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The Effects of Employment Protection: Learning from Variable Enforcement*

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Abstract

Employment protection legislations (EPL) are not enforced uniformly across the board. There are a number of exemptions to the coverage of these provisions: firms below a given threshold scale and workers with temporary contracts are not subject to the most restrictive provisions. This within country variation in enforcement allows to make inferences on the impact of EPL which go beyond the usual cross-country approach. In this paper we develop a simple model which explains why these exemptions are in place to start with. Then we empirically assess the effects of EPL on dismissal probabilities, based on a double-difference approach. Our results are in line with the predictions of the theoretical model. Workers in firms exempted from EPL are more likely to be laid-off. We do not observe this effect in the case of temporary workers. There is no effect of the exemption threshold on the growth of firms.

1. Introduction

The purpose of this paper is threefold i) extend standard models of employment protection legislation (EPL) allowing for disciplinary as well as economic dismissals, ii) explain why EPL is typically not enforced in the case of small units

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and iii) provide new evidence on the relationship between strictness of EPL and job loss as well as EPL thresholds and growth of firms.

Unlike previous studies drawing on cross-country variation, in this paper inferences are made by exploiting the *within* country variation in the enforcement of EPL. Regulations on dismissals typically allow for a threshold scale (generally defined in terms of the number of employees) below which the most restrictive EPL provisions (e.g., the compulsory reintegration in case of unjustified dismissal) are not enforced, the legal procedures for firings are eased, or severance payments are diminished. In this paper we develop a simple theoretical model to illustrate the rationale for these exemptions, and use this discontinuity in regulations(as well as the divide between fixed-term and permanent contracts) to infer the effects of EPL within a double-difference approach.

The vast *theoretical* literature on EPL does not take into account that legal restrictions to dismissals affect both economic and disciplinary dismissals. In an efficiency wage environment a la Shapiro and Stiglitz ([30]), this distinction is very important because the likelihood of disciplinary layoffs deters workers from shirking, whilst the probability of economic layoffs affects positively the efficiency wage the employer has to pay in order to induce workers not to shirk. This is because a higher risk of being dismissed per any given level of effort reduces the penalty associated with the fact of being caught shiriking. Hence, insofar as EPL negatively affects disciplinary layoffs, it increases the efficiency wage; when EPL instead acts mainly on economic layoffs, it reduces the efficiency wage. Insofar as monitoring effectiveness is decreasing in firms' size, this simple intuition explains the presence of threshold plant levels below which EPL is only mildly enforced. It would just make it too costly for small units to operate.

The vast *empirical* literature on EPL (surveyed in [26]) typically uses a cross-country approach in assessing the effects of EPL on labour markets. However, cross-country (and often pairwise) correlations of indicators of the strictness of EPL with measures of labour market performance cannot disentangle the effects of EPL *per se* from the effects of EPL when interacted with other institutions. Previous work – i.e., [8], and [24] – suggests that the effects of EPL on labour market performance interact with other institutional features, such as wage compression induced by collective bargaining, unemployment benefits and statutory minimum wages or the effects of early retirement and "soft" landing schemes. In a cross-country and multivariate regression framework it is not possible to take into account of all the relevant institutional interactions, owing to the few degrees of freedom available (there are no time-series for many institutions), and measure-

ment problems, which are particularly serious having to do mainly with ordinal measures (country rankings) of institutions, developed out of qualitative information on regulations. In this paper – following the seminal work by Garibaldi et al. (2003) – we exploit within country variation in the enforcement of EPL. This is a clear improvement with respect to the above literature insofar as the different institutions interacting with EPL are invariant across observations or, at least, do not have the same cross-sectional variation than EPL.

We model first the exemptions and EPL rules, and then develop accordingly our empirical framework. The model sheds light on the rationale and political support to these exemptions. It extends the standard models of adjustment costs for labour used by most of the EPL literature, allowing for imperfect monitoring of workers' effort. To keep things simple we rule out adverse selection and assume that workers are homogenous, so that in equilibrium there is no-shirking.

Our main theoretical results can be summarised as follows. From a theoretical perspective, EPL has ambiguous effects on wages: on the one hand, employment protection reduces the likelihood of exogenous (economic) layoffs thereby reducing the wage levels which can deter shirking; on the other hand, EPL makes it difficult also to dismiss undisciplined workers, and this reduces the credibility of the threat of dismissal for those shirking, forcing employers to pay higher wages in order to discourage opportunistic behaviour of their workers. The first effect tends to dominate in large units, while the wage enhancing effect dominates in small organisations that can better monitor workers' performance. Thus, exempting small firms from EPL reduces the dis-employment effects of employment protection. From a political economy perspective, EPL can only be accepted in large units as in small firms EPL stabilises employment at levels which can be lower than in a flexible regime under the bad state of the world.

Empirically, we show that the Italian EPL threshold scale does not significantly affect employment growth of firms while it affects the distribution of layoff rates by plant size. More precisely, exemptions from EPL induce a discontinuity in the relation between size of firms and likelihood of being dismissed, but not in the year-to-year probability that units increase their workforce. Our results are obtained by taking a double-differences approach. We compare the estimated layoff probabilities along two dimensions: the first is the coverage of EPL (workers in units with less than 15 employees are not covered by EPL), the second is the fact of having a permanent or a temporary contract (as workers under temporary contracts are not covered by EPL, *independently* of firm size). In estimating the effects of EPL on employment growth we use once more the 15-employees

threshold as well as the fact that in 1990 some regulations were tightened only for firms with less than 15 employees.

The plan is as follows. Section 2 reviews the literature. Section 3 develops a simple model rationalising exemptions from EPL of small units. Section 4 provides details on exemptions from EPL in Italy. Section 5 describes the data and displays our estimates. Section 6 concludes.

2. (Cross-country) Empirical Ambiguities

Table 2.1 reviews the empirical literature on the effects of EPL on the labour market. A few studies found significant effects of employment protection (generally measured using the OECD cross-country ranking) on employment and unemployment stocks, while a robust finding of this literature is that EPL negatively affects unemployment inflows and outflows. No unambiguous result is obtained concerning the impact of EPL on labour (the sum of hirings and separations) and job (the sum of job creation and destruction) turnover, although economic theory unambiguously predicts a negative effect of the strictness of employment protection on labour market flows. Explanations of this discrepancy between theory and facts – e.g., [8] and [9] – typically calls into play the interaction of EPL with other institutional features as well as measurement error. For instance, it is argued that institutions compressing wage structures tend to counteract the negative effects of EPL on labour market flows because they reduce the scope of price-driven adjustment mechanisms. These potential interactions with other institutional features question the relevance of many findings, which are all based on pairwise correlations. Measurement problems stem from the fact that there is a quite substantial within country variation in the actual enforcement of regulations, which is not captured by cross-country analyses.

From the above it follows that empirical work should preferably use data referred to the same country and exploit any time-series available in regulations. No reform of EPL was carried out on a stock basis, adjusting regulations for all workers with regular contracts. The type of reforms of EPL which have been carried out have only been enforced at the margin, adding new flexible contractual types to the existing "rigid" ones. These asymmetric reforms yield dual labour market regimes in which a flexible segment of the workforce coexists with a rigid one. Contrasting the behaviour of the two segments is not sufficient to identify the effects of EPL because there are rather obvious links between the two components of the workforce, which have been investigated by the literature. In

	STOCKS		FLOWS	
Author(s)	*Employment*	*Unemployment*	*Employment*	*Unemployment*
Emerson (1988)	?	?	-	-
Lazear (1990)	-	+		
Bertola (1990)	?	?		
Grubb & Wells (1993)	-			
Garibaldi,Konings,Pissarides(1994)	?	?	?	-
Addison & Grosso (1996)	?	?		
Jackman,Layard,Nickell(1996)	?	?	-	-
Gregg & Manning (1997)	?	?		-
Boeri (1997)	?	?	+	-
Di Tella & McCulloch (1998)	-	+		
OECD (1998)	?	?	?	-
Kugler & StPaul (2000)			+	-

Figure 2.1: **Survey of empirical evidence on EPL from cross-country data**

particular, [4] argue that flexible contracts provide a buffer stock to firms, which insulates permanent workers from employment adjustment in response to exogenous shocks. Studying the effects of EPL under dual regimes may then induce one to overstate the impact of these regulations. However dual regimes can be used in difference-in-difference policy evaluation studies.[1]

Another dimension of within-country variation which has *not* been used by the literature is the exemption of small units from the strictest EPL provisions. These exemptions are present in all countries with otherwise very restrictive EPL. In order to empirically exploit this within-country variation in EPL we need first to understand why these exemptions are in place. This is the task set out for the next section.

[1] As, for example, in [21].

3. Why Small Firms are Exempted from EPL?

In this section we extend models of EPL disentangling economic from disciplinary layoffs. This extension is essential to understand why EPL has asymmetric effects on small and large firms.

Our theoretical framework is a partial equilibrium and dynamic efficiency wage model, inspired by [28]. We distinguish between layoffs justified on economic grounds and firings for disciplinary reasons. Firm size is relevant for monitoring and, hence, for the probability of being fired. EPL applies to both types of dismissal, as the burden of the proof rests on the firm and it is generally much easier to support layoffs on economic than on disciplinary grounds.

3.1. The model without EPL

3.1.1. No-shirking condition

All workers are alike. Their utility is linear in earnings and effort

$$u_t = w_t - e_t \tag{3.1}$$

where w is the wage and e is effort, which, for simplicity, is assumed to be a discrete variable ($e = 0, 1$). Effort is imperfectly monitored by firms. If a worker chooses to exert effort, her value function is given by

$$V_t^{ns} = w_t - e_t + \delta[(1 - p_t^{ns})E_t V_{t+1} + p_t^{ns} U_{t+1}] \tag{3.2}$$

where p_t^{ns} is the probability of being dismissed for economic reasons, δ is the discount factor and U_t is the asset value of unemployment, notably

$$U_t = b + \delta[\rho E_t V_{t+1} + (1 - \rho)U_{t+1}] \tag{3.3}$$

being b the (flat) unemployment benefit and $0 < \rho < 1$ the (exogenous) outflow probability from unemployment into employment[2].

The asset value of being employed and shirking is given by

$$V_t^s = w_t + \delta[(1 - p_t^s(l))E_t V_{t+1}(l) + p_t^s(l)U_{t+1}] \tag{3.4}$$

[2]One may think of unemployed being randomly "assigned" o "referred" to firms of a given sector-region. If firms are hiring, then workers would find a job. Otherwise they would remain unemployed. Separations are always initiated by the employer in this setup.

where $p_t^s(l) > p_t^{ns}$ is the probability of being laid-off if *not* exerting effort in a firm of size l. Detection technologies are dependent on the size of firms. In particular, let $\bar{d} < d(l) \leq 1$ be the probability of being caught shirking (the detection-cum-firing probability) in a firm of size l, where $d(0) = 1,$ so that no self-employed shirks, $d' < 0$ and $d'' > 0$. This captures the fact that in large firms monitoring is more difficult, but not impossible. The total probability of being dismissed for a shirker is therefore given by:

$$p_t^s(l) = p_t^{ns} + (1 - p_t^{ns})d(l) \tag{3.5}$$

The no-shirking condition ($V_t^{ns} = V_t^s(l)$) is given[3] by

$$E_t V_{t+1}(l) - U_{t+1} = \frac{1}{\delta(p_t^s(l_t) - p_t^{ns})} = \frac{1}{\delta d(l_t)(1 - p_t^{ns})} \tag{3.6}$$

In words, the expected surplus of employment over the reservation wage is decreasing in the detection probability.

Now, using equations [3.4] and [3.6], we solve for the wage to obtain[4]:

$$E_t w_{t+1}(l) = (1 - \delta)(U_{t+1}) + \frac{[1 - \delta(1 - d(l_t))(1 - p_t^{ns})]}{\delta\, d(l_t)(1 - p_t^{ns})} \tag{3.7}$$

As we are interested in the steady-state properties of the model, we will focus on the case of static expectations ($V_t = V_{t+1} = V$), where from (3.7) we have that:

$$w(l) = (1 - \delta)U + \frac{[1 - \delta(1 - d(l))(1 - p^{ns})]}{\delta d(l)(1 - p^{ns})} \tag{3.8}$$

[3]Both for a shirker and a non-shirker we have that $E_t V_{t+1} = \max(E_t V_{t+1}^s, E_t V_{t+1}^{ns})$. Since workers are homogeneous $E_t V_{t+1}$ should be independent of the decision at t, provided that there is infinite horizon and there is no serial correlation in the parameters conditioned on decisions at t. The detection probability is an exogenous parameter in our model, which does not depend on the worker's past shirking behaviour.

[4]In addition to the no-shirking condition, the value of being employed and exerting effort should exceed the value of being unemployed, so that wages must also satisfy

$$w_t > b + e - \delta(1 - \rho - p_t^{ns})(E_t V_{t+1} - U)$$

By appropriate choice of b, we can make sure that this is not binding.

It is apparent from [3.8] that wages are increasing and concave in firm size via the d term. The economics behind this result is that a lower detection probability has to be compensated by higher wages: the penalty on shirking, the wage loss, should be sufficiently strong so as to deter opportunistic behaviour. Notice further that wages are increasing (and convex!) in the exogenous (for the worker) probability of being dismissed for economic reasons, p_t^{ns}. This can be better appreciated by considering the case where l is so small that d approaches one unit. In this case, equation (3.8) reduces to:

$$w = (1-\delta)U + \frac{1}{\delta(1-p^{ns})}$$

While p_t^{ns} is exogenous for the individual workers, it is endogenously determined in our model, as discussed below. The value of being unemployed is therefore given by

$$U = \frac{b}{1-\delta} + \frac{\rho}{(1-\delta)(1-p^{ns})d(l)}$$

3.1.2. Economic layoffs

Firms produce using labour as the only input. Their instantaneous profits are given by:

$$\pi_{it} = \theta_{it}\ f(l_t)\ - l_t w(l_t)\ \text{ where } f' > 0,\ f'' < 0$$

being θ_i the market value of the good in region i. We model prices as a first-order, discrete-space, Markov process[5]. In particular, we consider a two-states Markov process where prices can be either high (θ_i^h) or low ($\theta_i^l < \theta_i^h$) with a symmetric transition matrix, whose stayer coefficients are given by $\lambda > \frac{1}{2}$ so that there is some degree of persistence. Realisations of θ_i are common knowledge. Whenever a shock occurs, firms revise employment levels accordingly. We will consider later adjustment costs in labour. Call the two optimal levels of employment l_i^h and l_i^l : they maximise the value of firms in sector i when the states of the world are θ^h and θ^l respectively. Given the symmetry of the process, at the steady state, each plant will have for half of its time l_i^h employees and for the other half l_i^l

[5]Generalisations to continuous time Markov processes (e.g., in continuous time and contonuous state space) would not affect our results, while they would greatly complicate algebra.

Thus, the economic layoff probability at the steady state will be simply given by $\frac{1}{2}\frac{l_i^h - l_i^l}{l_i^h} = p_i^{ns}$.

3.1.3. Equilibrium

Wages and employment levels prevailing in plants under good and bad demand conditions are depicted in figure 3.1. Under good times, both wages and employment levels are higher than under $\theta_i = \theta_i^l$. Notice that the relative size of employment and wage variations depends on the curvature of the no-shirking condition in the relevant region: the steeper the curve, the lower the employment variation. Formally the two optimal employment levels are implicitly given by the first-order conditions:

$$f'\theta_i^l = w(l^l) + w'(l^l)\, l^l$$

and

$$f_i'\theta_i^h = w(l^h) + w'(l^h)\, l^h$$

which spell out the effect of employment adjustment on wages, hence on the marginal costs of labour, via changes in detection-cum-firing probabilities.

In each industry-region there is a continuum of firms of mass 1, which draw on sector-specific unemployment pools $u_i < p_i^{ns}$, so that job creation and destruction is always demand determined. There is no entry nor exit of firms.

3.2. Introducing EPL

We are now ready to introduce EPL. For simplicity, we model EPL as a cost on layoffs[6] which makes it unprofitable for firms to layoff workers in response to shocks. Under EPL the plant enters an "inactivity corridor" (Bertola, 1990) where it is optimal to keep employment unaltered over the "cycle". Inevitably EPL constrains also disciplinary layoffs. In the real world this happens via the costs of judicial procedures required to implement the dismissals. EPL usually establishes that either economic or disciplinary reasons for the dismissal have to be provided by the employer, who has the burden of the proof. Layoffs are considered

[6]Furthermore, our notion of EPL is one inflicting red-tape costs on employers rather than forcing them to implement transfers to the worker being dismissed. Red tape costs cannot be internalised in the employer-employee relationship, hence cannot be undone even under flexible wages.

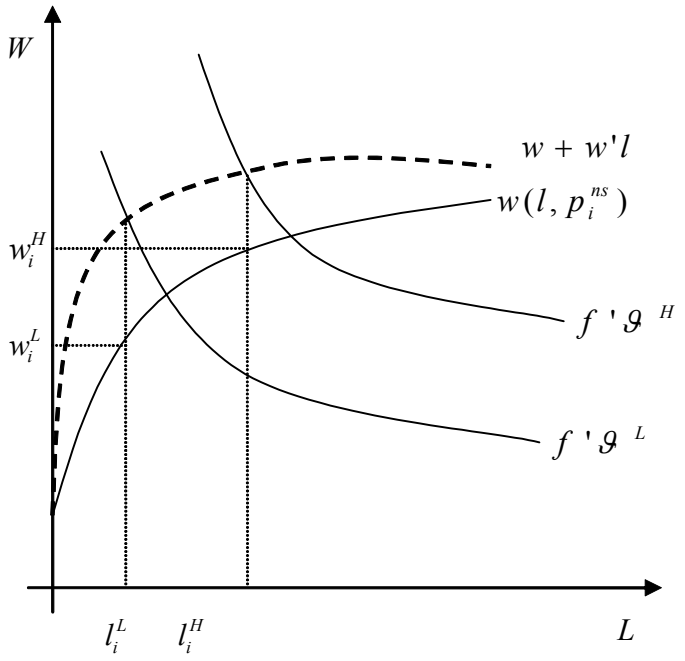

Figure 3.1: **Employment and wage adjustment without EPL**

to be unfair in most countries when there are *neither* subjective (misconduct) nor objective (economic) grounds for the interruption of the relationship. Penalties applied to employers implementing unfair dismissals do not discriminate among the two types of justifications (disciplinary and economic) for the dismissal (see [7]) and the employer finding it hard to prove the misconduct can always try to justify the dismissal on economic grounds. Thus, the costs of disciplinary layoffs are inevitably interrelated to those of economic dismissals.

Summarising, firms under a "rigid regime" do not implement economic dismissals, and choose employment maximising average, as opposed to instantaneous, profits. They also face restrictions in enforcing disciplinary layoffs, so that the detection-cum-firing probability is low also for small units. For simplicity, suppose that $d = \bar{d}$, that is, it is at its lowest level for any possible employment level.

3.2.1. A geometric illustration

In presence of EPL, the wage schedule is flat as in the continuous lines depicted in Figures 3.2 and 3.3. This flat wage schedule will lie somewhere below the asymptote of the no-shirking condition because EPL reduces also the probability of exogenous dismissals, depressing wages with respect to the flexible regime above a given level of employment. For lower employment levels, EPL pushes wages above the flexible regime as it prevents firms from using the disciplinary layoff deterrent to prevent shirking.

Under a rigid regime, for any realisation of the shock, the optimal employment level satisfies the first-order condition

$$\frac{1}{2}\left[\theta_i^h f'(\bar{l}) + \theta_i^l f'(\bar{l})\right] = \bar{w}$$

where variables denoted by a bar represent the rigid wage regime.

As shown by 3.2 and 3.3, EPL has different implications in regions dominated by relatively small and relatively large units (with low and high θ respectively). Where large plants are operating, EPL implies a stabilisation of employment above l^l: the largest the plant, the more likely that employment stabilises at a level which is close to l^h, the level attainable under good conditions in the flexible regime. In regions with small units, EPL involves instead a decline of employment *below* the level prevailing in a flexible labour market under the bad state of the world.

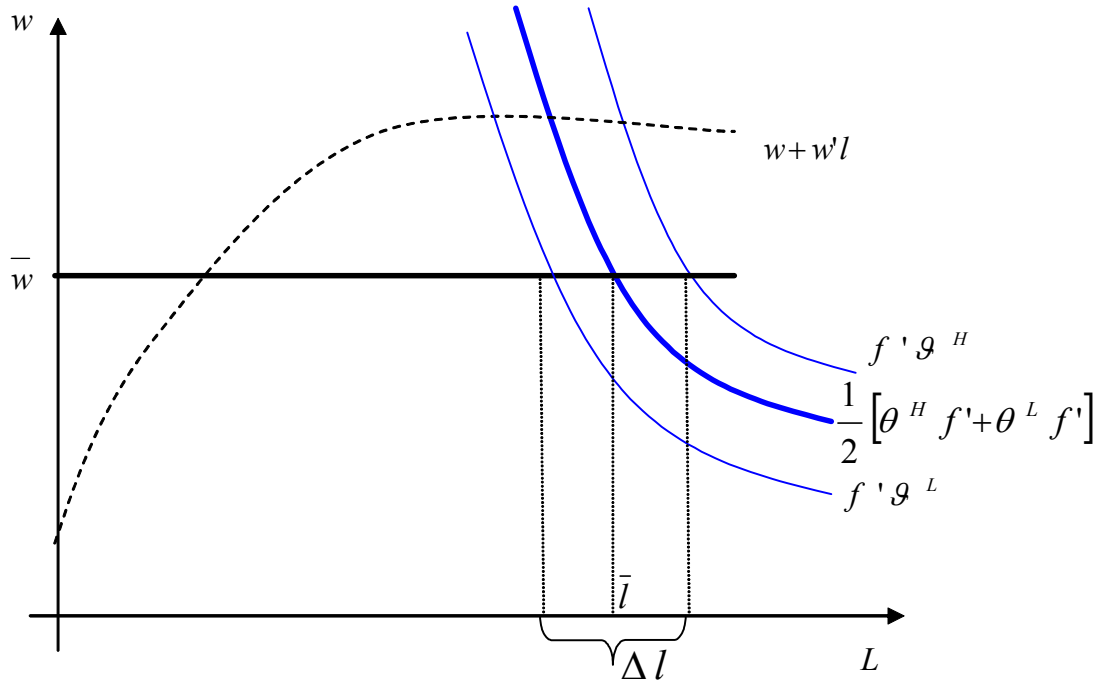

Figure 3.2: **Employment and wage adjustment with and without EPL: large firms**

Clearly the nature of the shift in the wage function, hence of the change in equilibria related to EPL, will depend on the slope of the no-shirking condition, hence on the characteristics of monitoring technologies. Below we provide some numerical simulations which are based on inferences on the firm-size firm-wage relationship in flexible labour markets. But let us discuss first exemption rules for this setup.

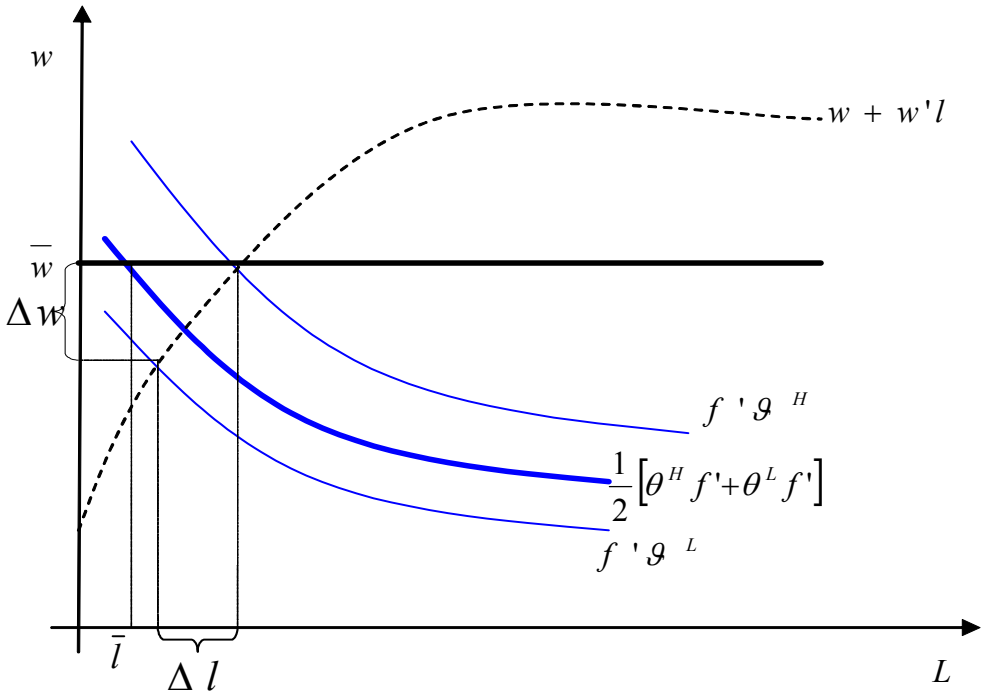

Figure 3.3: **Employment and wage adjustment with and without EPL: small firms**

3.2.2. Enforcement rules

Suppose that workers, in each region, decide on whether or not having EPL. They will be *ex-ante* favourable to the introduction of EPL insofar as

$$\phi_i \frac{\bar{w} - e}{1 - \delta} + (1 - \phi_i) \frac{b}{1 - \delta} > \frac{\frac{1}{2}[w(l^l) + w(l^h)] - e + \delta p_i^{ns} U}{1 - \delta(1 - p_i^{ns})} \tag{3.9}$$

where $\phi_i = \min \left\{ \frac{\widetilde{l}_i}{\frac{l_i^l + l_i^h}{2}}, 1 \right\}$ and we have dropped time subscripts as we are interested only in steady state comparisons. For small firms ϕ_i tends to zero so that condition (3.9) reduces to $\frac{b}{1-\delta} > \frac{\frac{1}{2}[w(l^l)+w(l^h)]-e+\delta p_i^{ns} U}{1-\delta(1-p_i^{ns})}$, which is never satisfied because $b < U$. For large firms, instead, $\phi_i = 1$, as EPL will stabilise employment at a level which is higher than average employment under the flexible regime. In this case, support to EPL implies that $\frac{\bar{w}-e}{1-\delta} > \frac{\frac{1}{2}[w(l^l)+w(l^h)]-e+\delta p_i^{ns} U}{1-\delta(1-p_i^{ns})}$, and after some algebra and by substituting here $p_i^{ns} = \frac{1}{2}\frac{l_i^h - l_i^l}{l_i^h}$, we have that

$$\frac{\delta(l^h - l^l)}{(1-\delta)l^h} \left(\bar{w} - (e + b) - \frac{4\rho l^h}{(l^h + l^l[d(l^l) + d(l^h)]} \right) > \big(w(l^l) - \bar{w}\big) + \big(w(l^h) - \bar{w}\big)$$

In between these two extreme cases, both, the left-hand-side and the right-hand-side of [3.9] are monotonically increasing in size. It follows that the two value functions will cross only once. This unique crossing point represents the optimal threshold scale for the exemption from EPL. Firms whose long-run equilibrium employment level is below this threshold will be exempted from EPL, which would consequently be confined to the largest units.

A corollary of this result is that an EPL threshold chosen according to the preferences of workers does not reduce the average size of plants in an industry. This is because EPL is supported by workers only when the threshold is equal or higher than average employment in the flexible regime. Insofar as EPL makes it unprofitable to adjust labout in response to shocks, it will, however, reduce employment turnover, that is, hiring and separations, in any firm subject to these regulations.

3.2.3. An example

In order to illustrate the comparative statics properties of the model, we analyse the case of constant returns to labour ($f(l) = l$) and a detection technology given

by $d(l) = l^{-\beta}$, $\beta > 0$. For notational ease, we set unemployment benefits (b) to be zero. Thus, dropping subscripts for simplicity, we have

$$w(l) = 1 + \frac{1 + \delta[\rho - (1 - p^{ns})]}{\delta d(l)(1 - p^{ns})}$$

The employment levels in the flexible regime are given by

$$l^l = [\Delta(\theta^l - 1)]^{\frac{1}{\beta}} \qquad l^h = [\Delta(\theta^h - 1)]^{\frac{1}{\beta}} \qquad \text{being } \Delta = \frac{\delta(1-p^{ns})}{(1+\beta)\{1+\delta[\rho-(1-p^{ns})]\}}$$

Thus,

$$1 - p^{ns} = \frac{(\theta^h - 1)^{\frac{1}{\beta}} + (\theta^l - 1)^{\frac{1}{\beta}}}{2(\theta^h - 1)^{\frac{1}{\beta}}}$$

Under the rigid regime, $p^{ns} = 0$ and, hence, the employment level is given by

$$\bar{l} = \left[\frac{\delta(\bar{\theta} - 1)}{(1 + \beta)[1 + \delta(\rho - 1)]}\right]^{\frac{1}{\beta}} \tag{3.10}$$

being $\bar{\theta} = \frac{\theta_l + \theta_h}{2}$. The wages corresponding to these three employment levels are:

$$w^h = w(l^h) = \tfrac{\beta+\theta_h}{1+\beta} \qquad w^l = w(l^l) = \tfrac{\beta+\theta_l}{1+\beta} \qquad \bar{w} = \tfrac{\beta+\bar{\theta}}{1+\beta}.$$

Therefore, in this case, workers' support to EPL is provided when

$$\frac{\bar{\theta} - 1}{1 - \delta}\phi > \frac{\bar{\theta} - 1 + (1 + \beta)\delta p^{ns} U}{1 - \delta(1 - p^{ns})}$$

where $\phi = \min\left\{\frac{(\bar{\theta}-1)^{\frac{1}{\beta}}}{(\theta^h-1)^{\frac{1}{\beta}}}\left[\frac{1+\delta[\rho-(1-p^{ns})]}{[1+\delta(\rho-1)]}\right]^{\frac{1}{\beta}}, 1\right\}$ or:

$$[1 - \delta(1 - p^{ns})]\,\phi > 1 - \delta + \frac{\delta^2 \rho p^{ns}}{1 + \delta[\rho - (1 - p^{ns})]} \tag{3.11}$$

After some manipulations the latter inequality can be rewritten as:

$$\frac{\delta}{1-\delta(1-\rho)} > \frac{1-\phi}{\phi p^{ns}} \tag{3.12}$$

Notice that this condition is always satisfied when $\phi = 1$. It is also more likely to be satisfied when the unemployment outflow rate, ρ, and p^{ns} are large. Note also that p^{ns} is increasing in the difference between labour productivity under the good and the bad states of nature $(\theta^h - \theta^l)$. More importantly, support to EPL is increasing in $\bar{\theta}$, hence, by (3.10), in the average employment level in the industry. Overall, support to EPL is more likely the stronger the volatility of employment in the flexible regime and the larger the optimal size of plants in an industry. How large should the long-run efficient size of plants be in order to have workers to vote for EPL? It will clearly depend on the values of parameters in the model, as discussed below.

3.2.4. Some "calibrations"

We now turn to numerical simulations enabling us to recover the politically supported threshold level of l from condition (3.11) in a more general specialisation of the detection technology, for different values of labour productivity in the low and in the high states and taking the elasticity of output with respect to employment to be 2/3, which is in line with the labour share in most OECD countries. We specify the detection technology to be $d^r(l) = \max\{1 - c^r \ln(l), 0\}$ where $0 < c^r < 1$. The superscript $r(= f, g)$ stands for the EPL regime (f: flexible, g: rigid), and $c^f < c^g$. This functional form is more flexible and eases the calibration, based on empirical estimates of firm size-firm wage effects. As in the previous example, we set $e = 1$ and $b = 0$. Each period is a quarter. We take $\delta = 0.9925$, which implies an annual discount rate of roughly 3%, and $\rho = 0.02$ which matches the quarterly hiring rates observed in the Italian case (see below).

In the baseline we chose the parameter of the detection technology (c) in such a way as to replicate the firm size-firm wage premia observed in flexible labour markets. A recent study with matched employer-employee data set identifies the firm size-firm wage effect in the US State of Washington ([1]). Although the elasticity of wages with respect to firm size is not numerically reported, a visual inspection of Figure 6 in that paper yields a somehow constant elasticity of the order of 0.03-0.035, which is consistent with the elasticity reported by [11]. Although this premia can be attributed to several factors, not only to a size-dependent monitoring technology [27], in the baseline simulation the parameter

of the detection technology under the flexible regime is chosen in such a way as to closely replicate this premium.

The key results from our simulations are reported in Figures 3.4 and 3.5. In Figure 3.4 we plot the detection technologies under each regime when its key parameters are $c^f = 0.05$ and $c^g = 0.1$. This specification of the detection technology under the flexible regime yields a firm size-firm wage premium of 3.7%, close to the available empirical estimates cited above. For the rigid regime, we assume that the detection-cum-firing probability decreases at a higher rate with firm size, as can be seen in Figure 3.4.

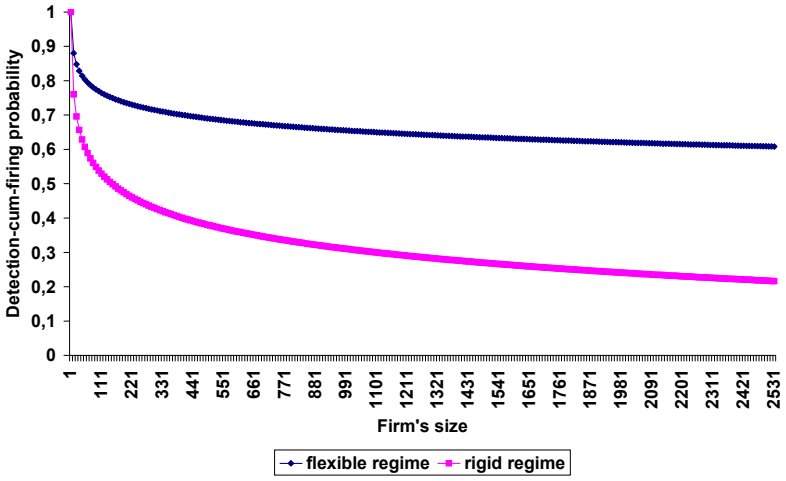

Figure 3.4. Detection technologies

In the top panel of Figure 3.5 we plot the average employment level in the flexible regime with respect to θ^h, where it is assumed that $\theta^h = 3\theta^l$, implying cyclical fluctuations of employment of about 50%. In the lower panel for each θ^h we plot workers preferences for EPL: a negative value indicates that workers are better off under the flexible regime. The average employment level above which we find support to EPL turns out to be 18, very close to the threshold scale used in implementing EPL in Italy, as discussed below.

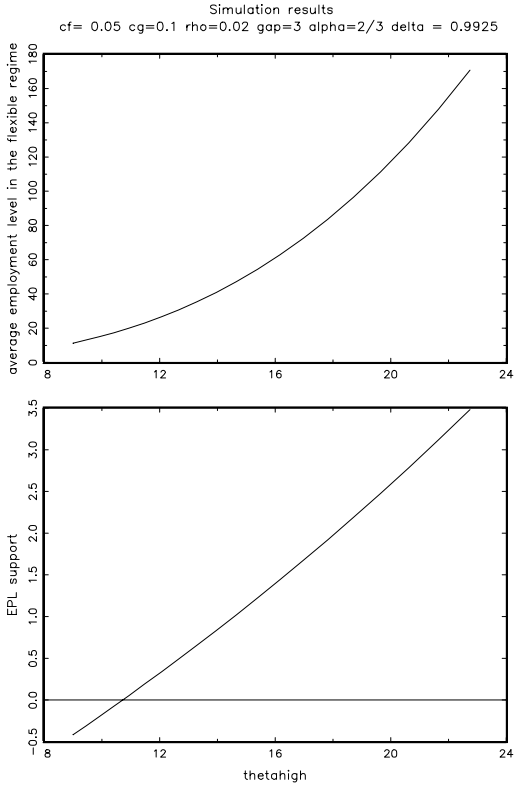

Figure 3.5. Simulation results.

4. Empirical evidence

The model above and its numerical simulations suggest that EPL can be politically supported by workers only when it involves firms with a relatively large equilibrium size. In these firms EPL reduces dismissal rates. Thus, we should observe a discontinuity in layoff probabilities at the threshold defining the range exempted from EPL. This discontinuity should not arise in plant-level net growth rates, as exemption thresholds chosen according to the preferences of workers do not reduce the average size of plants which would prevail without EPL. We test below these implications of the model drawing on individual data on labour market flows and plant-level growth rates in Italy, a country with strict EPL and

exemptions for small firms. Italian employment protection regulations and the data are briefly described below.

4.1. Italian thresholds

Individual, no-fault, dismissals of workers with a permanent contract are in Italy regulated by the norms of the Statuto dei Lavoratori, approved in 1970. The employer is required to give a written notice to the employee who can also require a communication of the detailed reasons for the dismissal and the start of a conciliation procedure by the provincial employment office or through conciliation committees set up under collective agreements. The length of the statutory notice period depends on the tenure of the worker. The worker can appeal to court against the dismissal within 60 days from the communication of the reasons of the dismissal, but has first to start a conciliation procedure with the firm. The size of firms matter in that the consequences of the judge's decision to overrule the firm's decision depend on the size of the firm. Workers in firms employing more than 15 employees in a single plant (or 60 overall) are protected by the so-called "tutela reale", that is, they can choose either the reinstatement in the firm, plus a compensation equal to foregone earnings between the date of the dismissal and the legal settlement of the case (with a minimum of 5 months), or a financial compensation of 15 months and the foregone earnings. Workers in the smallest units are instead covered by the so-called "tutela obbligatoria" (L. 604/1966): in this case it is the employer to choose between reinstatement and a compensation ranging between 2,5 and 6 months depending on seniority and the size of the firm. Thus, EPL on individual dismissals is much stricter for units with more than 15 employees.

4.2. Data

We use data from two sources. The first is the national Labour Force Survey, a quarterly survey with a large rotating panel. At yearly frequencies, we can track histories of about 40 per cent of the LFS sample, that is, about 80,000 individuals. The size of the firm is stated by the employees. This gives rise to problems of "heaping"; indeed the distribution of the stated employment levels reveals marked peaks at discrete intervals (e.g., 10 employees, 20 employees, etc.). There is no simple method to correct for this. Below we use sensitivity analyses to check the robustness of our results to marginal changes in the location of the threshold dummy. We combine information from matched records across LFS

waves (enabling us to identify separations) and from retrospective section of the survey allowing to measure the size of the firm the worker was attached to and the nature of the separations. Unfortunately we cannot disentangle disciplinary from economic layoffs.

The second statistical source is a sample of firms drawn from the Italian social security records (Inps archives), covering all private employees. It is the same dataset used by Garibaldi, Borgarello and Pacelli [17], Schivardi and Torrini [29]and Kugler and Pica [22] who also investigated threshold effects on employment growth. It allows to estimate yearly transition matrices for employment size classes over the period 1986-95. Clearly only firms surviving from one year to the next are recorded in this sample. This involves slightly overrepresenting large firms.

Based on this data source we could evaluate growth and persistence of firms below and above the 15 employees threshold, exploiting the "natural experiment" of the 1990 reform. It should be stressed that in this case there are not the "heaping" problems, which are present in the Labour Force Survey data.

4.3. Estimating Layoff Probabilities

To identify the impact of the threshold regarding firm size in the regulation of layoffs we compared the layoff probability of permanent workers with the probability of temporary workers not having their contract renewed in firms below and above the threshold. Obviously, besides EPL regulations concerning small firms, there are other factors affecting the likelihood of dismissal and the relationship between job turnover and firm size.[7] Thus, we initially test the effect of the 15 employee threshold in Italy on layoff probabilities, by regressing the probability of being separated from the firm (either being fired or not having a temporary contract renewed) from period t to $t+1$ on a number of personal (gender, age, educational attainments, region of residence) and firm characteristics (industry of affiliation, the number of employees at t in the plant the worker is attached to) plus a firm size dummy interacted with the individual contract status. Permanent workers being laid-off are those who are not employed at $t+1$ while they were at t and who declare to have lost their job because of a dismissal. Temporary workers separated from the firm are those who are not employed at $t+1$ under a temporary contract while they were at t and who declare to have lost their job because of a non-renewal. The sample includes only employees at t. Thus we

[7] On the relationship between firm size and turnover, see [31] and [3]

estimate:

$$E[l_{ijt} = 1|X_{ijt}, Z_{jt}, Perm_t] = \tau_t + \alpha X_{it} + \gamma Z_{jt} + \delta(S_j \text{ x } \text{Perm}_{\text{it}}) + \varepsilon_{ijt}$$

where l_{ijt} =1 if worker i in firm j at time t is separated from the firm, τ_t is a time effect, X_{it} is a set of individual characteristics (including contract status, Perm_{it}), Z_{it} is a set of firm characteristics (including size, S_j) and $\text{Perm}_{\text{it}} = 1$ for permanent workers, and equals 0 for temporary workers. Our parameter of interest is δ which measures the effect of firm size thresholds in the regulation of layoffs in the probability of separations.

The results regarding the marginal effects of the dummy variable for firms below 15 employees on layoff probabilities are displayed in Table 5.1. Overall, we observe a statistically significant and positive effect of the dummy capturing firms below the threshold scale defined by art.18 of the Statuto dei Lavoratori. Ceteris paribus, the exemption from the so-called "reintegra" would seem to increase by about 1 percentage point layoff probabilities. This effect is larger for women than for men.

The choice of discrete firm size variables to capture size effects other than EPL is obviously arbitrary. To check the robustness of the 15-employees threshold on layoff probabilities, we also run alternative regressions including the interaction of firm size dummy variables at different levels (5, 10, 20, 25, 35, 40 and 45 employees) and contract status, together with the dummy variable for firms below 15 employees interacted with contract status. The results (point-estimates of marginal effects and their 95% confidence interval bands) are presented in Figure 5.1. Overall, the estimated coefficient of the second variable, e.g. the dummy variable for firms below 15 employees interacted with contract status, remains positive and statistically significant when the other variables introduced are defined for firms above 30 employees, but not below 25. Given the "heaping" problem commented above and the relatively small sample size, we would not take this finding as conclusive evidence against EPL threshold effects. Overall, our estimates point to the relevance of the EPL threshold at the level of 15 employees in affecting layoff probabilities.

Table 4.1. Effects of EPL firms' size threshold on layoff probabilities. Marginal effects (in percentage points) from probit estimates. Italy, 1994-1996

	All	Males	Females
Less than 15 employees x Permanent Employee	0.94	0.71	1.61
	3.0	2.4	2.0

Sample: LFS 1993-1996. The first row is the marginal effect (in percentage points) and the second row is the corresponding unsigned t-statistics. All regressions include worker's age and age squared, educational attainment, tenure and tenure squared, firm size and firms size squared, a dummy for permanent employee, a dummy for services, a dummy for part-time, regional dummies, dummies for family status, and time dummies (and a dummy for gender in the regression for all workers).Number of observations: All:: 47,764. Males: 30,395. Females: 17,369.

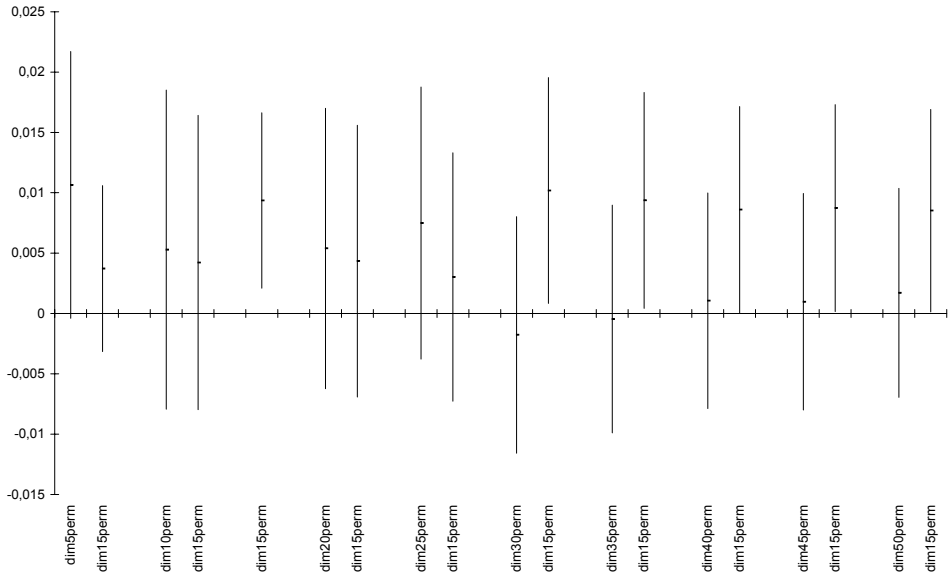

Figure 4.1: Estimated layoff probabilities by firm's size

Note: dim(i)perm: dummy variable for firms below i employees interacted with a dummy for permanent employee. The figure displayed the estimated 95% confidence interval band of the estimated coefficient of firm's size dummies in 10 regressions in which two interaction variables are included simultaneously in the same regression (except in the third regression in which only dim15perm is included).

4.4. Hirings by size of firms and the equilibrium size distribution

Our model predicts that EPL should reduce not only layoffs, but also hirings above the threshold scale. However, when the threshold is chosen by workers, it should not reduce average employment levels of firms.

LFS data allow us to estimate proxy monthly hiring rates (the workers declaring to have a tenure lower than one month) by size of firms. Results are presented in Figure 4.2. This points to a decline of hiring probabilities in a neighborhood of the 15 employees threshold. Well above the threshold, hirings start rising again, but remains at a lower level than below the threshold.

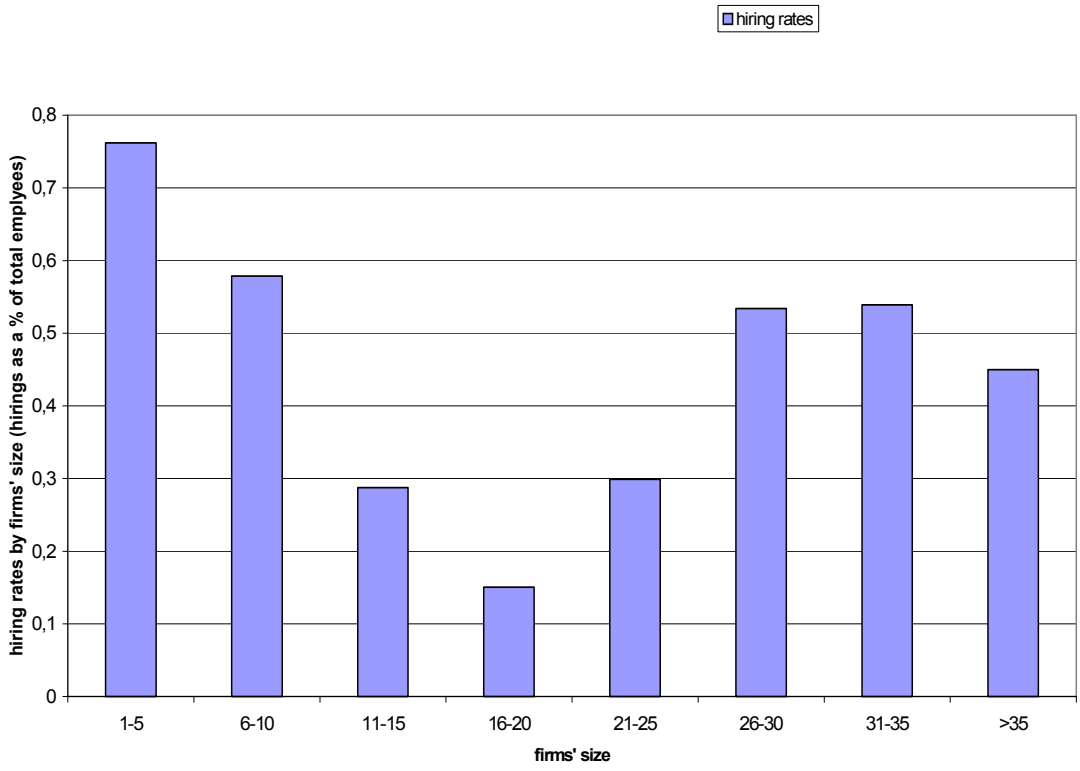

Figure 4.2. Hirings by firm's size: Italy

The Italian size distribution of firms (Figure **??**) does not point to a serious discontinuity in a neighborhood of the 15 employees threshold. In order to formally test whether EPL affects the equilibrium size distribution of firms we used

the Inps data and a double-difference approach. The first difference is represented by the 15 employees threshold. The second difference is represented by a reform which, in 1990, extended to firms *with less than 15 employees* mandatory severance pay (totaling up to 6 months of pay) in the case of unfair dismissals. Before that date, small firms were not obliged to obey the "just-clause" rule. Thus the reform, by tightening regulations for small units, confined the asymmetry between firms with more or less than 15 employees to the so-called "reintegra". There was another reform, in 1991, making it easier for large units to dismiss workers in the context of "group layoffs", but this reform involved only manufacturing firms with more than 15 employees and units in services with more than 50 employees. Thus, firms operating in services with more than 15 employees represent the "control group" for our natural experiment.[8]

Table 4.2 displays the results from our regressions. The top panel shows grouped logit estimates of the probability that a firm does *not* change size from one year to another. In particular, the dependent variable is given by $\ln(\frac{m_{ii}(t,t+1)}{1-m_{ii}(t,t+1)})$ where $m_{ii}(t,t+1) = \frac{n_{ii}(t,t+1)}{n_i(t)}$ and n is the number of firms in each size cell. The set of regressors includes a nonlinear function in size[9], as well as dummies for units lower than the mean size of firms in the sample (6 employees) for firms with less than 15 employees (our threshold dummy), the 1990 reform as well as the reform interacted with the threshold dummy. The latter two variables are crucial to our analysis: we expect the tightening of EPL to increase the persistence of firms with less than 15 employees, but not to exert spillover effects on the larger firms. We find that the 1990 dummy is indeed significant only when interacted with the threshold dummy, and in the case, it mildly increases the probability that a firm does not change size from one year to another (the log-odds ratio associated with this variable is .94). In the bottom panel of table 5.2, the dependent variable is $\ln(\frac{m_{ii+1}}{1-m_{ii}})$, where we omitted time subscripts for expositive ease. In other words, we focus on probabilities to increase size by one employee from one year to the next. In this case, there is evidence of regression to the mean as the 6-employees dummy is significant and negative. More importantly neither the reform dummy, nor the reform interacted with the threshold dummies are in this case significant.

Thus, EPL would seem to mildly increase persistence, but not the growth of firms. Schivardi and Torrini [29] who had access to richer data than us, could estimate the ergodic distribution implied by (stationary) transition matrices and

[8] [22] also use this reform to estimate the effects of product market regulations and labour market institutions on turnover.

[9] We tried with several specifications: $1/l$, l^2 and $\ln(l)$. The latter provided the best fit.

depure it from the effects of the EPL threshold dummy on persistence (obtained by analysing stayer coefficients above and below the diagonal, as done also by [17]). They concluded that "average firm size would increase by *less than 1 per cent* when removing the threshold effect". Garibaldi et al. [17] estimated a linear probability model on stayer and mover coefficient finding that the EPL thresold mildly affects persistence, but not growth of firms.

We take all this as evidence supporting the implications of the model: EPL affects the turnover of workers, firms' persistence, but not the average size of plants.

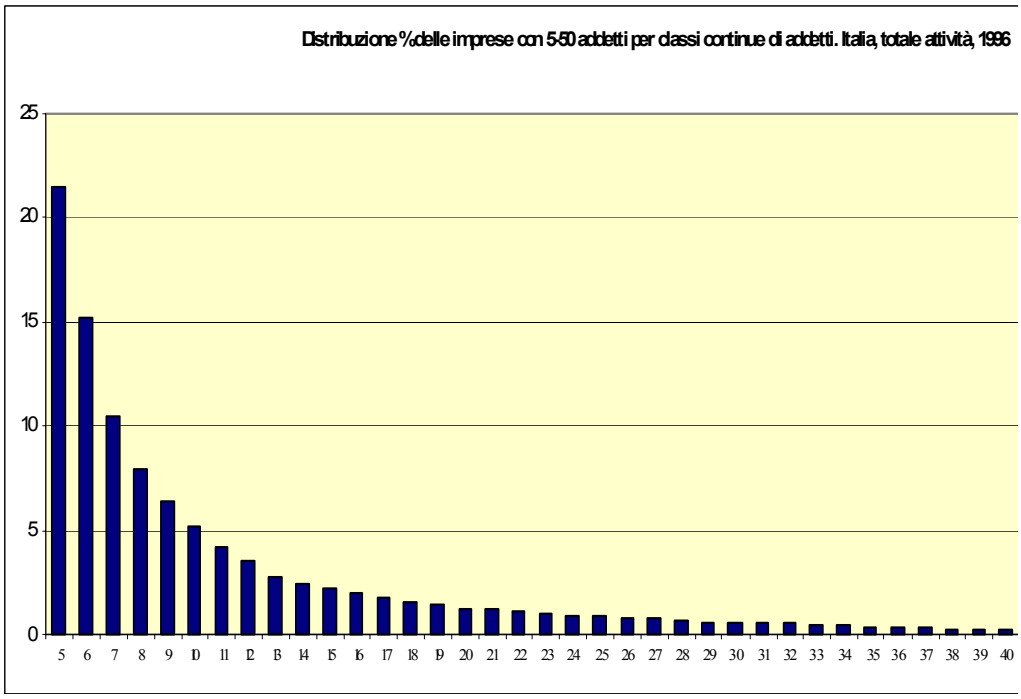

Figure 4.3. The size distribution of firm's size: Italy

Table 4.2. Effects of the EPL reform on "stayer" and "mover" coefficients.
Grouped logit estimates. Italy, services, 1986-1995

a) Persistence		
logsize	-.79	12.80
dummy 6 employees	.02	.46
dummy 15 employees	.18	3.80
dummy 1990	-.01	.28
dummy 1990 * dummy 15	.14	2.73
constant	.81	4.36
b) Growth		
logsize	-.33	4.46
dummy 6 employees	-.14	2.38
dummy 15 employees	.05	.93
dummy 1990	-.10	1.77
dummy 1990 * dummy 15	.03	.57
constant	-.92	4.20

Sample: Inps Archive data 1986-1995. The first column is the marginal effect and the second column is the corresponding unsigned t-statistics.

5. Final Remarks

There are a few institutional features of the labour market which have been as thoroughly investigated as employment protection. Despite the attention devoted by applied economists to this issue, we still know very little about the impact of these regulations on employment adjustment of firms. Above all, it is difficult to isolate the effects of EPL from those of other institutional features of the labour market. This is because most of the work has been carried out in terms of cross-country and pairwise correlations between EPL and various measures of labour market performance.

In this paper we take a different approach in that we focus on within country variation in the enforcement of EPL. In particular, we draw inferences from the exemptions clauses which relieve small units from EPL. To this end, we develop a theoretical model which extends standard models of EPL by disentangling disciplinary from economic layoffs and provides a political economy rationale for these exemption rules.

Our empirical results are in line with the predictions of the model: the small firm (15 employees) threshold does matter in conditioning layoff and hiring probabilities. It also mildly increases firms' persistence, that is, the probability that a firm does not change the number of employees from one year to another. But there is no evidence of any significant discontinuity in the size distribution of firms in correspondence to these thresholds.

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