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**The use of administrative data: from the evaluation of the
EPL effect to the analysis of the university graduates'
labor market.**

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By

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Contents

Acknowledgements.....	III
Vita.....	IV
Publications.....	V
Presentations.....	VII
Abstract.....	VIII
INTRODUCTION.....	1
CHAPTER 1. THE EFFECT OF EPL ON THE LABOR MARKET: THEORETICAL MODELS AND EMPIRICAL EVIDENCE.....	4
1.1 Introduction.....	4
1.2 The EPL and the measurement.....	6
1.3 The impact of the EPL on the labor market: theoretical models.....	10
1.3.1 The EPL with flexible wages.....	11
1.3.2 The EPL with fixed wages.....	14
1.3.3 Other theoretical predictions.....	17
1.3.4 Temporary versus permanent workers: the EPL at margin.....	20
1.4 Empirical evidence of the EPL.....	24
1.4.1. Empirical evidence of the EPL effect on labor market.....	25
1.4.2 The empirical evidence of the EPL effect on productivity.....	31
1.5 Conclusions.....	36
CHAPTER 2: THE PERVERSE EFFECTS OF JOB-SECURITY PROVISIONS ON JOB SECURITY IN ITALY: RESULTS FROM A REGRESSION DISCONTINUITY DESIGN.....	40
2.1 Introduction.....	40
2.2 Institutional background.....	44
2.2.1 The legislation for permanent contracts until 2012.....	45
2.2.2 The legislation for temporary contracts until 2012.....	48
2.2.3 The 2012 Labor Reform.....	50
2.3. Data description.....	51
2.3.1 Data sources.....	52
2.3.2 Measuring the threshold.....	54
2.3.3 Descriptive statistics.....	56
2.4. The empirical strategy.....	59

2.4.1 The regression discontinuity design (RDD)	59
2.4.2 Assessing the validity of the RDD in the present context ...	61
2.4.3 A difference-in-difference regression discontinuity design	68
2.5. Econometric results.....	72
2.5.1 Baseline results.....	72
2.5.2 Sensitivity analysis	80
2.6 The aggregate implications of employment protection.....	83
2.7 Conclusions.....	88
Annex.....	91
CHAPTER 3: THE IMPACT OF THE FINAL GRADUATION MARK ON THE GRADUATES' PROBABILITY TO BE HIRED BY FIRMS: AN ITALIAN CASE STUDY.....	95
3.1 Introduction.....	95
3.2 Data Description	102
3.2.1 The outcome variables.....	105
3.3. Methodology	107
3.3.1 The Intra-class correlation and Multilevel Models.....	107
3.2.2 Two level Empty Model.....	109
3.3.3 Two level Logistic Random Intercept Model.....	110
3.3.4 Two level Logistic Random Slope Model.....	112
3.4. Econometric Results	114
3.4.1 Empty Model and the Intra-class correlation	114
3.4.2 Two level Random Intercept	116
3.4.3 Two level Random Slope	124
3.5 The Disjunctive case: a unique ordinal outcome	125
3.6 Conclusions.....	128
CHAPTER 4: CONCLUSION	130
References 1 Chapter	133
References 2 Chapter	141
References 3 Chapter	146

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This thesis is dedicated to my wife Silvana and her Father.

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Abstract

The statistical enhancement of administrative data sources has played a pivotal role in the analysis of the labor market in the last decades. They permit us to obtain a clearer picture of the reality than the common surveys. In so doing, they represent a cognitive instrument capable to support the decision-making strategies adequately and timely.

This PhD thesis provides two case studies in this direction. Using unique administrative datasets for Italy, we deal with two important labor market issues.

In the first part, we investigate the impact of employment protection on the composition of the workforce and worker turnover. Chapter 1 provides an overview of the main existing literature about the effect of EP on labor market.

In Chapter 2, using a novel matched employer-employee administrative dataset, we adopt a regression discontinuity design (RDD) that exploits the variation in employment protection provisions in Italy between firms below 15 employees and those above 15 employees. Our newly dataset allows us to better identify the size of firms and most importantly the different typologies of labor contracts.

In order to justify the use of the RDD approach we conduct three different tests. First, we show that firm-size density is actually continuous around the threshold, as proposed in McCrary (2008). Second, we follow Schivardi and Torrini (2008) and assess whether firms just below and above the threshold differ in their propensity to grow. Finally, we conduct a series of balancing tests to investigate to what extent firms just above and below the threshold differ in terms of the observable characteristics.

Our RDD estimates suggest that EP increases worker reallocation, suggesting that EP tends to reduce rather to increase worker security. This can be explained by the fact that firms facing more stringent EP make a greater use of workers on fixed-term contracts. Indeed, the incidence of temporary work is 2-2.5 percentage points higher in larger firms. There is also evidence that EP reduces labor productivity. This effect is to an

important extent due to the impact of EP on worker reallocation and the incidence of temporary work.

In the second part, we investigate the effect of the final graduation mark on the graduates' probability to be hired by firms (Chapter 3). The analysis is based on a worker-level administrative dataset. By evaluating employment contracts on the basis of their expected duration, we estimate multilevel logit and multilevel ordered logit models to take into account the clustered structure of the data and the nature of the response variables.

Using a random intercept and a random slope specifications, we find the existence of a non-trivial effect of the graduation mark on the probability to be hired, even after controlling for the problem of selection. Specifically, the effect is non-monotonic: it is positive below a certain threshold, and it becomes negative afterwards. In case of permanent contracts, the effect of the graduation mark is not significant, while the major chosen by the student plays a key role.

Introduction

In 2010, *the Economist* defined the increasing availability of information produced daily and its flow in all the areas of economic activity as *data deluge*. This information represents a powerful source of knowledge extraordinarily important that can affect the strategies of firms and public decisions significantly.

In this context, the statistical enhancement of data collected for administrative purposes has acquired a pivotal role in the last decades. This is particularly true in the public sector. This kind of data permits us to obtain a picture of the reality which is complementary to that of common surveys. As a result, they represent a cognitive instrument capable to support the decision-making strategies adequately and timely.

My research provides two case studies in this direction. We deal with two important labor market issues by using unique employer-employee administrative datasets for Italy which have never been used before. Particularly, the use of the New Informative System of Compulsory Communications represents an absolute novelty. Introduced by the Ministerial Decree of October 30, 2007 this Informative System records each workforce movement in private and public Italian firms. Moreover, for each worker movement, it provides a rich set of information about workers and firms' characteristics.

In the first case study, we investigate the impact of employment protection legislation (*EPL*) on the composition of the workforce and worker turnover. Chapter 1 provides an overview of the main existing literature about the effect of *EPL* on labor market, assessing what economic theory predicts and what is observed through the empirical analysis. Particularly, we have examined the relationship between the *EPL* and the stock of employment, worker flows to and from unemployment, the duration of unemployment and productivity. Theoretical and empirical research seem to converge on the following results: more stringent regulations reduce personnel turnover and job

reallocation, while they increase the duration of unemployment. Conversely, the effect on the aggregate employment and unemployment is hard to grasp.

Finally, the EPL may affect productivity directly and indirectly through several channels. By reducing firms' ability to respond to the exogenous shock of demand and technological changes in a suitable manner, the EPL may have a negative effect on productivity. In addition it may lower worker effort. But stringent regulation safeguarding the long-term employment relationship may improve work intensity, making firms and workers more likely to invest in human capital with a consequent positive effect on the productivity.

In Chapter 2, co-authored with Stefano Scarpetta and Alexander Hijzen (OECD and IZA, France), using a novel matched employer-employee administrative dataset, we adopt a regression discontinuity design (RDD) that exploits the variation in employment protection provisions in Italy between firms below 15 employees and those above 15 employees. Our newly dataset allows us to better identify the size of firms and most importantly the different typologies of labor contracts.

In order to justify the use of the RDD approach we conduct three different tests. First, we show that firm-size density is actually continuous around the threshold, as proposed in McCrary (2008). Second, we follow Schivardi and Torrini (2008) and assess whether firms just below and above the threshold differ in their propensity to grow. Finally, we conduct a series of balancing tests to investigate to what extent firms just above and below the threshold differ in terms of the observable characteristics.

Our RDD estimates suggest that EP increases worker reallocation, suggesting that EP tends to reduce rather to increase worker security. This can be explained by the fact that firms facing more stringent EP make a greater use of workers on fixed-term contracts. Indeed, the incidence of temporary work is 2-2.5 percentage points higher in larger firms. There is also evidence that EP reduces labor productivity. This effect is to an important extent due to the impact of EP on worker reallocation and the incidence of temporary work.

In the second case study, we explore the effect of the final graduation mark on the graduates' probability to be hired by firms (Chapter 3). The analysis is based on a worker-level administrative dataset. By evaluating employment contracts on the basis of their expected duration, we estimate multilevel logit and multilevel ordered logit models to take into account the clustered structure of the data and the nature of the response variables.

Using a random intercept and a random slope specifications, we find the existence of a non-trivial effect of the graduation mark on the probability to be hired, even after controlling for the problem of selection. Specifically, the effect is non-monotonic: it is positive below a certain threshold, and it becomes negative afterwards. In case of permanent contracts, the effect of the graduation mark is not significant, while the major chosen by the student plays a key role.

Chapter 1. The effect of EPL on the labor market: theoretical models and empirical evidence.

1.1 Introduction

The employment protection legislation (EPL) is generally justified by certain recurring factors: the need to protect workers from unfair behavior of their employers, the fact that imperfections in financial markets limit workers' ability to insure themselves against the risk of dismissal and the need to preserve the firm-specific human capital by preventing the destruction of jobs that are viable in the long-term (Hijzen et al, 2013).

To achieve this aim, the EPL introduces rules that define the limits within which firms could hire or lay off workers. In case of permanent contracts, EPL defines the conditions under which an individual or collective dismissal are permitted. It also regulates the use of fixed-term or temporary work agency contracts and their duration (Martin and Scarpetta, 2012). In this regard, it regulates the terms under which these can be offered, the maximum number of successive renewals and the maximum cumulative duration.

All such limitations raise the overall costs to adjust the size and composition of the workforce, thus constraining firms' capacity to respond to the changes in technology and market demand adequately and timely. This may have negative effects on a more efficient allocation of personnel to optimize production and on the growth of productivity (Martin and Scarpetta, 2012). From a macroeconomic perspective, these adjustment costs may influence the overall welfare and the national finances, by affecting employment and unemployment levels, structural changes, wage, productivity and growth (Skedinger, 2010).

Furthermore, these costs may show very high variability. Indeed, several components such as the implementation and enforcement of the law (i.e. how law works practically) make the picture of the EPL legislative context harder to define. In this regard, Venn (2009) and Bassanini et al. (2008) stress the

importance of the interpretation of the rules by the courts and the effectiveness of the EPL enforcement in the evaluation of its impact. Ichino et al (2003) and Bertola et al (2000) argue that the state of the economy influences the court's decisions. More specifically, judges decide in favor of the workers when the economic conditions are characterized by high unemployment levels. This increases considerably the dismissal cost for firms operating in economically depressed areas. In a similar manner, Marinescu (2008) shows that in the UK judges are more likely to decide in favor of the employee if the unemployment is high, but only if the dismissed employee is still unemployed during the trial. As a matter of fact, if the employee has found another job, the macroeconomic conditions and the unemployment do not play any role. Okudaira et al (2011) provide an empirical evaluation of the EPL on productivity of firms, by exploiting the variations in the enforcement of the law across the Japanese regions. They find that strict enforcement of employment protection by courts may have a significant impact thus to reduce the total factor productivity as well as the labor productivity of firms.

The main objective of this paper is to provide a literature review about the effect of the EPL on the labor market, by assessing what economic theory predicts and what is observed through the empirical analysis. Specifically, we will examine the relationship between the EPL and the stock of employment, the worker flows to and from unemployment, the duration of unemployment and productivity.

The paper is organized as follows. The first section describes the main legislative characteristics of the EPL, by introducing some of the most comprehensive EPL measurement indices in the literature.

The second section provides a review of the theoretical results. First we follow Laezer (1990) and show that if wages are perfectly flexible, the effect of the EPL is completely neutralized. Then, we follow Schivardi (1999) and observe that in a context with rigid wages, the EPL is inefficient. Other theoretical predictions about the effect of the employment protection on

aggregate employment, labor reallocation and productivity are further provided.

In the third section, we examine the main empirical evidence emerging from the literature. While there is a substantial convergence on the effect of the EPL on the employment flows, there is no consensus about the overall impact of the EPL on the employment and unemployment stocks. Finally, stringent rules on hires and firings could affect the efficiency of production and the growth of productivity through several channels (OECD, 2007). The fourth paragraph is the conclusion.

1.2 The EPL and the measurement.

The objective of this paragraph is to provide an adequate background to the main economic implications of the EPL on the labor market. In order to achieve this aim, we describe the main legislative characteristics of the EPL. One way to get a summary view of these characteristics is to introduce and show in details some of the most comprehensive EPL measurement indices in the literature. Indeed, these indices consider the legislation in its entirety by assigning weights to its various components (Skedinger, 2010).

Several authors (Heckman; Pages, 2004) and institutions (OECD, World Bank) have identified EPL measurement indices. The OECD – index is the most widely used in the literature. It was introduced in the early 1990s (Grubb and Wells, 1993; OECD, 1999, 2004, 2009) and has been revised recently (Venn, 2009). This index is defined from 21 items. Each of these items is assigned a score which takes into account the level of stringency of the labor market regulation. They refer to the main areas of the job protection regulation: that regarding the costs and procedures of individual and collective dismissals of permanent workers, that concerning the hiring of workers on fixed-term and that regarding the temporary work agency contracts. Each of these areas contributes differently to the determination of the overall level of stringency and protection of the labor market. The

different contributions are measured through a system of weights.

Regarding the laying off of permanent workers, the index examines 9 items related to the possible difficulties inherent the procedures involved in dismissing individuals or groups of workers. For instance, the modalities of notification procedure are considered. The strictness score in this case may vary from the lowest value, when the oral statement is enough, to the highest value, when this notification should be necessarily authorized by a third party. The other variables analyzed in this section are the length of the trial period, the stringency of the definition of unfair dismissal and the possibility of reinstatement following unfair dismissal. There are other 4 items which refer to the additional rules for collective dismissals. In this case, the indicator takes into account the existence of specific regulations, the requirements of additional notifications and the costs for collective dismissals.

The 8 items of the fixed-term employment include aspects concerning the use of this type of contract. For example, the indicator examines the reasons why an employer decides to use temporary workers. The strictness score which is assumed, in such a case, is that the lowest value is assigned in the absence of limits about the use of temporary contracts, and the highest value given only when the use is allowed in specific and limited cases. The maximum duration of successive temporary contracts and the restrictions on the number of renewals are other two issues considered in this section. The temporary work agency contracts play a key role in the definition of the indicator, since they are considered illegal in some countries whereas there are no limitations in their use in other contexts.

The most recent update of this index provides for the addition of three further items that were not included in the previous version. They take into account the maximum period allowed workers to appeal against a dismissal considered unfair; the authorizations necessary for temporary work agencies; the requirement for the temporary work agency employees to

receive the same payment and working conditions as the permanent employees of the user firms.

Some other issues are addressed in the last version of the index. The first one is about the set of employment protection rules introduced by collective agreements or individual contracts. These may include more generous provisions than the minimum standard laid down by legislation. The new index takes this aspect into account and distinguishes these further employment protection provisions on the basis of their features and related additional cost for firms. As a matter of fact, there exist some norms that are agreed on between firms and workers in order to improve productivity, adjust wages or other working conditions (Venn, 2009). These rules cannot be treated as those included in the law, since they are thought with the aim to maximize profits and they are not imposed by third parties (i.e. government). Conversely, there are cases in which what is established by the collective bargaining at a sectorial, regional and national level is extended to firms and workers who were not initially present in the agreement. This kind of norms should be considered as part of the EPL since they limit the ability of firm to adjust their workforce to the market demand.

A second important issue is represented by the enforcement of the employment protection, i.e. how it works in practice (Tiecco, 2009). This aspect plays an important role since the complexity of the rules, the timing and the modalities of their implementation can raise the firing costs significantly. In this regards, the degree of specialization of the courts in labor disputes may be essential. Some countries have special courts (e.g. Australia, Germany, France, etc), others address the issues in the ordinary courts (e.g. Japan, Finland, Greece, Netherlands, etc), and still others have special branches in the ordinary courts (e.g. Italy, Austria). In some countries there are the lay judges with expertise in labor matters, who are nominated by employer and employee representatives, serving alongside professional judges. Several studies show that the level of specialization of the courts represents an important determinant of the costs and the effectiveness of the enforcement. The appeals in the highly

specialized courts are, on the average, faster and fewer. At the same time, it is possible to observe a positive correlation between the degree of the courts' specialization and the number of dismissal cases (Venn, 2009).

Some countries have pre-court dispute resolution procedures thought to help parties to resolve disputes before an official complaint is made. In other countries, the attempts at conciliation are a prerequisite before proceeding with the lawsuit and in any case the court takes into account the conciliation efforts carried out before making a decision. Many OECD countries have institutionalized procedures that encourage the parties to resolve disputes before appealing to the court. The revised OECD indicator includes some of these aspects since they may obviously change significantly the costs faced by firms in the case of dismissal. There are several categories of workers excluded from protection legislation. In many cases, they represent a minimum number of individuals. Although the OECD fails to take into account all these categories, Venn (2009) shows that the impact in the cases where exemptions are more significant (e.g. Italy, where the workers of smaller firms are governed by less restrictive rules) is limited.

There are alternative measures of the EPL with features significantly different from the OECD indicator. Among the most widely used, mention can be made of the indicator introduced by Heckman and Pages (2004) or the World Bank (World Bank's Doing Business "Employing workers", 2008). The first focuses on regulatory issues directly quantifiable in terms of costs of firms. This approach is adopted in order to reduce the degree of subjectivity. They propose the measure of the direct monetary cost of dismissals of workers with permanent contracts for economic reasons in the OECD and Latin American countries. On the other hand, the World Bank's ranking takes into account a number of labor market policy measures related to the difficulty of hiring and firing, the firing costs and the stiffness of the working hours. However, the indicator ignores the complexity of rules characterizing the EPL and none of the measures adopted includes provisions for collective bargaining

or judicial decisions, as in the OECD indicator. Although these are methodological differences, there is a positive and statistically significant correlation between the OECD ranking and these two alternative measures (Venn, 2009).

The indices of the measurement above described provide a comprehensive view of the legislative complexity regarding the employment protection. Furthermore, they have played a pivotal role in the empirical research on the effects of employment protection. This will be shown later.

1.3 The impact of the EPL on the labor market: theoretical models.

This paragraph examines the theoretical impact that the introduction of more stringent regulations on hiring and separation would have in the labor market. More specifically, we analyze the effect that the firing cost may have on the overall employment. The firing cost has two dimensions. The first one is represented by a transfer from the employer to the employee (i.e. advance notification, severance payment), the second one includes sort of taxes, like the red tape costs, legal expenses and financial penalties to be paid by the employer outside the job relationship (Garibaldi, 2005). It is part of the administrative requirements that firms have to satisfy in the case of dismissal.

In the first part of this section, we propose two models. First, we follow Laezer (1990) and show that if wages are perfectly flexible, the effect of the EPL is completely neutralized, since the higher firing cost of firms is offset by a transfer of the same amount from the employee to the employer. Conversely, in the second model, we follow Schivardi (1999). In this case, the hypotheses are the following. The wage is fixed and so the firing cost cannot be undone by the bargaining agreement between employer and employee. We show that a more stringent regulation is associated with lower job flows and employment turnover. The effect of EPL on the overall employment is null in the long run. More flexible economy is more efficient, since firms

have a better capacity to adjust workforce. In the third paragraph, we provide evidence of the other theoretical predictions about the effect of the employment protection on the labor market. The final part of this section examines the implications of a dual context characterized by stricter regulation associated with permanent contracts and flexibility associated with temporary contracts.

1.3.1 The EPL with flexible wages.

In this section we follow Lazer (1990) by discussing the effect of the EPL in a theoretical economy with perfectly flexible wages. We assume that the EPL consists only in the firing cost. This is represented by the government requirement for the firm to pay a severance payment in case of dismissal. The effect of the EPL in this case is null, since the transfer of money from the employer to the employee is completely offset by the transfer of the same amount from the employee to the employer. Hence, the total cost of dismissal does not increase and then the employment is not affected.

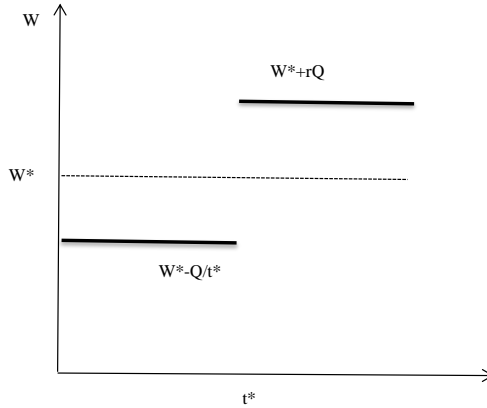
Let us consider a two-period labor market, where there are no labor unions, there is no minimum wage and the market is perfectly flexible. Individuals are risk neutral. Therefore, they are not interested in the wage-time variations, but in the average wage (Garibaldi, 2001).

The contract is signed in the first period, but becomes effective in the second period. First, we assume that there is no compulsory severance payment. Defining A as the reservation wage, M the firm's productivity and W the wage paid by the employer to the employee, in the equilibrium without EPL we have:

$$M^* = W^* = A^*$$

The marginal productivity of the firm is equal to the worker's reservation wage. Figure 1 shows the equilibrium condition without EPL: the wage is constant for the entire duration of the job contract.

Fig.1 Salary offered in the flexible regime (r : economy interest rate).



Now, suppose that the government requires a compulsory severance payment for the dismissal of a worker. In equilibrium the worker chooses to accept the job in the second period if the following relationship holds:

$$A + Q < W'$$

where Q is the severance payment and W' is the wage in the second period. On the other side, the firm decides to offer the job if:

$$M + Q > W'$$

Therefore, the severance payment Q increases the reservation wage that is now equal to:

$$W' = Q + W^*$$

This means that the introduction of the severance payment makes the contract more attractive to the worker. In order to compensate for this, the worker pays a fee to the firm so that the overall compensation remains the same. In this context, this fee takes the form of a lower wage for a certain period (less than the

marginal product), during which the worker transfers to the firm the amount of the severance payment:

$$fee = Q$$

Firms pay exactly the same cost with or without the severance payment and the employee receives, on average, the same wage. Hence, with or without the severance payment firm and employee behave exactly at the same manner. We may conclude that in an economy with flexible wages, the introduction of employment protection legislation has no effect on the labor market.

The results obtained are valid if the severance payment is fully received by the worker. Indeed, the presence of a third subject could lead to inefficiency. Let us suppose that Q is the amount of the severance payment received by the worker and Q' that paid by the firm, and assume that:

$$Q' < Q$$

We can assume that the difference $Q - Q'$ is paid, for example, by the unemployment insurance system.

In the second period, we have:

$$W' = A^* + Q \text{ (for worker)}$$

and:

$$W' = M' + Q' \text{ (for firm)}$$

Given that W_2^* is the equilibrium wage, we should have

$$W_2^* + Q = W_2^* + Q'$$

Therefore the efficiency is obtained only for $Q = Q'$. Since $Q > Q'$, the value of labor force is higher than what the firm would be willing to pay and this inefficiency leads to underemployment.

1.3.2 The EPL with fixed wages.

In this section we follow Schivardi (1999) by assessing the effect that the introduction of the employment protection legislation would have in the labor market in the case of fixed wages (Schivardi, 1999). We distinguish two countries, country f and country r . The first one is characterized by total flexibility in the adjustment of the workforce, in the other the firing cost is so high that dismissals are not allowed. Let us suppose that in each country there is one firm with the same production function:

$$Y = A_i \log L_i \quad i = \{h|l\}$$

where A_i is the productivity which may assume the values $A_h > A_l$ with probability p and $1 - p$, respectively. A_l represents the productivity during the recession whereas A_h represents the productivity during the expansion. L_i is the labor input.

Let us consider first the country f . Let us call the wage W . A firm maximizes its profits, once the level of productivity is observed. The optimal level of employment is then chosen in order to maximize the function:

$$\pi^f = \max_{L_i} [A_i \log L_i - W L_i]$$

from which it follows that:

$$L_{max}^f = \frac{A_i}{W} \quad (1)$$

Conversely, in the rigid country, the level of employment cannot be decided after observing the productivity level. In this case, firm decides to maximize the expected value of profits:

$$\begin{aligned} \max_{L_i} E[A_i \log L_i - W L_i] \\ = \max_{L_i} [p A_h + (1 - p) A_l] \log L_i - W L_i \end{aligned}$$

the solution in this case is given by:

$$L_{max}^r = \frac{pA_h + (1-p)A_l}{W} \quad (2)$$

The value L_{max}^r represents an intermediate value between the value of the employment in the flexible country during the recession (A_l) and the expansion (A_h).

From the above comparison between the employment levels of the two countries (1) e (2) the following results emerge. The average employment in the long run is the same in both the rigid and flexible economy. Thus, restrictions on layoffs have no effect on the average level of employment. This result can be explained as follows. In the long run the flexible economy will cross, on average, a fraction p of high productivity period and a fraction $1 - p$ of low productivity. From this, we obtain the equivalence between (1) and (2).

A second consequence is related to the variability of employment, which is higher in the flexible economy. Indeed, by definition, in the rigid economy there is no change in employment, while, depending on the business cycle of the economy, country f records an employment variation equal to:

$$\Delta L = \frac{A_h - A_l}{W}$$

Concerning the duration of unemployment, we can notice that it is higher in the rigid economy. This is a consequence of the fact that in the rigid economy r there is no turnover, therefore unemployed workers have no possibility to find a new job. On the other hand, in the flexible economy the unemployed find a job during the expansion phase. Therefore, the duration of unemployment depends on the probability of being in expansion, that is equal to $\frac{1}{p}$, where p is the probability that productivity is equal to A_h .

Finally, the flexible economy is more efficient and this is due to a better capacity of firms to adjust the workforce, since they can use more employment during periods of high productivity. This can be easily checked. In the flexible economy L is chosen in order to maximize the profit. Let π^f be the profit in the flexible economy and π^r the profit in the rigid economy, we obtain that:

$$\pi^f > \pi^r$$

if

$$p\theta \log \theta > [p\theta + (1-p)\theta] \log [p\theta + (1-p)\theta]$$

where $A_h = \theta A_l$

Let:

$$b(p) = p\theta \log \theta$$

and

$$c(p) = [p\theta + (1-p)\theta] \log [p\theta + (1-p)\theta]$$

we have that:

$$b(0) = c(0)$$

$$b(1) = c(1)$$

$$\dot{b}(p) = \theta \log \theta > 0$$

$$\dot{c}(p) = (\theta - 1) \log(p(\theta - 1) + 1) + \theta - 1 > 0$$

Hence, $b(p) > c(p) \quad \forall p \in (0,1)$ and this means that profits are lower in the rigid economy.

1.3.3 Other theoretical predictions.

This section looks into the other theoretical predictions about the effects of job security provisions on the labor market. So far, the discussion has led to the following results: first, higher employment protection reduces job turnover, whereas increases the duration of unemployment; second, restrictions on layoffs seem to have no effect on the employment in the long run. Finally, profits are lower in the more rigid economy.

There exists a general convergence on the effect of EPL on job and worker turnover as well as the duration of employment and unemployment. However the effect on the aggregate employment and unemployment is ambiguous.

Bentolila and Bertola (1990) propose a partial equilibrium analysis of labor demand with a linear adjustment cost function. They find that firing costs influence the more the firing policy of firms than their hiring policy. As a consequence the average long-run employment slightly increases. Alvarez and Veracierto (1998) obtain similar results through a general equilibrium model. They show that the severance payment reduces unemployment and have large positive effects on employment. The severance payment reduces layoff rates while it increases the job finding rate. If the former result is not surprising, the second seems to be less intuitive. The idea behind this result is the following. The lower layoff rate increases the length of time that workers are expected to remain employed. This induces them to search job more intensively thereby increasing the probability to find a job. Conversely, Hopenhayn and Rogerson (1993) present a general equilibrium model and show that the effect of the dismissal cost on employment is significantly negative. Their main finding is that a tax on dismissal reduces greatly the steady state of employment and the average labor productivity. Using firm level data for the calibration of their model, they find that a firing tax equal to 1 year's wages lowers the total employment by 2.5% and the average productivity by 2.1%. The intuition for productivity result is straightforward. The dismissal cost hinders the structural change of firms that use less efficiently their employees. The mobility of workers from contracting firms and

industries to the expanding ones slows down and enacts negative consequences for productivity and growth. Ljungqvist (2002) follows the same line of research and tries to explain the reason of the different results in Bentolila and Bertola (1990) and Hopenhayn and Rogerson (1993). In order to achieve this aim, he proposes three alternative models of employment determination: a search model, a matching model and a model with employment lotteries. In the first model he assumes that workers search for new jobs if the productivity level is smaller than the reservation productivity. In contrast, the unemployed workers choose an optimal search intensity that influences the unemployment spells. In this context, layoff costs make the labor reallocation in response to the productivity shocks more costly. This lowers the less frictional unemployment. In the second model, the matching function depends on the number of vacancies and unemployed workers. The surplus of a match is divided between the worker and the firm through Nash bargaining. Two different bargaining assumptions are taken into account. The first assumption is that the worker's relative share of the match surplus is constant when the layoff cost varies. The second assumption allows the worker's share to increase with the layoff cost. The implications are therefore that with a constant share the result is similar as in the search model and the layoff cost makes the reallocation of labor more costly. The labor reallocation is then reduced and the frictional unemployment is lower. Conversely, if the layoff costs reduce the share of the firms' match surplus, the equilibrium for firms is achieved with a higher unemployment. Indeed, the higher unemployment weakens workers' bargaining power and cuts down significantly the time firms are expected to fill a vacancy and restore their profitability. In a model with employment lotteries, the higher layoff cost has a significant negative effect on employment. In this model, agents choose the probability of working while a lottery establishes which agents work. There is no frictional unemployment. Firms create new jobs if the expected discounted profits are not negative. The extent of these expected discounted profits depends negatively on the amount of firms' future layoff

taxes. This means that a higher layoff tax has a negative effect on the optimal choice of employment. As a consequence, the agents' return to work is lower and the probability of working is reduced.

Job security provisions may also affect in a different manner the levels of unemployment and employment of the various demographic groups. Indeed, the way they are designed often affects differently the subgroups of population. For instance, mention can be made of the periods of notice and the severance pay which increase significantly with the job tenure by raising the risk of layoff for persons with shorter tenure (*i.e. youth and women*) (Skedinger, 2010).

Bertola et al (2007) investigate the impact of labor market institutions on the employment levels of different groups of the workforce. Their main findings show that stricter labor market regulations tend to be associated with lower employment levels among groups with a higher labor supply elasticity (*i.e. youth, women and older workers*), while it maintains high the employment rates for prime age men. The empirical evidence of the paper, based on macroeconomic and institutional data on 26 OECD countries for 8 five-year period from 1960 to 1999, confirms the theoretical predictions, except for the older individuals. As a matter of fact, they find that the employment protection legislation lowers the unemployment rates of the prime aged (*i.e. 25-54*) with respect to the younger workers, while there is no evidence of the raise of unemployment of older individuals. Chéron et al (2011) analyze the effect of the employment protection legislation by different age groups. In the hypothesis of a finite working life, they first investigate the effect of a constant firing tax over ages. This tax reduces job destruction for older workers more than younger ones. The intuition is the following. Let us suppose that a firm has to decide whether to dismiss older or younger workers, *ceteris paribus*. In the first case the shorter distance from retirement could induce firms to keep the worker until he will be retired in order to avoid the firing tax. In the case of younger workers, the value of the actual firing tax could be less than the expected

future loss in keeping the worker. Therefore, firms tend to dismiss the younger workers. In the hypothesis of an age-increasing firing tax, the argumentation provided above is still valid. The effect therefore is similar: the job destruction rate of young workers is higher than that of the older ones. Chéron et al (2011) argue that the optimal firing tax displays a hump-shaped profile. It is age increasing under a certain threshold age, above which it decreases. This stimulates firms to fire fewer older workers, or postpone their dismissal, since the expected firing cost is lower in the future.

1.3.4 Temporary versus permanent workers: the EPL at margin.

The employment protection legislation reduces employees' probability to lose their job, but at the same time it lowers the unemployed probability to flow out from unemployment. The EPL is then well accepted by the employed but not by the unemployed. Since the employed workers generally represent a greater part of the electorate, it is easy to understand the reasons why the EPL is difficult to remove or reduce once introduced (Garibaldi, 2001). This is on the basis of the political theory of the EPL (Saint Paul, 1993; Saint Paul, 2000; Vindigni, Scotti, Tealdi, 2013). The necessity to introduce into the labor market more flexibility occurred from the second half of the 90s. Recently the economic crisis has confirmed this and various international organizations (OECD, 2012) are advocating for such reforms. However, this need has been satisfied in some cases leaving unchanged the conditions of the insider workers and increasing the flexibility of labor market just for the outsider workers. This kind of reform is known as reform at margin. It can be justified by political reasons since they allow to achieve the broadest consensus among workers. Indeed, on one hand the insiders do not see their level of protection tampered with. On the other hand, the outsiders – namely youth and unemployed – consider this flexibility as an instrument to improve their

possibilities to enter the labor market, although in more precarious conditions.

The last part of this section concerns the theoretical effect of employment protection reforms at margin. Boeri and Garibaldi (2007) analyze the effect that such a reform at the margin may have on the employment and productivity. Let us suppose to be in a rigid economy, as in the context above described, but we allow now firms to have a flexibility at the margin. In other words, they can hire or fire temporary workers (L^{temp}), while the number of permanent employees (L^{perm}) remains unchanged. The optimal level of employment L^* is obtained by:

$$L^* = L^{perm} + L^{temp}$$

where L^{perm} is given by (2; see the previous section), while L^{temp} is equal to:

$$\begin{cases} \frac{(1-p)(A_h - A_l)}{W} & \text{if } A_i = A_h \\ 0 & \text{if } A_i = A_l \end{cases}$$

The first main consequence is that the average employment \bar{L}^* increases permanently. Indeed, denoted as p the percentage of firms that are in favorable economic conditions and $(1-p)$ those in unfavorable economic conditions, we observe that:

$$\bar{L}^* = L^{perm} + p \frac{(1-p)(A_h - A_l)}{W}$$

which says that $\bar{L}^* > L^{perm}$. This is what Boeri and Garibaldi define as the honeymoon effect in employment.

A second consequence concerns the average productivity which falls permanently. Indeed, it is possible to show that:

$$\left(\frac{y}{L}\right)^{perm} > \left(\frac{y}{L}\right)^*$$

where we say $(\frac{y}{L})^*$ the average productivity in the reform context. This results is a direct application of the law of diminishing return. The idea behind it is that expanding firms hire temporary workers. This additional employment decreases the marginal productivity of labor and, consequently, the average productivity declines. Finally, as regards the effect on average profits, it is observed that the reform allows firms to have the same average profits during unfavorable economic conditions whereas they are able to increase employment during better periods, so that they can achieve the optimal level. This chance is not permitted in the rigid context.

In the last part of this paragraph we provide other theoretical predictions about the main effects on the labor market in a legislative context where the rules for temporary employment are liberalized but those for permanent employment remains unchanged.

Blanchard and Landier (2001) investigate the effect of such a partial reform of employment protection, both theoretically and empirically. The main assumptions of the theoretical model are the following: the employment protection is considered as layoff costs, that is higher for regular workers; the new entrants are hired with temporary contracts and have initially a lower productivity than the regular workers; should the temporary worker's productivity raise and achieve the level of a permanent worker, the firm can decide to keep him or her in a regular job or to hire a new temporary worker with a lower productivity. With regard to the theoretical implications, a partial reform which increases the difference between the firing costs of regular and temporary workers leads to a higher employee excess turnover. Furthermore, the decrease in the temporary firing cost reduces the value of temporary jobs, thus making them look the more like unemployment and the less like regular jobs. This increases the dualism in the labor market.

In the empirical section, Blanchard and Landier (2001) analyze the evolution of the labor market in France in the years between 1980 and 2000. They focus on the development of fixed-duration contract that was introduced in 1979 and was limited in its use in

1982 and 1986. The introduction of temporary contracts changed completely the labor market especially for the youth. Indeed, the proportion of workers, aged 20-24, with permanent contracts drops from 85% in 1983 to 46% in 2000. The probability to move from temporary to permanent contract decreases, while the probability to remain on temporary contracts increases throughout the period. Finally, the probability of staying or becoming unemployed is not clearly identified. Cahuc and Postel-Vinay (2001) obtain similar results. They investigate the effect of policies that render high the employment protection of permanent contracts, while trying to facilitate the use of fixed-duration contracts. The effect may be adverse. Indeed, the liberalization of temporary contracts may increase both job creation and job destruction. The theoretical impact on the overall unemployment is then ambiguous. However, by calibrating the model on the European labor market, they show that the effect of job destruction is prevalent in the presence of a positive firing cost and this increases unemployment. Interestingly, the paper shows that the nature of firm ownership may play a key role. In case profits are not redistributed among workers (*e.g. continental and southern Europe*) then the preferred policy situation is the dual labor market, in which job protection and temporary contracts coexist. Conversely, in case profits are distributed among workers (*e.g. Anglo Saxon economies*), the flexible labor market is the preferred context.

In conclusion, economic theory on the effect of employment protection converges on the following results: more stringent regulations reduce job and worker turnover, while increase the duration of unemployment. The effect on the aggregate employment seems to be, instead, ambiguous. Stricter job protection regulation lowers both the layoff and hiring rates and this two opposing effects generally compensate each other. EPL may affect differently the levels of employment in the various demographic groups. More stringent job protection provisions tend to be associated with lower employment among groups characterized by higher labor supply elasticity (*i.e. women and the youth*). Furthermore, the coexistence of less (*i.e. temporary*) and

more (*i.e. permanent*) protected workers in the labor market leads to higher employee excess turnover and labor market duality. However, once again no clear cut answer can be provided about the impact on the aggregate employment. Finally, theoretical results about the effect of EPL on productivity suggest that higher layoff cost reduces productivity since it hinders the structural change of firms that use less efficiently their employees.

1.4 Empirical evidence of the EPL

In this section we review the empirical evidence about the impact of employment protection on labor reallocation and productivity. Particularly, the first paragraph reviews the empirical evidence on the role that EPL plays on the labor market in terms of job and worker flows as well as the stock of employment. While the effect of EPL on in and out flow of jobs seems to be clear, there is no consensus about the impact on unemployment. Economic theory gives no guidance on the effects of severance pay on unemployment rates (Laezer, 1990).

In the second paragraph, empirical evidence on productivity is reviewed. Stringent regulations on hiring and firing could affect the efficiency of production and productivity growth through several channels (OECD, 2007). By reducing the ability of firms to adjust their workforce to the exogenous shocks of demand and technological changes adequately and timely, the EPL may have direct effects on the growth of productivity. The effects may also be indirect: first, the influence on the risk level of firms to invest in new technologies, second the investment of workers and firms in the human capital and finally the incentive effects on worker effort.

1.4.1. Empirical evidence of the EPL effect on labor market.

There is a wide literature that analyzes the impact of the employment protection on labor market in terms of job and worker flows as well as the stock of employment.

One strand of this literature finds that the EPL effect on the aggregate employment and unemployment levels is not significant (tab.1). Nickell (1997) investigates the effect of policy measures on the labor market. Among other results, he argues that the generosity of the unemployment benefits may have an impact which depends on the pressure on unemployed to obtain work. The presence of labor unions may result in high unemployment in the absence of coordination with the employers. Labor taxes generally increase unemployment. Regarding the employment protection legislation and the overall labor market legislation, he shows that these do not seem to have significant implications on the average levels of unemployment. Jackman et al (1996) confirm this evidence. Employment protection reduces hirings and thus increases long term unemployment. But it also reduces firings and short term unemployment. Hence, the effect on hirings is almost neutralized by the effect on firings and this shows no significant effect on the persistence of unemployment. Consistently with these results, OECD (1999) finds that the strictness of EPL has a residual or insignificant effect on the overall unemployment. Conversely, by analyzing gender and age, it is possible to observe that the effect on the demographic composition of the unemployed population appears to be significant. Indeed, the cross country comparison suggests that as a result of a combined effect a stricter EPL does not seem to have any influence on the aggregate of unemployment. A stricter EPL induces lower unemployment for adults, that is balanced by a higher unemployment for younger workers. With regards to employment, the results are similar and confirm that higher EPL is associated with higher adult employment rates and lower youth and female employment rates. Regarding job flows, stricter EPL is associated with lower turnover and, as confirmed

by theoretical models, unemployment spells tend to be longer. As a matter of fact, with stricter EPL, fewer people become unemployed but the unemployed finds it more difficult to reintegrate into the labor market.

Blanchard and Portugal (2001) present the case of Portugal and the US. At the beginning of the 90s, these two economies had for a long time the same unemployment rate, although operating in a very different labor protection legislation. Portugal has high EPL whereas the US is the country with the least strict regulation (OECD, 2013). However, although Portugal and the US show similar unemployment rates, they are characterized by two different labor markets as a consequence of the EPL effect on employment flows. Indeed, the different regulation induced in Portugal much lower job flows, approximately one third of those registered in the United States, but at the same time the unemployment duration was three times higher. Since the unemployment rate is the product of these two quantities, the combined effect leads to a similar unemployment rate. This provides clear evidence of the ambiguous effect of the EPL on employment. Bassanini and Duval (2006) achieve similar results. By analyzing the impact of structural policies and institutions on aggregate unemployment, they find no significant impact of EPL. Differently from what was observed by the OECD (1999), they suggest that this insignificant coefficient may be the result of two opposite effects: an upward pressure on unemployment due to the EPL on the regular contracts and a downward pressure on temporary contracts. Although the main objective of their paper is to investigate the effect of product market competition on unemployment and wages, Griffith et al. (2006) obtain interesting results concerning the relationship between labor market regulations and unemployment: taxes and unemployment benefits affect positively the unemployment, while no significant effect is related to the job protection provisions.

Using an international macro panel data on OECD countries, Allard et al (2007) find no significant effect on the overall employment by providing a separate analysis of the EPL impact

on insiders and outsiders. Consistently with the theoretical prediction and the empirical results of Bertola et al (2007), they observe a different impact on the employment levels of the worker groups. This can be the result of the effects of EPL on the human capital. More specifically, by raising the time spent without job for outsiders (i.e. women and youth), the EPL causes a net drop in their human capital increasing the relative unemployment rates. Furthermore, this human capital loss has also a clear negative effect on productivity. Indeed, the effect on the depreciation of the outsiders' human capital persists throughout their career reducing their later productivity.

Baccaro et al (2007) estimate a country-level dynamic model with the unemployment rate as a function of a series of labor market institutions (*i.e. employment protection, benefit replacement rate, benefit duration, the change in union density, bargaining coordination, the tax wedge*) and macroeconomic variables. They adopt the EPL index elaborated by the OECD. Employment protection does not seem to be associated with higher unemployment rates. Its coefficient varies in sign across specifications, but it is statistically insignificant. The same results emerge from benefit employment rates, tax wedge and wage coordination, whereas there is a positive association between unemployment and union density. Finally, Rovelli et al (2008) assess the effect of labor market policies on the employment outcomes across EU countries and find that EPL does not seem to influence the employment rates. Its contribution is either not significant or weakly positive.

Although most of the empirical studies confirm the absence of a significant effect of the EPL on employment, there are a number of studies which seem to indicate the presence of a possible effect (tab.2).

Laezer (1990) examines data from 22 countries, including United States and most of Europe, in the years between 1956 and 1984. He finds a significant effect of severance pay on the labor market. Although not completely consistent, his estimates suggest that an increase of severance pay substantially lowers the number of jobs in the economy. This is in line with the

previous results. However this would raise the unemployment rate and reduce the employment rate. More specifically, he finds that moving from a no-severance pay condition to three months of required severance pay to employees would reduce in the US the employment rate by 1 percent. At the same time, this increases the unemployment rate by 5.5 percent. The burden of this situation would be on the youth. Furthermore, empirical evidence suggests that severance pay turns full time jobs into part-time ones, permanent workers to temporary workers. Since part-timers and temporary workers are exempted from severance pay, employers tend to substitute full time and permanent workers with part-timers and temps. Di Tella et al (1998), Heckman and Pages (2000) and Addison and Teixeira (2005) strictly refer to this paper.

Using survey data on the hiring and firing restriction for 21 OECD countries during the period 1984-1990, Di Tella et al (1998) extend the contributions of Laezer (1990) and assess the effect of flexibility on the labor market of the countries mentioned. The sign of the relationship between flexibility and employment rate is significantly positive. Similarly, the effect of flexibility on the labor market participation is positive and both of these results are larger in the female labor market in the short run. The long-run effect seems instead similar by gender. The paper also finds that lower labor market regulations reduce the unemployment rates and the share of long-term unemployed. Heckman and Pages (2000) analyze the impact of EPL in Latin American labor markets. Their results confirm those mentioned above about the effect on job and worker flows. Stricter job protection norms reduce job flows in and out of employment. The probability of exiting employment is lower, but at the same time the probability to find a job is lower. This leads to insecurity among workers who insist to maintain the existing rules. With regards to the impact on employment, their findings are similar to Laezer (1990). They show that EPL affects negatively the level of employment. This is confirmed in all specifications except for females. On the other hand the impact on unemployment rates is positive and it seems to be much larger for women and the youth

but smaller in developing countries. Finally, Addison and Teixeira (2005) investigate the effect of severance pay on employment and unemployment by extending the sample period of Laezer's (1990) dataset. They confirm Laezer's results on unemployment rate, while those concerning the employment rate, long-term unemployment rate and labor force participation rate seem to disappear when they control for country dummies. Scarpetta (1996) confirms the existence of a significant EPL impact. He assesses the role of labor market policies and institutional settings on unemployment. Regarding the effect of employment protection regulations, he finds out that it raises unemployment and non-employment rates. The non-employment rate is the sum of unemployed workers and inactive individuals divided by the total working age population. Stronger positive effects are observed on the youth and long term unemployment. In order to evaluate the impact of the American with Disabilities Act (ADA) on the disabled employees' labor outcomes, Acemoglu and Angrist (2001) find a negative relationship between stricter job protection and employment level. In 1994 ADA demanded from employers with fifteen or more employees to improve working conditions of disabled employees (*e.g. availability of wheel chair access and special equipment for disabled workers*), avoiding any form of discrimination in terms of job opportunities (*i.e. wages, hiring, separation*). ADA increases the cost of hiring disabled workers, while its effect on the disabled separations seems to be residual. The aggregate effect on the overall employment levels is then negative. Kugler et al (2003) assess the effect of the 1997 labor market reform in Spain. This reform reduced the unfair dismissal cost of permanent employees for the following social categories: workers under 30 and over 45 years of age, the long-term unemployed, women under-represented in their occupation and disabled workers. They find that the reform affected both hiring and dismissal, as theory suggests. But in the case of older men the effect on hirings is offset by the effect on firings, and this leads to insignificant net changes in the permanent employment. Conversely, in the case of the youth, the effect on dismissal

seems to be irrelevant. This therefore makes the overall effect on the permanent employment of young workers positive. Botero et al (2004) investigate the regulation of labor market in 85 countries, by testing the validity of three broad theories: the efficiency theory, the political power theory, and the legal theory. With regard to the implications of stricter employment protection, their results confirm that it leads to higher unemployment, especially for the youth. Furthermore, they find that in such a legislative context lower male participation in the labor force is observed. Similarly, Kahn (2007) finds that there is a positive relation between the strictness of EPL and the youth, female and immigrant unemployment rates. Using data of International Adult Literacy Survey (IALS), from 1994-1998 for several countries, he observes that strict EPL protracts the permanent jobs of prime age men, while leaving the other groups out of work or shifting among temporary jobs for a long time. Fiavola and Schneider (2008) analyze the role of labor market institutions by explaining the differences among labor market developments in the European countries, particularly the new European Union member countries. Adopting the OECD EPL indicator, they take into account four models with the following variables as the outcome: unemployment rate, long-term unemployment, employment rate and activity rate. There is no evidence of a significant effect of the EPL on the unemployment rate and the long-term unemployment. On the other hand, the third and the fourth model show that higher job protection regulation tends to lower both the employment and activity rates. Finally, Sà (2008) evaluates the effect of employment protection legislation on the native and immigrant labor markets. Immigrants are generally characterized by a less awareness of the regulations and their rights. This may give them a competitive advantage in the labor market since employers may find them more attractive. Using data on some OECD countries over the period 1995 -2005 and the OECD EPL indicator, they find that this conclusion is valid. Stricter regulation reduces the employment rates of natives while increases the employment rates of immigrants. The effect is

higher for immigrants who have spent longer time in the country. This seems to be a paradox, considering the results for natives. Indeed, the awareness of rights increases over time, making immigrants with a longer permanence seem like natives. But longer permanence improves immigrants' productivity and this effect seems to dominate.

There are a few authors who estimate a positive effect on employment. Using establishment level data collected by the Census Bureau, Autor et al (2007) explore the impact of the adoption of wrongful discharge protection by US state courts during the period 1970-1990. This law introduced some exceptions to the employment-at-will doctrine. Employers were prohibited to fire workers violating the public policy and without a good cause. There are three main area of research: that regarding the effect on employment fluctuations, that concerning the effect on employment levels and that relative to the impact on productivity. The effect on employment fluctuations is in line with the expected theoretical results: the employment protection lowers the flows (by 5-12%). The total employment increases by 4.8 to 7.8 log points after the introduction of the exception. But this result is considered anomalous by the same authors. The effect on productivity will be discussed in the next paragraph.

1.4.2 The empirical evidence of the EPL effect on productivity.

In the previous paragraphs we have already observed theoretical results and some empirical evidences on the effect of the employment protection legislation on productivity. This issue will be dealt with in depth in this paragraph. Stringent regulation on hiring and firing could affect the efficiency of production and productivity growth through several channels (OECD, 2007). By reducing firms' ability to respond to the exogenous shocks of demand and technological changes adequately and timely, the EPL may have direct effects on the growth of productivity (tab.3). The effects may also be indirect

(tab.4): first, the influence on the risk level of firms to invest in new technologies, second the investment of workers and firms in the human capital, third the incentive effects on worker effort. The theoretical model and the empirical results presented in Hopenhayn and Rogerson (1993) show a negative effect of the employment protection legislation on productivity. More specifically, they find that a firing tax which is equivalent to 1 year's wage lowers the average productivity by 2.1%. The conclusion is straightforward. The dismissal cost hinders the structural change of firms that use less efficiently their employees. The mobility of workers from contracting firms and industries to the expanding ones slows down, with negative consequences for productivity and growth. Scarpetta et al (2002) assess the influence of policy institutions on the differences in productivity observed across 19 OECD countries over the period 1984-1998. The results confirm the negative impact of EPL on productivity only in countries with an intermediate degree of centralisation/ coordination in wage bargaining, since it raises the adjustment cost of the workforce and thus hinders technology adoption. Similarly, Micco and Pages (2004) verify that the EPL has implications on the productivity of areas where frequent workforce adjustments are required. In this paper, a negative relationship between layoff costs and the level of the labor productivity is observed, although results seem to depend on the inclusion of a country (*i.e. Nigeria*) in the sample. The pro-workers reforms may have an adverse effect, leading to lower levels of investment, employment, productivity and output. Furthermore, they may also increase the informal sector activity. These results emerge from Besley et al (2004) in which the effect of labor market regulation on the development of manufacturing firms in India in the period 1958-1992 is considered. Using establishment level data for US from 1970 to 1999 Autor et al (2007) evaluate the empirical link between dismissal costs and productivity. During that period, state courts in the US adopted stricter job security provisions. The main finding of the paper is the significantly negative effect on the total factor productivity (TFP), that is stronger in the short run. It reaches its peak three

years after the introduction of the stricter norms. A negative EPL effect on productivity is confirmed in Bassanini and Venn (2007). Using firm level data they analyze the effect of the employment protection legislation, minimum wages, parental leave and unemployment benefits on productivity. Regarding the EPL, they find that norms on regular contracts induce a small but significantly negative effect on the growth of aggregate productivity. Particularly by using the OECD-EPL indicator, with a scale from 1 (*i.e. the least stringent*) to 6 (*i.e. the most stringent*), they show that a 1-point increase in the stringency of regulation produces a 0.04 percentage point reduction of the TFP. Bassanini et al (2008) propose an analysis of the EPL across industries. Although EPL is defined at an aggregate level, using data at the industry level from 1982 to 2003 and a difference-in-difference approach, they find that the EPL effect on productivity is negative but the extent varies significantly across industries. It is larger in the industries where regulations are more likely to be binding, i.e. sectors that rely on the adjustment of the workforce through layoffs rather than in sectors where turnover and the internal labor market are prominent.

Finally, the same results are in Dougherty et al (2011). Using plant-level data between 1998-99 and 2007-08, they assess the impact of employment protection legislation on productivity in India. A difference in difference approach is adopted in order to take into account the level of stringency in the labor market across Indian states and the industry level labor intensity. Their main findings are that there is a significantly positive correlation between lower labor regulation and multifactor productivity. But this result is confirmed only in the industries where labor intensity is higher, otherwise it is close to zero. Similar results emerge from the labor productivity.

A strand of the empirical literature analyze the several indirect channels through which the EPL may affect productivity.

An example is provided by the indirect influence that EPL may exert on firms' risk level in terms of investment in new technologies. Saint-Paul (2002) develop a model to analyze the effect of labor market stringency on incentives for R&D and

international specialization. In a rigid labor market firms tend to produce mature goods, i.e. products with a steady demand. In a low firing cost country, firms are more propensive to invest in producing new goods that will be also produced in the high firing cost country only when they have reached a more mature stage. In other words, the flexible economies tend to invest more in R&D, whereas rigid economies tend to invest more mature innovation. The authors argue that this seems to be at the basis of the different propensity to invest in new technology between Europe and the US. Similarly, Bartelsman et al. (2004) show that the effect of EPL on the firms' capacity to innovate and adopt new technologies may depend on the characteristics of the sector in which they operate. In sectors where technology plays a minor role, EPL lowers the incentives to innovate. In sectors where firms need to innovate, some distinctions are necessary. If firms follow the same technology process, it is easier to invest in the internal labor force and thus the effect of EPL may be lower. Differently, if firms need to change continuously their technology by shifting in the kind of human capital required, then the EPL effect may be significantly higher.

But EPL may also have an impact on worker effort. Ichino and Riphahan (2005) show that stringent rules have a negative effect on workers and consequently on productivity. By analyzing data of 800 white collar workers of a prominent bank operating in Italy, they observe workers' absenteeism during the three month probation period, in which time they could be fired at will and after when they are fully protected against firing. They show that the number of days of absence increase significantly once workers are fully protected. In a subsequent study, Arai et al (2003) find a negative relation between the share of temporary workers and the sick rate in a panel of 10,000 non-agricultural private establishments in Sweden, during the period 1989-1999. Similarly, Engellandt et al. (2003) observe the temporary (*i.e. less protected*) workers' effort with respect to permanent (*i.e. more protected*) workers. Using the Swiss Labor Force Survey during the period 1996-2001, they analyze the unpaid overtime hours and the absence rate. The main findings are the following.

Temporary workers are more likely to work unpaid overtime hours than permanent workers and this testifies higher effort by this type of worker. Conversely, they do not find any significant difference in the absence rate between protected and unprotected workers.

Another empirical contribution in this direction is given in Lindbeck et al (2006). They provide evidence of the effect of the employment protection legislation on the worker effort and more specifically on absenteeism. The 2001 Swedish job security reform reduced the stringency level for firms with less than ten employees and the main findings of the paper suggest that this reduction lowers significantly absenteeism as a result of sickness by around 0.25 days per year per employee. Four effects may be considered the causes of this result: first, firms may fire more easily workers with high absence; second, workers may prefer to move voluntarily toward bigger firms (*i.e. exempted by the law reform*); third, firms may reduce the attention in hiring decision and this may increase the probability to hire workers with high absence; finally, workers in small firms tend to reduce their absence since the risk to be fired is higher. The authors show that this last effect is quantitatively the most important (*half of the total*). Olsson (2007) investigates the same effect obtaining similar results.

Bradley et al. (2012) investigate the link between the contract type and absenteeism in the public sector. Using a large 2001-2004 dataset containing approximately 180,000 public sector workers in Australia, they compare temporary and permanent worker behavior. The main findings confirm the previous results. More protected workers show higher absence rates, even though their estimates are smaller than those observed in the previous studies. Furthermore, the workplace incentives, such as the possibility to convert from temporary in permanent contracts, play a prominent role and seems to reduce the absence rate.

Dolado et al (2008) evaluate the effect of the extended use of temporary contracts in Spain on productivity, both theoretically and empirically. In the theoretical model they show that

temporary workers provide higher effort if they perceive that the conversion rate of fixed-term into permanent contracts is high. Using firm-level data during the period 1991-2005, they regress TFP with respect to the share of temporary employees and the conversion rate. Empirical evidence of the theoretical predictions is obtained. Indeed, firms with a larger share of temporary workers result less productive and the estimated effect of the conversion rate on TFP is significantly positive.

However, there could be some EPL effects which may counteract the negative effects so far described. Let us think about the positive impact on firms and workers in terms of investment in human capital. Stringent regulation safeguarding the long-term employment relationship may increase workers' effort, making firms and workers more likely to invest in human capital. Belot, Boon and van Ours (2007) develop a theoretical model and analyze the trade-off between productivity gains and costs. They show that the welfare, defined as the sum of the utilities of firm and worker, is strictly increasing with respect to the cost of firing, but below a threshold. This threshold, which represents the social optimal firing cost, is strictly larger than zero.

1.5 Conclusions

This paper has covered the main literature on the effect of employment protection legislation on the labor market, assessing what economic theory predicts and what is observed through the empirical analysis. Particularly, we have examined the relationship between the EPL and the stock of employment, worker flows to and from unemployment, the duration of unemployment and productivity.

Theoretical and empirical research seem to converge on the following results: more stringent regulations reduce personnel turnover and job reallocation, while they increase the duration of unemployment. Conversely, the effect on the aggregate employment and unemployment is hard to grasp. Indeed, by lowering both the layoff and hiring rates the aggregate effect on

employment seems to be ambiguous. However, most of the studies confirm a null or negative effects, whereas there are just a few authors who estimate a positive effect. Finally, we analyze the effect of legislative contexts which leave unchanged the conditions of the insider workers while increase the flexibility of labor market just for the outsider workers. This leads to higher employee excess turnover and labor market duality.

By reducing firms' ability to respond to the exogenous shocks of demand and technological changes adequately and timely, the EPL may have direct effects on the growth of productivity. But it may also affect productivity indirectly, by influencing the risk level of firms to invest in new technologies, the investment of workers and firms in the human capital and the incentive effects on worker effort. All in all, the evidence shows a negative effect of the employment protection legislation on productivity, since it may hinder the structural change of firms that use less efficiently their employees. In addition EPL may exert a negative effect by lowering worker effort. Conversely, stringent regulation safeguarding the long-term employment relationship may improve work intensity, making firms and workers more likely to invest in human capital with a consequent positive effect on the productivity.

Tab.1 Insignificant EPL effect on the aggregate employment and unemployment

Paper	Data/Sample	Period	Main Findings
Nickell (1997)	20 OECD countries	1983-88 and 1989-1994	No significant EPL effect on the average levels of unemployment
Jackman, Layard and Nickell (1996)	20 OECD countries	1983-88 and 1989-1994	EPL reduces hirings and separations. No significant effect on the aggregate unemployment
OECD (1999)	OECD countries (sample size between 16 and 21)	1985-1990 and 1992-1997	No significant EPL effect on the average levels of unemployment. Stricter EPL induces lower unemployment for adults, but higher for the youth
Blanchard and Portugal (2001)	Establishment level data for Portugal and the US	1983-1995	EPL reduces job flows but increases the unemployment duration. No significant effect on unemployment rate.
Bassanini and Duval (2006)	20 OECD countries	1982-2003	EPL on regular contracts exerts an upward pressure on unemployment, while EPL on temporary contracts exerts a downward pressure on unemployment. No significant EPL effect on aggregate unemployment.
Griffith, Harrison and Macartney (2006)	14 OECD countries	1986-2000.	No significant effect of EPL on unemployment
Allard and Lindert (2007)	21 OECD countries	1978-2001	EPL increases the unemployment rate of women and the youth. No significant effect on the aggregate employment.
Baccaro and Rei (2007)	18 OECD countries	1960-1998.	No significant effect of EPL on unemployment
Rovelli and Bruno (2008)	27 OECD countries	2000-2005	No significant or weakly positive effect of EPL on employment rates

Tab.2 Significant EPL effect on the aggregate employment and unemployment

Paper	Data/Sample	Period	Main Findings
Laezer (1990)	22 Countries (including the US, Canada, most of Europe, Israel, Japan, Australia and New Zealand)	1956-1984	EPL lowers the number of jobs, raises the unemployment rate and reduces the employment rate.
Scarpetta (1996)	OECD countries (sample size between 15 and 17)	1983-1993	EPL raises unemployment and non-employment rates
Di Tella and MacCulloch (1999)	21 OECD countries	1984-1990	Lower EPL raises employment rate; the effect is larger for females and in the short run.
Heckman and Pages (2000)	Sample of OECD and Latin American Countries (sample size between 36 and 43 countries)	1990-1999	EPL reduces the in and out flows of job and affects negatively the level of employment
Acemoglu and Angrist (2001)	Current Population Surveys (USA)	1988-1997	EPL affects negatively the overall employment.
Kugler, Jimeno and Hernanz (2003)	Spanish Labor Force Survey	1987-2000	EPL does not affect the level of employment of older workers, while it reduces significantly in case of the youth
Botero, Djankov, La Porta, Lopez-de-Silanes and Shleifer (2004)	Sample of 85 countries	1928-1995	EPL raises unemployment , especially for the youth.
Addison and Teixeira (2005)	20 OECD countries	1970-1993	EPL raises the unemployment rate. No significant effect on employment rate, long-term unemployment rate and labor force participation rate
Kahn (2007)	International Adult Literacy Surveys	1994-1998	EPL increases the youth, female and immigrant unemployment rates.
Bertola, Blau and Kahn (2007)	26 OECD countries	1960-1999	EPL lowers the unemployment rates of prime aged with respect to the younger. No effect on the unemployment rate of older individuals
Autor, Kerr and Kugler (2007)	Establishment-level data from Census Bureau	1970-1990	EPL lowers job flows and increases the total level of employment
Fiavola and Schneider (2008)	17 European countries	1999-2004	No significant EPL effect on the unemployment rate and long-term unemployment. EPL lowers both the employment and activity rates.
Sà (2008)	25 EU member States	1985-2005	EPL reduces the employment rates of natives while increases the employment rate of immigrants.

Tab.3 Direct EPL effect on productivity

Paper	Data/Sample	Period	Main Findings
Hopenhayn and Rogerson (1993)	Longitudinal Research data for U.S.	1972-1977	Negative effect of EPL on productivity
Scarpetta, Hemmings, Tressel and Woo (2002)	19 OECD countries	1984-1998	Negative effect of EPL on productivity in countries with an intermediate degree of centralisation/coordination
Micco and Pages (2004)	United Nations Industrial Development Organization (UNIDO, 2002) - sample size between 65-69 countries	1985-1995	Negative effect of EPL on productivity. Results seem to depend on the inclusion of a country in the sample
Besley and Burgess (2004)	Panel dataset on Indian states	1958-1992	EPL leads to lower levels of investment, employment, productivity and output. It also increases the informal sector.
Autor, Kerr and Kugler (2007)	Establishment level data for US	1970-1999	Negative effect of EPL on TFP in the short run
Bassanini and Venn (2007)	11 OECD countries	1982-2003	Negative effect of EPL on productivity: The extent of this effect varies significantly across industries.
Dougherty, Frisncho Robles and Krishna (2011)	Plant level data for India	1998-99 and 2007-08	Negative effect of EPL on productivity in the industries with higher labor intensity

Tab.4 Indirect EPL effect on productivity

Paper	Data/Sample	Period	Main Findings
Saint-Paul (2002)			
Arai and Thoursie (2003)	Panel of 10,000 establishments in non-agricultural private sector in Sweden	1989-1999	Negative relationship between the share of temporary workers and the sick rate
Engellandt and Riphahan (2003)	Swiss Labor Force Survey	1996-2001	Temporary workers are more likely to work unpaid overtime hours than permanent workers. No significant difference in the absence rate
Bartelsman, Bassanini, Haltiwanger, Jarmin, Scarpetta and Schank (2004)	Macro and sectoral data for 18 OECD countries. Firm level data for US and Germany	1984-1998 for OECD countries. 1999-2003 for US. 1993 for West Germany and 1996 for East Germany.	In low-tech sectors EPL reduces the incentives to innovate; EPL effect is higher if firms need to change continuously their technology
Ichino and Riphahan (2005)	Panel of 800 white collar workers of a bank in Italy	1993-1995	Number of days of absence increase for fully protected workers.
Lindbeck, Palme and Persson (2006)	Panel data containing information on all individuals permanently living in Sweden	1992-2002	Positive association between the reduction of EPL and sickness absence
Olsson (2007)	Panel of Swedish establishments in the non-agricultural private sector	1994-2001	Positive association between the reduction of EPL and sickness absence. The extent of the EPL effect is lower than in Lindbeck (2006)
Dolado and Stucchi (2008)	Firm level data for Spain	1991-2005	Firms with a large share of temporary employees result less productive. The effect of the perceived conversion rate from temporary to permanent has a positive effect on TFP
Okudaria, Takizawa and Tsuru (2011)	The Basic Survey of Japanese Business Structure and Activities	1994-2002	Strict enforcement of employment protection by courts may reduce the TFP and labor productivity
Bradley, Green and Leevae (2012)	Panel of 180,000 public sector workers in Australia	2001-2004	More protected workers show higher absence rate. The workplace incentives reduce the absence rate

Chapter 4: Conclusion

The statistical enhancement of administrative data sources has played a pivotal role in the analysis of the labor market in the last decades. They permit us to obtain a clearer picture of the reality than the common surveys. In so doing, they represent a cognitive instrument capable to support the decision-making strategies adequately and timely.

This PhD thesis provides two empirical case studies entirely based on the main Italian administrative data sources.

In the first case study, we investigate the impact of employment protection (EP) on the composition of the workforce and worker turnover.

Chapter 1 provides an overview of the main existing literature about the effect of EP on labor market, both theoretically and empirically. Particularly, we have examined the relationship between the EP and the stock of employment, worker flows to and from unemployment, the duration of unemployment and the productivity. Theoretical and empirical research seem to converge on the following results: more stringent regulations reduce personnel turnover and job reallocation, while they increase the duration of unemployment. The effect on the aggregate employment is instead ambiguous. We also investigate the effect of legislative contexts which leave unchanged the conditions of the insider workers and increase the flexibility of labor market just for the outsider workers. These contexts lead to higher employee excess turnover and labor market duality.

Finally, the evidence shows a negative effect of EP on productivity, since it reduces firms' ability to respond to the exogenous shock of demand and technological changes adequately.

In Chapter 2 (co-authored with Alexander Hijzen and Stefano Scarpetta), we follow this line of investigation by analysing the impact of employment protection on the composition of the workforce and worker turnover. Using a unique firm-level administrative dataset for Italy, we adopt a regression discontinuity design (RDD) that exploits the variation in

employment protection provisions in Italy between firms below 15 employees and those above 15 employees.

We justify the use of the RDD approach through three different tests. First, we show that firm-size density is actually continuous around the threshold, as proposed in McCrary (2008). Second, we follow Schivardi and Torrini (2008) and assess whether firms just below and above the threshold differ in their propensity to grow. Finally, we conduct a series of balancing tests to investigate to what extent firms just above and below the threshold differ in terms of the observable characteristics.

Our RDD estimates suggest that EP increases worker reallocation, suggesting that EP tend to reduce rather to increase worker security. This can be explained by the fact that firms facing more stringent EP make a greater use of workers on fixed-term contracts. Indeed, the incidence of temporary work is 2-2.5 percentage points higher in larger firms. There is also evidence that EP reduces labor productivity. This effect is to an important extent due to the impact of EP on worker reallocation and the incidence of temporary work.

The second case study, analysed in Chapter 3, provides a further example of the use of administrative data for statistical purposes. Using a novel matched employer-employee administrative dataset, we investigate the effect of the final graduation mark on the graduates' probability to be hired by firms. By evaluating employment contracts on the basis of their expected duration, we estimate multilevel logit and multilevel ordered logit models to take into account the clustered structure of the data and the nature of the response variables.

Using a random intercept and a random slope specifications, we find the existence of a non-trivial effect of the graduation mark on the probability to be hired, even after controlling for the problem of selection. Specifically, the effect is non-monotonic: it is positive below a certain threshold, and it becomes negative afterwards. In case of permanent contracts, the effect of the graduation mark is not significant, while the major plays a key role.

In conclusion, we believe that, further to these results, this PhD thesis provides an interesting contribution to the development and enhancement of administrative data, especially for Italy. Future studies on the evaluation of public policy impact on both the labor market and the educational system could not be carried out without this type of data.

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