the change in utility reaches zero. In this case, workers in larger firms (a_2) benefit more from higher protection (blue dashed line), while workers in less capitalized firms (a_1) suffer less from being excluded from stronger EPLs (red solid line).

Thirdly, figure 13 shows the change in entrepreneurs utilities as a function of a^x. Entrepreneurs benefit from stricter EPLs as long as they remain excluded from tighter regulations ($a < a^x$). The explanation comes from the fact that more protective EPLs, i.e. a lower a^x, reduces the equilibrium wage reducing operating costs. When entrepreneurs are subject to stricter EPLs ($a > a^x$), they receive lower utilities because they must pay a higher expected wage, $\bar{w}$. As shown in the figure, agents operating less capitalized firms (a_1) benefit more from being excluded from higher protection (red solid line), while those running larger firms (a_2) suffer less from facing more stringent EPLs (blue dashed line).

To sum up, there are diverging interests towards the scope of EPLs. Workers in smaller firms ($a < \tilde{a}_0^x$) would like the government to impose stricter EPLs on everyone but them. In contrast, workers in larger firms ($a > \tilde{a}_0^x$) would like higher protection for them, but not for the rest. Finally, all firms would like the government to impose strong EPLs on their competition, but to remain operating under weak EPLs. The question that remains is, what is the EPLs design that aggregates these preferences according to the government's political orientation?

Intuitively, from figures 11 and 12, a left-wing government may want to impose an S-shaped EPLs design because it can benefit both workers in large ($a > \tilde{a}_0$) and small firms ($a < \tilde{a}_0$). However, in choosing the equilibrium policy the government must consider two opposing forces: decreasing the size threshold benefits workers in smaller firms, but hurts those in larger firms due to lower wages. On the other hand, figure 13 suggests that a right-wing government can benefit owners of smaller firms by imposing stricter EPLs on larger firms. Next section characterizes the equilibrium policy when wages are flexible.

5.2.3 Equilibrium policy with flexible wages

Now I proceed to the study of the equilibrium labor policy under flexible wages. To simplify the exposition define,

$$\bar{U}^e(a^x) \equiv \int_{\underline{a}}^{a^x} U^e(a|x_0)\partial G + \int_{a^x}^{a_M} U^e(a|x_1)\partial G, \tag{22}$$

$$\bar{U}^w(a^x) \equiv \int_{\underline{a}}^{a^x} U^w(a|x_0)\partial G + \int_{a^x}^{a_M} U^w(a|x_1)\partial G, \tag{23}$$

where expression (22) is the aggregate entrepreneurs' welfare ($\lambda = 0$) and (23) corresponds to the aggregate workers' welfare ($\lambda = 1$). Thus, weighted welfare is given by

$$\bar{U}(a^x, \lambda) = \lambda \cdot \bar{U}^w(a^x) + (1 - \lambda) \cdot \bar{U}^e(a^x). \tag{24}$$

The following proposition characterizes the political equilibrium.

Proposition 5

1. *$\bar{U}(a^x, \lambda)$ achieves a global maximum in $[\underline{a}_0, a_M]$ at some size threshold $a^x_{gp} \in (\underline{a}_0, a_M)$ characterized by*

$$a^x_{gp} = \sup_{a^x} \bar{U}(a^x, \lambda). \tag{25}$$

Suppose that $g(\cdot)$ satisfies $g' < 0$, then,

2. *$\bar{U}^e(a^x, \lambda)$ and $\bar{U}^w(a^x, \lambda)$ are strictly concave in a^x.*

3. *The equilibrium size threshold, a^x_{gp} under flexible wages is the unique solution to,*

$$\lambda \frac{\partial \bar{U}^w(a^x_{gp}, \lambda)}{\partial a^x} = -(1-\lambda)\frac{\partial \bar{U}^e(a^x_{gp}, \lambda)}{\partial a^x}, \quad x \in \{\varphi, \theta\}. \tag{26}$$

4. *The equilibrium size threshold a^x_{gp} is decreasing in λ.*

The proposition shows that without imposing any additional assumption on the wealth distribution function $g(\cdot)$, the political equilibrium is such that the size threshold satisfies: $a^x \in (\underline{a}_0, a_M)$. That is, the preferred EPLs design is S-shaped regardless of the government's political orientation. As opposed to the case with sticky wages, the solution of the government's problem can be characterized by (25) for any $\lambda \in [0, 1]$.

Under the additional assumption that $g' < 0$, both $\bar{U}^e$ and $\bar{U}^w$ are strictly concave in the size threshold, a^x. Thus, $\bar{U} = \lambda \bar{U}^w + (1-\lambda)\bar{U}^e$ is concave for any $\lambda \in [0, 1]$. The solution to the government's problem is uniquely given by (26) for any λ. Figure 14 illustrates these features. The red solid line corresponds to $\bar{U}^w$, where a^x_{LW} is the solution of the government's problem when $\lambda = 1$ (left-wing). The blue dashed line shows $\bar{U}^e$ ($\lambda = 0$) in terms of a^x which reaches its maximum at some a^x_{RW} (right-wing). The dotted line corresponds to $\bar{U}$ when $\lambda \in [0, 1]$ which attains its maximum at some $a^x_C \in (a^x_{LW}, a^x_{RW})$.

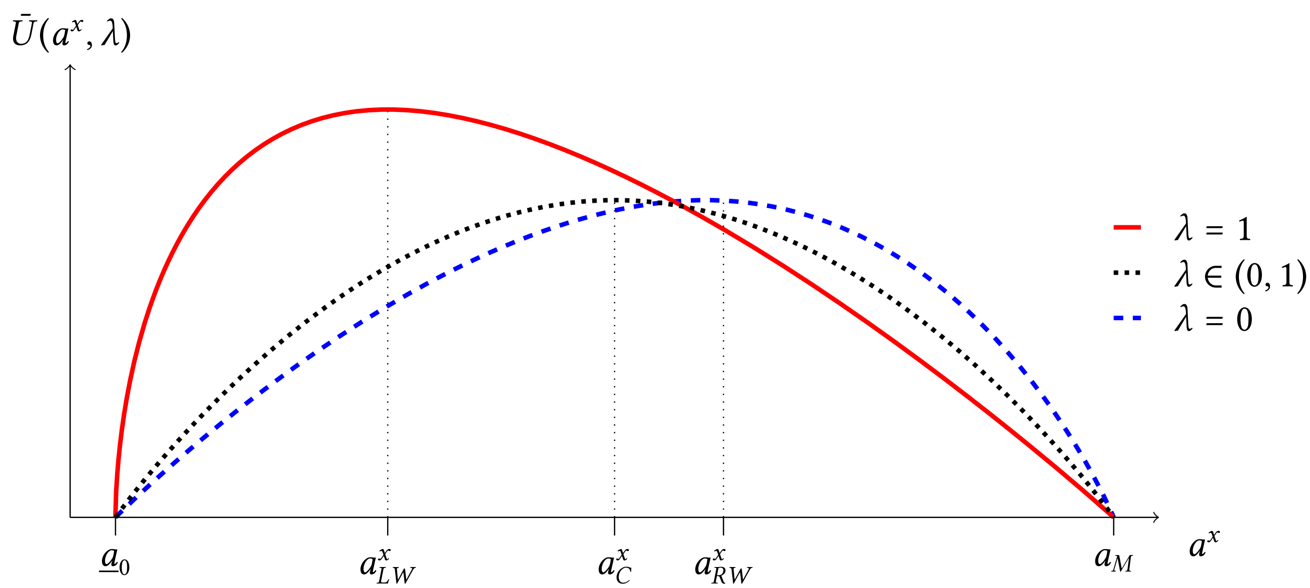

Figure 14: Weighted welfare ($\bar{U}$) as a function of λ and a^x, flexible wage, $g' < 0$.

Proposition 5 states the main result of the paper. The equilibrium EPLs design under flexible wages is S-shaped regardless of the political orientation of the government. Thus, even when the government cares only about entrepreneurs, it imposes stricter EPLs on larger firms. Conversely, even when the government cares only about workers, it keeps workers in smaller firms under less protection. Moreover, the size threshold is decreasing in λ, thus more leftist governments establish more protective EPLs. These results are consistent with the stylized facts presented in figures 1 and 2 in section 2.

The intuition for these results is as follows. First, right-wing governments understand that stricter EPLs in larger firms leads to a lower equilibrium wage due to increased competition in the labor market. The small-scale sector significantly benefits from lower labor costs due to increased access to credit and investment. Large firms have to pay higher labor costs, but can more easily adjust their operations due to unconstrained access to credit. Thus, from a right-wing government's perspective, an S-shaped EPLs design is a way to cross-subsidize smaller firms, at a relatively low cost for larger firms.

Secondly, left-wing governments understand that smaller firms cannot accommodate stricter EPLs, which would negatively affect their workers. Thus, even when a left-wing government would like to give protection to all workers, it keeps those in smaller firms under weak protection to protect them from the negative impact that EPLs would have on their firms' operations.

Finally, when λ increases, i.e. when the government is more leftist, the red solid line in figure 14 receives a larger weight relative to the dashed blue line. Thus, the maximum of the dotted line, a_C^x moves to the left. In consequence, more leftist governments establish a lower size-threshold.

To sum up, the ideal of a right-wing government can be stated as follows:

"*regulate large businesses to foster small businesses growth*",

while the ideal of a left-wing government is:

"*do not regulate the small businesses to protect their workers*".

5.3 Discussion: sticky versus flexible wages

In this section, I briefly discuss the differences between the equilibrium policies under sticky and flexible wages. First, section 5.1 shows that, when wages are sticky, only more leftist governments are willing to implement an S-shaped EPLs design. From the point of view of more right-wing governments, increasing EPLs is too costly for firms. Thus, they keep low EPLs across the board. On the other hand, section 5.2 shows that when wages are flexible, firms that are not subject to stricter EPLs benefit from reduced wages. In that case, right-wing governments are willing to impose stricter EPLs to larger firms as a way to cross-subsidize the small business sector. Left-wing governments keep smaller firms under weak EPLs to protect their workers, so they also implement S-shaped EPLs.

Based on these results, one should expect that S-shaped EPLs are more likely to emerge in countries where wages are more flexible and under more leftist governments. In contrast, in countries where wages are more rigid, with high minimum wages or strong unions, the ability of wages to offset the effects of EPLs is restricted. Thus, governments are less likely to impose S-shaped EPLs in such countries. Related to these results, Garicano et al. (2016) show that aggregate welfare losses from S-shaped regulations are increasing in the degree of wage rigidity.

5.4 Ex-post competitive equilibrium

This section characterizes the ex-post competitive equilibrium that arises as a result of implementing the labor policy described in section 5.2, denoted by $\mathcal{P}$.

First, as a result of more protective EPLs, there is stronger competition in the labor market. Thus, the equilibrium wage is lower than under $\mathcal{P}_0$, $w(\mathcal{P}) < w(\mathcal{P}_0)$. From the point of view of individual workers, those working for firms with $a \geq a^x$ receive an expected wage $\bar{w}^1 \equiv \bar{w}(\mathcal{P}|a \geq a^x)$ larger than the one under initial regulations $\bar{w}(\mathcal{P}_0)$. In contrast, those in firms with $a < a^x$ are paid a lower expected wage, $\bar{w}^0 \equiv \bar{w}(\mathcal{P}|a < a^x) < \bar{w}(\mathcal{P}_0)$.

Suppose a relatively protective labor policy, such that $a^x < \underline{a}$. From the point of view of firms, those such that $a \in [\underline{a}, a^x)$ face lower labor costs after a regulatory change and thus, have easier access to credit and operate at a more efficient scale. On the other hand, those credit constrained firms ($a \in [a^x, \overline{a})$) that are subject to stricter EPLs, suffer from higher operating costs, lose access to credit and thus have to shrink. More capitalized firms ($a > \overline{a}$) remain unconstrained and operating optimally even when they pay higher expected wages. Figure 15 illustrates the ex-post competitive equilibrium.

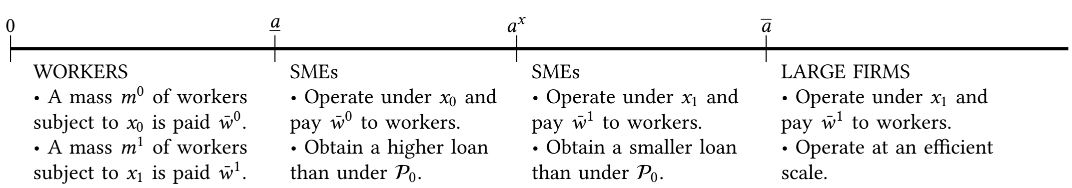

Figure 15: Ex-post competitive equilibrium.

The figure shows the ex-post equilibrium that will arise under an EPLs design more likely to be implemented by a left-wing government ($a^x < \overline{a}$). In contrast, a more right-wing government may want to implement a threshold such that $a^x \geq \overline{a}$. In that case, all firms with $a < \overline{a}$ benefit from the a regulatory change, while unconstrained entrepreneurs with $a \geq a^x$ bear the costs.

5.5 Political affiliations

As shown in section 5.2, depending on the political orientation of the government, different labor regulation policies are selected. Therefore, whether the policy-maker is left or right-wing matters in terms of ex-post welfare for each group of agents. I focus on the case with flexible wages which is more interesting.

In this section, it is assumed that given initial EPLs, $\mathcal{P}_0$ agents can anticipate the equilibrium policy that a left or right-wing government will implement at $t = 1$ and therefore, their ex-post expected payoffs at $t = 2$. I study the political support for a left-wing labor policy (governments with $\lambda = 1$) and a right-wing one ($\lambda = 0$).

The political affiliations of the different interest groups as function of their firms assets are summarized in figure 16. There are three cases depending on the location of $\tilde{a}_0^x$, as illustrated by panels a) to c). In the figure, 'W' and 'E' stand for 'workers' and 'entrepreneurs', respectively. 'LW' and 'RW' stand for 'left-wing' and 'right-wing', respectively.

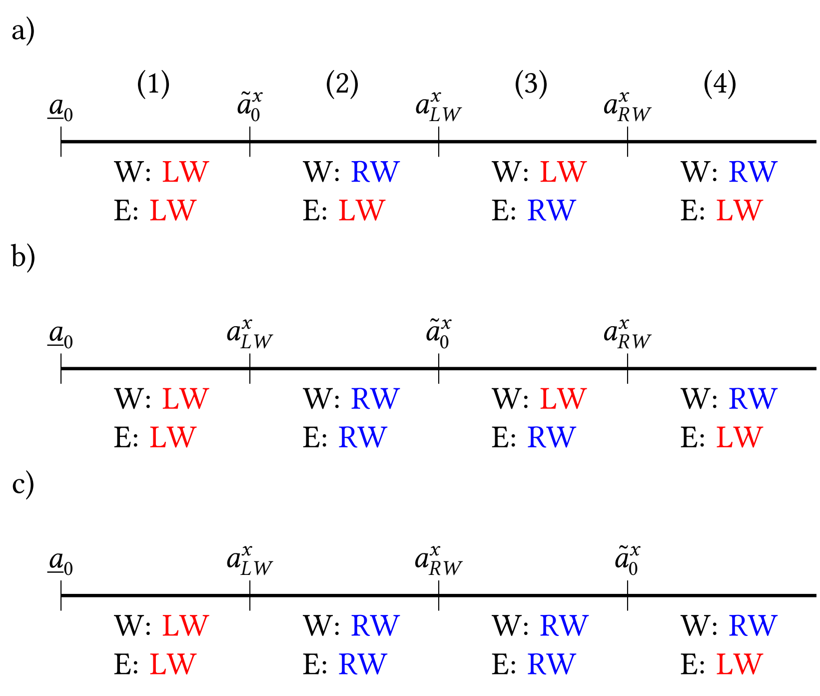

Figure 16: Political affiliations.

First, the figure shows that there are four ranges of agents with different political affiliations, enumerated as 1, 2, 3 and 4. In any case there are two groups of workers that have opposing interests. Those attached to the smallest firms (group 1) support a left-wing labor policy as opposed to those in largest firms (group 4). The intuition is as follows. Workers in group 1 don't want protection, since a higher expected wage hurts their firms which are forced to shrink and hire less labor. A left-wing government provides protection to a large set of workers, but not to those in the smallest firms (those in group 1). This pushes down the equilibrium wage benefiting the smallest firms and thus, their workers. Workers in group 4 can anticipate that even the most right-wing government will protect them. Thus, they are against more leftist governments that set a lower size threshold which leads to a lower wage and hurts them.

Secondly, there is a middle class of workers and entrepreneurs with heterogeneous political preferences (groups 2 and 3). In panel a), when $\tilde{a}_0^x < a_{LW}^x$, workers in firms with $a \in [\tilde{a}_0^x, a_{LW}^x)$ know that even the most leftist government is not going to provide them with higher protection. Thus, since they are better off under a higher expected wage, they support a right-wing government which sets a lower size threshold. As opposed to their interests, entrepreneurs running those firms support a leftist government which is not going to impose higher EPLs to their firms, but is going to do so for the rest of the firms, leading to a lower equilibrium wage. On the other hand, the political preferences are reversed for agents in firms with $a \in (a_{LW}^x, a_{RW}^x)$. In this case workers can receive higher protection if they support a left-wing government, but their entrepreneurs suffer from higher wages. Interestingly, as $\tilde{a}_0^x$ increases relative to a_{LW}^x and a_{RW}^x (panel b) and panel c)), fewer workers want protection and more middle-class agents support a right-wing government.

Overall, the model predicts heterogeneous political preferences across groups of workers and entrepreneurs. Those agents in the smallest and largest firms have well-defined political preferences. However, there is middle-class with heterogeneous preferences depending on the different configurations of the parameters. Cross class coalitions arise in equilibrium.

6 Extensions

6.1 Bargaining

This section presents an alternative mechanism through which governments can achieve the outcome of the equilibrium policy described in section 5. Each group of workers in each firm is organized as unions. That is, as societies with the purpose of promoting working conditions in line with their common interests. Unions bargain with the owners of their firms (entrepreneurs) to define EPLs before production takes place and to maximize their workers' welfare, U^w. The government can control the resulting outcome by constraining unions' bargaining power.

Negotiation terms are as follows. At $t = 1$, potential entrepreneurs and unions sign an employment contract which defines the strength of EPLs to be exercised at $t = 2$. The contract specifies whether the firm is going to operate under weak EPLs, x_0 or strong EPLs, x_1. Entrepreneurs cannot precommit to a given level of employment, l since debt and labor are decided at period $t = 2$, i.e. after $\mathcal{P}$ has been set. Conversely, at $t = 1$, unions in bargaining with entrepreneurs set their demands taking into account the effect on debt, and thus on the amount of labor that will be hired at $t = 2$. However, as negotiations take place independently between unions and entrepreneurs of different firms, they cannot anticipate the general equilibrium effects that may arise from economy-wide changes in labor regulations.

I assume that unions and entrepreneurs bargain over firm's specific EPLs, $\mathcal{P}(a)$ by following the random proposer model of Binmore (1987). Unions and entrepreneurs make take-it-or-leave-it proposals with frequencies μ and $1 - \mu$, respectively. That is, firm's specific labor rules are set at the union's optimal level with frequency μ and at the entrepreneur's preferred level with frequency $1 - \mu$. Thus, $\mu \in [0, 1]$ can be interpreted as the unions' bargaining power, which is now the policy instrument of the government.

Importantly, μ is not size-contingent. That is, the government's policy intervention operates in a single dimension and it is flat across firms. Since the government's policy has a single degree of freedom, it is a non-trivial task to find a level of μ that can replicate the political weighted welfare of the equilibrium platform studied in section 5.

Negotiations lead to the expected labor regulation policy, $\mathcal{P}_{rp} : [\underline{a}_0, a_M] \longrightarrow \mathcal{O}$ to be implemented at $t = 2$, where $\mathcal{O}$ is the convex set given by:

$$\mathcal{O} = \{(\varphi, \theta) : \left(\zeta^{\varphi}\varphi_0 + (1 - \zeta^{\varphi})\varphi_1, \zeta^{\theta}\theta_0 + (1 - \zeta^{\theta})\theta_1\right); \;\; \zeta^{\varphi}, \zeta^{\theta} \in [0, 1]\}.$$

Lemma 3 *The expected labor regulation policy, $\mathcal{P}_{rp} : [\underline{a}_0, a_M] \longrightarrow \mathcal{O}$ that arises from the random proposer model satisfies,*

$$
\mathcal{P}^{\varphi}_{rp}(a) = \begin{cases} \varphi_0 & \textit{if } a \in [\underline{a}_0, \tilde{a}^{\varphi}_0), \\ \varphi_0 + \mu\Delta & \textit{if } a \geq \tilde{a}^{\varphi}_0, \end{cases} \tag{27}
$$

and

$$
\mathcal{P}^{\theta}_{rp}(a) = \begin{cases} \theta_0 & \textit{if } a \in [\underline{a}_0, \tilde{a}^{\theta}_0), \\ \theta_0 + \mu\Delta & \textit{if } a \geq \tilde{a}^{\theta}_0. \end{cases} \tag{28}
$$

Figure 17 illustrates lemma 3. As opposed to section 5, the government has no control over the size threshold at which EPLs becomes stricter, $\tilde{a}^x_0$. In this case, the government can alter the equilibrium policy by changing the bargaining power of unions, μ. Thus, now the government has control over the size of the discontinuity at the size threshold. In what follows I show the conditions under which the expected regulation policy that arises from the random proposer model can replicate the political weighted welfare of the preferred EPLs design.

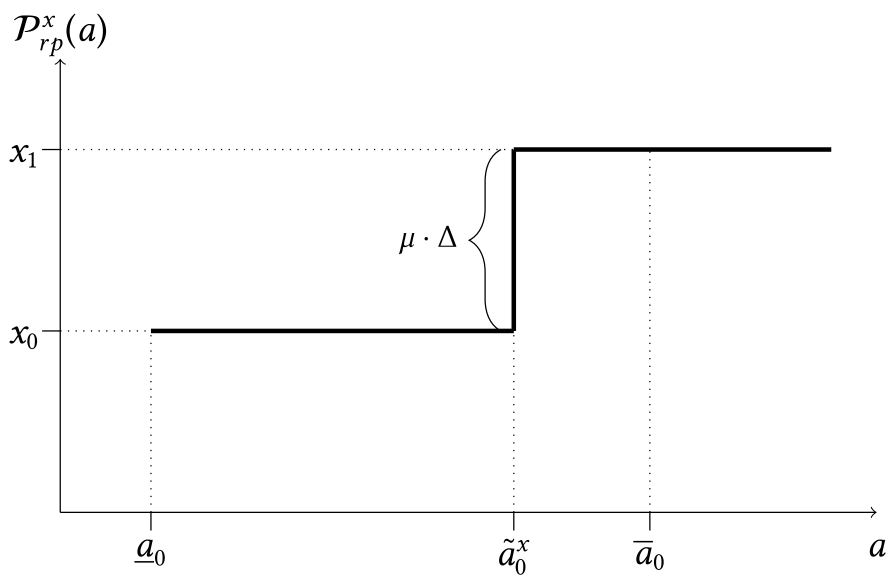

Figure 17: Expected labor regulation policy, $\mathcal{P}^x_{rp}$ for $x = \{\varphi, \theta\}$.

6.1.1 Bargaining under sticky wages

I analyze the case in which wages are sticky which is simpler. The question to be studied in this section is as follows. Can the government choose unions' bargaining power such that the resulting expected labor policy replicates the weighted welfare implied by the preferred EPLs design?

This question translates into finding a μ such that $\mathcal{P}_{rp}$ gives the weighted welfare of the size threshold given by (21). The following condition characterizes the bargaining power, $\mu(\lambda)$ that a government must choose as a function of its political orientation, λ.

Proposition 6 *The function $\mu(\lambda)$ that implements the welfare of the preferred policy is as follows,*

$$\mu(\lambda) = \begin{cases} 0 & \text{if } \lambda \leq \frac{1}{2+1/(\gamma-2)}, \\ \chi(\lambda) & \text{if } \lambda \in (\tilde{\lambda}, 1], \end{cases} \tag{29}$$

where $\chi(\lambda) \in (0, 1]$ is some increasing function in λ such that $\chi(1) = 1$ and $\tilde{\lambda} > \frac{1}{2-1/\gamma}$.

The proposition shows that there is a union's bargaining power that can implement the weighted welfare of the preferred policy for $\lambda \in \left[0, \frac{1}{2+1/(\gamma-2)}\right] \bigcup (\tilde{\lambda}, 1]$. As expected, more leftist governments provide higher bargaining power to unions. In contrast, right-wing governments are able to exactly enforce their preferred policy by not allowing unions to exist, $\mu = 0$. Left-wing regulators can implement the exact equilibrium policy only when $\lambda = 1$ and by giving all the bargaining power to unions, $\mu = 1$. Otherwise, when $\lambda \in (\tilde{\lambda}, 1)$, the weighted welfare of the preferred policy is achievable under a labor policy that is different to the one described in section 5.1. In what follows I explain the intuition for this last result.

In this case the government does not have control over the threshold at which EPLs become stricter, which is now fixed and given by $\tilde{a}_0^x$. However, section 5.1.2 shows that, when $\lambda \in (\tilde{\lambda}, 1)$, the preferred policy is such that the size threshold satisfies: $a^x > \tilde{a}_0^x$. Thus, when $\lambda \in (\tilde{\lambda}, 1)$, the labor policy arising from independent negotiations has a lower size threshold than the preferred policy. That is, it provides protection to a larger set of workers than the preferred policy. The government can solve this issue by limiting the bargaining power of unions (μ), that is by controlling the intensive margin of EPLs. In figure 17 this means reducing the size of the 'jump' ($\mu\Delta$) at the threshold. As a result, the policy that implements the weighted welfare of the political equilibrium of section 5.1 provides protection to a larger set of workers, but the intensity of this protection is lower.

The main result of this section is that the government is able to replicate the weighted welfare of the preferred size-contingent regulation by using a one-dimensional policy instrument, μ. The explanation for this result comes from the fact that in equilibrium there are no unions in smaller firms ($a < \tilde{a}_0^x$). That is, even when workers from this sector are allowed to form unions and bargain on labor conditions, they accept to remain under weak protection regardless of their bargaining power. Thus, is like unions never come to exist in smaller firms. In consequence, the government chooses μ in order to have control of the outcome of negotiations in larger firms ($a > \tilde{a}_0^x$) and in this way, attain the desired level of welfare.

6.2 Strategic Behavior of Firms

This section allows for strategic behavior of firms. That is, firms can adjust their size in response to the labor policy. I show that agents running firms close to the size threshold may want to underinvest or under-report their size to benefit from weaker EPLs.

In section 6.2.1, I study the case in which the size threshold is defined in terms of assets, as in section 5. In section 6.2.2, I analyze the case when the size threshold is defined in terms of labor. I show that when firms act strategically, the government cannot enforce its preferred labor policy. As a result, the economy will deviate from the weighted welfare of the political equilibrium described in section 5. Based on data from France, Guner et al. (2008) and Garicano et al. (2016) provide evidence of a size distortion around the size threshold from which EPLs become stricter. This finding is consistent with firms strategically adjusting their size to avoid EPLs when facing an S-shaped design.

The question that arises then is whether the government can achieve the weighted welfare of the preferred policy by implementing an alternative mechanism. The answer is yes, but under certain conditions. As shown in section 6.1, the government can achieve the outcome of its preferred policy by allowing workers to form unions and bargain on EPLs with their entrepreneurs. In the case of sticky wages, the government chooses the bargaining power of unions as shown by proposition 6.

6.2.1 The size threshold in terms of assets

So far I have assumed that firms' assets are observable. Suppose now that firms decide how much assets to report to the government and that the labor policy is implemented in terms of an asset threshold, a^x as described in section 5. Would the economy achieve the political weighted welfare of the preferred EPLs design?

If the extent of EPLs is defined in terms of assets, then firms may want to under-state their assets in order to operate under lower EPLs. However, under-reporting involves a cost: since banks restrict credit to less-capitalized agents, under-reporting means they have less access to credit than if they reported truthfully. Thus, under-reporting means more flexible EPLs at the cost of lower investment.

The following lemma shows that there is a range of agents with $a \geq a^x$ that claim to have slightly less wealth than a^x. That is, they under-report their size. As a result, they invest less in a firm than if they reported truthfully, but gain from reduced labor costs. In consequence, the economy will deviate from the weighted welfare implied by the equilibrium policy of section 5.

Lemma 4 *There exists a critical value $\bar{\epsilon} > 0$ such that agents with $a \in [a^x, a^x + \bar{\epsilon})$ report having slightly less assets than a^x.*

6.2.2 The size threshold in terms of labor

Section 5 studied the equilibrium labor policy when the government can set a critical asset level a^x (with $x \in \{\varphi, \theta\}$) from which EPLs become stricter. However, as shown in figures 1 and 2 in the introduction, in practice S-shaped EPLs are defined in terms of number of workers. The question is, can the equilibrium labor policy be mapped into terms of labor?

Figure 18 shows the amount of labor hired by each firm in terms of assets under the labor policy a^x. The red solid line corresponds to the amount of labor hired by firms exempted from tighter EPLs ($a \in [\underline{a}, a^x)$). The blue dashed line shows labor in firms subject to stronger EPLs ($a > a^x$). If the government could enforce the chosen labor policy, labor as function of assets would be as in the figure. That is, each firm would hire labor optimally according to its assets and EPLs.

Suppose now that the government would like to implement the preferred policy by setting the size threshold in terms of labor. One alternative would be to impose stricter EPLs to any firm that hires $l \geq l(a^x|x_1)$. As shown in the figure, there is a range of firms $[a^x_1, a^x)$ that would be subject to stricter EPLs if they decide to hire the optimal amount of labor (red solid line). Alternatively, the government could state that any firm with $l \geq l(a^x|x_0)$ must operate under stricter EPLs. In this case a range of firms with $a \in (a^x, a^x_2]$ would face weak EPLs even when the equilibrium policy states they should face strict EPLs. Inevitably, imposing a size threshold in terms of labor would lead to an undesired outcome due to distorted hiring decisions around the threshold. What is the solution then?

One possibility is to restate the government problem as follows. Instead of choosing an asset-threshold a^x at which EPLs become stricter, the government imposes a labor-threshold, l^x at which stronger EPLs apply. That is, in finding the preferred policy the government now internalizes the distortions generated from imposing a labor-threshold.

Could the government use this mechanism to achieve the weighted welfare ($\bar{U}$) under the equilibrium EPLs from section 5? Intuitively, one would like to find some $l^x \in [l(a^x|x_1), l(a^x|x_0)]$ such that the losses of agents forced to hire less labor than optimal are compensated by the gains of those 'unfairly' operating under weaker ELPs. Section 8.4.3 in the Appendix formulates the problem and shows that the solution is unable to replicate the weighted welfare attained under the preferred policy from section 5. However, as shown in section 6.1, this can be done through independent negotiations between unions and entrepreneurs.

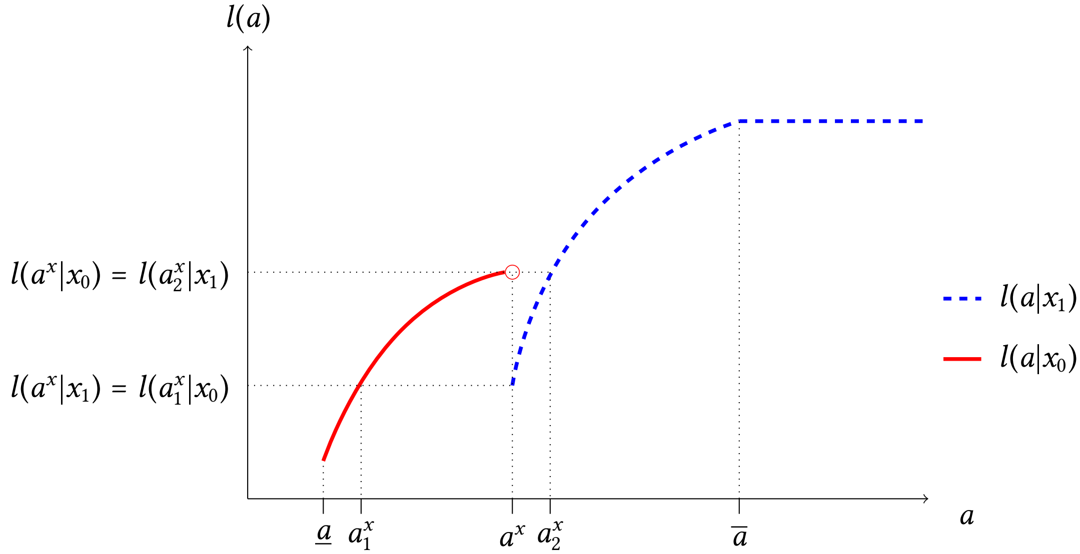

Figure 18: Labor as function of assets.

7 Conclusions

Employment protection legislations (EPLs) are not equally enforced across firms. In many countries, there is a size threshold above which firms face stricter EPLs, so that EPLs are essentially S-shaped as a function of firm size. The quantitative macro literature shows that the welfare costs of EPLs can amount to 3.5% of GDP. But if EPLs are so costly, why do they exist? Why are they S-shaped in many countries?

This article addresses these questions from a political economy perspective. I develop a macro model for the study of the scope of EPLs. Citizens are heterogeneous in wealth and choose to become workers or entrepreneurs. Occupational choice leads to the emergence of interest groups regarding EPLs. Agents' political preferences are aggregated through probabilistic voting à la Persson and Tabellini (2000). The equilibrium policy depends on a parameter measuring the government's political orientation.

The main result is that, when wages are flexible, the equilibrium policy is S-shaped regardless of the political orientation of the government. Thus, even if the government cares only about workers, it keeps those in smaller firms unprotected. Conversely, even when the government weights only entrepreneurs, it imposes stricter EPLs on larger firms. Additionally, more pro-worker governments establish a lower size threshold from which EPLs become stronger. These results are consistent with the empirical facts presented in section 2.

The rationale for these results comes from the impact of S-shaped EPLs on the labor market. Higher workers' protection in larger firms boosts labor market competition leading to a lower equilibrium wage. Smaller firms substantially benefit from reduced wages, while larger firms can more easily absorb stricter EPLs. Thus, pro-business governments view S-shaped EPLs as a way to cross-subsidize small firms at a relatively low cost for larger firms. On the other hand, pro-worker governments anticipate that smaller firms would struggle to accommodate stricter EPLs, which in turn would negatively affect their workers. Thus, they also impose lighter EPLs on smaller firms.

The previous argument relies on having flexible wages, that respond to changes in EPLs. When wages are sticky, only more pro-worker governments implement an S-shaped EPLs design. Thus, S-shaped EPLs are more likely to arise in countries with more flexible wages and under more leftist (pro-worker) governments.

Finally, I show that the outcome of the preferred labor policy is achievable through independent negotiations between groups of workers (unions) and entrepreneurs. In this case, the policy instrument is the bargaining power of unions. Since in equilibrium there are no unions in smaller firms, the government chooses unions' power to control the outcome of negotiations in larger firms.

This paper opens the door for a deeper understanding of the emergence of EPLs across countries. First, as far as I know, this is the first paper to provide a theory where S-shaped EPLs can arise as an equilibrium outcome of aggregating endogenous political interests.

Secondly, the model provides new testable predictions regarding the welfare effects of EPLs across groups of workers and firms. EPLs, which supposedly protect workers, reduce the welfare of workers in smaller firms, while they only benefit those in larger firms. Moreover, larger firms are less reluctant to improvements of EPLs than smaller firms. In future work, I plan to test these results by using firm-level panel data and by exploiting the state-level adoption of Wrongful Discharge Laws (WDLs) in the US. Thirdly, the model shows that more protective labor regulations are more likely to arise in countries with more flexible wages, which is a new result that can be tested in the data.

Finally, other types of size-contingent regulations are widespread worldwide, such as special tax treatments, credit subsidies, and restrictions on the expansion of businesses. As shown in section 8.4.4 in the Appendix, the model can be adapted to accommodate these different policies. The study of the political economy of these regulations is left for future work.

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8 Appendix

8.1 Basics

8.1.1 Optimal debt contract

In what follows I characterize the conditions that define the optimal debt contract under the initial policy, $\mathcal{P}_0 = (\varphi_0, \theta_0)$. These conditions can be generalized to any policy, $\mathcal{P}$.

Define the auxiliary function,

$$\Psi(a, d, l|\varphi_0, \theta_0) \equiv U^e(a, d, l|\varphi_0, \theta_0) - \phi k, \tag{30}$$

which measures the severity of agency problems for a triplet (a, d, l).[20] Analogously as in FH, it can be shown that there exists a minimum wealth required to obtain a loan, $\underline{a}_0 = \underline{a}(\varphi_0, \theta_0)$ which is given by[21]

$$\Psi(\underline{a}_0, \underline{d}_0, \underline{l}_0|\varphi_0, \theta_0) = 0 \Longleftrightarrow U^e(\underline{a}_0, \underline{d}_0, \underline{l}_0|\varphi_0, \theta_0) = \phi\underline{k}_0 \tag{31}$$

$$\Psi_d(\underline{a}_0, \underline{d}_0, \underline{l}_0|\varphi_0, \theta_0) = 0 \Longleftrightarrow pf_k(\underline{k}_0, (1-s)\underline{l}_0) = 1 + r^* + \phi, \tag{32}$$

$$\frac{\partial U^e(\underline{a}_0, \underline{d}_0, \underline{l}_0|\varphi_0, \theta_0)}{\partial l} = 0 \Longleftrightarrow pf_l(\underline{k}_0, (1-s)\underline{l}_0) = \bar{w}(\varphi_0, \theta_0), \tag{33}$$

where $\underline{k}_0 \equiv \underline{a}_0 + \underline{d}_0$, $\underline{d}_0 > 0$ is the amount of debt that the first agent with access to credit can get and $\underline{l}_0$ are the units of labor he hires. Intuitively, the first condition asks that the minimum wealth to get a loan $\underline{a}_0$ leaves the agent just indifferent between absconding with the loan or honoring the contract. The second expression imposes that an agent with $\underline{a}_0$ is obtaining his minimum debt, $\underline{d}_0$. The final condition imposes that labor hired $\underline{l}_0$ is optimal at the capital level $\underline{a}_0 + \underline{d}_0$.

Thus, there is credit rationing: a rationed borrower ($a < \underline{a}_0$) may be willing to pay a higher interest rate in order to obtain a loan, but investors will not accept such offer since they cannot trust the borrower. From condition (32), the marginal return to investment of the first agent with access to credit is $1 + r^* + \phi$, which corresponds to the highest possible return to investment. As a increases, the return to capital falls until eventually it attains the level obtained by an efficient firm $1 + r^*$. Since U^e is increasing and continuous in the relevant range, there exists a critical wealth level $\overline{a}_0 > \underline{a}_0$, such that an entrepreneur owing $\overline{a}_0$ is the first agent that can obtain a loan to invest efficiently,

$$\Psi(\overline{a}_0, k_0^* - \overline{a}_0, l^*) = 0. \tag{34}$$

[20] If $\Psi > 0$ the incentives to commit default decrease as Ψ increases. In contrast, if $\Psi < 0$ the entrepreneur has incentives to behave maliciously. A more negative Ψ means that the entrepreneur has less incentives to honor the credit contract and absconds with the loan.

[21] Conditions below arise from a *minimax* problem. See proof of lemma 1 in FH for more details.

Thus, in equilibrium these two thresholds define an endogenous range of entrepreneurs, $[\underline{a}_0, \overline{a}_0)$ who have restricted access to credit and operate at an inefficient scale. Because in this range the marginal return to capital is larger than the marginal cost of debt, those agents will decide to ask for their maximum allowable loan given by

$$\Psi(a, d, l|\varphi_0, \theta_0) = 0, \tag{35}$$

where labor $l \equiv l(a|\varphi_0, \theta_0)$ satisfies,

$$p(1-s)f_l(a+d, (1-s)l) = \bar{w}(\varphi_0, \theta_0). \tag{36}$$

8.1.2 Occupational choice

In section 3.3, I define $\hat{a}_0$ as critical wealth level from which agents prefer to form a firm instead of becoming workers. Formally, this threshold is defined as follows,

$$\hat{a}_0 \equiv \inf_{\{a\}}\{U^e(a, d(a), l(a)) - u^w(a)\} \geq 0$$

Note that different arrangements could arise in the model as function of $\underline{a}_0$ and $\hat{a}_0$. Figure 19 illustrates these features. Panel a) shows the case in which $\underline{a}_0 > \hat{a}_0$. All agents with $a < \hat{a}_0$ become workers and those with $a \geq \underline{a}_0$ become entrepreneurs. Those agents with $a \in (\hat{a}_0, \underline{a}_0)$ may either become workers or invest their little wealth in a firm (micro-entrepreneurs). In the paper I study the case in which all agents with $a < \underline{a}_0$ become workers. Panel b) presents a case in which some agents that can access the credit market prefer to become workers, $a \in [\underline{a}_0, \hat{a}_0)$. In FH we show that the properties of the model are preserved under the cases that are not studied in this paper.

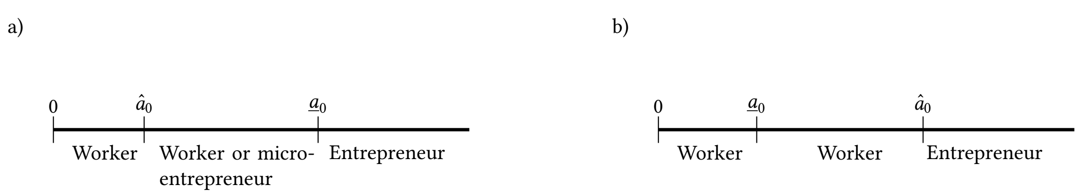

Figure 19: Occupational choice.

8.1.3 Measuring workers' welfare

This section shows that $U^w(l)$ is an appropriate measure of welfare for the group of workers attached to a firm hiring labor l.

Recall the labor market equilibrium condition,

$$l_s \cdot G(\underline{a}) = \int_{\underline{a}}^{a_M} l \, \partial G(a),$$

multiply by the expected wage $\bar{w}$ and subtract $\varsigma(l_s)G(\underline{a})$ on both sides,

$$\begin{aligned}
\underbrace{[\bar{w} \cdot l_s - \varsigma(l_s)]}_{=u^w(l_s)} G(\underline{a}) &= \left(\int_{\underline{a}}^{a_M} (\bar{w} \cdot l) \, \partial G(a) \right) - \varsigma(l_s)G(\underline{a}), \\
\Rightarrow u^w(l_s) \cdot G(\underline{a}) &= \left(\int_{\underline{a}}^{a_M} (\bar{w} \cdot l) \, \partial G(a) \right) - \left(\varsigma(l_s) \int_{\underline{a}}^{a_M} \frac{l}{l_s} \, \partial G(a) \right), \\
\Rightarrow u^w(l_s) \cdot G(\underline{a}) &= \int_{\underline{a}}^{a_M} U^w(l) \, \partial G(a). \qquad (37)
\end{aligned}$$

where in the second line I used the labor market equilibrium condition. Expression (37) shows how the aggregate workers' welfare in the economy, $u^w(l_s) \cdot G(\underline{a})$ is distributed across firms. It turns out that $U^w(l) = \bar{w}l - \frac{l}{l_s}\varsigma(l_s)$ is the correct measure for workers' welfare in firm l.

8.1.4 Individual workers' welfare under S-shaped EPLs

In this section I show how to obtain individual workers' welfare under an S-shaped policy characterized by the size threshold a^x. Define $u_0^w \equiv u^w(l_s(x_0))$ and $u_1^w \equiv u^w(l_s(x_1))$, where $l_s(x)$ is the individual labor supply given by (6). Since workers are randomly attached to firms, the expected utility of an individual worker, $\mathbb{E}u^w$ is given by

$$\mathbb{E}u^w = \frac{m^0}{m^0 + m^1} u_0^w + \frac{m^1}{m^0 + m^1} u_1^w, \qquad (38)$$

where m^0 and m^1 are the masses of workers that supply $l_s(x_0)$ and $l_s(x_1)$, respectively, as defined by conditions (17) and (18). Since the total mass of workers if given by $G(\underline{a}_0)$, the total workers' welfare in the economy, $\bar{U}^w$ is given by

$$\begin{aligned}
\bar{U}^w &= \left[\frac{m^0}{m^0 + m^1} u_0^w + \frac{m^1}{m^0 + m^1} u_1^w \right] \cdot G(\underline{a}_0) \\
&= m_0 u_0^w + m_1 u_1^w, \qquad (39)
\end{aligned}$$

where in the second line I have used condition (19). Based on equation (37) the following condition must hold

$$m_0 u_0^w + m_1 u_1^w = \int_{\underline{a}_0}^{a^x} U^w(a|x_0)\partial G + \int_{a^x}^{a_M} U^w(a|x_1)\partial G. \qquad (40)$$

Thus, the government's problem can be written in terms of any of these two measures. In this paper, I use the expression on the right-hand side because of two reasons: i) it allows to obtain proposition 3 and simplify the government's problem, and ii) it allows to characterize the political preferences of the different 'groups of workers', which admits a more intuitive interpretation of the results.

8.2 Main Proofs

Proposition 1 *Consider the initial labor regulation,* $\mathcal{P}_0 : [\underline{a}_0, a_M] \longrightarrow \{\varphi_0, \theta_0\}$ *, then:*

1. *All entrepreneurs are worse off after a marginal increase of* φ *or* θ*.*

2. *This negative effect is strictly decreasing if* $a \in [\underline{a}_0, \overline{a}_0)$ *and becomes constant for* $a \geq \overline{a}_0$*.*

Proof:

To simplify calculations, define $x = \{\varphi, \theta\}$. Differentiation of U^e in terms of x gives,

$$\frac{\partial U^e}{\partial x} = [pf_k - (1 + r^*)]\frac{\partial d}{\partial x} - \frac{\partial \bar{w}(\varphi, \theta)}{\partial x} l. \tag{41}$$

Define $\bar{w}_\varphi \equiv \frac{\partial \bar{w}(\varphi,\theta)}{\partial \varphi} = \frac{\partial w}{\partial \varphi}[p((1 - s) + s\varphi) + (1 - p)\theta] + psw$ and $\bar{w}_\theta \equiv \frac{\partial \bar{w}(\varphi,\theta)}{\partial \theta} = \frac{\partial w}{\partial \theta}[p((1 - s) + s\varphi) + (1 - p)\theta] + (1 - p)w$. Additionally, use that $\frac{\partial d}{\partial x} = \frac{l \cdot \bar{w}_x}{f_k - (1+\underline{r})}$ in (41),

$$\frac{\partial U^e}{\partial x} = l \cdot \bar{w}_x \left[\frac{pf_k - (1 + r^*)}{pf_k - (1 + \underline{r})} - 1\right] = \phi \bar{w}_x \frac{l}{pf_k - (1 + \underline{r})} < 0. \tag{42}$$

Thus, the effect of increased $x = \{\varphi, \theta\}$ on entrepreneurs' utility is negative. In particular, $\lim_{a \to \underline{a}_0 +} \frac{\partial U^e(a)}{\partial x} = -\infty$ and $\frac{\partial U^e(\overline{a}_0)}{\partial x} = -l^* \bar{w}_x$.

In order to conclude that this negative effect becomes weaker as a increases, all is left to show is that $\frac{\partial}{\partial a}\left(\frac{\partial U^e}{\partial x}\right) > 0$. Differentiate (42) with respect to a,

$$\frac{\partial}{\partial a}\left(\frac{\partial U^e}{\partial x}\right) = \frac{\phi \bar{w}_x}{(pf_k - (1 + \underline{r}))^2}\left[\frac{\partial l}{\partial a}(pf_k - (1 + \underline{r})) - l\frac{\partial}{\partial a}(pf_k)\right].$$

Note that,

$$\frac{\partial}{\partial a}(f_k) = \left(f_{kk} - \frac{f_{kl}^2}{f_{ll}}\right)\left(1 + \frac{\partial d}{\partial a}\right) = -\frac{\alpha f}{(1 - \beta)k^2}(1 - \alpha - \beta)\left(1 + \frac{\partial d}{\partial a}\right) < 0, \tag{43}$$

then,

$$\begin{aligned}
\frac{\partial}{\partial a}\left(\frac{\partial U^e}{\partial x}\right) &= \frac{\phi \bar{w}_x}{(pf_k - (1 + \underline{r}))^2}\left(1 + \frac{\partial d}{\partial a}\right)\left[-\frac{f_{kl}}{(1 - s)f_{ll}}(pf_k - (1 + \underline{r})) + l\frac{p\alpha f}{(1 - \beta)k^2}(1 - \alpha - \beta)\right], \\
&= \frac{\phi \bar{w}_x}{(pf_k - (1 + \underline{r}))^2}\left(1 + \frac{\partial d}{\partial a}\right)\left[\frac{\alpha l}{k(1 - s)^2(1 - \beta)}(pf_k - (1 + \underline{r})) + l\frac{pf_k}{(1 - \beta)k}(1 - \alpha - \beta)\right], \\
&= \underbrace{\frac{\phi l \bar{w}_x}{(1 - s)^2(1 - \beta)k(pf_k - (1 + \underline{r}))^2}\left(1 + \frac{\partial d}{\partial a}\right)}_{>0}\left[\alpha(pf_k - (1 + \underline{r})) + pf_k(1 - s)^2(1 - \alpha - \beta)\right].
\end{aligned}$$

Denote the term in brackets by h and notice that,

$$h \equiv \alpha(pf_k - (1+\underline{r})) + pf_k(1-s)^2(1-\alpha-\beta) > -\alpha\phi + (1+r^*)(1-s)^2(1-\alpha-\beta) > 0,$$

where the first inequality comes from $pf_k \in [1+r^*, 1+\underline{r}]$ and the second one uses assumption 1. Therefore, $\frac{\partial}{\partial a}\left(\frac{\partial U_e}{\partial x}\right) > 0, x \in \{\varphi, \theta\}$ and smaller firms are more adversely affected by an improvement in EPLs measured by φ or θ, which concludes the proof. ■

Proposition 2 *Consider the initial labor regulation, $\mathcal{P}_0 : [\underline{a}_0, a_M] \longrightarrow \{\varphi_0, \theta_0\}$ and suppose a marginal increase of φ or θ. Then, there are cutoffs $\tilde{a}_0^{\varphi} \in (\underline{a}_0, \overline{a}_0)$ and $\tilde{a}_0^{\theta} \in (\underline{a}_0, \overline{a}_0)$ given by*

$$\frac{\partial U^w(\tilde{a}_0^x|\mathcal{P}_0)}{\partial x} = 0, \quad x \in \{\varphi, \theta\}$$

such that,

1. *Workers' welfare in firms with $a \in [\underline{a}_0, \tilde{a}_0^x)$ decreases.*
2. *Workers' welfare in firms with $a > \tilde{a}_0^x$ increases.*
3. *This marginal effect is strictly increasing in $a \in [\underline{a}_0, \overline{a}_0)$ and becomes constant for $a \geq \overline{a}_0$.*

Proof: Differentiating condition (4) with respect to $x = \{\varphi, \theta\}$:

$$\begin{aligned}
\frac{\partial U^w(a|\varphi,\theta)}{\partial x} &= \bar{w}_x l + \frac{\partial l}{\partial x}\bar{w}(\varphi,\theta) - \frac{\left[\frac{\partial l}{\partial x}\varsigma(l_s) + l\varsigma'(l_s)\frac{\partial l_s}{\partial x}\right] l_s - l\varsigma(l_s)\frac{\partial l_s}{\partial x}}{(l_s)^2}, \\
&= \bar{w}_x l + \frac{\partial l}{\partial x}\left(\underbrace{\bar{w}(\varphi,\theta)}_{=\varsigma'(l_s)} - \frac{\varsigma(l_s)}{l_s}\right) - \frac{l}{l_s}\frac{\partial l_s}{\partial x}\left(\varsigma'(l_s) - \frac{\varsigma(l_s)}{l_s}\right), \\
&= \bar{w}_x \cdot l \underbrace{\left[1 - \frac{1}{\varsigma''(l_s)\cdot l_s}\left(\varsigma'(l_s) - \frac{\varsigma(l_s)}{l_s}\right)\right]}_{=(\gamma-1)/\gamma>0} + \underbrace{\frac{\partial l}{\partial x}}_{<0}\underbrace{\left(\varsigma'(l_s) - \frac{\varsigma(l_s)}{l_s}\right)}_{=(\gamma-1)l_s^{\gamma-1}>0},
\end{aligned} \tag{44}$$

where the last equality uses that $\frac{\partial l_s}{\partial x} = \frac{\bar{w}_x}{\varsigma''(l_s)} > 0$. Note that the sign of $\frac{\partial U^w(a|\varphi,\theta)}{\partial x}$ is ambiguous and depends on a. For a firm which is operating close enough to $\underline{a}_0$, $\lim_{a\to\underline{a}_0^+}\frac{\partial U^w(a|\varphi,\theta)}{\partial x} = -\infty$ (since $\lim_{a\to\underline{a}_0^+}\frac{\partial d}{\partial x} = -\infty$ and so, $\lim_{a\to\underline{a}_0^+}\frac{\partial l}{\partial x} = -\infty$). Thus, at least in a neighborhood of $\underline{a}_0$ workers are worse off. In addition, note that the labor market must satisfy the welfare equilibrium condition,

$$\int_{\underline{a}}^{a_M} u^w(\varphi,\theta)\partial G = \int_{\underline{a}}^{a_M} U_w(a|\varphi,\theta)\partial G, \tag{45}$$

Differentiate in terms of $x \in \{\varphi, \theta\}$ and evaluate at $\mathcal{P}_0$,

$$\underbrace{\frac{\partial u^w(\varphi_0, \theta_0)}{\partial x} G(\underline{a}_0) + u^w(\varphi_0, \theta_0) g(\underline{a}_0) \frac{\partial \underline{a}_0}{\partial x}}_{>0} = \int_{\underline{a}_0}^{a_M} \frac{\partial U_w(a|\varphi_0, \theta_0)}{\partial x} \partial G - U_w(a|\varphi_0, \theta_0) g(\underline{a}_0) \frac{\partial \underline{a}_0}{\partial x}, \tag{46}$$

where I have used that $\frac{\partial u^w(\varphi_0,\theta_0)}{\partial x} > 0$ and $\frac{\partial \underline{a}_0}{\partial x} > 0$.

Using the fact that $\frac{\partial U^w(a|\varphi_0,\theta_0)}{\partial x} < 0$ in some neighborhood of $\underline{a}_0$ and that the second term of the right-hand side is also negative, it follows that $\frac{\partial U^w(a|\varphi_0,\theta_0)}{\partial x}$ must be positive in some range (otherwise condition (46) is violated). If $\frac{\partial U^w(a|\varphi_0,\theta_0)}{\partial x}$ is strictly increasing in a then there exist some threshold $\tilde{a}_0^x \equiv \tilde{a}^x(\mathcal{P}_0) \in (\underline{a}_0, \overline{a}_0)$ defined by

$$\frac{\partial U^w(\tilde{a}_0^x|\mathcal{P}_0)}{\partial x} = 0, \quad x \in \{\varphi, \theta\},$$

such that $\frac{\partial U^w(a|\varphi_0,\theta_0)}{\partial x} < 0$ if $a \in [\underline{a}_0, \tilde{a}_0^x)$ and $\frac{\partial U^w(a|\varphi_0,\theta_0)}{\partial x} > 0$ if $a > \tilde{a}_0^x$.

All is left to show is that $\frac{\partial}{\partial a}\left(\frac{\partial U^w(a|\varphi_0,\theta_0)}{\partial x}\right) > 0$. Differentiation of $\frac{\partial U^w(a|\varphi,\theta)}{\partial x}$ with respect to a leads to:

$$\frac{\partial}{\partial a}\left(\frac{\partial U^w(a|\varphi,\theta)}{\partial x}\right) = \underbrace{\bar{w}_x \cdot \frac{\partial l}{\partial a}}_{>0} \underbrace{\left[1 - \frac{1}{\varsigma''(l_s) \cdot l_s}\left(\varsigma'(l_s) - \frac{\varsigma(l_s)}{l_s}\right)\right]}_{>0} + \frac{\partial}{\partial a}\left(\frac{\partial l}{\partial x}\right) \underbrace{\left(\varsigma'(l_s) - \frac{\varsigma(l_s)}{l_s}\right)}_{>0}.$$

Observe that the sign of $\frac{\partial}{\partial a}\left(\frac{\partial U^w(a|\varphi,\theta)}{\partial x}\right)$ depends on $\frac{\partial}{\partial a}\left(\frac{\partial l}{\partial x}\right)$. In what follows I show

From the FOC of labor (36),

$$\begin{aligned}
& p(1-s)\left(f_{lk}\frac{\partial d}{\partial \theta} + (1-s) f_{ll}\frac{\partial l}{\partial \theta}\right) = \bar{w}_x, \\
\Rightarrow \quad & \frac{\partial l}{\partial x} = \frac{\frac{\bar{w}_x}{p(1-s)} - f_{lk}\frac{\partial d}{\partial \theta}}{(1-s) f_{ll}} = \frac{\bar{w}_x}{1-s}\left(\frac{1}{p(1-s) f_{ll}} - \frac{l f_{kl}}{f_{ll}(f_k - (1+\underline{r}))}\right) \\
& \qquad = \frac{\bar{w}_x}{1-s}\left(\frac{1}{p(1-s) f_{ll}} - \frac{\beta(1-s) f_k}{f_{ll}(p f_k - (1+\underline{r}))}\right),
\end{aligned} \tag{47}$$

where the last equality follows from $f_{kl} = \frac{\alpha(1-s)\beta f}{kl} = \frac{\beta(1-s)f_k}{l}$. Differentiation of (47) leads to:

$$\begin{aligned}
\frac{\partial}{\partial a}\left(\frac{\partial l}{\partial x}\right) &= \frac{\bar{w}_x}{1-s}\Bigg[-\frac{\frac{\partial}{\partial a}(f_{ll})}{p(1-s)f_{ll}^2} - \beta(1-s)\frac{\frac{\partial}{\partial a}(f_k)(pf_k-(1+\underline{r}))f_{ll}}{(pf_k-(1+\underline{r}))^2 f_{ll}^2} + \beta(1-s)f_k\frac{\left(p\frac{\partial}{\partial a}(f_k)f_{ll} + (pf_k-(1+\underline{r}))\frac{\partial}{\partial a}(f_{ll})\right)}{(pf_k-(1+\underline{r}))^2 f_{ll}^2}\Bigg] \\
&= \frac{\bar{w}_x}{1-s}\left(\frac{\partial}{\partial a}(f_{ll})\left[\frac{\beta(1-s)f_k(pf_k-(1+\underline{r}))}{(pf_k-(1+\underline{r}))^2 f_{ll}^2} - \frac{1}{p(1-s)f_{ll}^2}\right] + \beta(1-s)\frac{\partial}{\partial a}(f_k)\frac{f_{ll}(1+\underline{r})}{(pf_k-(1+\underline{r}))^2 f_{ll}^2}\right) \\
&= \underbrace{\frac{\bar{w}_x}{p(1-s)^2(pf_k-(1+\underline{r}))^2 f_{ll}^2}}_{\equiv h_x>0}\left[\frac{\partial}{\partial a}(f_{ll})\cdot[\beta(1-s)^2 pf_k(pf_k-(1+\underline{r})) - (pf_k-(1+\underline{r}))^2]\right. \\
&\quad \left. + \beta(1-s)^2 p\frac{\partial}{\partial a}(f_k)\cdot f_{ll}(1+\underline{r})\right].
\end{aligned} \tag{48}$$

Notice that,

$$\frac{\partial}{\partial a}(f_{ll}) = f_{llk}\left(1+\frac{\partial d}{\partial a}\right) + f_{lll}(1-s)\frac{\partial l}{\partial a} = \left(f_{llk} - \frac{f_{kl}\cdot f_{lll}}{f_{ll}}\right)\left(1+\frac{\partial d}{\partial a}\right) = \frac{\alpha\beta(1-s)^2 f}{kl^2}\left(1+\frac{\partial d}{\partial a}\right) > 0. \tag{49}$$

Defining $\tilde{h}_x \equiv h_x\left(1+\frac{\partial d}{\partial a}\right)$ and replacing (49) and (43) in (48) gives:

$$\begin{aligned}
\frac{\partial}{\partial a}\left(\frac{\partial l}{\partial \theta}\right) &= \tilde{h}_x\Bigg[\frac{\alpha\beta(1-s)^2 f}{kl^2}\cdot[\beta(1-s)^2 pf_k(pf_k-(1+\underline{r})) - (pf_k-(1+\underline{r}))^2] \\
&\quad - \beta(1-s)^2 p\frac{\alpha f}{(1-\beta)k^2}(1-\alpha-\beta)\cdot f_{ll}(1+\underline{r})\Bigg], \\
&= \tilde{h}_x\frac{f_{ll}}{k}\Bigg[\frac{\alpha}{(\beta-1)}\cdot[\beta(1-s)^2 pf_k(pf_k-(1+\underline{r})) - (pf_k-(1+\underline{r}))^2] \\
&\quad - \beta(1-s)p\frac{f_k}{1-\beta}(1-\alpha-\beta)\cdot(1+\underline{r})\Bigg], \\
&= \underbrace{-(1-\beta)^{-1}\tilde{h}_x\frac{f_{ll}}{k}}_{>0}\Bigg[\alpha[\beta(1-s)^2 pf_k(pf_k-(1+\underline{r})) - (pf_k-(1+\underline{r}))^2] \\
&\quad + \beta(1-s)^2 pf_k(1-\alpha-\beta)(1+\underline{r})\Bigg].
\end{aligned}$$

The sign of this expression is determined by the sign of the term in brackets which we denote by q:

$$\begin{aligned}
q &\equiv \alpha[\beta(1-s)^2 pf_k(pf_k-(1+\underline{r})) - (pf_k-(1+\underline{r}))^2] + \beta(1-s)^2 pf_k(1-\alpha-\beta)(1+\underline{r}), \\
&= \alpha(pf_k-(1+\underline{r}))[\beta(1-s)^2 pf_k - (pf_k-(1+\underline{r}))] + \beta(1-s)^2 pf_k(1-\alpha-\beta)(1+\underline{r}), \\
&= -\alpha(pf_k-(1+\underline{r}))(pf_k(1-\beta(1-s)^2) - (1+\underline{r})) + \beta(1-s)^2 pf_k(1-\alpha-\beta)(1+\underline{r}).
\end{aligned}$$

Recall that $pf_k \in [1 + r^*, 1 + \underline{r}]$, then $pf_k - (1 + \underline{r}) \in [-\phi, 0]$ and $pf_k(1 - \beta(1 - s)^s) - (1 + \underline{r}) \in [-(\beta(1 - s)^2(1 + r^*) + \phi), -\beta(1 - s)^2(1 + r^* + \phi)]$. Using these properties and assumption 1,

$$\begin{aligned} q &\geq -\alpha\phi(\beta(1-s)^2(1+r^*)+\phi) + \beta(1-s)^2(1+r^*)(1-\alpha-\beta)(1+r^*+\phi), \\ &> -\alpha\phi(\beta(1-s)^2(1+r^*)+\phi) + \beta(1-s)^2(1+r^*)(1-\alpha-\beta)(\beta(1-s)^2(1+r^*)+\phi), \\ &> (\beta(1-s)^2(1+r^*)+\phi)\big[-\alpha\phi + \beta(1-s)^2(1+r^*)(1-\alpha-\beta)\big] > 0, \end{aligned}$$

which implies that $\frac{\partial}{\partial a}\left(\frac{\partial l}{\partial x}\right) > 0$. Thus, $\frac{\partial}{\partial a}\left(\frac{\partial U^w(a|\varphi_0,\theta_0)}{\partial x}\right) > 0$, which leads to the result of the proposition. ■

Proposition 3 *Any labor regulation policy, $\mathcal{P}$ that solves* (14) *satisfies monotonicity at each component,*

$$\mathcal{P}^x(a) : \mathcal{P}^x(a') \leq \mathcal{P}^x(a'') \quad \forall a' < a'', x \in \{\varphi, \theta\}.$$

Moreover, there are size thresholds $a^\varphi \in [\underline{a}_0, a_M]$ and $a^\theta \in [\underline{a}_0, a_M]$ such that:

$$\mathcal{P}^x(a) = \begin{cases} x_0 \ \text{if}\ a < a^x, \\ x_1 \ \text{if}\ a \geq a^x. \end{cases}$$

Proof: By contradiction, suppose that there is some solution to problem (14), $\mathcal{P}^x(a)$ such that it violates monotonicity in some non-zero measure set $\mathcal{A} \in \mathcal{B}([\underline{a}_0, a_M])$ and for which monotonicity holds in $[\underline{a}_0, a_M] - \{\mathcal{A}\}$.

Let x_i, with $i \in \{0, 1\}$ be defined as,

$$x_i = \begin{cases} \varphi_i & \text{if } x = \varphi, \\ \theta_i & \text{if } x = \theta. \end{cases}$$

Assume that $\mathcal{A}$ satisfies,

$\mathcal{A} : \mathcal{A} = \mathcal{A}_0 \bigcup \mathcal{A}_1$ with $\mathcal{A}_0 \bigcap \mathcal{A}_1 = \emptyset$ and $a' \in \mathcal{A}_0, a'' \in \mathcal{A}_1 \implies a' < a''$,

and define,

$$\mathcal{P}^x(a) : \mathcal{P}^x(a') > \mathcal{P}^x(a''), a' \in \mathcal{A}_0, a'' \in \mathcal{A}_1.$$

This last condition is equivalent to $\mathcal{P}^x(\mathcal{A}_0) > \mathcal{P}^x(\mathcal{A}_1) \iff \mathcal{P}^x(\mathcal{A}_0) = x_1$ and $\mathcal{P}^x(\mathcal{A}_1) = x_0$.

Further, define $m^e_G(x_0|\mathcal{P}, \mathcal{A})$ and $m^e_G(x_1|\mathcal{P}, \mathcal{A})$ as the masses of entrepreneurs in the set $\mathcal{A}$ that operate under x_0 and x_1 when $\mathcal{P}$ is implemented,

$$m^e_G(x_i|\mathcal{P}, \mathcal{A}) = \int_{a \in \mathcal{A}} \mathbf{1}[\mathcal{P}^x(a) = x_i] \partial G, \quad i \in \{0, 1\} \tag{50}$$

Consider the alternative labor regulation policy, $\mathcal{P}^{x'}$ such that,

$$\mathcal{P}^{x'}(a) = \begin{cases} \mathcal{P}^{x}(a) & \text{if } a \in [\underline{a}_0, a_M] - \{\mathcal{A}\}, \\ \{\mathcal{P}^{x'}(a) \,:\, \mathcal{P}^{x'}(\tilde{\mathcal{A}}_0) < \mathcal{P}^{x'}(\tilde{\mathcal{A}}_1)\} & \text{if } a \in \mathcal{A} = \tilde{\mathcal{A}}_0 \bigcup \tilde{\mathcal{A}}_1, \end{cases}$$

where,
$\{\mathcal{A} \,:\, \mathcal{A} = \tilde{\mathcal{A}}_0 \bigcup \tilde{\mathcal{A}}_1$ with $\tilde{\mathcal{A}}_0 \bigcap \tilde{\mathcal{A}}_1 = \emptyset$ and $a' \in \tilde{\mathcal{A}}_0, a'' \in \tilde{\mathcal{A}}_1 \Longrightarrow a' < a''\}$,
and
$\{\tilde{\mathcal{A}}_0, \tilde{\mathcal{A}}_1 \,:\, m^e_G(x_0|\mathcal{P}^{x'}, \mathcal{A}) = m^e_G(x_0|\mathcal{P}^{x}, \mathcal{A})$ and $m^e_G(x_1|\mathcal{P}^{x'}, \mathcal{A}) = m^e_G(x_1|\mathcal{P}^{x}, \mathcal{A})\}$.

Observe that $\mathcal{P}^{x'}(\tilde{\mathcal{A}}_0) = x_0$ and $\mathcal{P}^{x'}(\tilde{\mathcal{A}}_1) = x_1$. Thus, $\mathcal{P}^{x'}$ satisfies monotonicity in $\mathcal{A}$. Moreover, it reverts and preserves the masses of entrepreneurs operating under x_0 and x_1 that arise from $\mathcal{P}^{x}$. From proposition 1, $\frac{\partial}{\partial a}\left(\frac{\partial U^e}{\partial x}\right) > 0$, thus the aggregate welfare of entrepreneurs is higher under $\mathcal{P}^{x'}$. Additionally, proposition 2 shows that $\frac{\partial}{\partial a}\left(\frac{\partial U^w}{\partial x}\right) > 0$, hence workers' welfare is also larger under $\mathcal{P}^{x'}$. Therefore, $\mathcal{P}^{x}$ cannot solve problem (14).

Nevertheless, observe that $\mathcal{P}^{x'}$ may not satisfy monotonicity in $[\underline{a}_0, a_M]$. For instance, if $\mathcal{P}^{x}$ was such that $\mathcal{P}^{x}(a) = x_1, \forall a$. But since $\mathcal{A}$ was chosen arbitrarily, the argument can be repeated iteratively to discard any solution for which monotonicity does not hold in some non-zero measure set. Hence, the solution to the government's problem must satisfy monotonicity in both components.[22] Thus, by monotonicity of $\mathcal{P}^{x}(a)$ there is some $a^x \in [\underline{a}_0, a_M]$ such that $\mathcal{P}^{x}(a) = x_0$ if $a < a^x$ and $\mathcal{P}^{x}(a) = x_1$ if $a \geq a^x$. ■

Proposition 4 *The equilibrium size threshold, a^x_{gp} under sticky wages is as follows:*

1. *If $\lambda \leq \frac{1}{2+1/(\gamma-2)}$, then $a^x_{gp} = a_M$.*
2. *If $\lambda > \frac{1}{2-1/\gamma}$, then $a^x_{gp} \in [\tilde{a}^x_0, \overline{a}_0)$ satisfies,*

$$\lambda \frac{\partial U^w(a^x_{gp}|x_0)}{\partial x} = -(1-\lambda)\frac{\partial U^e(a^x_{gp}|x_0)}{\partial x}.$$

In particular, if $\lambda = 1$, then $a^x_{gp} = \tilde{a}^x_0$ and $a^x_{gp} > \tilde{a}^x_0$ if $\lambda < 1$.

Proof: The FOC of the government's problem is as follows,

$$\lambda[U^w(l(a^x_{gp}|x_0)) - U^w(l(a^x_{gp}|x_1))]g(a^x_{gp}) + (1-\lambda)[U^e(k(a^x_{gp}), l(a^x_{gp})|x_0) - U^e(k(a^x_{gp}), l(a^x_{gp})|x_1)]g(a^x_{gp}) = 0.$$

[22] Notice that the resulting $\mathcal{P}^{x'}$ is not necessarily the solution. It is an arbitrary labor regulation policy that satisfies monotonicity and that dominates any $\mathcal{P}^{x}$ that violates monotonicity in some non-zero measure set.

Rearranging terms,

$$(2\lambda-1)[\bar{w}(x_0)l(a^x_{gp}|x_0)-\bar{w}(x_1)l(a^x_{gp}|x_1)]-\lambda\left[\frac{l(a^x_{gp}|x_0)}{l_s(a^x_{gp}|x_0)}\varsigma(l_s(a^x_{gp}|x_0))-\frac{l(a^x_{gp}|x_1)}{l_s(a^x_{gp}|x_1)}\varsigma(l_s(a^x_{gp}|x_1))\right]$$
$$+(1-\lambda)[\tilde{f}(a^x_{gp}|x_0)-\tilde{f}(a^x_{gp}|x_1)]=0,$$

where I have defined,

$$\tilde{f}(a|x)\equiv pf(k(a|x),l(a|x))+(1-p)\eta k(a|x)-(1+\rho)d(a|x)-F, \tag{51}$$

which corresponds to expected firm's output net of credit and operation costs. Define now a measure of 'weighted worker's welfare' as follows,

$$\hat{U}^w(a|x)=(2\lambda-1)\bar{w}(x)l(a|x)-\lambda\frac{l(a|x)}{l_s(x)}\varsigma(l_s(x)). \tag{52}$$

Then the FOC reads as,

$$\hat{U}(a^x_{gp}|x_0)-\hat{U}(a^x_{gp}|x_1)=\tilde{f}(a^x_{gp}|x_1)-\tilde{f}(a^x_{gp}|x_1)$$

Divide both sides of previous expression by Δ and take $\lim_{\Delta\to 0}(\cdot)$ to obtain,[23]

$$\frac{\partial\hat{U}(a^x_{gp}|x_0)}{\partial x}=-(1-\lambda)\frac{\partial\tilde{f}(a^x_{gp}|x_0)}{\partial x}. \tag{53}$$

Analogously to expression (44), differentiation of (52) in terms of $x\in\{\varphi,\theta\}$ leads to,

$$\frac{\partial}{\partial x}\left(\hat{U}^w(a|\varphi,\theta)\right)=\bar{w}_x\cdot l\left[(2\lambda-1)-\frac{1}{\varsigma''(l_s)\cdot l_s}\left((2\lambda-1)\varsigma'(l_s)-\lambda\frac{\varsigma(l_s)}{l_s}\right)\right]+\underbrace{\frac{\partial l}{\partial x}}_{<0}\left((2\lambda-1)\varsigma'(l_s)-\lambda\frac{\varsigma(l_s)}{l_s}\right) \tag{54}$$

In what follows expression (54) is used to characterize the solution to (53). Two cases are studied: i) $\lambda\leq\frac{1}{2+1/\gamma-2}$ and ii) $\lambda>\frac{1}{2-1/\gamma}$. When $\lambda\in\left[\frac{1}{2+1/\gamma-2},\frac{1}{2-1/\gamma}\right]$ there may exist multiple solutions.

Case 1: $\lambda\leq\frac{1}{2+1/(\gamma-2)}$

Note that in this case,

$$(2\lambda-1)\varsigma'(l_s)-\lambda\frac{\varsigma(l_s)}{l_s}=[(2\lambda-1)\gamma-\lambda](l_s)^{\gamma-1}<0,$$

[23]Observe that this expression is analogous to (21). As will be clear later, this alternative form is useful for the study of the solution to the government's problem.

and

$$(2\lambda-1)-\frac{1}{\varsigma''(l_s)\cdot l_s}\left((2\lambda-1)\varsigma'(l_s)-\lambda\frac{\varsigma(l_s)}{l_s}\right)=\frac{(2\lambda-1)\gamma(\gamma-2)+\lambda}{\gamma(\gamma-1)}<\frac{\lambda(2(\gamma-2)+1)+\gamma-2}{\gamma(\gamma-1)}<0.$$

Proceeding as in proposition 2, differentiation of (54) in terms of a leads to,

$$\frac{\partial}{\partial a}\left(\frac{\partial \hat{U}^w(a|x_0)}{\partial x}\right)=\underbrace{\bar{w}_x\cdot\frac{\partial l}{\partial a}}_{>0}\underbrace{\left[(2\lambda-1)-\frac{1}{\varsigma''(l_s)\cdot l_s}\left((2\lambda-1)\varsigma'(l_s)-\lambda\frac{\varsigma(l_s)}{l_s}\right)\right]}_{<0}$$
$$+\underbrace{\frac{\partial}{\partial a}\left(\frac{\partial l}{\partial x}\right)}_{>0}\underbrace{\left((2\lambda-1)\varsigma'(l_s)-\lambda\frac{\varsigma(l_s)}{l_s}\right)}_{<0}<0.$$

Hence, the left-hand side of (53) decreasing in a. Using a similar argument as the one used in proposition 2, $\lim_{a\to\underline{a}_0^+}\frac{\partial \hat{U}^w(a|x_0)}{\partial x}=+\infty$ and there is some cutoff $\hat{a}_0^x\in(\underline{a}_0,\overline{a}_0)$ given by

$$\frac{\partial \hat{U}(\hat{a}_0^x|x_0)}{\partial x}=0,$$

such that $\frac{\partial \hat{U}^w(a|x_0)}{\partial x}>0$ if $a<\hat{a}_0^x$ and $\frac{\partial \hat{U}^w(a|x_0)}{\partial x}<0$ if $a>\hat{a}_0^x$. Moreover, from proposition 1,

$$\frac{\partial}{\partial a}\left(-\frac{\partial \tilde{f}(a|x_0)}{\partial x}\right)<0.$$

Thus, the right-hand side of (53) is also decreasing in a. Additionally, $\lim_{a\to\underline{a}_0^+}-\frac{\partial \tilde{f}(a|x_0)}{\partial x}=+\infty$ and $-\frac{\partial \tilde{f}(a|x_0)}{\partial x}=0$ for $a\geq\overline{a}_0$. Since $\frac{\partial \hat{U}^w(\hat{a}_0^x|x_0)}{\partial x}=0$ and $\hat{a}_0^x<\overline{a}_0$, then $-\frac{\partial \tilde{f}(a|x_0)}{\partial x}$ is always above $\frac{\partial \hat{U}^w(a|x_0)}{\partial x}$. Thus, there is no solution for equation (53). Figure 23 in section 8.5 of this appendix illustrates condition (53) in terms of a_{gp}^x. The left-hand side is represented by the red solid line, while the blue dashed line depicts the right-hand side.

In conclusion, the solution of the government's problem is $\mathcal{P}_{gp}(a)=(\varphi_0,\theta_0)$, i.e. $a_{gp}^x=a_M$.

Case 2: $\lambda>\frac{1}{2-1/\gamma}$

Note that this condition is equivalent to $\gamma>\frac{\lambda}{2\lambda-1}$. Thus,

$$(2\lambda-1)\varsigma'(l_s)-\lambda\frac{\varsigma(l_s)}{l_s}=[(2\lambda-1)\gamma-\lambda](l_s)^{\gamma-1}>0$$

and

$$(2\lambda-1)-\frac{1}{\varsigma''(l_s)\cdot l_s}\left((2\lambda-1)\varsigma'(l_s)-\lambda\frac{\varsigma(l_s)}{l_s}\right)=\frac{(2\lambda-1)\gamma(\gamma-2)+\lambda}{\gamma(\gamma-1)}>\frac{\lambda(\gamma-1)}{\gamma(\gamma-1)}=\frac{\lambda}{\gamma}>0.$$

Using the same argument used in proposition 2, $\frac{\partial}{\partial a}\left(\frac{\partial \hat{U}^w(a|x_0)}{\partial x}\right) > 0$. Moreover , $\lim_{a\to \underline{a}_0^+} \frac{\partial \hat{U}^w(a|x_0)}{\partial x} = -\infty$ and there is a cutoff $\hat{a}_0^x \in (\underline{a}_0, \overline{a}_0)$ such that $\frac{\partial \hat{U}^w(a|x_0)}{\partial x} < 0$ if $a < \hat{a}_0^x$ and $\frac{\partial \hat{U}^w(a|x_0)}{\partial x} > 0$ if $a > \hat{a}_0^x$.[24]

As in the previous case, figure 24 in section 8.5 illustrates equation (53) in terms of a_{gp}^x. There is a unique solution $a_{gp}^x \in (\hat{a}_0^x, \overline{a}_0)$ to equation (53). In particular, when $\lambda = 1$ the FOC reads as $\frac{\partial U^w(a_{gp}^x|x_0)}{\partial x} = 0$, which by proposition 2 is solved by $a_{gp}^x = \tilde{a}_0^x$. Otherwise, when $\lambda \in (\frac{1}{2-1/\gamma}, 1)$, $a_{gp}^x > \hat{a}_0^x > \tilde{a}_0^x$, as shown in the figure. ■

Lemma 1 *If $\lambda > \frac{1}{2-1/\gamma}$, the equilibrium size threshold, a_{gp}^x under sticky wages is strictly decreasing in λ.*

Proof: Differentiating (21) in terms of λ,

$$\frac{\partial U^w}{\partial x} + \lambda \cdot \frac{\partial^2 U^w}{\partial a_{gp}^x \partial x}\frac{\partial a_{gp}^x}{\partial \lambda} = \frac{\partial U^e}{\partial x} - (1-\lambda)\cdot \frac{\partial^2 U^e}{\partial a_{gp}^x \partial x}\frac{\partial a_{gp}^x}{\partial \lambda},$$

$$\Longrightarrow \frac{\partial a_{gp}^x}{\partial \lambda} = \frac{\frac{\partial U^e}{\partial x} - \frac{\partial U^w}{\partial x}}{\lambda \frac{\partial^2 U^w}{\partial a_{gp}^x \partial x} + (1-\lambda)\frac{\partial^2 U^e}{\partial a_{gp}^x \partial x}}. \tag{55}$$

Note that from (21),

$$\lambda\left(\frac{\partial U^w}{\partial x} - \frac{\partial U^e}{\partial x}\right) = -\frac{\partial U^e}{\partial x} > 0,$$

thus, the numerator of (55) is negative. Finally, from propositions 1 and 2, the denominator is positive. Thus, $\frac{\partial a_{gp}^x}{\partial \lambda} < 0$, when $\lambda > \frac{1}{2-1/\gamma}$. ■

Lemma 2 *The equilibrium wage w is increasing in a^x. In particular, if $a^x = \underline{a}_0$, the change in w is such that $\frac{\partial \bar{w}}{\partial a^x} = 0$.*

Proof: Recall the labor market equilibrium conditions:

$$m^0 \cdot l_s(x_0) = \int_{\underline{a}}^{a^x} l(a|x_0)\partial G, \tag{56}$$

$$m^1 \cdot l_s(x_1) = \int_{a^x}^{a_M} l(a|x_1)\partial G, \tag{57}$$

$$m^0 + m^1 = G(\underline{a}). \tag{58}$$

[24] Since $\lambda > 2\lambda - 1$ when $\lambda \in (0,1)$, then the cutoff at which $\frac{\partial \hat{U}^w}{\partial x} = 0$ is to the right of that at which $\frac{\partial U^w}{\partial x} = 0$.

Differentiation of conditions (56) to (58) in terms of a^x leads to,

$$\frac{\partial m^0}{\partial a^x} l_s^0 + m^0 \frac{\partial l_s^0}{\partial a^x} = \int_{\underline{a}}^{a^x} \frac{\partial l^0(a)}{\partial a^x} \partial G + l^0(a^x) g(a^x) - l^0(\underline{a}) g(\underline{a}) \frac{\partial \underline{a}}{\partial a^x}, \tag{59}$$

$$\frac{\partial m^1}{\partial a^x} l_s^1 + m_1 \frac{\partial l_s^1}{\partial a^x} = \int_{a^x}^{a_M} \frac{\partial l^1(a)}{\partial a^x} \partial G - l^1(a^x) g(a^x), \tag{60}$$

$$\frac{\partial m^1}{\partial a^x} = g(\underline{a}) \frac{\partial \underline{a}}{\partial a^x} - \frac{\partial m^0}{\partial a^x}, \tag{61}$$

where I have defined $l^0(a) \equiv l(a|x_0)$, $l^1(a) \equiv l(a|x_1)$, $l_s^0 \equiv l_s(x_0)$ and $l_s^1 \equiv l_s(x_1)$.

Combining (60) and (61),

$$\frac{\partial m^0}{\partial a^x} = \left(- \int_{a^x}^{a_M} \frac{\partial l^1(a)}{\partial a^x} \partial G + l^1(a^x) g(a^x) + l_s^1 g(\underline{a}) \frac{\partial \underline{a}}{\partial a^x} + m_1 \frac{\partial l_s^1}{\partial a^x} \right) \frac{1}{l_s^1}, \tag{62}$$

rearranging (59),

$$\frac{\partial m^0}{\partial a^x} = \left(\int_{\underline{a}}^{a^x} \frac{\partial l^0(a)}{\partial a^x} \partial G + l^0(a^x) g(a^x) - l^0(\underline{a}) g(\underline{a}) \frac{\partial \underline{a}}{\partial a^x} - m^0 \frac{\partial l_s^0}{\partial a^x} \right) \frac{1}{l_s^0}. \tag{63}$$

Equalizing conditions (62) and (63),

$$l_s^1 \int_{\underline{a}}^{a^x} \frac{\partial l^0(a)}{\partial a^x} \partial G + l_s^0 \int_{a^x}^{a_M} \frac{\partial l^1(a)}{\partial a^x} \partial G - l_s^1 (l^0 + l_s^0) g(\underline{a}) \frac{\partial \underline{a}}{\partial a^x} - m^0 l_s^1 \frac{\partial l_s^0}{\partial a^x} - m^1 l_s^0 \frac{\partial l_s^1}{\partial a^x} = (l^1(a^x) - l^0(a^x)) g(a^x),$$

$$\Rightarrow \frac{\partial w}{\partial a^x} \left(l_s^1 \int_{\underline{a}}^{a^x} \underbrace{\frac{\partial l^0(a)}{\partial w}}_{<0} \partial G + l_s^0 \int_{a^x}^{a_M} \underbrace{\frac{\partial l^1(a)}{\partial w}}_{<0} \partial G - l_s^1 (l^0 + l_s^0) g(\underline{a}) \underbrace{\frac{\partial \underline{a}}{\partial w}}_{>0} - m^0 l_s^1 \underbrace{\frac{\partial l_s^0}{\partial w}}_{>0} - m^1 l_s^0 \underbrace{\frac{\partial l_s^1}{\partial w}}_{>0} \right) = \underbrace{(l^1(a^x) - l^0(a^x))}_{<0} g(a^x).$$

This last condition implies that $\frac{\partial w}{\partial a^x} > 0$. Finally, suppose that $a^x \leq \underline{a}_0$, that is EPLs increase from x_0 to x_1 for all firms. Recall the equilibrium labor market condition under a flat labor policy,

$$l_s G(\underline{a}) = \int_{\underline{a}}^{a_M} l(a) \partial G.$$

Differentiation in terms of $x = \{\varphi, \theta\}$ leads to,

$$\frac{\partial l_s}{\partial x} G(\underline{a}) + l_s g(\underline{a}) \frac{\partial \underline{a}}{\partial x} = \int_{\underline{a}}^{a_M} \frac{\partial l}{\partial x} \partial G,$$

$$\Rightarrow \frac{\partial \bar{w}}{\partial x} \underbrace{\left(\frac{\partial l_s}{\partial \bar{w}} G(\underline{a}) + l_s g(\underline{a}) \frac{\partial \underline{a}}{\partial \bar{w}} - \int_{\underline{a}}^{a_M} \frac{\partial l}{\partial \bar{w}} \partial G \right)}_{>0} = 0,$$

where I have used that $\frac{\partial l_s}{\partial x} = \frac{\partial \bar{w}}{\partial x}\frac{\partial l_s}{\partial \bar{w}}$, $\frac{\partial \underline{a}}{\partial x} = \frac{\partial \bar{w}}{\partial x}\frac{\partial \underline{a}}{\partial \bar{w}}$ and $\frac{\partial l}{\partial x} = \frac{\partial \bar{w}}{\partial x}\frac{\partial l}{\partial \bar{w}}$. In conclusion, $\frac{\partial \bar{w}}{\partial x} = 0$ if $a^x \leq \underline{a}_0$.[25] ■

Proposition 5

1. *$\bar{U}(a^x, \lambda)$ achieves a global maximum in $[\underline{a}_0, a_M]$ at some size threshold $a^x_{gp} \in (\underline{a}_0, a_M)$ characterized by*

$$a^x_{gp} = \sup_{a^x} \bar{U}(a^x, \lambda).$$

Suppose that $g(\cdot)$ satisfies $g' < 0$, then,

2. *$\bar{U}^e(a^x, \lambda)$ and $\bar{U}^w(a^x, \lambda)$ are strictly concave in a^x.*

3. *The equilibrium size threshold, a^x_{gp} under flexible wages is the unique solution to,*

$$\lambda \frac{\partial \bar{U}^w(a^x_{gp}, \lambda)}{\partial a^x} = -(1-\lambda)\frac{\partial \bar{U}^e(a^x_{gp}, \lambda)}{\partial a^x}, \quad x \in \{\varphi, \theta\}.$$

4. *The equilibrium size threshold a^x_{gp} is decreasing in λ.*

Proof: Differentiation of equations (23) and (22) in terms of a^x leads to,

$$\begin{aligned}\frac{\partial \bar{U}^e(a^x)}{\partial a^x} &= \int_{\underline{a}_0}^{a^x} \frac{\partial U^e(a|x_0)}{\partial a^x}\partial G + \int_{a^x}^{a_M} \frac{\partial U^e(a^x|x_1)}{\partial a^x}\partial G + [U^e(a^x|x_0) - U^e(a^x|x_1)]g(a^x), \\ &= \frac{\partial w}{\partial a^x}\left[\int_{\underline{a}_0}^{a^x} \frac{\partial U^e(a|x_0)}{\partial w}\partial G + \int_{a^x}^{a_M} \frac{\partial U^e(a^x|x_1)}{\partial w}\partial G\right] + [U^e(a^x|x_0) - U^e(a^x|x_1)]g(a^x).\end{aligned} \tag{64}$$

$$\begin{aligned}\frac{\partial \bar{U}^w(a^x)}{\partial a^x} &= \int_{\underline{a}_0}^{a^x} \frac{\partial U^w(a|x_0)}{\partial a^x}\partial G + \int_{a^x}^{a_M} \frac{\partial U^w(a|x_1)}{\partial a^x}\partial G + [U^w(a^x|x_0) - U^w(a^x|x_1)]g(a^x), \\ &= \frac{\partial w}{\partial a^x}\left[\int_{\underline{a}_0}^{a^x} \frac{\partial U^w(a|x_0)}{\partial w}\partial G + \int_{a^x}^{a_M} \frac{\partial U^w(a|x_1)}{\partial w}\partial G\right] + [U^w(a^x|x_0) - U^w(a^x|x_1)]g(a^x).\end{aligned} \tag{65}$$

Proof of Item 1

I start by showing that $\bar{U}^e$ and $\bar{U}^w$ achieve a global maximum. First, recall that $\lim_{a\to\underline{a}_0} \frac{\partial U^w(a|x_0)}{\partial x} = -\infty$ and $\lim_{a\to\underline{a}_0} \frac{\partial U^e(a|x_0)}{\partial x} = -\infty$ (see the proofs of propositions 1 and 2). Therefore, $\lim_{a^x\to\underline{a}_0^+} \frac{\partial \bar{U}^w(a^x)}{\partial a^x} >$

[25] Note that the proof works even when $\underline{a}$ responds to a change in a^x. In particular, the result holds when the minimum wealth does not change (i.e $\frac{\partial \underline{a}}{\partial x} = 0$) and is given by $\underline{a}_0$.

0 and $\lim_{a^x \to \underline{a}_0^+} \frac{\partial U^e(a^x)}{\partial a^x} > 0$. Secondly, note that $\bar{U}^w(a^x)$ and $\bar{U}^e(a^x)$ are bounded in $[\underline{a}_0, a_M]$,

$$\bar{U}^e(a^x) < M^e \equiv U^e(a_M|x_0)[1 - G(\underline{a}_0)], \quad \forall a^x \in [\underline{a}_0, a_M],$$
$$\bar{U}^w(a^x) < M^w \equiv U^w(\overline{a}_0|x_1)[1 - G(\underline{a}_0)], \quad \forall a^x \in [\underline{a}_0, a_M],$$

where I have used the result of proposition 1 that $U^e(a|x)$ is increasing in a and decreasing in x. Also, proposition 2 states that $U^w(a|x)$ is weakly increasing in (a, x) and positive for $a \in [\tilde{a}_0^x, a_M]$. Thus, $\bar{U}^e(a^x)$ and $\bar{U}^w(a^x)$ are bounded by some finite positive numbers M^w and M^e, respectively.

In conclusion, $\bar{U}^e(a^x)$ and $\bar{U}^w(a^x)$ are continuous and bounded functions in $[\underline{a}_0, a_M]$ satisfying: i) $\bar{U}^e(\underline{a}_0) = \bar{U}^e(a_M) > 0$ and $\bar{U}^w(\underline{a}_0) = \bar{U}^w(a_M) > 0$,[26] ii) $\frac{\partial \bar{U}^e(\underline{a}_0^+)}{\partial a^x} > 0$ and $\frac{\partial \bar{U}^w(\underline{a}_0^+)}{\partial a^x} > 0$. Thus, $\bar{U}^e(a^x)$ and $\bar{U}^w(a^x)$ achieve a global maximum $\tilde{M}^e > \bar{U}^e(\underline{a}_0)$ and $\tilde{M}^w > \bar{U}^w(\underline{a}_0)$ given by

$$\tilde{M}^e = \sup_{a^x} \bar{U}^e(a^x), \quad x \in \{\varphi, \theta\},$$
$$\tilde{M}^w = \sup_{a^x} \bar{U}^w(a^x), \quad x \in \{\varphi, \theta\},$$

In consequence, $\bar{U} = \lambda \bar{U}^w + (1 - \lambda)\bar{U}^e$ achieves a global maximum. Moreover, properties i) and ii) imply that the global maximum is achieved at some $a_{gp}^x \in (\underline{a}_0, a_M)$. Thus, the equilibrium policy is S-shaped regardless of the value of λ.

Proof of Item 2

Differentiation of (64) and (65) in terms of a^x leads to,

$$\frac{\partial^2 \bar{U}^e}{\partial a^{x2}} = -2\left[\frac{\partial U^e(a^x|x_1)}{\partial a^x} - \frac{\partial U^e(a^x|x_0)}{\partial a^x}\right] \cdot g(a^x) - [U^e(a^x|x_1) - U^e(a^x|x_0)] \cdot g'(a^x), \tag{66}$$
$$\frac{\partial^2 \bar{U}^w}{\partial a^{x2}} = -2\left[\frac{\partial U^w(a^x|x_1)}{\partial a^x} - \frac{\partial U^w(a^x|x_0)}{\partial a^x}\right] \cdot g(a^x) - [U^w(a^x|x_1) - U^w(a^x|x_0)] \cdot g'(a^x). \tag{67}$$

Note that $\frac{\partial U^e}{\partial a^x} = \frac{\partial w}{\partial a^x}\frac{\partial U^e}{\partial w}$ and $\frac{\partial U^w}{\partial a^x} = \frac{\partial w}{\partial a^x}\frac{\partial U^w}{\partial w}$. Propositions 1 and 2 show that $\frac{\partial^2 U^e}{\partial a \partial w} > 0$ and $\frac{\partial^2 U^w}{\partial a \partial w} > 0$. Thus, the first terms of equations (66) and (67) are negative. Moreover, recall that $\frac{\partial U^e}{\partial x} < 0$. Thus, if $g' < 0$, then the second term of (66) is negative. Therefore, $\frac{\partial^2 \bar{U}^e}{\partial a^{x2}} < 0$ and $\bar{U}^e$ is strictly concave in a^x. Note however that the sign of $\frac{\partial U^w}{\partial x}$ depends on a^x. In particular, if $a^x > \tilde{a}_0^x$ then from proposition 2, $\frac{\partial U_w}{\partial x} > 0$ and the sign of (67) is ambiguous.

In order to find the sign of (67), I use the fact that the labor market satisfies the following welfare condition,

$$\bar{U}^w = u^w(x_0)m^0 + u^w(x_1)m^1.$$

[26]These properties come from the fact that having $a^x = \underline{a}_0$ or $a^x = a_M$ leads to the same expected wage $\bar{w}$ and thus, to the same equilibrium outcomes (see the last part of lemma 2)

Differentiating twice in terms of a^x gives,

$$\frac{\partial^2 \bar{U}^w}{\partial a^{x2}} = -2\left[\frac{\partial u^w(x_1)}{\partial a^x} - \frac{\partial u^w(x_0)}{\partial a^x}\right]\frac{\partial m^0}{\partial a^x}, \\ -2\underbrace{\frac{\partial w}{\partial a^x}}_{>0}\left[\frac{\partial u^w(x_1)}{\partial w} - \frac{\partial u^w(x_0)}{\partial w}\right]\underbrace{\frac{\partial m^0}{\partial a^x}}_{>0}, \tag{68}$$

where I have used that $\frac{\partial m_1}{\partial a^x} = -\frac{\partial m_0}{\partial a^x}$. For the term in square brackets note that,

$$\frac{\partial u^w}{\partial x} = \frac{\partial \bar{w}}{\partial x} l_s + \underbrace{(\bar{w} - \varsigma'(l_s))}_{=0}\frac{\partial l_s}{\partial x},$$

therefore,

$$\frac{\partial^2 u^w}{\partial w \partial x} = \underbrace{\frac{\partial^2 \bar{w}}{\partial w \partial x}}_{>0} l_s + \underbrace{\frac{\partial \bar{w}}{\partial x}\frac{\partial l_s}{\partial w}}_{>0} > 0,$$

In conclusion, (68) is negative and $\bar{U}^w$ is also strictly concave in a^x.

Proof of Item 3

Since both $\bar{U}^e$ and $\bar{U}^w$ are strictly concave, then $\bar{U} = \lambda \bar{U}^w + (1-\lambda)U^e$ is strictly concave. The unique size threshold a^x_{gp} that maximizes $\bar{U}$ is then given by (26).

Proof of Item 4

Finally, from propositions 1 and 2, $\frac{\partial U^w(a)}{\partial w} \geq \frac{\partial U^e(a)}{\partial w}$ for $a > \underline{a}_0$. Therefore, the size threshold at which $\frac{\partial \bar{U}^w}{\partial a^x} = 0$ is to the left of that at which $\frac{\partial \bar{U}^e}{\partial a^x} = 0$. Since both functions are concave, the size threshold that maximizes $\bar{U}$ moves to the left as λ increases, which proves the last item. ■

Lemma 3 *There exists a critical value $\bar{\epsilon} > 0$ such that agents with $a \in [a^x, a^x + \bar{\epsilon})$ report having slightly less assets than a^x.*

Proof: Consider an agent endowed with wealth $a = a^x + \epsilon$, where $\epsilon > 0$. Thus, if she reports her assets truthfully she invests $k = a^x + \epsilon + d(a^x + \epsilon)$ and hires $l = l(a^x + \epsilon)$ units of labor. The utility she obtains from reporting a is given by

$$U^e(a|x_1) = pf(k, l) + (1-p)\eta k - \bar{w}(x_1)l - (1+\rho)d,$$

Otherwise, if she under-reports her size and says that she owns slightly less than a^x, then her utility is given by

$$U^e(a^x|x_0) = pf(k^x, l^x) + (1-p)\eta k^x - \bar{w}(x_0)l - (1+\rho)d^x,$$

where $k^x = a^x + d(a^x)$ and $l^x = l(a^x)$. Define the following auxiliary function,

$$h(\epsilon) \equiv U^e(a|x_1) - U^e(a^x|x_0) = p[f(k,l) - f(k^x, l^x)] + (1-p)\eta[k - k^x] - \bar{w}(x_1)l + \bar{w}(x_0)l^x - (1+\rho)[d - d^x]. \tag{69}$$

First, note that,

$$h(\epsilon)\Big|_{\epsilon=0} = \bar{w}(x_0)l^x - \bar{w}(x_1)l < 0,$$

since $\bar{w}(x_0) < \bar{w}(x_1)$ and $l > l^x$. Secondly, differentiate $h(\epsilon)$ in terms of ϵ,

$$\begin{aligned}\frac{\partial h(\epsilon)}{\partial \epsilon} &= U^e_k(a|x_1)\frac{\partial k}{\partial \epsilon} + U^e_l(a|x_1)\frac{\partial l}{\partial \epsilon} + U^e_d(a|x_1)\frac{\partial d}{\partial \epsilon},\\ &= \underbrace{[pf_k(k,l) + (1-p)\eta]}_{>0}\left(1 + \frac{\partial d}{\partial \epsilon}\right) + \underbrace{[pf_k(k,l) - (1+r^*)]}_{\geq 0}\frac{\partial d}{\partial \epsilon} > 0,\end{aligned}$$

where I have used that $\frac{\partial d}{\partial \epsilon} = \frac{\partial d}{\partial a}\frac{\partial a}{\partial \epsilon} > 0$, since $\frac{\partial d}{\partial a} > 0$. Finally, since $h(0) < 0$, $h' > 0$ and h is continuous in ϵ, there is a unique $\bar{\epsilon} > 0$ such that $h(\bar{\epsilon}) = 0$. Thus, any agent with assets $a \in [a^x, a^x + \bar{\epsilon})$ is better off by reporting slightly less assets than a^x. ■

Lemma 4 *The expected labor regulation policy, $\mathcal{P}_{rp} : [\underline{a}_0, a_M] \longrightarrow \mathcal{O}$ that arises from the random proposer model satisfies,*

$$\mathcal{P}^{\varphi}_{rp}(a) = \begin{cases} \varphi_0 & \text{if } a \in [\underline{a}_0, \tilde{a}^{\varphi}_0), \\ \varphi_0 + \mu\Delta & \text{if } a \geq \tilde{a}^{\varphi}_0, \end{cases}$$

and

$$\mathcal{P}^{\theta}_{rp}(a) = \begin{cases} \theta_0 & \text{if } a \in [\underline{a}_0, \tilde{a}^{\theta}_0), \\ \theta_0 + \mu\Delta & \text{if } a \geq \tilde{a}^{\theta}_0. \end{cases}$$

Proof: Define $\mathcal{P}_u(a) = (\mathcal{P}^{\varphi}_u(a), \mathcal{P}^{\theta}_u(a))$ and $\mathcal{P}_e(a) = (\mathcal{P}^{\varphi}_e(a), \mathcal{P}^{\theta}_e(a))$ as the preferred policies of unions and entrepreneurs, respectively. First, observe that when bargaining, agents cannot anticipate the effect of their decisions on the equilibrium wage, w. Thus, in this case, $w_{\varphi} = psw$ and $w_{\theta} = (1-p)w$. That is, they only consider the direct positive effect of higher labor protection on the expected wage, but not the negative effect on w that happens when the economy-wide labor regulations improve. From proposition 2, $\frac{dU^w(|\varphi,\theta)}{dx} < 0$ if $a \in [\underline{a}_0, \tilde{a}^x)$ and $\frac{dU^w(|\varphi,\theta)}{dx} > 0$ if $a > \tilde{a}^x$. Thus,

$$\mathcal{P}^{\varphi}_u(a) = \begin{cases} \varphi_0 & \text{if } a \in [\underline{a}_0, \tilde{a}^{\varphi}_0), \\ \varphi_1 & \text{if } a \geq \tilde{a}^{\varphi}_0, \end{cases}$$

and

$$\mathcal{P}_u^{\theta}(a) = \begin{cases} \theta_0 & \text{if } a \in [\underline{a}_0, \tilde{a}_0^{\theta}), \\ \theta_1 & \text{if } a \geq \tilde{a}_0^{\theta}, \end{cases}$$

Moreover, from proposition 1, $\frac{\partial U^e(a|\mathcal{P}_0)}{\partial x} < 0$ for any $a \geq \underline{a}_0$, thus $\mathcal{P}_e^{\varphi}(a) = \varphi_0$ and $\mathcal{P}_e^{\theta}(a) = \theta_0$.

From the random proposer model, the labor regulation is set at $\mathcal{P}_u(a)$ with frequency μ and at $\mathcal{P}_e(a)$ with frequency $1-\mu$. Thus, the resulting expected labor rule $\mathcal{P}_{rp} = (\mathcal{P}_{rp}^{\varphi}, \mathcal{P}_{rp}^{\theta})$ is given by

$$\mathcal{P}_{rp}^{\varphi}(a) = \begin{cases} \varphi_0 & \text{if } a \in [\underline{a}_0, \tilde{a}_{rp}^{\varphi}), \\ \varphi_1\mu + \varphi_0(1-\mu) & \text{if } a \geq \tilde{a}_{rp}^{\varphi}, \end{cases}$$

and

$$\mathcal{P}_{rp}^{\theta}(a) = \begin{cases} \theta_0 & \text{if } a \in [\underline{a}_0, \tilde{a}_{rp}^{\theta}), \\ \theta_1\mu + \theta_0(1-\mu) & \text{if } a \geq \tilde{a}_{rp}^{\theta}, \end{cases}$$

Using that $\varphi_1 = \varphi_0 + \Delta$ and $\theta_1 = \theta_0 + \Delta$ leads to expressions (27) and (28). ■

Proposition 6 *The function $\mu(\lambda)$ that implements the welfare of the preferred policy is as follows,*

$$\mu(\lambda) = \begin{cases} 0 & \text{if } \lambda \leq \frac{1}{2+1/(\gamma-2)}, \\ \chi(\lambda) & \text{if } \lambda \in (\tilde{\lambda}, 1], \end{cases}$$

where $\chi(\lambda) \in (0,1]$ is some increasing function in λ such that $\chi(1) = 1$ and $\tilde{\lambda} > \frac{1}{2-1/\gamma}$.

Proof: Define the weighted welfare of the preferred policy given λ as follows,

$$\tilde{U}(\lambda) \equiv \max_{a^x \in (\underline{a}_0, a_M)} \left\{ \lambda \cdot \left(\int_{\underline{a}_0}^{a^x} U^w(a|x_0)\partial G + \int_{a^x}^{a_M} U^w(a|x_1)\partial G \right) + (1-\lambda) \cdot \left(\int_{\underline{a}_0}^{a^x} U^e(a|x_0)\partial G + \int_{a^x}^{a_M} U^e(a|x_1)\partial G \right) \right\}. \tag{70}$$

Define the weighted welfare of the expected labor regulation policy ($\mathcal{P}_{rp}$) given λ and bargaining power μ as,

$$V(\lambda,\mu) = \lambda \cdot \left(\int_{\underline{a}_0}^{\tilde{a}_0^x} U^w(a|x_0)\partial G + \int_{\tilde{a}_0^x}^{a_M} U^w(a|\tilde{x}_1)\partial G \right) + (1-\lambda) \cdot \left(\int_{\underline{a}_0}^{\tilde{a}_0^x} U^e(a|x_0)\partial G + \int_{\tilde{a}_0^x}^{a_M} U^e(a|\tilde{x}_1)\partial G \right), \tag{71}$$

where $\tilde{x}_1 \equiv x_0 + \mu \cdot \Delta$. First, note that from lemma 3, when $\lambda = 1$ and $\mu = 1$, then the size thresholds arising from the random proposer model are $(\tilde{a}^{\varphi}, \tilde{a}^{\theta})$, which coincide with the preferred policy of the government. Thus, we have that $\tilde{U}(1) = V(1,1)$. That is, $\mu = 1$ implements $\tilde{U}(1)$. Secondly, observe that if $\mu = 0$, then $\mathcal{P}_{rp} = (\varphi_0, \theta_0)$ which coincides with $\mathcal{P}_{gp}$ given $\lambda \leq \frac{1}{2+1/(\gamma-2)}$. Therefore, $\mu = 0$ implements $\tilde{U}(\lambda)$ for any $\lambda \leq \frac{1}{2+1/(\gamma-2)}$.

Finally, all is left to do is to find what μ implements $\tilde{U}(\lambda)$ when $\lambda > \frac{1}{2-1/\gamma}$. Define the FOC (53) as a function of (λ, μ, a),

$$FOC(\lambda, \mu, a) \equiv \lambda \frac{\partial U^w(a|\tilde{x}_1)}{\partial x} + (1-\lambda)\frac{\partial U^e(a|\tilde{x}_1)}{\partial x}. \tag{72}$$

Additionally, differentiate $V(\lambda, \mu)$ in terms of μ,

$$\begin{aligned}
\frac{\partial V(\lambda,\mu)}{\partial \mu} &= \frac{\partial \tilde{x}_1}{\partial \mu}\left(\lambda \int_{a^x}^{a_M} \frac{\partial U^w(a|\tilde{x}_1)}{\partial x}\partial G + (1-\lambda)\int_{a^x}^{a_M} \frac{\partial U^e(a|\tilde{x}_1)}{\partial x}\partial G\right), \\
&= \Delta \left(\int_{\tilde{a}_0^x}^{a_M} \lambda \frac{\partial \tilde{U}(a|\tilde{x}_1)}{\partial x} + (1-\lambda)\frac{\partial U^e(a|\tilde{x}_1)}{\partial x}\partial G\right), \qquad (73) \\
&= \Delta \int_{\tilde{a}_0^x}^{a_M} FOC(\lambda, \mu, a)\partial G. \qquad (74)
\end{aligned}$$

Pick $\lambda = 1 - \varepsilon$, for some $\varepsilon > 0$, but small. Note that $FOC(1-\varepsilon, 1, a) < 0$ if $a > a^x_{gp}$. Thus, by continuity of $FOC(\lambda, \mu, a)$, there must be some $\epsilon \in (0, 1)$ such that $\frac{\partial V(\lambda,\mu)}{\partial \mu} < 0$ for $\mu \in (1-\epsilon, 1)$. In consequence, it must be that $V(1-\varepsilon, \mu) \geq V(1-\varepsilon, 1) = \tilde{U}(1-\varepsilon)$ for some $\mu \in (1-\epsilon, 1)$. Hence, for a given $\lambda = 1-\varepsilon$, there exists some $\mu(\lambda) \in (1-\epsilon, 1)$ that implements $\tilde{U}(1-\varepsilon)$. Since $\tilde{U}(\lambda)$ is increasing in λ, it must be that the function characterizing $\mu(\lambda)$, named as $\chi(\lambda)$, is increasing in λ. Finally, since ε must be small, this result applies to some neighbourhood $\lambda \in (\tilde{\lambda}, 1)$, where $\tilde{\lambda} > \frac{1}{2-1/\gamma}$. This concludes the proof. ■

8.3 Data

This section explains how the data presented in figures 1 and 2 was constructed. I list below the sources for each of the 25 countries. Labor codes were obtained mainly from the International Labor Organization (ILO). For some countries the information comes from studies regarding labor regulations (which are cited after those countries' names). The focus is on countries that apply S-shaped EPLs. Thus, the data is on the size threshold from which EPLs become stricter. For each country, I searched the year in which the size threshold was enacted and all the instances in which it was changed. I consider both individual and collective dismissal regulations.

Left and right-wing governments are defined on the basis of the political orientation of the executive as measured by the World Bank Database of Political Institutions (WDPI), and defined in Beck et al. (2001). The WDPI provides a variable that can take three values "Left", "Center" or "Right". There are only two instances in which a size threshold was enacted by a center government: in 1960, Italy and in 2007, Finland.

Argentina According to the Small and Medium Entreprises Law (SMEL) enacted in 1995, article 83, the rules on notice period don't apply to SMEs defined as those companies with less than 40 employees.

Australia According to the Workplace Relations Act, 2005, claims of unfair dismissal were not available for workers in firms with 100 or more workers. Four years later, the Fair Work Act 2009, defined exemptions pertaining to dismissal in firms with less than 15 employees. Source: Vranken (2005).

Austria The Work Constitution Act, 1973, establishes that protection regarding individual dismissal only applies to firms with more than 5 employees. According to section 45a of the Labour Market Promotion Act, 1969, the definition of collective dismissals excluded enterprises with less than 20 workers. Since there are size thresholds from which both individual and collective dismissal regulations apply I choose to use the one reported by ILO, i.e. 5.

Belgium According to article 1, Royal Order on Collective Dismissals, 1976, collective dismissal regulations apply to firms with more than 20 workers. However, individual dismissal regulations apply to all firms.

Bulgary According to the Labor Code, 1986, enterprises with less than 20 workers are excluded from collective dismissal regulations. Individual dismissal regulations apply to all firms.

Cyprus The Collective Dismissals Act, section 2, 2001, excludes firms with less than 20 employees from collective dismissal regulations. Individual dismissal regulations apply to all firms.

Czech Republic According to section 62 of the Labor Code, 2006, enterprises with less than 20 workers are excluded from collective dismissal regulations. Individual dismissal regulations apply to all firms.

Denmark According to section 1 of the Collective Dismissals Act, 1994, enterprises with less than 20 workers are excluded from collective dismissal regulations. Individual dismissal regulations apply to all firms.

France Labor laws make special provisions for firms with more than 10, 11, 20 or 50 employees. However, 50 is generally agreed by labor lawyers to be the threshold from which costs increase significantly. According to the Labor Code, articles L.1235-10 to L.1235-12, 1973, firms with at least 50 employees firing more than 9 workers must follow a complex redundancy plan with oversight from Ministry of Labor. Sources: Garicano et al. (2016), Gourio and Roys (2014).

Finland The Act on Cooperation within Undertakings, 2007, establishes that procedures with regards to economic dismissals apply only to firms with 20 or more workers.

Germany In 1951, the Federal Parliament enacted a federal Act on the Protection against Dismissal (Kündigungsschutzgesetz, PADA). The Act provided that dismissals in establishments with more than 5 workers required a social justification. The threshold for the applicability of the PADA has changed three times. In 1996, from 5 to 10 employees and then back again to 5 workers in 1999. Since 2004 this threshold has been shifted to 10 workers. Sources: Siefert and Funken-Hotzel (2003), Verick (2004), Bellmann et al. (2014).

Greece According to Act No. 1387/1983 enterprises with less than 20 workers are excluded from collective dismissal regulations. Individual dismissal regulations apply to all firms.

Hungary According to section 94 of the Labor Code, 1992, enterprises with less than 20 workers are excluded from collective dismissal regulations. Individual dismissal regulations apply to all firms.

Italy Individual dismissals were first regulated in Italy in 1966 through Law No. 604. In case of dismissal, workers could take employers to court. If judges ruled that these dismissals were unfair, employers had either to reinstate the worker or pay a firing cost which depended on firm size. Those firms with more than 60 employees had to pay twice the amount paid by those firms with less than 60 workers. In 1970, the Workers' Statute (Law No. 300) established that in case of unfair dismissal those firms with more than 15 employees had to reinstate workers and pay their foregone wages. Sources: Kugler and Pica (2008), Rutherford and Frangi (2018)

South Korea The Labour Standards Act enacted in 1997, article 11, establishes that employment regulations apply to firms with more than 5 workers. Source: Yoo and Kang (2012).

Kyrgyzstan According to article 55 of the Labor Code, 2004, fixed-term contracts may be concluded during the first year of its creation in enterprises employing up to 15 workers.

Montenegro According to article 92 of the Labor Law, 2008, regulations on collective dismissals apply only to firms with at least 20 employees.

Morroco According to article 66 of the Labor Code, 2003, regulations on collective dismissals apply only to firms with at least 10 employees. Individual dismissal regulations apply to all firms.

Portugal The Decreto-Lei 64-A/89 introduced in 1989 softened the dismissal constraints faced by firms. Article 10 defined 12 specific rules that firms with more than 20 workers needed to follow. Only four of these rules applied to firms employing 20 or fewer workers. Firms with less than 50 employees were allowed to conduct a collective dismissal involving only two workers, but those enterprises with more than 50 workers required that at least five workers be dismissed. Source: Martins (2009).

Romania Article 1 of the Labor Code, 2004, that regulated individual and collective dismissal excluded enterprises with less than 20 employees.

Slovakia A new definition of collective dismissals was introduced in 2011 into the Labor Code. According to section 73, enterprises with less than 20 workers are excluded from procedural requirements regarding collective dismissals.

Slovenia The Employment Relationship Act (ERA), 2002, excluded firms with less than 20 employees from the procedural requirements applicable to collective dismissals.

Turkey According to article 18 of the Labor Act, 2003, workers in establishments with less than 30 employees are not covered by the job security provision.

United States According to the Workforce Investment Act passed in 1989, firms with 100 or more employees, excluding part-time employees, are required to provide 60 days' written notice to displaced workers. Source: Addison and Blackburn (1994).

Venezuela Under the Organic Labor Law of 1990, enterprises with less than 10 employees were exempt from the obligation to reinstate workers even if there was a court decision ruling that the dismissal was unjustified.

8.4 Additional Extensions

8.4.1 Political mechanism

This section presents a politico-economy microfoundation for the political equilibrium described in the paper. I show that the government's problem (presented in section 3.4) can be rationalized as a probabilistic voting model along the lines of Persson and Tabellini (2000, pp. 52-58), where the political weight λ depends on the primitives of the model. Figure 20 illustrates the time line.

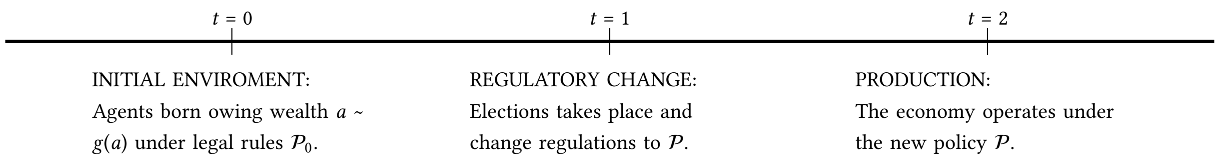

Figure 20: Timeline.

As shown in section 3.3, given $\mathcal{P}_0$, there are two groups of voters: workers (W) with wealth $a < \underline{a}_0$, and entrepreneurs (E) with $a \geq \underline{a}_0$. Their utilities are represented by (2) and (4), respectively. The political preferences of agents are defined on the basis of the ex-ante competitive equilibrium. That is, given $\mathcal{P}_0$ and a, agents vote understanding what their position in society would be and how an improvement of EPLs would affect them relative to this initial position.

The electoral competition takes place between two parties, A and B. Both parties simultaneously and noncooperatively announce their electoral platforms, $\mathcal{P}_A$ and $\mathcal{P}_B$, subject to the labor market equilibrium condition (14). The policies $\mathcal{P}_A$ and $\mathcal{P}_B$ map firm's assets to a specific strength of EPLs (x_0 or x_1, with $x \in \{\varphi, \theta\}$). Thus the proposed political platform of the parties is constrained to the set of functions: $\mathcal{P} : [0, a_M] \longrightarrow \Theta$, where $\Theta \equiv \{(\varphi_0, \theta_0), (\varphi_1, \theta_0), (\varphi_0, \theta_1), (\varphi_1, \theta_1)\}$ is the set of EPLs that can be implemented at each firm.

Under a multidimensional policy, Downsian electoral competition is known to produce cycling problems that arise because parties' objective functions are discontinuous in the policy space. Probabilistic voting smooths the political objective function by introducing uncertainty from the parties point of view (Lindbeck and Weibull, 1987). Specifically, there is uncertainty about the political preferences of each voter. As in Fischer and Huerta (2021), I assume there is a continuum of agents (a, v). Voter (a, v) in group $j \in \{W, E\}$ votes for party A if:

$$U^j(a|\mathcal{P}_A) > U^j(a|\mathcal{P}_B) + \delta + \sigma_v^j(a), \tag{75}$$

where δ reflects the general popularity of party B, which is assumed to be uniformly distributed on $[-1/(2\psi), 1/(2\psi)]$. The value of δ becomes known after the policy platforms have been announced. Thus parties announce their policy platforms under uncertainty about the results of the election. The variable $\sigma_v^j(a)$ represents the ideological preference of voter (a, v) for party B. The distribution of $\sigma_v^j(a)$ differs across workers and entrepreneurs, which is assumed to be uniform on $[-1/(2\chi^j), 1/(2\chi^j)]$. Note that neither group is biased towards either party, but that they differ in their ideological homogeneity represented by the density χ^j. Parties know the group-specific ideological distributions before announcing their platforms. The term $\delta + \sigma_v^j(a)$ captures the relative 'appeal' of candidate B. That is, the inherent bias of voter v with wealth a in group j for party B, irrespective of the proposed political platforms.

I study the policy outcome under an electoral rule corresponding to proportional representation. Thus a party requires more than 50% of total votes to win the election. To characterize the political outcome, it is useful to identify the 'swing voter' ($v = V$) in each group $j \in \{W, E\}$ and for each value of wealth a in that group. That is, the voter in group j with wealth a who is indifferent between the two parties:

$$\sigma_V^j(a) = U^j(a|\mathcal{P}_A) - U^j(a|\mathcal{P}_B) - \delta. \tag{76}$$

All agents endowed with wealth a whose ideological preference is such that $\sigma_v^j(a) < \sigma_V^j(a)$ vote for party A, while the rest vote for party B. Therefore, conditional on δ, the fraction of agents in group j with wealth a that vote for party A is:

$$\begin{aligned}\pi_A^j(a|\delta) &= Prob[\sigma_v^j(a) < \sigma_V^j(a)],\\ &= \chi^j[U^j(a|\mathcal{P}_A) - U^j(a|\mathcal{P}_B) - \delta] + \frac{1}{2}.\end{aligned} \tag{77}$$

The probability that party A wins the election, p_A is then given by

$$p_A = Prob\left[\int_0^{\underline{a}_0} \pi_A^W(a|\delta)\partial G(a) + \int_{\underline{a}_0}^{a_M} \pi_A^E(a|\delta)\partial G(a) \geq \frac{1}{2}\right],$$

where the probability is taken with respect to the general popularity measure δ. Rearranging terms leads to:

$$\begin{aligned}p_A = Prob\Bigg[&\chi^W \int_0^{\underline{a}_0} [U^W(a|\mathcal{P}_A) - U^W(a|\mathcal{P}_B)]\partial G(a) + \chi^E \int_{\underline{a}_0}^{a_M} [U^E(a|\mathcal{P}_A) - U^E(a|\mathcal{P}_B)]\partial G(a)\\ &- \delta[\chi^W G(\underline{a}_0) + \chi^E(1 - G(\underline{a}_0))] \geq 0\Bigg],\\ = Prob\Bigg[&\delta \leq \frac{\chi^W \int_0^{\underline{a}_0}[U^W(a|\mathcal{P}_A) - U^W(a|\mathcal{P}_B)]\partial G(a) + \chi^E \int_{\underline{a}_0}^{a_M}[U^E(a|\mathcal{P}_A) - U^E(a|\mathcal{P}_B)]\partial G(a)}{\chi^W G(\underline{a}_0) + \chi^E(1 - G(\underline{a}_0))}\Bigg],\\ = Prob\Bigg[&\delta \leq \frac{\chi^W[\bar{U}^W(\mathcal{P}_A) - \bar{U}^W(\mathcal{P}_B)] + \chi^E[\bar{U}^E(\mathcal{P}_A) - \bar{U}^E(\mathcal{P}_B)]}{\bar{\chi}}\Bigg],\end{aligned}$$

where I have defined:

$$\bar{U}^W(\mathcal{P}) \equiv \int_0^{\underline{a}_0} U^W(a|\mathcal{P})\partial G(a),$$
$$\bar{U}^E(\mathcal{P}) \equiv \int_{\underline{a}_0}^{a_M} U^E(a|\mathcal{P})\partial G(a),$$
$$\bar{\chi} \equiv \chi^W G(\underline{a}_0) + \chi^E(1 - G(\underline{a}_0).$$

Therefore, the probability that party A wins the election is,

$$p_A = \psi\left[\frac{\chi^W}{\bar{\chi}}(\bar{U}^W(\mathcal{P}_A) - \bar{U}^W(\mathcal{P}_B)) + \frac{\chi^E}{\bar{\chi}}(\bar{U}^E(\mathcal{P}_A) - \bar{U}^E(\mathcal{P}_B))\right] + \frac{1}{2}$$

Define the relative political weight of workers and entrepreneurs by $\lambda^W \equiv \psi\frac{\chi^W}{\bar{\chi}}$ and $\lambda^E \equiv \psi\frac{\chi^E}{\bar{\chi}}$, respectively. Since both parties maximize the probability of wining the election, the Nash equilibrium is characterized by

$$\mathcal{P}_A^* = \arg\max_{\mathcal{P}_A}\{\lambda^W(\bar{U}^W(\mathcal{P}_A) - \bar{U}^W(\mathcal{P}_B)) + \lambda^E(\bar{U}^E(\mathcal{P}_A) - \bar{U}^E(\mathcal{P}_B))\}$$
$$\mathcal{P}_B^* = \arg\max_{\mathcal{P}_B}\{\lambda^W(\bar{U}^W(\mathcal{P}_B) - \bar{U}^W(\mathcal{P}_A)) + \lambda^E(\bar{U}^E(\mathcal{P}_B) - \bar{U}^E(\mathcal{P}_A))\}$$

As a result, the two parties' platforms converge in equilibrium to the same policy function $\mathcal{P}^*$ that maximizes the weighted welfare of workers and entrepreneurs,

$$\mathcal{P}^* = \arg\max_{\mathcal{P}}\{\lambda^W\bar{U}^W(\mathcal{P}) + \lambda^E\bar{U}^E(\mathcal{P})\}, \tag{78}$$

subject to the labor market equilibrium condition (14).

In order to interpret problem (78), rewrite the political weights as follows,

$$\lambda^W = \frac{\psi}{G(\underline{a}_0) + \frac{\chi^E}{\chi^W}(1 - G(\underline{a}_0))},$$
$$\lambda^E = \frac{\psi}{\left(\frac{\chi^W}{\chi^E} - 1\right)G(\underline{a}_0) + 1}.$$

Note that the political weights depend on both exogenous and endogenous variables. First, they are a function of the dispersion of the ideological preferences of both groups, measured by χ^j. Secondly, they are a function of the variability of party's B general popularity, ψ. Finally, they depend on the minimum wealth to obtain a loan, $\underline{a}_0$ under the initial policy $\mathcal{P}_0$. As explained in section 3.3, that threshold is endogenously determined as a function of the primitives of the model. [27]

The political weights λ^j have an structural interpretation: they measure the relative dispersion of ideological preferences within group j. The ratio χ^W/χ^E determines the number of swing voters in each group. For instance, when χ^W increases then the political weight of workers λ^W increases, but λ^E decreases. Intuitively, workers become more responsive to EPLs announcements in favor or against them. As a result, the vote of entrepreneurs become less responsive to EPLs announcements compared to workers. Thus workers become more politically powerful relative to entrepreneurs and the equilibrium platform becomes more pro-worker.

In order to write problem (78) as in section 3.4, I normalize the political weights by choosing $\psi = \frac{\chi^w G(\underline{a}_0)+\chi^E(1-G(\underline{a}_0))}{\chi^W+\chi^E}$. Thus, $\lambda^W + \lambda^E = 1$. Define $\lambda \equiv \lambda^E$, then the problem can be rewritten as

$$\mathcal{P}^* = \arg\max_{\mathcal{P}}\{\lambda \bar{U}^W(\mathcal{P}) + (1-\lambda)\bar{U}^E(\mathcal{P})\},$$

subject to the labor market equilibrium condition (14).

This corresponds to the 'government's problem' presented in the body of the paper. Thus when λ increases, the representative government chooses a policy platform that favors relatively more workers (pro-worker). If λ decreases the government becomes more pro-entrepreneurs. In particular, when $\chi^W \longrightarrow +\infty$ then $\lambda \longrightarrow 1$ and the government weights only workers. In contrast, if $\chi^E \longrightarrow +\infty$ then $\lambda \longrightarrow 0$ and the government cares only about entrepreneurs.

8.4.2 Two-dimensional labor reform

This section deals with a two-dimensional labor reform. That is, the government can change both individual and collective dismissal regulations. From proposition 3, problem (14) reduces to finding two size thresholds, a^φ and a^θ, from which EPLs become stricter. To simplify exposition define, $a^1 \equiv \min\{a^\varphi, a^\theta\}$ and $a^2 \equiv \max\{a^\varphi, a^\theta\}$. Further, define,

$$(\tilde{\varphi}, \tilde{\theta}) \equiv (\varphi_1, \theta_0)\mathbf{1}[a^\varphi \geq a^\theta] + (\varphi_0, \theta_1)\mathbf{1}[a^\varphi < a^\theta].$$

Thus, aggregate entrepreneurs' welfare ($\lambda = 0$) is,

$$\bar{U}^e(a^\varphi, a^\theta) = \int_{\underline{a}_0}^{a^1} U^e(a|\varphi_0, \theta_0)\partial G + \int_{a^1}^{a^2} U^e(a|\tilde{\varphi}, \tilde{\theta})\partial G + \int_{a^2}^{a_M} U^e(a|\varphi_1, \theta_1)\partial G,$$

[27] Specifically, $\underline{a}_0$ depends on: i) the probability of success of a firm p, ii) the recovery rate of bankruptcy procedures η, iii) the initial strength of EPLs (φ_0, θ_0), iv) the international interest rate ρ, v) the fixed cost F to start a firm, and vi) the parameters of the production function α, β.

while aggregate workers' welfare ($\lambda = 1$) is given by

$$\bar{U}^w(a^\varphi, a^\theta) = \int_{\underline{a}_0}^{a^1} U^w(a|\varphi_0, \theta_0)\partial G + \int_{a^1}^{a^2} U^w(a|\tilde{\varphi}, \tilde{\theta})\partial G + \int_{a^2}^{a_M} U^w(a|\varphi_1, \theta_1)\partial G.$$

The government's problem is written as follows,

$$\begin{aligned}
\max_{(a^\varphi, a^\theta)\in[\underline{a}_0, a_M]^2} &\{\bar{U}(a_1, a_2) \equiv \lambda\bar{U}^w(a_1,a_2) + (1-\lambda)\bar{U}^w(a_1, a_2)\} \\
s.t \qquad m(\varphi_0, \theta_0)\cdot l_s(\varphi_0, \theta_0) &= \int_{\underline{a}_0}^{a^1} l(a|\varphi_0, \theta_0)\partial G, \\
m(\tilde{\varphi}, \tilde{\theta})\cdot l_s(\tilde{\varphi}, \tilde{\theta}) &= \int_{a^1}^{a^2} l(a|\tilde{\varphi}, \tilde{\theta})\partial G, \\
m(\varphi_1, \theta_1)\cdot l_s(\varphi_1, \theta_1) &= \int_{\underline{a}_0}^{a^1} l(a|\varphi_1, \theta_1)\partial G, \\
\sum_{(\varphi,\theta)\in\Theta} m(\varphi, \theta) &= G(\underline{a}_0),
\end{aligned}$$

where $m(\varphi, \theta)$ corresponds to the mass of workers subject to EPLs $(\varphi, \theta) \in \Theta$ and recall that a^1 and a^2 are defined in terms of (a^φ, a^θ). The first three conditions equalize labor supplied and demanded under the different EPL regimes. The final condition asks that the sum of workers under different EPLs must equal the total mass of workers, $G(\underline{a}_0)$. As in the unidimensional case, these conditions uniquely define $m(\varphi, \theta) \in \Theta$ and the equilibrium wage w. The following proposition describes the equilibrium policy under flexible wages.

Proposition 7 *$\bar{U}(a^\varphi, a^\theta, \lambda)$ achieves a global maximum in $[\underline{a}_0, a_M]^2$ at some size thresholds $a^\varphi_{gp} \in (\underline{a}_0, a_M)$ and $a^\theta_{gp} \in (\underline{a}_0, a_M)$ characterized by*

$$(a^\varphi_{gp}, a^\theta_{gp}) = \sup_{(a^\varphi, a^\theta)} \bar{U}(a^\varphi, a^\theta, \lambda). \tag{79}$$

Proof: The same arguments used to prove item 1 of proposition 5 apply in the two-dimensional case. Thus, $\bar{U}(a^\varphi, a^\theta)$ is a bounded and continuous function in $[\underline{a}_0, a_M]^2$, satisfying:[28]
i) $\bar{U}(\underline{a}_0, \underline{a}_0) = \bar{U}(a_M, a_M) > 0$, ii) $\frac{\partial\bar{U}(\underline{a}_0^+, a^\theta)}{\partial a^\varphi} > 0, \forall a^\theta \in [\underline{a}_0, a_M]$ and iii) $\frac{\partial\bar{U}(a^\varphi, \underline{a}_0^+)}{\partial a^\theta} > 0, \forall a^\varphi \in [\underline{a}_0, a_M]$.

In consequence, $\bar{U}(a^\varphi, a^\theta)$ achieves a global maximum. Moreover, properties i) to iii) imply that the global maximum is achieved at some $a^\varphi_{gp} \in (\underline{a}_0, a_M)$ and $a^\theta_{gp} \in (\underline{a}_0, a_M)$. ■

As in the unidimensional case, the proposition states that the equilibrium policy is S-shaped in both dimensions regardless of the political orientation of the government. Thus, in equilibrium there are three possible regulatory regimes: (φ_0, θ_0), $(\tilde{\varphi}, \tilde{\theta})$ and (φ_1, θ_1).

[28]I omit the dependece of $\bar{U}$ on λ to simplify notation.

Figure 21 illustrates the case in which $a_{gp}^{\varphi} > a_{gp}^{\theta}$, i.e. $(\tilde{\varphi}, \tilde{\theta}) = (\varphi_1, \theta_0)$. First, smaller firms with assets $a \in [\underline{a}_0, a_{gp}^{\varphi})$ are subject to both low individual and low collective dismissal regulations, (φ_0, θ_0). There is a range of medium-sized firms with assets $a \in [a_{gp}^{\varphi}, a_{gp}^{\theta})$ that face stronger individual regulations, but weak collective dismissal regulations, (φ_1, θ_0). Finally, larger firms with $a > a_{gp}^{\theta}$ are subject to stronger individual and collective EPLs, (φ_1, θ_1).

This EPLs design illustrates the cases of Austria and France. In the case of Austria, individual dismissal regulations apply only to firms with more than 5 employees, while collective regulations exclude firms with less than 20 workers. In France, firms with more than 10 workers are subject to stricter EPLs regarding economic dismissal. Additionally, in case of firing more than 9 workers (collective dismissal) firms with more than 50 workers must follow a special legal process which increases dismissal costs.

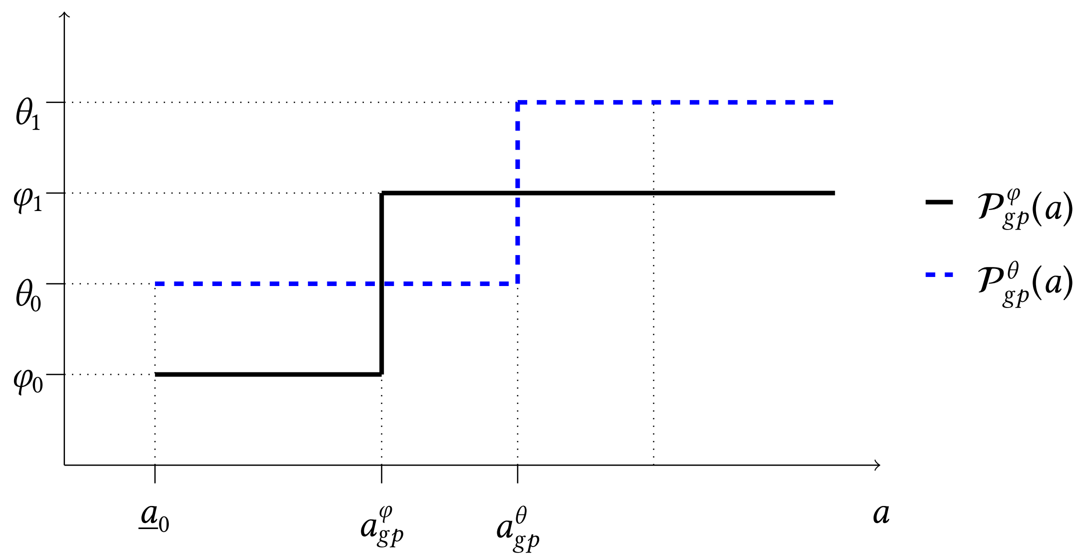

Figure 21: Equilibrium labor policy, $\mathcal{P}_{gp}(a) = (\mathcal{P}_{gp}^{\varphi}(a), \mathcal{P}_{gp}^{\theta}(a))$.

8.4.3 The size threshold in terms of labor

Section 6.2.2 shows that imposing a size threshold in terms of labor would distort hiring decisions. Firms may want to hire less labor than optimal to benefit from weak EPLs. The government problem can be restated as follows. Instead of choosing an asset threshold, a^x it can impose a labor threshold, l^x at which stronger EPLs apply. That is, in finding the preferred policy the government now internalizes the distortions from setting a labor threshold. Could the government use this mechanism to achieve the weighted welfare of the preferred policy in section 5? This section formalizes the government problem and shows that the solution of that problem is unable to replicate the welfare attained under the preferred policy of section 5.

Suppose that the government defines a labor threshold, $l^x > 0$ at which stronger EPLs apply. That is, firms hiring less labor than l^x are subject to weak EPLs, x_0, while firms hiring at least l^x units of labor face strong EPLs, x_1. Under this regulation there is a set of firms that prefer to hire slightly less labor than l^x to benefit from weak EPls. This range of firms is characterized by two endogenous asset thresholds, a_1^x and a_2^x with $a_1^x < a_2^x$:

$$U^e(a_1^x, d(a_1^x), l^x|x_0) = U^e(a_1^x, d(a_1^x), l(a_1^x)|x_0), \tag{80}$$

$$U^e(a_2^x, d(a_2^x), l^x|x_0) = U^e(a_2^x, d(a_2^x), l(a_2^x)|x_1). \tag{81}$$

Figure 22 illustrates the units of labor hired as a function of firms assets. There are three groups of firms. First, firms with $a \in [\underline{a}_0, a_1^x)$ are subject to weak EPLs (x_0) and hire labor optimally. Secondly, firms with $a \in [a_1^x, a_2^x]$ hire slightly less than l^x units of labor in order to operate under weak EPLs. Thus, they hire less labor than what is optimal according to their operation scale. Finally, firms with $a > a_2^x$ operate under strong EPLs (x_1) a hire an optimal amount of labor.[29]

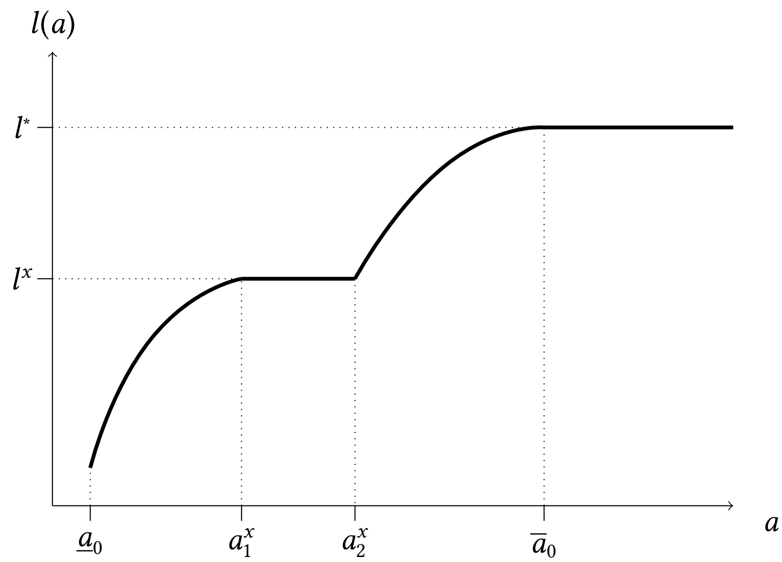

Figure 22: Labor decisions as function of assets.

Define the aggregate entrepreneurs welfare as a function of the labor threshold l^x:[30]

$$\bar{U}^e(l^x) = \int_{\underline{a}_0}^{a_1^x} U^e(a, l(a)|x_0)\partial G + \int_{a_1^x}^{a_2^x} U^e(a, l^x|x_0)\partial G + \int_{a_2^x}^{a_M} U^e(a, l(a)|x_1)\partial G, \tag{82}$$

[29] Recall that given capital, $k(a) = a + d(a)$, the optimal amount of labor, $l(a)$ is given by $pf_l(k(a), l(a)) = \bar{w}$.

[30] I omit the dependence on $d(a)$ to simplify notation.

while workers welfare is given by

$$\bar{U}^w(l^x) = \int_{\underline{a}_0}^{a_1^x} U^w(a, l(a)|x_0)\partial G + \int_{a_1^x}^{a_2^x} U_w(a, l^x|x_0)\partial G + \int_{a_2^x}^{a_M} U_w(a, l(a)|x_1)\partial G. \tag{83}$$

Differentiating (82) in terms of l^x,

$$\begin{aligned}\frac{\partial \bar{U}^e(l^x)}{\partial l^x} &= \frac{\partial a_1^x}{\partial l^x} \underbrace{\left[U^e(a_1^x, l(a_1^x)|x_0) - U^e(a_1^x, l^x|x_0)\right]}_{=0} \cdot g(a_1^x) + \frac{\partial a_2^x}{\partial l^x} \underbrace{\left[U^e(a_2^x, l^x|x_0) - U^e(a_2^x, l(a_2^x)|x_0)\right]}_{=0} \cdot g(a_2^x) \\ &+ \int_{a_1^x}^{a_2^x} \frac{\partial U^e(a, l^x|x_0)}{\partial l^x}\partial G, \\ &= \int_{a_1^x}^{a_2^x} \frac{\partial U^e(a, l^x|x_0)}{\partial l^x}\partial G = \int_{a_1^x}^{a_2^x} [pf_l(k(a), l^x) - \bar{w}]\partial G > 0,\end{aligned}$$

where I have used conditions (80) and (81). Additionally, note that $pf_l(k(a), l^x) - \bar{w} > 0$ for $a \in [a_1^x, a_2^x]$, since $l^x < l(a)$. That is, firms with $a \in [a_1^x, a_2^x]$ hire less labor than optimal. Analogously, differentiation of (83) gives,

$$\begin{aligned}\frac{\partial \bar{U}^w(l^x)}{\partial l^x} &= \int_{a_1^x}^{a_2^x} \frac{\partial U^w(a, l^x|x_0)}{\partial l^x}\partial G = \int_{a_1^x}^{a_2^x} \left[\bar{w}(x_0) - \frac{\varsigma(l_s^0)}{l_s^0}\right]\partial G, \\ &= \int_{a_1^x}^{a_2^x} \underbrace{\left[\bar{w}(x_0) - \frac{\varsigma'(l_s^0)}{\gamma}\right]}_{>0}\partial G > 0,\end{aligned}$$

where I have used that $\bar{w}(x_0) = \varsigma'(l_s^0)$ (see equation (6)) and that $\gamma > 2$.

Therefore, both $\bar{U}^e(l^x)$ and $\bar{U}^w(l^x)$ are strictly increasing in l^x. Thus, the weighted welfare, $\bar{U}(l^x) = \lambda \bar{U}^w(l^x) + (1-\lambda)\bar{U}^e(l^x)$ is strictly increasing in l^x. Hence, the preferred policy is $l_{gp}^x \longrightarrow +\infty$. This is equivalent to implement a flat labor policy where all firms are subject to weak EPLs, x_0. That is, the government chooses to keep EPLs unchanged and implement $\mathcal{P}_0$.

Section 5 shows that the only case in which the equilibrium policy is $\mathcal{P}_0$ is when $\lambda > \frac{1}{2-1/\gamma}$ and wages are sticky. In any other case the preferred policy is S-shaped. Therefore, if the government defines the size threshold in terms of labor, it is unable to achieve the weighted welfare of the preferred policy described in section 5.

8.4.4 General regulations

Suppose that regulations are given by some function $\mathcal{P} : [0, a_M] \longrightarrow [0, 1]$ that maps firms assets into firm's specific strength of regulations, i.e. $\mathcal{P}(a) = \nu(a)$. The government can increase the strength of regulations from ν_0 to $\nu_1 = \nu_0 + \Delta$, with $\Delta > 0$.

Regulations are translated into a payment, $\tau^e(a; w, \rho, \nu, \mathcal{P})$ that must be made by an entrepreneur with assets a who wants to operate a firm, and as a transfer, $\tau^w(l_s; w, \rho, \nu, \mathcal{P})$ to a worker who is supplying l_s units of labor. Note that payments and transfers can depend on assets (a) or labor supplied (l_s), prices (w and ρ), firm's specific regulations ($\nu \equiv \nu(a)$) and regulations applied to other firms ($\mathcal{P}$). To simplify the exposition, suppose that if a firm invest k and hires l units of labor, then output is $f(k, l)$ with certainty. Thus, there is no bankruptcy or a job separation probability.

Thus, the utility of an entrepreneur with assets a who is subject to regulations ν is,

$$U^e(a|\nu) = f(k, l) - wl - (1 + \rho)d - \tau^e(a; w, \rho, \nu, \mathcal{P}) - F. \tag{84}$$

The utility of an individual worker who supplies l_s units of labor in a firm under regulations ν is given by

$$u^w(l_s|\nu) = wl_s + \tau^w(l_s; w, \rho, \nu, \mathcal{P}) - \varsigma(l_s). \tag{85}$$

The parameter ν measures the strength of regulations faced by an entrepreneur that starts a firm with assets a. In this section, I show how these framework can be used for the study of other size-contingent regulations. These regulations can be divided into two categories: taxes or subsidies to *labor* and *capital* use.

8.4.4.1 Labor use Regulations may impose a cost to labor use. In the paper I focused on dismissal regulations. Thus, τ^e was proportional to the labor income owed to workers in a given firm, $w \cdot l(a)$. Additionally, this payment was made only if the worker was fired. Therefore, τ^e was paid with probability s in case of individual dismissal and $(1 - p)$ in case of collective dismissal.

However, $\tau^e(a; w, \rho, \nu)$ can represent more general labor regulations, such as safety standards, working conditions, health insurance, training subsidies, among other employment regulations that are also size-contingent. For instance, in France firms reaching 50 employees must form a committee for hygiene, safety and work conditions, as well as pay higher payroll rates to subsidize training (Gourio and Roys, 2014). These costs can be interpreted as a variable tax on labor use that firms must pay in order to operate. These costs are proportional to the total labor hired by the firm,

$$\tau^e(a; w, \rho, \nu, \mathcal{P}) = \nu \cdot l(a), \tag{86}$$

and thus workers attached to that firm receive benefits given by

$$\tau^w(l; w, \rho, \nu, \mathcal{P}) = \nu \cdot l(a). \tag{87}$$

In this case, ν can be interpreted as the strength of labor regulations or as a measure of employment' benefits in a given firm.

8.4.4.2 Capital use

8.4.4.2.1 Size-restrictions Governments may impose a tax on firms growing too large. For example, Japan and France impose restrictions on the expansion of the retail sector (see Bertrand and Kramarz, 2002, for a discussion of the French case). Under these rules, retail businesses must follow a special procedure to obtain a license for the expansion of existing retail businesses, or for the opening of new stores beyond a size threshold.

In this case, the cost for capital use can be modeled as a tax proportional to total capital invested,

$$\tau^e(a; w, \rho, \nu, \mathcal{P}) = \nu \cdot k(a), \tag{88}$$

where ν captures the differences in taxes on capital use across firms with different sizes. Households (workers) receive a lump-sum transfer,

$$\tau^w(l; w, \rho, \nu, \mathcal{P}) = \frac{\int_{\underline{a}_0}^{a_M} \nu k(a) \partial G}{G(\underline{a})}, \tag{89}$$

where note that in this case τ^w does not depend on which firm the worker is attached to.

8.4.4.2.2 Financial subsidies In many countries smaller firms receive credit subsidies. For instance, South Korea provides large financial subsidies for smaller firms (Guner et al., 2008). These policies can be modeled in terms of changed credit costs,

$$\tau^e(a; w, \rho, \nu, , \mathcal{P}) = \nu \cdot \rho d(a). \tag{90}$$

Thus, the 'effective' credit cost of a firm with debt $d(a)$ is given by $(1 + \rho(1 + \nu))d(a)$. A credit or interest rate subsidy can be represented by a low (or negative) ν relative to other firms. As before, workers receive a lump-sum transfer,

$$\tau^w(l; w, \rho, \nu, , \mathcal{P}) = \frac{\int_{\underline{a}_0}^{a_M} \nu \rho d(a) \partial G}{G(\underline{a})}, \tag{91}$$

8.4.4.2.3 Special tax treatments In many developed and developing countries SMEs enjoy of special tax treatments, such as a reduction of property tax payments or corporate tax rates (e.g US, UK, Belgium, Germany). Additionally, in many countries tax enforcement increases with size (for recent evidence, see Bachas et al., 2019). These types of policies can be interpreted as a tax on firm's assets which varies across firms through ν,

$$\tau^e(a; w, \rho, \nu, \mathcal{P}) = \nu \cdot a. \tag{92}$$

Again, workers receive,

$$\tau^w(l; w, \rho, \nu, \mathcal{P}) = \frac{\int_{\underline{a}}^{a_M} \nu a \partial G}{G(\underline{a})}. \tag{93}$$

8.5 Additional Figures

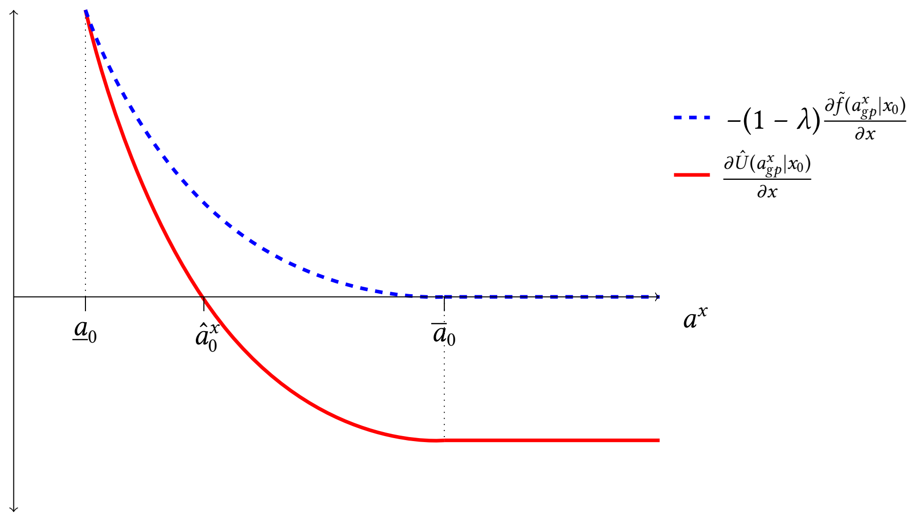

Figure 23: FOC as function of a^x under sticky wage when $\lambda \leq \frac{1}{2+1/(\gamma-2)}$.

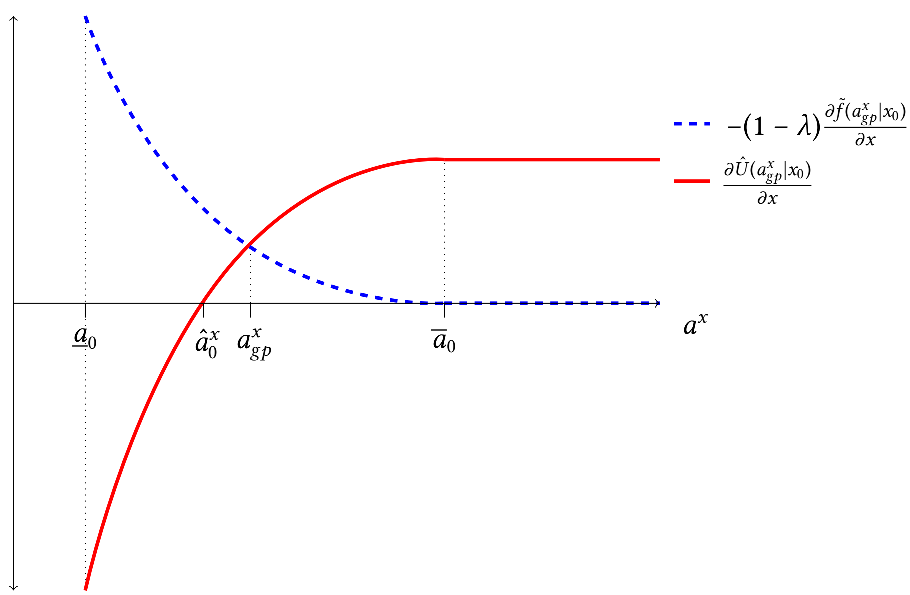

Figure 24: FOC as function of a^x under sticky wage when $\lambda > \frac{1}{2-1/\gamma}$.