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JUNE 2019

ISSN: 2365-9793

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ABSTRACT

Complementarities between Labour Market Institutions and Their Causal Impact on Youth Labour Market Outcomes[1]

We analyse theoretically and empirically the effects on young people's labour market outcomes of two specific labour market institutions and their interaction: employment protection legislation andactive labour market policy. The paper examines recent policy reforms in Italy focusing on the impact of the 2012 Fornero reforms of employment protection legislation as well as the initial impact of the EU-wide Youth Guarantee scheme introduced in Italy in March 2014. The paper then examines how these two policy reforms interacted. The analysis first confirms the finding that the Fornero reform increased permanent hires particularly amongst the very youngest workers; it then goes on to find that the YG was indeed successful in increasing the hires of young people, although this operated through a statistically significant increase in female hires on temporary contracts. Third, it finds some evidence of dampening effect of the YG on EPL reforms as predicted by theory.

JEL Classification: J13, J63, J68
Keywords: youth employment, job search, ALMPs, EPL

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[1] An earlier version of this paper was prepared as a contribution to the ILO's Youth Employment Porgramme. Data access was provided through the VisitINPS Scholars A programme, whose support is gratefully acknowledged. The paper benefitted greatly from the useful comments provided by ILO colleagues Mariya Aleksynska, Janine Berg, Clemente Pignatti and Valerio De Stefano as well as those provided by participants in an ILO workshop held in Geneva.

1. Introduction

The Great Recession precipitated by the Global Economic and Financial Crisis had – and still has – a large labour market impact in the EU, inducing a large decrease in employment rates in many Member States. It is often plausibly argued that young people were particularly hard hit. In 2017, at 16.8 per cent, youth unemployment rates in the EU were still over one percentage point higher than they had been in pre-recession 2007 (15.7 per cent). Perhaps more significantly long-term unemployment rates of young people at 28.1 per cent were still above their 2007 level (26.2) notwithstanding the introduction of the Youth Guarantee which was explicitly aimed at reducing the time spent by young people between education and work or between jobs.

A number of relatively recent and some not so recent papers have looked at the factors driving youth employment and unemployment, in recent years focusing on the role of labour market institutions (LMI). Throughout this literature, from its beginnings in the 1980s, studies have unanimously found a major role for aggregate demand in determining youth labour market outcomes with a more variable role played by demographic and, above all, institutional factors.[2]

Labour market institutions are often likely to affect young people more than other age-groups for fairly obvious reasons; thus, for example, by virtue of their age, young people are usually either new or recent labour market entrants and are consequently more likely to be affected by employment protection legislation (EPL) in as much as this influences new hires. Whilst the net employment effects of EPL – whether for young people or adults – are both theoretically and empirically ambiguous, the picture as regards flows is clearer; strong EPL reduces labour turnover (Boeri and van Ours, 2013). It is also unclear how EPL interacts with other labour market institutions.

The paper seeks to throw light on these issues by examining theoretically and empirically the effects of EPL and ALMP individually and conjointly on flows in youth labour markets. In order to do so, we first develop a simple theoretical matching model and then proceeds to examine empirically the impact of two specific labour market reforms in Italy and their impact on the flows of young people into employment. Italy is an interesting case in that it has recently introduced major reforms of EPL as well as – in common with all other EU countries - a comprehensive active labour market policy for young people: the Youth Guarantee. This allows an examination of the role of specific complementarities between labour market institutions - in this case, how the introduction of a new ALMP interacts with the reform of EPL in influencing job flows – as well as an examination of the individual effects of the two policy changes.

[2] Early examples here are Clark and Summers (1982) on the USA and Rice (1986) on the UK. There were numerous others for which readers are referred to the reference list in the cited papers. The more recent literature is considered explicitly in the next section.

Firm size restrictions in the application of the EPL legislation and age restrictions in access to participation on the Youth Guarantee allow us to identify the effects on youth hires of each of the two policy reforms through difference-in-difference estimates as well as to identify the effects of the interaction effect of the two policies through a triple-difference approach. One might emphasise here that our focus is on worker flows, and specifically, new hires of young people rather than on the net effect of these two policy changes on youth employment rates.

The analysis contributes to at least two strands of literature, by theoretically and empirically evaluating a) the effects of employment protection on youth labour market outcomes; and, b) the impact of active labour market policies. The paper specifically adds to the literature by analysing the *joint* impact of these two types of labour market interventions.

The paper is organized as follows. Section 2 provides a brief overview and review of the relevant literature. Section 3 presents a simple matching model that illustrates the individual and joint effects of employment protection legislation and active labour market policies, with the purpose of guiding the empirical analysis. Section 4 discusses the changes in the law in Italy exploited for identification purposes. Section 5 describes the empirical strategy, discusses the Italian data and presents the results and Section 6 offers some concluding remarks.

2. Labour market institutions and youth labour markets

Boeri (2010, p. 1182) defines a labour market institution as "a system of laws, norms or conventions resulting from a collective choice, and providing constraints or incentives which alter individual choices over labor and pay". For the most part, labour market institutions serve to protect the more vulnerable participants in the labour market, typically guaranteeing certain rights and providing workers with some basic protections from harm and/or loss of income. But labour market institutions themselves are just part of the larger institutional setting which determines what actually goes on in labour markets. Berg and Kucera (2008) make the further distinction between labour institutions, which comprise formal and informal rules, practices and policies affecting how the labour market works, and a subset of these, labour *market* institutions, which includes EPL but explicitly excludes "non-market" institutions such as trade unions and the work ethic. The relevant point here is that all these factors have important implications for the quality and quantity of work available to, and performed by, young people. In this paper, the concern is primarily with the quantitative youth employment effects of labour market institutions, in particular the systems of rules and regulations governing labour markets as encapsulated in employment protection legislation (EPL) and how these interact with another type of labour market institution explicitly intended to promote the quality and quantity of youth employment, active labour market policy (ALMP); and, specifically the Youth Guarantee.

Labour market institutions are often likely to influence the labour market experiences of young people more than those of other groups. For example, young people are usually, by virtue of their age, either new or relatively recent labour market entrants, and are consequently more likely to be affected by EPL *inasmuch as* this has an effect on job seekers and/or the newly employed. As is well known, flows into and out of jobs is, ceteris paribus, higher for younger workers than older ones.

It is also important, however, to recognize that policies (and programmes) are not implemented in a void; it is reasonable to suppose that labour market outcomes arising as a consequence of any specific policy or programme choice will be influenced by existing institutional arrangements. Specific complementarities among labour market institutions have arguably received *relatively* little attention in the literature.

This Section first offers a short review of the very large literature on the effects of employment protection on labour reallocation (for a recent comprehensive review, see Skedinger, 2010) and then briefly surveys the studies that evaluate the impact of active labour market policies.

2.1 Employment protection legislation (EPL)

Employment protection legislation comprises the rules governing the hiring and firing of workers. "EPL imposes legal restrictions on dismissals and sets compensations to workers to be paid by their former employers in case of early termination of a permanent contract […] EPL also imposes restrictions on the hiring of workers under temporary contracts." (Boeri and van Ours, 2013, p. 275). Whilst it is a key labour market institution (or set of institutions) which provides stability in employment and protects workers against arbitrary dismissal by employers, it has sometimes been cited as a cause of high unemployment.

Stronger employment protection reduces the flows of above-all young (but also adult/older) workers into and out of employment. This is the unequivocal finding of the substantial body of theoretical and above-all empirical literature which has examined the question. Employment protection legislation (EPL) acts as a tax on both hiring and firing, reducing accessions and separations; firing costs provide incentives to retain workers whose wage exceeds their productivity during bad times and not to hire workers whose wage lies below their productivity during good times (Bentolia and Bertola, 1990). Put simply, employers find it more expensive and/or more difficult to fire incumbent workers and so job separations will fall. At the same time, anticipating potential costs and difficulties associated with releasing workers should demand for the firms' product decrease and/or if workers prove to be less productive than expected, firms will also be more reluctant to hire.

But, is this a good or a bad thing? Job stability may be seen as a positive attribute in itself. Job stability encourages training and reduces deadweight losses arising from the transaction costs involved in hiring new workers. But, does stronger EPL lead to higher or lower levels of youth employment and unemployment? Theoretically, the net result of the reduced flows of young people into and out of jobs as a consequence of more protective EPL may be higher or lower employment (Bentolila and Bertola, 1990). Moreover, empirical work in the area has thus far not produced an unequivocal answer to the question of whether stronger EPL does, in fact, reduce employment or not. Amongst significant studies in this area, neither Jimeno and Rodriguez-Palenzuela (2002) nor Bertola et al. (2007), for example, find a significant role for EPL in reducing youth employment whereas Bassanini and Duval (2006), on the other hand, do.[3]

Early empirical papers, based on cross-country aggregate data (Bertola and Rogerson, 1997, among many others), identify the effect of EPL exploiting cross-country variation in EPL. Results from this approach are, however, likely to be biased in the presence of non-observable country-specific factors that affect labour market outcomes and are correlated with EPL. Adding the time dimension to the cross-country dimension does not help much given the limited time variability of EPL. To overcome this problem, many studies have focused on the within-country variation of EPL, either across individuals (e.g. Marinescu, 2009) or across firms (e.g. Boeri and Jimeno, 2005). Many papers that follow this approach, including this one,

[3] Along with a positive impact of minimum wages on youth employment.

do so exploiting the discontinuities in firing-costs regimes that apply to firms of different sizes within countries (Bauer et al., 2007; Kugler and Pica, 2008; Schivardi and Torrini, 2008; Martins, 2009; Leonardi and Pica, 2013; Cingano et al., 2016). Acemoglu and Angrist (2001), Autor (2003) and Autor et al. (2007) take a different route and exploit instead, within the U.S., variation across states in EPL. The advantage of the within-country analysis is that it easily allows to control for both time-invariant and time-varying factors, including institutional features, which affect all economic agents equally.

The consensus that emerges from this literature noted above is that EPL unambiguously reduces worker reallocation; but it also reduces entry wages and firm total factor productivity (TFP). The effect on job flows is less clear-cut. This may be due to the fact that, for lack of higher frequency data, the literature usually estimates the impact of firing costs on *annual* job flows. This may lead to underestimate the allocative inefficiencies generated by EPL, as the impact of transitory shocks on high-frequency adjustments is not captured by annual data (Blanchard and Portugal, 2001).

Even though the conventional wisdom has it that EPL mostly harms young workers, the literature is almost silent on the age gradient of the EPL effect. One notable exception is Chéron et al. (2011) that shows, in a formal model, that higher firing taxes benefit older workers and increase job destruction rates for younger generations. Consistently, Leonardi and Pica (2013) find that the negative wage effect of EPL is stronger for younger workers.

2.2 Active labour market programmes (ALMPs)

ALMPs are typically publicly funded programmes which aim to improve the employment prospects of participants. These take various forms including, singly or in combination, employment services and job search assistance (ESJSA), subsidised employment, on or off-the-job skills training and/or entrepreneurship promotion.

Often, individual ALMPs offer a range of support covering more than one of these elements and increasingly, profiling is employed to identify the specific needs of individual beneficiaries. These days, participants often receive a combination of forms of support – e.g. ESJSA combined with a wage subsidy with a private employer on condition that the employer provides training – chosen on the basis of the participants' specific characteristics.

The empirical literature on active labour market policies is large and provides somewhat mixed evidence regarding the effectiveness of ALMPs for young people. The most recent meta-analysis of Kluve et al. (2017) which recovered 3629 treatment effects from 105 interventions suggests that ALMPs for young people have, on average, a positive albeit modest impact on employment and income outcomes. They also find that youth programme impact tends to increase over time

A consistent finding in the literature over the last two decades is that comprehensive programmes with specific interventions targeting individual profiles tend to be particularly effective. Kluve et al. (*op. cit.*) also find support for this view although it more evidently applies in low and middle income countries than in high income ones. More generally, rather than the type of intervention *per se*, it appears that country context, specific design features as well as the profile of participants are the crucial factors in determining significant employment and income impacts. This is also consistent with the view emerging from the more qualitative literature review of Bördős et al. (2017).

In terms of ALMP impact, this paper focusses on the EU's Youth Guarantee – and specifically on its implementation in Italy. Introduced in 2014, the Youth Guarantee programme committed European Union member states to ensure that within four months of leaving school or becoming unemployed, anyone younger than 25 receives either a quality job offer suited to their education, skills and experience or the opportunity to acquire the education, skills and experience needed to find a job in the future through an apprenticeship, a traineeship or continued education. The programme was extended to individuals up to age 29 in a number of countries including Italy.

The Youth Guarantee programme is rather more than just a comprehensive active labour market programme (ALMP). It is intended to ensure that all young people who are NEET receive assistance before extended joblessness permanently impairs their chances of finding work. An important innovation is that it aims to systematically extend outreach to young people who are not looking for a job and who are not in education or training whereas previous interventions usually targeted only people explicitly seeking work – the young unemployed. The emphasis of the Youth Guarantee programme on young people who are not looking for a job and who are not in education or training (inactive NEETs) significantly extends the reach of the initiative to include the most disadvantaged and discouraged. The range of options also goes well beyond the scope of typical ALMP interventions. In addition to subsidized employment and training opportunities, it includes subsidized participation in general education and apprenticeships. Because it has stimulated national policy reforms, it may reasonably be seen as a youth labour market policy framework rather than simply a large scale ALMP (ILO, 2017).

2.3 Policy interactions

Specific labour market institutions do not operate in a void; it is reasonable to suppose that outcomes arising as a consequence of any specific policy or programme choice will be influenced by existing institutional arrangements. This paper is specifically concerned with two such interactions and their impact on the youth labour market. Typically, the impact of complementarities and, more generally, interactions between labour market institutions have received *relatively* little attention in the literature. Notable exceptions are the papers by Bassanini and Duval (2006, 2009) which examine in some detail the role of interactions in

aggregate labour markets.[4] Estimating empirical panel models of aggregate unemployment, they find that labour market institutions are complementary in that the effects of specific institutions such as EPL and unemployment benefits reinforce one another. This contrasts with this analysis which, looking explicitly at young people, finds that in both a theoretical matching model and its empirical counterpart, ALMPs mitigate the effects of stronger (or weaker) EPL, dampening the positive (negative) stimulus to youth employment arising from weaker (stronger) legislation.

In minimum wage research, a few studies have broached this issue. One example is the analysis by Neumark and Wascher (2004). Although this is not its main focus, in a cross-country analysis of the impact of minimum wages on youth employment, the authors include a specification with interactions between minimum wages and other labour market institutions. It finds that the two institutions which consistently have statistically significant interactions with minimum wages are strong EPL and expenditure on ALMPs, both of which offset the estimated negative employment effects of minimum wages on young people as a whole (15–24) and on teenagers (15–19). Boockmann (2010) reported the results of a meta-analysis of 55 empirical studies estimating the employment effects of minimum wages in 15 industrialized countries seeking the source of heterogeneity of effects in labour market institutions. In this case, particular attention is paid to the unemployment benefit replacement ratio, employment protection and the collective bargaining system. More recently, O'Higgins and Moscariello (2017) have found evidence of complementarities between institutional arrangements in determining the impact of minimum wages on youth employment. Specifically, they find that in both emerging and developed countries, the effects of minimum wages depend *inter alia* on the strength of EPL: the stronger the EPL, the smaller the negative effects (if any) on youth employment. In high income countries, the analysis also suggests that minimum wages will have a smaller dis-employment effect in the presence of the appropriate collective bargaining arrangements – specifically in the presence of strong worker representation, accompanied by coordinated but decentralized collective bargaining.

In the next section we present a simple theoretical matching model along the lines of Mortensen and Pissarides (1994) introducing EPL (in the form of positive dismissal costs) and ALMPs which improve labour market matching; the model shows that – beyond the standard effects of dismissal costs in terms of reducing job creation and job destruction – ALMPs mitigate the negative effects of dismissal costs on worker flows.

[4] Boeri et al. (2012) also explicitly treat interactions among labour market institutions, although they are primarily concerned with the trade-off between two such institutions (unemployment benefits and EPL) as an outcome of the political process, rather than its effects per se. The impact of labour market institutions themselves has been the subject of an extensive literature. In addition to the papers cited in the text, see also de Serres et al. (2012) and OECD (2007, ch. 4), among many others.

3. EPL and ALMPs in a matching framework

This section illustrates the individual and joint effects of employment protection legislation and active labour market policies within the framework of a simple matching model. The model augments Mortensen and Pissarides (1994) with dismissal costs and match-enhancing labour market policies and shows – beyond the standard effects of dismissal costs in terms of reducing job creation and job destruction – that ALMPs mitigate the negative effects of dismissal costs on worker flows. This means that there are economic complementarities between EPL and ALMPs, in the sense that the effectiveness of one policy depends on the implementation of the other policy (Boeri et al., 2012).

3.1 Assumptions

Firms have a discount factor *r*. There is a cost *c* of holding the vacancy open. There is free entry, so that the value of a vacancy is equal to zero in equilibrium. The number of matches in the economy is given by *Am(u,v)*, which depends on the unemployment and vacancy rates *u* and *v* (with the labour force normalized to one), and on the efficiency parameter A meant to capture the extent of ALMPs. The matching function is assumed to be increasing in both *u* and *v*, and to be homogeneous of degree one. Accordingly, using a measure of labour market 'tightness', θ (*= v/u*), the arrival rate of applicants is *Am(u,v)/v = Am*(*1/θ, 1*) = *Aq*(θ) with *Aq´*(θ) < 0. As in Mortensen and Pissarides (1994), jobs are assumed to start at the highest possible level of productivity, ε_m, but are subject to productivity shocks with instantaneous probability, λ, where the new match-specific productivity, ε', is drawn from a distribution function *G*(.) on the support [ε_0, ε_m]. Jobs hit by shocks are either terminated or continued, and if they are terminated they have to pay a dismissal cost, *F*, which is assumed to be pure waste. Wages are determined via Nash bargaining.

3.2 Firms

The values of filled and vacant jobs are, respectively:

$$rJ(\varepsilon) = \varepsilon - w(\varepsilon) + \lambda \int_{\varepsilon_0}^{\bar{\varepsilon}} \left[-F - J(\varepsilon) \right] dG(\varepsilon') + \lambda \int_{\bar{\varepsilon}}^{\varepsilon_m} \left[J(\varepsilon') - J(\varepsilon) \right] dG(\varepsilon') \quad (1)$$

$$rV = -c + Aq(\theta)\left[J(\varepsilon_m) - V \right] \quad (2)$$

where $\bar{\varepsilon}$ is the threshold match-specific productivity at which firms are indifferent between dismissing and retaining the worker.[4] Since there is free entry, the equilibrium value of a vacancy is zero:

$$rV = 0 \Leftrightarrow J(\varepsilon_m) = \frac{c}{Aq(\theta)} \tag{3}$$

which implies that the present discounted value of the profits generated by a filled job is equal to the expected cost of opening a vacancy.

3.3 Workers and wage setting

The value of being employed is:

$$rW(\varepsilon) = w(\varepsilon) + \lambda \int_{\varepsilon_0}^{\bar{\varepsilon}} [U - W(\varepsilon)] dG(\varepsilon') + \lambda \int_{\bar{\varepsilon}}^{\varepsilon_m} [W(\varepsilon') - W(\varepsilon)] dG(\varepsilon') \tag{4}$$

The value of being unemployed is:

$$rU = b + \theta Aq(\theta)[W(\varepsilon_m) - U] \tag{5}$$

Where b is the value of leisure which may include unemployment benefits and household production.

Nash bargaining implies that the wage rate $w(\varepsilon)$ is such that the worker appropriates a share $\beta \in (0,1)$ of the total surplus of the match, given by, $J(\varepsilon) + W(\varepsilon) - U = S(\varepsilon)$. Thus, the wage is such that:

$$W(\varepsilon) - U = \beta S(\varepsilon) \tag{6}$$

3.4 Job destruction

To determine the job destruction condition, we sum up equations (1), (4) and (5) and use the sharing rule (6). Given that $J(\varepsilon) + W(\varepsilon) - U = S(\varepsilon)$, we get:

$$\begin{aligned} rS(\varepsilon) &= \varepsilon - b + \lambda \int_{\varepsilon_0}^{\bar{\varepsilon}} [-F - J(\varepsilon) - W(\varepsilon) + U] dG(\varepsilon') \\ &\quad + \lambda \int_{\bar{\varepsilon}}^{\varepsilon_m} [(J(\varepsilon') + W(\varepsilon') - U) - (J(\varepsilon) + W(\varepsilon') - U)] dG(\varepsilon') \\ &\quad - \theta Aq(\theta)[W(\varepsilon_m) - U] \\ &= \varepsilon - b - \lambda FG(\bar{\varepsilon}) - \lambda S(\varepsilon) + \lambda \int_{\bar{\varepsilon}}^{\varepsilon_m} S(\varepsilon') dG(\varepsilon') - \theta Aq(\theta) \beta S(\varepsilon_m) \end{aligned}$$

since $G(\varepsilon_m) = 1$. Hence,

$$(r + \lambda) S(\varepsilon) = \varepsilon - b - \lambda FG(\bar{\varepsilon}) + \lambda \int_{\bar{\varepsilon}}^{\varepsilon_m} S(\varepsilon') dG(\varepsilon') - \theta Aq(\theta) \beta S(\varepsilon_m) \tag{7}$$

Notice that $S(\varepsilon)$ is linearly increasing in ε with $S'(\varepsilon)=\frac{1}{r+\lambda}$. Integrating the term $\lambda\int_{\underline{\varepsilon}}^{\varepsilon_m} S(\varepsilon')dG(\varepsilon')$ by parts:

$$\lambda\int_{\underline{\varepsilon}}^{\varepsilon_m} S(\varepsilon')dG(\varepsilon') = \lambda\left[S(\varepsilon')G(\varepsilon')\right]_{\underline{\varepsilon}}^{\varepsilon_m} - \lambda\int_{\underline{\varepsilon}}^{\varepsilon_m} S'(\varepsilon')G(\varepsilon')d\varepsilon'$$

$$= -\lambda F + \lambda F G(\underline{\varepsilon}) + \frac{\lambda}{r+\lambda}\int_{\underline{\varepsilon}}^{\varepsilon_m}\left[1-G(\varepsilon')\right]d\varepsilon'$$

Plugging the above equation back into (7), and remembering that $S(\varepsilon_m) = J(\varepsilon_m)/(1-\beta)$, we get:

$$(r+\lambda)S(\varepsilon) = \varepsilon - b - \lambda F + \frac{\lambda}{r+\lambda}\int_{\underline{\varepsilon}}^{\varepsilon_m}\left[1-G(\varepsilon')\right]d\varepsilon' - \theta c\frac{\beta}{1-\beta} \tag{8}$$

Finally, using the fact that $S(\underline{\varepsilon}) = -F$, we obtain the *job destruction condition*:

$$0 = rF + \underline{\varepsilon} - b + \frac{\lambda}{r+\lambda}\int_{\underline{\varepsilon}}^{\varepsilon_m}\left[1-G(\varepsilon')\right]d\varepsilon' - \theta c\frac{\beta}{1-\beta} \tag{9}$$

which determines $\underline{\varepsilon}$, the reservation value of the shock below which it is not profitable to keep a filled position open.

The job destruction schedule is upward sloping in $(\theta, \underline{\varepsilon})$ space. As θ goes up the worker's opportunity cost of not searching goes up and so does the wage. This makes filled jobs less profitable and induces firms to shut down positions more often, i.e. for higher values of $\underline{\varepsilon}$.

Job destruction comparative statics

The job destruction schedule shifts leftward if EPL becomes stricter (*F* goes up) and it is not affected by matching efficiency (i.e. by changes in *A*). Totally differentiating equation (9) with respect to F and $\underline{\varepsilon}$:

$$\frac{d\underline{\varepsilon}}{dF} = -\frac{r}{1-\frac{\lambda}{r+\lambda}\left[1-G(\underline{\varepsilon})\right]} < 0 \tag{10}$$

3.5 Job creation

From (7) it follows that:

$$S(\varepsilon_m) - S(\bar{\varepsilon}) = \frac{\varepsilon_m - \bar{\varepsilon}}{r + \lambda} \tag{11}$$

From which, given that $S(\varepsilon_m) = J(\varepsilon_m)/(1 - \beta)$ and $S(\bar{\varepsilon}) = -F$, using equation (3), we have that:

$$0 = \frac{\varepsilon_m - \bar{\varepsilon}}{r + \lambda} - \frac{c}{Aq(\theta)} \frac{1}{1 - \beta} - F \tag{12}$$

Equation (12) is the *job creation condition*. The JC curve is a decreasing relationship between θ and $\bar{\varepsilon}$. As the labour market becomes tighter (θ decreases) the expected cost of filling a vacancy increases. This reduces the incentive to create new positions.

Job creation comparative statics

The job creation schedule shifts downward if EPL becomes stricter (i.e. *F* goes up) and upward if matching efficiency increases (i.e. *A* goes up). This is straightforward totally differentiating equation (12) with respect to *F* and $\bar{\varepsilon}$ and with respect to *F* and *A*:

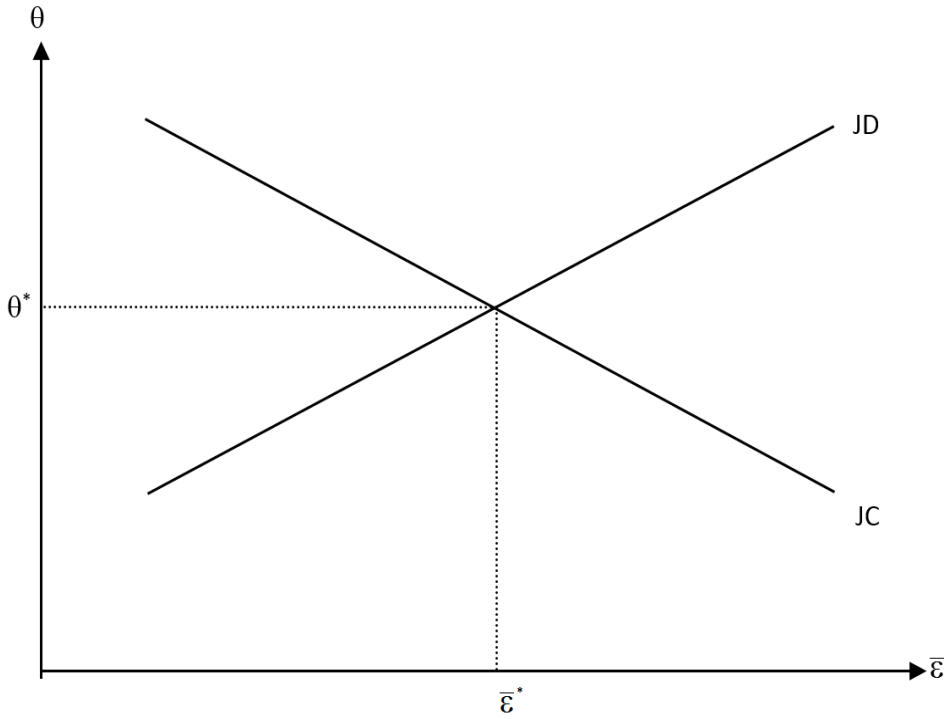
$$\frac{d\bar{\varepsilon}}{dF} = -\frac{-1}{-\frac{1}{r + \lambda}} = -(r + \lambda) < 0 \tag{13}$$

$$\frac{d\bar{\varepsilon}}{dA} = -\frac{-\frac{-c}{A^2 q(\theta)} \frac{1}{1 - \beta}}{-\frac{1}{r + \lambda}} = \frac{c(r + \lambda)(1 - \beta)}{A^2 q(\theta)} > 0 \tag{14}$$

3.6 Equilibrium and comparative statics

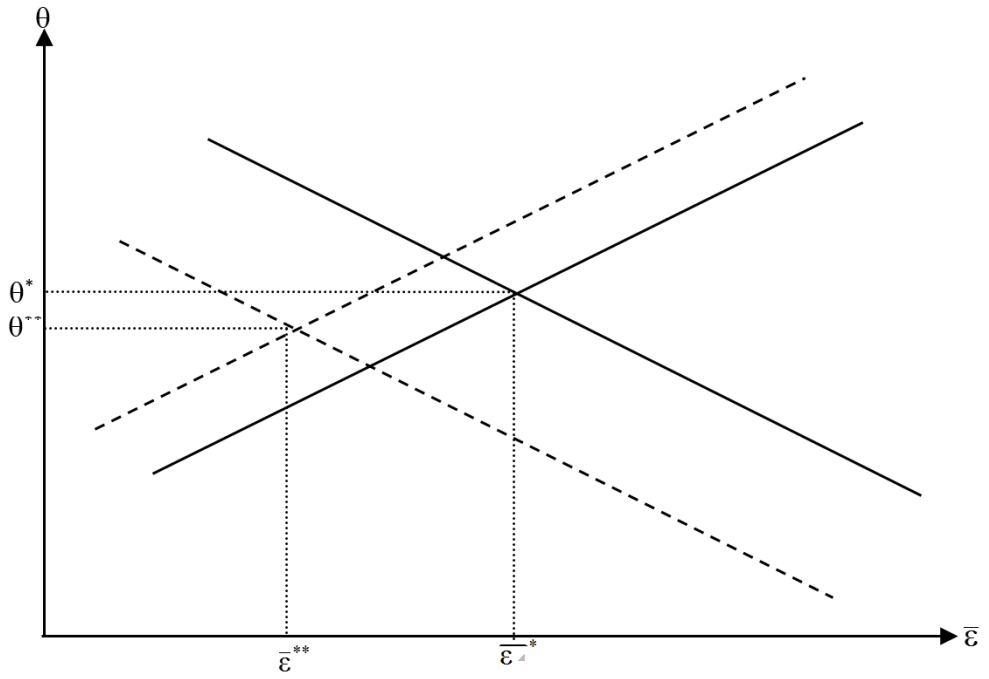
Equation (12), the *job creation condition*, together with equation (9), the *job destruction condition*, determines the equilibrium values of θ and $\bar{\varepsilon}$. The equilibrium is depicted in Figure 1.

Figure 1: Equilibrium values of θ and $\bar{\varepsilon}$



We are interested in analysing the effect of an increase of *F* on the equilibrium value $\bar{\varepsilon}^*$. Given that an increase in *F* shifts the job destruction schedule upward and the job creation schedule leftward, $\bar{\varepsilon}^*$ unambiguously falls. Not surprisingly, costly EPL induces firms to create and destroy jobs less frequently, as shown in Figure 2.

Figure 2: Comparative statics with respect to F



Analytically, this result is obtained totally differentiating (9) and (12) with respect to *F*, θ and $\bar{\varepsilon}$ and solving for $\frac{d\bar{\varepsilon}}{dF}$:

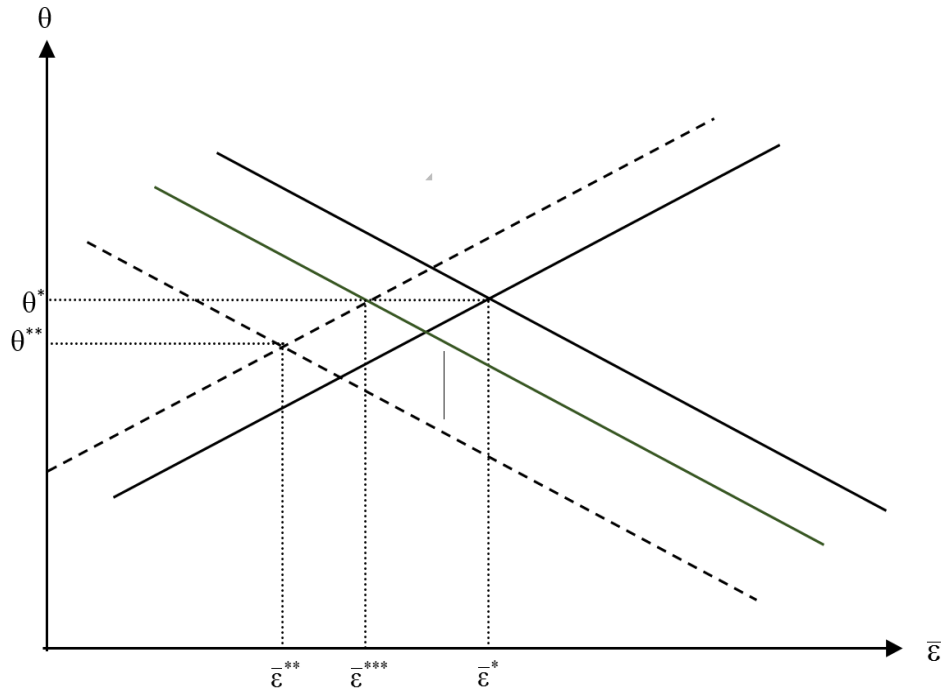
$$\frac{d\bar{\varepsilon}}{dF} = \frac{-r + \beta A \frac{[q(\theta)]^2}{q'(\theta)}}{1 - \frac{\lambda}{r+\lambda}\left[1 - G(\bar{\varepsilon})\right] - \frac{\beta}{r+\lambda} A \frac{[q(\theta)]^2}{q'(\theta)}} < 0 \qquad (15)$$

Interestingly, the negative effect on labour turnover is mitigated in presence of active labour market policy that increase the efficiency of the matching process. i.e.:

$$\frac{d^2\bar{\varepsilon}}{dFdA} > 0 \qquad (16)$$

as shown in Figure 3 (see appendix for the proof). That is, the fall in job creation occasioned by stricter EPL is mitigated by the more efficient matching arising from the ALMP.

Figure 3: Comparative statics with respect to F and A



Empirical prediction:

The model predicts that the reduction in worker flows caused by employment protection legislation is smaller in the presence of active labour market policies that increase the efficiency of the matching process.

Simply stated, the model suggests that the introduction of ALMPs which improve the efficiency of matches between job seekers and firms searching for workers reduce the downward (upward) pressure of stronger (weaker) EPL on labour market flows. The effects of ALMPs in this context are thus analogous to the role of automatic stabilizers in the macro-economy.

4. Reform of EPL and ALMP in Italy

In this section we review the Italian regulatory background and the legislation changes to be analysed below.

4.1 EPL: The *Fornero* reform

Over the years, Italian legislation disciplining the unfair dismissal of workers has changed often. The *Fornero Reform* passed in 2012 changed the rules concerning dismissals for firms with more than 15 employees. It established that in case of unfair dismissal, the dismissed worker no longer has the automatic right to reinstatement but rather receives a monetary compensation that ranges between 12 and 24 months' salary. Thus, the reform significantly reduced the firing costs borne by larger firms.

Although the Fornero reform touched upon several aspects of labour legislation,[5] the empirical approach used here isolates the effect of the change in the level of EPL, since all the other legislative changes did not affect firms above and below the 15-employee threshold differently. Thus, the reduction in firing costs for firms with more than 15 workers (but not for those employing up to 15 workers) induced by the 2012 reform is exploited in order to identify the impact of EPL on the Italian labour market through looking at the "difference-in-difference" in hires before and after the reform in firms above and below the threshold.

4.2 ALMP: The Youth Guarantee in Italy

EU Council Recommendation of 22 April 2013 on establishing a "Youth Guarantee" invited Member States (MS) to ensure that all young people under the age of 25 receive a good-quality offer of employment, continued education, apprenticeship or traineeship within a period of four months of becoming unemployed or leaving formal education. The Youth Guarantee has been implemented throughout Europe. Thus, the Youth Guarantee programme committed European Union member states to ensure that within four months of leaving school or becoming unemployed, anyone younger than 25 receives either a quality job offer suited to their education, skills and experience or the opportunity to acquire the education, skills and experience needed to find a job in the future through an apprenticeship, a traineeship or continued education.

The Youth Guarantee programme is rather more than just a comprehensive active labour market programme (ALMP). It is intended to ensure that all young

[5] For instance, the law redesigned the rules on apprenticeships and re-employment of workers over-50.

people who are NEET receive assistance before extended joblessness permanently impairs their chances of finding work. An important innovation is that it aims to systematically extend outreach to young people who are not looking for a job and who are not in education or training whereas previous interventions usually targeted only people explicitly seeking work – the young unemployed. The emphasis of the Youth Guarantee programme on young people who are not looking for a job and who are not in education or training (inactive NEETs) significantly extends the reach of the initiative to include the most disadvantaged and discouraged.[6] The range of options also goes well beyond the scope of typical ALMP interventions. In addition to subsidized employment and training opportunities, it includes subsidized participation in general education and apprenticeships. Because it has stimulated national policy reforms, it may reasonably be seen as a youth labour market policy framework rather than simply a large scale ALMP (ILO, 2017).

In Italy, the EU recommendation was introduced in the national legislation through Law 99 passed on August 9, 2013, which also extended the programme to all individuals up to age 29 in the country. The program kicked off on May 1, 2014. Practical implementation of the programme has been left to Regional Employment Services which are required to offer either a (subsidized or unsubsidized) job offer job placement services or some form of educational or training opportunity.

The programme is ambitious and although we have not seen any impact evaluations of the YG, some countries – including Italy – have found it a challenge to implement to the full the programme. Monitoring reports and commentaries on the implementation of the programme suggest that it was rolled relatively gradually and this may be one reason why we find its initial impact on hiring to be modest as discussed further below. Certainly, although NEET rates have fallen on average – in Italy and in the EU as a whole – since the programme was implemented, this of course does not necessarily imply that the YG was the cause for this reduction – rather than - or, more likely - in addition to, economic recovery. Moreover, the reduction in NEET rates was the result of a reduction in youth unemployment rates, as opposed to any reduction in the proportion of inactive young people who were NEET.[7]

The introduction of the Youth Guarantee allows us to identify: a) the causal effects of the programme itself in its early stages; and b) the interaction between the weakening of EPL and the introduction of a comprehensive ALMP for young people. In this case identification of the causal effects is achieved by comparing the differential effects of the introduction of the YG on the hiring of people aged 29 and below – who were eligible for the YG - with those aged above 29 – who were not.

[6] Although there scepticism has been expressed concerning the ability of the programme to effectively

[7] See, for example, EC (2018). The NEET rate fell from 12.5% in 2014 to 10.9% in 2017; however, the prevalence of the inactive amongst NEET rose from 49% to 56%, so in fact the proportion of young people who are inactive-NEETs has hardly changed at all.

Comparing this differential hiring before and after the Fornero reform further allows the identification of the joint impact of the changes to EPL and ALMP.

5. EPL and ALMP in Italy: empirical strategy and results

5.1 Empirical strategy

In order to identify the effect of EPL on hires, a standard *difference-in-difference* regression model is employed. An interaction term between firm size and the post-reform period (July 2012 - March 2014) identifies the differential change in permanent hires in 'large' firms relative to 'small' firms after the reform[8] – that is, the impact of the EPL reform on hires by firms.

Equation (17) formalizes our identification strategy:

$$y_{it} = \alpha_i + \delta_t + \tau \times Policy_{it} + \beta \times Size_{it}^{16-19} + \gamma \times Policy_{it} \times Size_{it}^{16-19} + u_{it} \qquad (17)$$

Where *i* indexes the cell defined as the intersection between firm size $\times$ province $\times$ 2-digit sector $\times$ contract type $\times$ age $\times$ gender, and *t* denotes time (measured in months). Additionally, y_{it} is the (log of the) number of hires in cell *i* at time *t*; α_i is a cell fixed effect; δ_t is a time effect (month $\times$ year dummies); "*Policy*" is a post reform dummy which takes value 1 after the *Fornero reform* was passed, i.e. after July 2012; "$Size^{16\text{-}19}$" is a dummy that takes value 1 for firms with more than fifteen (and less than twenty) employees. To ensure comparability between treated and controls we estimate the above equation for only for firms with between 10 and 19 employees. We cluster standard errors at the regional level (Betrand et al., 2004) to account for within-region serial correlation of the shocks.

The coefficient of the interaction term (γ) between the firm size dummy and the post-reform dummy (i.e. July 2012 - March 2014) represents the *average treatment on the treated* (ATT) and identifies the differential change in permanent hires in large firms relative to small firms after the reform.

The inclusion of cell fixed effects accounts for unobserved time-invariant specific characteristics at the cell level, while the time dummy controls for common macro-economic shocks. Of course, it is possible that firms self-select into or out of the treatment group, as they can choose whether to grow beyond or shrink below the fifteen employee threshold. However, Schivardi and Torrini (2008) and Leonardi and Pica (2013) show that the firm size distribution displays no bunching right below the threshold, and that the probability to grow is only slightly smaller for

[8] Note that in what follows, we refer to firms with more than fifteen workers as 'large' as distinct from 'small' firms which have fifteen workers or fewer. In more standard terminology all firms with between 10 and 19 employees would be deemed 'small'. The specific appellations used here are for simplicity.

firms with 14 employees relative to firms far away from the threshold. Thus, it is unlikely that firm sorting biases our results.

In a similar way we identify the effect of ALMPs on hires. A Youth Guarantee term (taking a value of one following the implementation of the YG in May 2014, and zero otherwise) is introduced to allow identification of the effect of the YG. The effect of interest is consequently identified by the interaction between this YG term and the age-group (either 25-29 or 30-34) of hires. That is, the effect of the YG is estimated by comparing the difference in the hiring rates of 25-29 year olds before and after the May 2014 with the analogous difference in the hiring rates of 30-34 year olds.

Equation (18) formalizes our identification strategy:

$$y_{it} = \alpha_i + \delta_t + \tau \times YG_{it} + \beta \times age_{it}^{25-29} + \gamma \times YG_{it} \times age_{it}^{25-29} + u_{it} \qquad (18)$$

As before, *i* indexes the cell defined as the intersection between firm size $\times$ province $\times$ 2-digit sector $\times$ contract type $\times$ age $\times$ gender, and *t* denotes time (measured in months); y_{it} is the (log of the) number of hires in cell *i* at time *t*; α_i is a cell fixed effect; δ_t is a time effect (month $\times$ year dummies); YG_{it} is a dummy which takes value 1 after the *Youth Guarantee* was passed, i.e. after May 2014; "$age^{25\text{-}29}$" is a dummy that takes value 1 for hires of workers aged between 25 and 29. To ensure comparability between treated and controls we estimate the above equation for hires of workers aged between 25 and 34 years old. Again, we cluster standard errors at the regional level.

The effect of the interaction between EPL and ALMP is also identified. This involves comparing the difference-in-difference in the hiring rates of young people (25-29) in small (up to 15 employees) and large firms (more than 15 employees) with the analogous difference-in-difference in the hiring rates of those aged 30-34 before July 2012 (before either reform was introduced) with the same difference-in-difference after May 2014 when both reforms had been implemented. Thus, the model is one of difference-in-difference-in-difference or triple difference. Specifically, the joint effect of EPL and ALMP is based on the estimation of a model that features, in addition to cell fixed effects and year $\times$ month dummies, a post-Fornero dummy, a post-Youth Guarantee dummy, a large firm dummy (over 15 workers) and a young worker dummy (aged 29 and below), fully saturated with all the interaction terms.

5.2 Data

The analysis uses administrative panel data from the Italian Social Security Institute (INPS) for the period 2012-2014 inclusive. The dataset includes information on the number of monthly hires and conversions in permanent contracts of workers in firms with at least one employee. Since the INPS collects

information for the purpose of computing retirement benefits, whence derive the contributions charged by workers and employers, this data source is very reliable.

One major shortcoming of this data set is that the unit of observation is neither the firm nor the worker: it is rather the cell identified by province, sector (based on the *Ateco 2002* 2-digit classification), firm size (measured in terms employment), type of contract (i.e. apprenticeship, fixed-term, and open-ended contract), position (i.e. blue collar, white collar, apprentice, *quadro*,[9] and manager), number of hours worked (i.e. full time, part time), gender and age. Table 1 shows the employee-firm characteristics available in the data.

Table 1: Employee and firm characteristics available in the data

Type of contracts	Hiring on open-ended contracts; Hiring on fixed-term contracts; Hiring on apprenticeship; Conversion in open-ended contract from fixed-term agreement; Conversion in open-ended contract from apprenticeship.
Employee age (classes)	Less than 20 years; 20-24 years; 25-29 years; 30-34 years; 35-39 years; 40-44 years; 45-49 years; 50-54 years; 55-59 years; 60-64 years; More than 65 years.
Employee gender	Man; Woman.
Employee position	Blue collar; White collar; Quadro; Apprentice; Manager.
Hours	Full-time; Vertical part-time; Horizontal part-time; Mixed part-time.
Sector (Ateco 2002 classification)	Agriculture, hunting and forestry (A); Fishing, fish farming and related services (B); Mineral processing (C); Manufacturing (D); Production and distribution of electricity, gas and water- (E); Buildings (F); Wholesale and retail trade, and repair of durable goods (G); Hotels and restaurants (H); Transport, storage and communication (K); Public administration (L); Public Education (M); Public Health and social work (N); Other public, social and personal services (O); Activities of households (P); Extraterritorial organizations and bodies organizations and bodies (Q).
Firm size (classes)	1 worker; 2-9 workers; 10-15 workers; 16-19 workers; 20-49 workers; 50-99 workers; 100-199 workers; 200-499 workers; 500-999 workers; More than 1000 workers.
Broad geographical area	North-West; North-East; Centre; South; Islands; Abroad.
Region	20 Italian regions.

[9] Employees in the quadro position are high-level white collars right below managers.

Province	About 100 Italian provinces.

We focus on private sector firms and employees and drop public sector hires. We also exclude hires by Italian firms located abroad and the agricultural sector for which the relevant thresholds are different. Moreover, we exclude hires in managerial positions since they are not covered by the Fornero reform. We focus on hires in firms between 10 and 19 employees when analysing the Fornero reform, and further restrict to workers aged between 25 and 34 when analysing the Youth Guarantee.

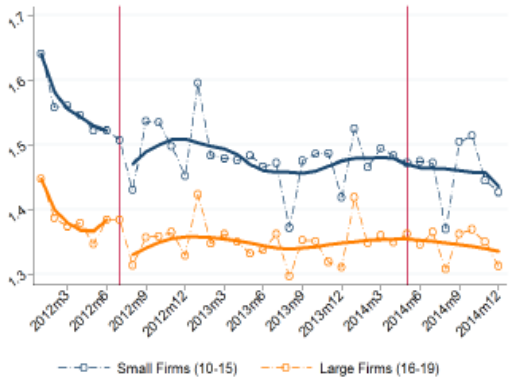
The final dataset spans the period between January 2012 and December 2014.

5.3 Results: Impact of the 2012 EPL Fornero reform[10]

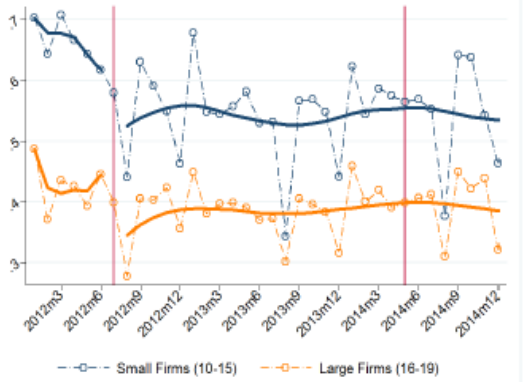
Figure 4 provides a visual representation of the identification strategy used to assess the impact of the Fornero reform. It compares the number of hires (and conversions into permanent contracts) in large firms relative to small firms over time. Under the assumption that, absent the reform, large and small firms would have experienced the same trends in hires, any deviation in the hires in large firms relative to small firms is ascribable to the *Fornero reform*.

Figure 4: Hiring and conversions in small firms relative to large firms.

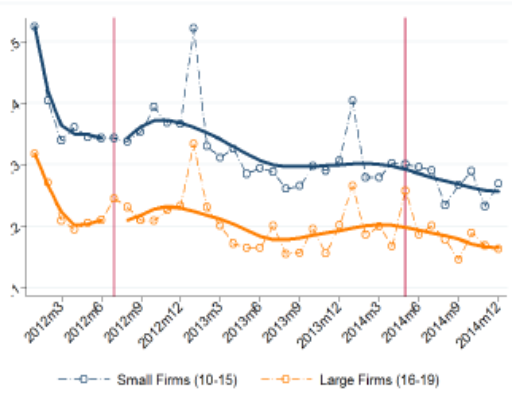
[10] This section draws on work undertaken by one of the authors with Francesco Ingino.



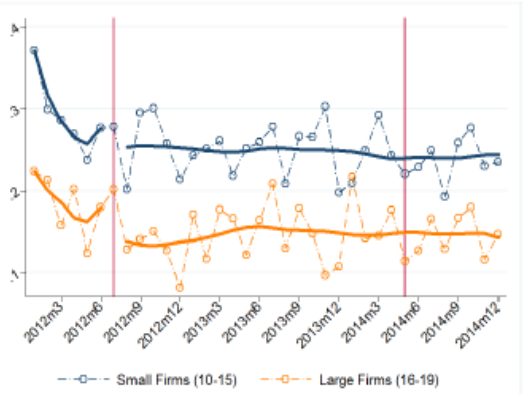
(a) All type of contracts



(b) New open-ended contracts



(c) Conversions of temporary into permanent contracts



(d) Conversion of apprenticeships into permanent contracts

Note: Each dot represents the average (log of the) number of hires in each cell by firm-size (10-15 and 16-19 employees) and type of contract. The cell is defined at the province × sector × gender × age × position × full-time/part-time level. Panel 8 includes all contracts types. Panel 8 restricts to permanent hires; panels 8 and 8 focus on conversions into open-ended contracts of fixed-term contracts and apprenticeship, respectively. The first vertical red line indicates the date of approval of the Fornero reform (July 2012); the second one indicates the starting date of the Youth Guarantee (May 2014).

Table 2 shows the estimates from equation (17), the conditional version of the visual representation in Figure 4. The dependent variable is the (log of the) number of hires recorded in each month and within each cell between January 2012 and March 2014. The results show that the hiring on open-ended contracts increased in firms just above the 15-employee threshold relative to the firms just below after the reform (column 1). This effect is largely driven by the increase in new permanent hires which went up by about 5 per cent (column 2)[11]. The implication is that the reduction in the cost of firing brought about by the Fornero reform induced firms to expand permanent hires by around 5 per cent. This result is consistent with the model presented in section 3 as well as with the previous empirical (Blanchard and Portugal, 2001; Bauernschuster, 2009; Kugler, 2008;

[11] Since Ln(1 + a) ≈ a for small a, the percentage change in hires due to the dummy variable of interest (in this case the 'Fornero'*'large firms' interaction dummy) is roughly given by the relevant parameter (β) value; whereas, the precise value is given by $e^{\beta} - 1$. In this case the parameter value suggests a percentage change of 5.1% whereas the precise (estimated) percentage change is actually 5.2%.

Acemoglu and Angrist, 2001 among others) and theoretical (Hopenhayn, 1993; Bentolila and Bertola, 1990) literature.

Table 2: Effect of reform on permanent employment in large firms relative to small firm

Variables	(1)	(2)	(3)	(4)
	All type of contracts	Permanent contracts	Conversion from temporary to permanent	Conversion from apprentice to permanent
Reform Period (July 2012 - March 2014)	.003	-.018	.054***	- .037***
	(.009)	(.011)	(.012)	(.013)
Reform Period x Large firms	.039***	.051***	.017	.012
	(.005)	(.007)	(.010)	(.016)
Constant	.402***	.436***	.371***	.208***
	(.013)	(.014)	(.015)	(.015)
Obs.	362,519	219,329	118,966	24,224
No. Cell	99,901	56,933	35,766	7,202
R-squared	.019	.019	.037	.008
Cell FE	YES	YES	YES	YES
Month Dummies	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES

Notes: Significance levels: ***1%, **5%, *10%. Standard errors in parentheses adjusted for clustering at regional level. The sample includes only hires in firms between 10 and 19 employees. The dependent variable is (the log of) the number of hires in each cell given by the intersection between province, sector (Ateco2002 classification), worker age, gender, firm size, type of position (blue collar, white collar etc..), and full-time/part-time.

Somewhat discouragingly, as regards the situation of young people, there is a negligible – and not statistically significant - effect of the reform on the number of conversions into permanent contracts of temporary workers and apprentices (columns 3-4). Thus, conversions into open-ended contracts both from fixed-term agreements and from apprenticeships seem instead to be unaffected by the reform.

In order to investigate whether the common trend assumption hold and the results in column 1 and 2 are genuinely due to the Fornero reform, we run placebo exercises and compare hires in firms above and below 100 employees (columns 1 and 2) and hires in firms above and below 20 employees (columns 3 and 4). Reassuringly, the estimates in Table 3 show no effects at the fake thresholds.

Table 3: Effect of reform on permanent employment in large firms relative to small firm

Variables	(1)	(2)	(3)	(4)
	All type of Contracts 50-99 vs 100-199	Permanent contracts 50-99 vs 100-199	All type of contracts 10-19 vs 20-49	Permanent contracts 10-19 vs 20-49
Reform Period (July 2012 - March 2014)	.0213** (.00995)	.0162 (.0175)	.0125* (.0067)	-.0103 (.0083)
Reform Period x Large firms	-.0100 (.0126)	-.0201 (.0159)	.0075 (.0060)	.0075 (.0081)
Constant	.532*** (.0189)	.617*** (.0218)	.455*** (.0128)	.489*** (.0132)
Obs.	251,049	133,773	626,446	368,593
No. Cell	73,838	39,200	162,407	91,335
R-squared	.026	.028	.020	.019
Cell FE	YES	YES	YES	YES
Month Dummies	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES

Notes: Significance levels: ***1%, **5%, *10%. Standard errors in parentheses adjusted for clustering at regional level. The sample includes only hires in firms between 50 and 200 employees in columns 1 and 2, and between 10 and 49 employees in columns 3 and 4. The dependent variable is (the log of) the number of hires in each cell given by the intersection between province, sector (Ateco2002 classification), worker age, gender, firm size, type of position (blue collar, white collar etc..), and full-time/part-time.

A further issue of relevance concerns how the effects of the reform varied across types of (potential) employee and/or job. We investigate this along four dimensions: employee age, gender, position, and full-time/part-time. To this purpose, the effects of the reform on different groups is estimated separately by introducing interactions between the post-reform period term and the specific characteristics such as age, that we wish to investigate. All the other variables have the same interpretation as in the baseline model. The triple interaction term identifies the differential effect of the reform on the relevant sub-group.

Table 4 reports the results of estimating equation (19), where the variable D_{sit} identifies the sub-group having the specific characteristic under investigation. More specifically, D_{sit} takes value 1 if characteristic s is present in the cell *i* at time *t*, otherwise it is equal to zero. All the other variables have the same interpretation as in the baseline model (17). The triple interaction term identifies the differential effect of the reform on the relevant sub-group.

$$y_{it} = \alpha_i + \delta_t + \tau \times Policy_{it} + \beta \times Size_{it}^{16-19} + \sum_{s=1}^{S-1}(\theta_s \times D_{sit}) + \nu \times Policy_{it} \times Size_{it}^{16-19}$$
$$+ \sum_{s=1}^{S-1}(\lambda_s \times D_{sit}) \times Size_{it}^{16-19} + \sum_{s=1}^{S-1}(\mu_s \times D_{sit}) \times Policy_{it}$$

$$+\sum_{s=1}^{S-1}(\gamma_s \times D_{sit}) \times Policy_{it} \times Size_{it}^{16-19} + u_{it} \quad (19)$$

Column 1 of Table 4 shows the differential effect of the reform depending on the age of the newly hired worker: teen workers (< 20 years), workers in their twenties (20-29 years) or thirties (30-39), as well as mature workers (aged 40-54 years), and older workers (> 55 years). Teen workers are the excluded category. Results reveal a negative relationship between the effects of policy and workers' age. Proportionately, the youngest – teenage - group of workers reaped the greatest benefits from the *Fornero reform*. The hiring rates of teenagers increased by around 13 per cent, and for young adults (aged 20-29) by around six per cent, whilst recruitment of workers over forty years old increased by around four per cent. [12] These findings are consistent with Bertola et al. (2007) and Skedinger (2010) which report that, amongst young people, an increase in the stringency of employment protection is associated with a higher prevalence of involuntary unemployment. Our results show that less strict EPL is associated with greater benefits (in terms of hires on a permanent basis) for younger workers.

[12] The precise estimated percentage change (e^{β}-1) in this case is 12.9% (compared to the coefficient based rough estimate of 12.1%). However, note that the pre-reform hires of teenagers on permanent contracts were much fewer than those of older workers (e.g. less than one fifth of the hires of 20-24 years old) so that, in absolute terms, the (6%) impact on hires of the reform on twenty-somethings was clearly significantly larger than the (13%) impact for teenagers.

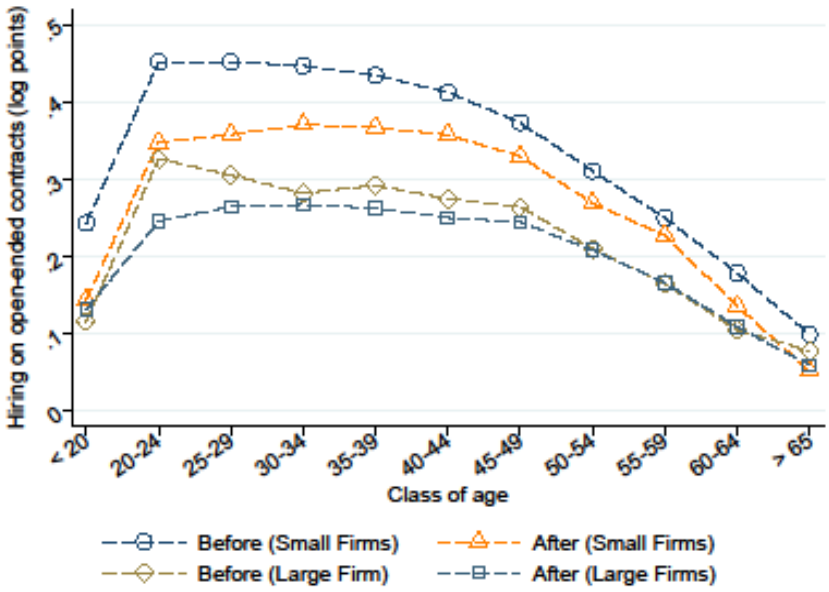
Table 4: Regression results for EPL with heterogeneity

	(1) Employee Age	(2) Job Position	(3) Hours per week
Reform Period (July 2012 - March 2014)	.029**	.040**	-.056***
	(.014)	(.018)	(.010)
Reform Period x Large firms	.121***	.061***	.064***
	(.023)	(.008)	(.009)
Reform x Large Firm x 20-29 years	-.066**		
	(.023)		
Reform x Large Firm x 30-39 years	-.057*		
	(.027)		
Reform x Large Firm x 40-54 years	-.081**		
	(.030)		
Reform x Large Firm x 55+ years	-.083		
	(.032)		
Reform x Large Firm x White-Collar		-.041***	
		(.008)	
Reform x Large Firm x Quadro		.004	
		(.027)	
Reform x Large Firm x Part Time			-.027*
			(.013)
Constant	.435***	.435***	.430***
	(.014)	(.014)	(.014)
Obs.	219,329	219,329	219,329
No. Cell	56,933	56,933	56,933
R-squared	.02	.02	.02
Cell FE	YES	YES	YES
Month Dummies	YES	YES	YES
Year Dummies	YES	YES	YES

Notes: Significance levels: ***1%, **5%, *10%. Standard errors in parentheses adjusted for clustering at regional level. The sample includes only hires in firms between 10 and 19 employees. The dependent variable is (the log of) the number of hires in each cell given by the intersection between province, sector (ISIC2002 classification), worker age, gender, firm size, position (white-collar or blue-collar or quadro), and full-time/part-time). In column (1) the excluded category is the group of teen workers (< 20 years old); in column (2) the excluded category is the group of blue-collar employed. In column (3) the excluded category is the group of full-time workers.

The greater benefits accruing to the youngest age-groups are shown also in Figure 5 where the triple interaction coefficients are plotted by age group, separately for large and small firms.

Figure 5: Heterogeneity of effects by age



Note: The graph refers to permanent hires by firm size. Each dot represents the average number of hires by age class.

Column 2 of Table 4 looks at the impact of the policy across different positions, blue-collars (the excluded category), white-collars, and *quadro*. Results shows a larger positive impact of reform for blue-collars workers. Column 3 shows the heterogeneous effect across full-time and part-time jobs. The coefficient of the triple interaction suggests that the *Fornero reform* has mainly affected full-time jobs. Finally, there is no evidence of a differential impact of the reform across men and women.

Overall, the results support the view that the reform favoured the hiring of young blue collar workers employed in full-time jobs.

5.4 Results: Impact of the Youth Guarantee

Table 5 shows the impact of the Youth Guarantee obtained using a similar approach as above although this time the key distinction used to identify the 'before and after' effect is age. As before, a difference-in-difference regression was estimated. The dependent variable is the (log of the) number of hires recorded each month between January 2012 and December 2014. The impact of the Youth Guarantee is measured by comparing the number of hires of workers aged 25-29 with the number of hires of workers aged 30-34 before and after the implementation of the Youth Guarantee in May 2014; the effect measured for different types of contract is, as before, highlighted in bold in the table.

The results suggest that the Youth Guarantee increased hires, albeit slightly (column (1)); the effect is statistically significant for overall hires and the size of the coefficient suggests an increase of a little under one per cent. However, separate estimation by type of contract (columns (2) – (4)) shows that this effect is driven by

one component – an increase (of the order of one and a half per cent) in temporary hires. Although all the other estimated effects are also positive, they are not statistically significant.

Table 5: Impact of the Youth Guarantee

VARIABLES	(1) All types of contracts	(2) Permanent contracts	(3) Apprenticeships	(4) Temporary contracts
Youth Guarantee x Young Person	.0076*** (.003)	.0015 (.003)	.0195 (.019)	.0143*** (.003)
Constant	.640*** (.018)	.529*** (.020)	.516*** (.010)	.768*** (.020)
Obs.	1,748,644	815,050	129,193	804,401
No. Cell	264,652	150,559	23,016	91,077
R-squared	.024	.023	.030	.036
Cell FE	YES	YES	YES	YES
Month Dummies	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES

Notes: Statistical significance levels: ***1%, **5%, *10%. Standard errors in parentheses adjusted for clustering at regional level. The sample includes only hires of workers aged between 25 and 34. The dependent variable is (the log of) the number of hires in each cell given by the intersection between province, sector (ISIC2002 classification), worker age, gender, firm size, position (white-collar or blue-collar or quadro), and full-time/part-time).

Table 6 which reports the results of separate regressions for males (Panel A) and females (Panel B), further clarifies, that the positive and statistically significant effect of the Youth Guarantee relies on its moderately strong effect (an increase of a little under two and a half per cent) on the temporary hires of young women. During 2014 at least, the guarantee seems to have had no statistically significant effect on the hires of young men.

To make sure that the above results on the full sample and on the female subsample are not driven by pre-existing trends, Table 7 reports estimates from a placebo exercise in which we compare the number of hires of workers aged 30-34 and the number of hires of workers aged 35-39. As the Youth Guarantee covers only individuals aged under 30 years old, finding a positive effect at the 35 years old threshold would indicate that diverging pre-trends are likely to bias our estimates. Reassuringly, results show no effects either in the full sample (columns 1 and 2) or in female sample (columns 3 and 4).

Table 6: Impact of the Youth Guarantee, Males and Females

VARIABLES	(1) All type of contracts	(2) Permanent contracts	(3) Apprenticeships	(4) Temporary contracts
	Males			
Youth Guarantee x Young Person	.0026	-.0006	.0155	.0058
	(.0028)	(.0035)	(.0227)	(.0046)
Constant	.702***	.601***	.550***	.833***
	(.017)	(.020)	(.017)	(.020)
Obs.	945,119	461,360	67,656	416,103
No. Cell	133,827	77,035	11,542	45,250
R-squared	.024	.025	.036	.033
	Females			
Youth Guarantee x Young Person	.0134***	.0046	.0243	.0231***
	(.0041)	(.0053)	(.0166)	(.0047)
Constant	.567***	.435***	.479***	.699***
	(.019)	(.020)	(.017)	(.020)
Obs.	803,525	353,690	61,537	388,298
No. Cell	130,825	73,524	11,474	45,827
R-squared	.025	.022	.025	.043
Cell FE	YES	YES	YES	YES
Month Dummies	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES

Notes: Statistical significance levels: ***1%, **5%, *10%. Standard errors in parentheses adjusted for clustering at regional level. The sample includes only hires of workers aged between 25 and 34. The dependent variable is (the log of) the number of hires in each cell given by the intersection between province, sector (ISIC2002 classification), worker age, gender, firm size, position (white-collar or blue-collar or *quadro*), and full-time/part-time).

Table 7: Impact of the Youth Guarantee, Placebo

VARIABLES	(1) All type of Contracts	(2) Permanent contracts	(3) Females: all type of contracts	(4) Females: Temporary contracts
Youth Guarantee x Young Person (30-34 vs 35-39)	.0024	.0021	.0021	.0041
	(.0020)	(.0030)	(.0026)	(.0039)
Constant	.646***	.745***	.557***	.661***
	(.0174)	(.0172)	(.0202)	(.0191)
Obs.	1,522,538	752,237	686,488	356,533
No. Cell	234,795	88,766	116,430	44,684
R-squared	.025	.035	.027	.041
Cell FE	YES	YES	YES	YES

Month Dummies	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES

Notes: Statistical significance levels: ***1%, **5%, *10%. Standard errors in parentheses adjusted for clustering at regional level. The sample includes only hires of workers aged between 30 and 39. The dependent variable is (the log of) the number of hires in each cell given by the intersection between province, sector (ISIC2002 classification), worker age, gender, firm size, position (white-collar or blue-collar or *quadro*), and full-time/part-time).

5.5 Results: complementarities between EPL reform and the Youth Guarantee

In order to evaluate the joint effects of the Fornero reform and the Youth Guarantee a model is estimated restricting the before/after comparison to comparing before the Fornero reform (pre July 2012) with the period after the implementation of the Youth Guarantee (from May 2014). The sample is also restricted to ages 25-34 and firms with between 10 and 19 employees (Table 8). In the first place, the results confirm what went before although, given the smaller sample size, the effects are not as precise as above. Thus, for example, the effect of the Fornero reform in increasing hires (of youngish workers aged between 25 and 34) on permanent contracts was an increase of around 7 per cent (or 5 per cent considering all contracts).

Table 8: Joint effect of the Fornero Reform and of the Youth Guarantee

VARIABLES	(1) All type of Contracts	(2) Permanent contracts	(3) Apprenticeships	(4) Temporary contracts
Post Fornero x Large firms	.047**	.070***	.071	.038
	(.017)	(.012)	(.051)	(.023)
Youth Guarantee x Young person	.0126	.0097	-.0228	-.0002
	(.0079)	(.0100)	(.0347)	(.0124)
Post reforms x Young person x Large firms	**-.018**	**-.003**	**-.048**	**-.020**
	(.012)	(.014)	(.046)	(.015)
Constant	.480***	.428***	.399***	.537***
	(.017)	(.021)	(.017)	(.014)
Obs.	118,708	56,508	8,587	53,613
No. Cell	37,166	20,155	3,156	13,855
R-squared	.039	.033	.033	.057
Cell FE	YES	YES	YES	YES
Month Dummies	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES

Notes: Statistical significance levels: ***1%, **5%, *10%. Standard errors in parentheses adjusted for clustering at regional level. The sample includes only hires of workers aged between 25 and 34 in firms with between 10 and 19 workers. The dependent variable is (the log of) the number of hires in each cell given by the intersection between province, sector (ISIC2002 classification), worker age, gender, firm size, position (white-collar or blue-collar or *quadro*), and full-time/part-time).

The principal coefficient(s) of interest, however, is the one - indicated in bold - which estimates the effect of the interaction between the Youth Guarantee and the Fornero reform of EPL. That is, Post reforms x Young x Large firms. The simple theoretical matching model outlined above suggested that implementation of the Youth Guarantee should, inter alia, dampen the increase in hires arising from the reduction in employment protection associated with the Fornero reform. That is, the YG is expected to improve the efficiency of the matching process, thus lowering the cost of filling a vacancy. As a consequence, the fluctuations in worker flows induced by variations in the strength of EPL will be less marked. In this case, the positive effect of a relaxation of EPL on the hiring of young people will necessarily be smaller in the presence of match-efficiency enhancing ALMP as was shown above in the theoretical model. However, although the coefficient is consistently negative[13] as predicted by our theoretical model, it is never statistically significant.

Both the relatively moderate impact of the YG on hiring and the lack of statistical significance of its interaction with EPL reform may, in part, be the consequence of the dates covered in our analysis[14]. The YG was implemented from May 2014, however, the number of young people who were recipients of some form of intervention under the programme only gradually increased from that date on. That is, the programme was extended over time to the whole eligible population, rather than being implemented *in plena* as from May 2014. Certainly it is consistent with the YG not having had a major impact on the short-term labour market prospects of participants during the period under study.

[13] Very similar results were obtained when the joint impact of EPL reform and the YG was estimated for males and females separately (not reported here).

[14] But also may reflect the relatively small sample size for the estimation of the interaction effect as compared with the significantly larger samples used for estimating the effects of EPL and the ALMP separately, noted above.

6. Conclusions

This paper has analysed the impact of complementarities between employment protection legislation and active labour market policy on the youth labour market. Using the example of Italy, which has undertaken major reforms in both areas in recent years, it suggests a rigorous way of examining this question appropriately in the case of substantial reforms of EPL and ALMP.

A theoretical matching model was presented which introduced explicit consideration of the impact of both EPL and a match-efficiency enhancing active labour market programme as well as the specific effects of interaction between the two interventions. With regard to EPL, the model produces the standard prediction that stricter (weaker) EPL will reduce (increase) both job creation and job destruction; hence, stronger (weaker) EPL leads to a fall (increase) in flows to and from employment in the labour market. The net effect on employment stocks is a priori indeterminate. On the other hand, through its match-enhancing effects, ALMPs will increase job creation, *ceteris paribus* leaving job destruction unaffected. Thus, if the ALMP is successful in improving the match between young workers and jobs as expected, it will have an unequivocally positive impact on job creation. On the other hand, in its the interaction with EPL, the introduction of a match-enhancing ALMP tends to reduce the impact of changes in EPL on job creation.

The attention paid here to complementarities between labour market institutions is, as was noted above, a little unusual in the literature, but at the same time is, in our view, a rather important element in understanding the impact of different labour market interventions; and, specifically, why the impact of changes in one institution or policy may differ in differing labour market contexts with differing institutions. That such complementarities maybe important in determining outcomes seems to us to be rather self-evident. The theoretical model developed and outlined here seeks to bring these issues to the forefront.

The empirical approach adopted allows us to be confident in the identification of causality, as opposed to simple association; looking at the difference-in-difference (and then the double difference in difference, or triple difference) permitted the identification of the causal effects on hiring of: a) the Fornero reform which reduced the strength of employment protection legislation in Italy in 2012; b) the introduction of the Youth Guarantee scheme in Italy; and, c) the interaction between them. This is achieved by the regression discontinuity design. Whilst many factors no doubt contribute to the hiring practices of firms and how these vary across time and space as well as across firm (e.g. size and sector) and individual characteristics (e.g. age and gender), it can be plausibly argued that the only difference between firms above and below 15 employees was the application of the relaxation of EPL embodied in the Fornero reform. Similarly, the Youth Guarantee affected only those under 30 and hence comparing the difference (in difference) of hiring rates of firms for those just below and just above this age

threshold allows us to identify the effect of the programme (albeit the effect on the potentially treated, rather than on the treated themselves). As a consequence, the double interaction comparing the difference over time of the hiring rates of 25-29 year olds by firms with a little more than 15 workers, with the change over time of the hiring rates of 30-34 year olds by firms with a little fewer than 15 workers gives us the joint effect of the YG and EPL reforms.

Our empirical results are consistent with the simple matching model developed in the first part of the paper. Specifically, we found that:

a) the relaxation of EPL in Italy did lead to an increase in hires – which itself varied across age–groups – and which was largest for teenagers with an increase in monthly hiring rates of the order of 12 per cent;

b) The increased hires arising from the reform of EPL were driven by an increase in open-ended contract hires, however it did not lead to any discernible increase in the translation of temporary (including apprenticeship) contracts into permanent ones;

c) The introduction of the Youth Guarantee also raised hires amongst young people moderately (by around 1 per cent) although this was driven by an increase in temporary hires as opposed to open-ended contracts or apprenticeships and the effect was felt primarily amongst young women;

d) The interaction between the YG and EPL reform tended to moderate the effects of the reduced EPL, however, although the estimated effect was consistently negative as suggested by a simple matching model, it was never statistically significant.

Appendix: Proof of the proposition in equation (16)

This appendix elucidates the theoretical model and provides a proof of the proposition in equation (16) concerning the interaction between EPL and active labour market policy.

Proof:

Job destruction condition:

$$0 = rF + \bar{\varepsilon} - b + \frac{\lambda}{r+\lambda}\int_{\bar{\varepsilon}}^{\varepsilon_m}\left[1 - G(\varepsilon')\right]d\varepsilon' - \theta c\frac{\beta}{1-\beta} \tag{9}$$

Job creation condition:

$$0 = \frac{\varepsilon_m - \bar{\varepsilon}}{r+\lambda} - \frac{c}{Aq(\theta)}\frac{1}{1-\beta} - F \tag{12}$$

Totally differentiating the job destruction condition with respect to $\bar{\varepsilon}$ and *F*, and then with respect to θ and *F*, we get:

$$\frac{d\bar{\varepsilon}}{dF} = -\frac{r}{1 - \frac{\lambda}{r+\lambda}\left[1 - G(\bar{\varepsilon})\right]} < 0$$

$$\frac{d\theta}{dF} = -\frac{r}{-c\frac{\beta}{1-\beta}} > 0$$

Totally differentiating the job destruction condition with respect to $\bar{\varepsilon}$ and *A*, and then with respect to θ and *A*, we get:

$$\frac{d\bar{\varepsilon}}{dA} = 0$$

$$\frac{d\theta}{dA} = 0$$

Next, totally differentiating the job creation condition with respect to $\bar{\varepsilon}$ and F, θ and F, $\bar{\varepsilon}$ and A, and finally with respect to θ and A, we get:

$$\frac{d\bar{\varepsilon}}{dF} = -\frac{1}{\frac{1}{r+\lambda}} < 0$$

$$\frac{d\theta}{dF} = \frac{1}{\frac{c}{A}\frac{q'(\theta)}{[q'(\theta)]^2}\frac{1}{1-\beta}} < 0$$

$$\frac{d\bar{\varepsilon}}{dA} = \frac{\frac{c}{A^2}\frac{1}{[q(\theta)]^2}\frac{1}{1-\beta}}{\frac{1}{r+\lambda}} > 0$$

$$\frac{d\theta}{dA} = -\frac{\frac{c}{A^2}\frac{1}{q(\theta)}\frac{1}{1-\beta}}{\frac{c}{A}\frac{q'(\theta)}{q^2(\theta)}\frac{1}{1-\beta}} = -\frac{1}{A}\frac{q(\theta)}{q'(\theta)} > 0$$

We are now in the position to jointly totally differentiate the job creation and job destruction conditions with respect to $\bar{\varepsilon}$, θ and F and then solve for $d\bar{\varepsilon}/dF$:

$$0 = rdF + d\bar{\varepsilon} - \frac{\lambda}{r+\lambda}\left[1 - G(\bar{\varepsilon})\right]d\bar{\varepsilon} - c\frac{\beta}{1-\beta}d\theta$$

$$0 = -\frac{d\bar{\varepsilon}}{r+\lambda} - \frac{c}{A[q(\theta)]^2}\left(-q'(\theta)\right)d\theta\frac{1}{1-\beta} - dF$$

Dividing both equations by dF:

$$0 = r + \frac{d\varepsilon}{dF}\left[1 - \frac{\lambda}{r+\lambda}\left(1 - G(\bar{\varepsilon})\right)\right] - c\frac{\beta}{1-\beta}\frac{d\theta}{dF} \qquad (*)$$

$$0 = -\frac{d\bar{\varepsilon}}{dF}\frac{1}{r+\lambda} + \frac{c}{A[q(\theta)]^2}q'(\theta)\frac{d\theta}{dF}\frac{1}{1-\beta} - 1$$

From the last equation we get:

$$\frac{d\theta}{dF} = \left[1 + \frac{d\bar{\varepsilon}}{dF}\frac{1}{r+\lambda}\right]\frac{A[q(\theta)]^2}{cq'(\theta)}\left(1-\beta\right) \qquad (**)$$

We plug equation *(**)* into equation *(*)* and get:

$$\frac{d\bar{\varepsilon}}{dF}\left[1-\frac{\lambda}{r+\lambda}\left(1-G(\bar{\varepsilon})\right)\right]=-r+c\frac{\beta}{1-\beta}\left[1+\frac{d\bar{\varepsilon}}{dF}\frac{1}{r+\lambda}\right]\frac{A\left[q(\theta)\right]^2}{q'(\theta)}\frac{(1-\beta)}{c}$$

$$\frac{d\bar{\varepsilon}}{dF}\left[1-\frac{\lambda}{r+\lambda}\left(1-G(\bar{\varepsilon})\right)\right]=-r+\beta\frac{A\left[q(\theta)\right]^2}{q'(\theta)}+\frac{d\bar{\varepsilon}}{dF}\frac{\beta}{r+\lambda}\frac{A\left[q(\theta)\right]^2}{q'(\theta)}$$

$$\frac{d\bar{\varepsilon}}{dF}\left[1-\frac{\lambda}{r+\lambda}\left(1-G(\bar{\varepsilon})\right)-\frac{\beta}{r+\lambda}\frac{A\left[q(\theta)\right]^2}{q'(\theta)}\right]=-r+\frac{\beta A\left[q(\theta)\right]^2}{q'(\theta)}$$

$$\frac{d\bar{\varepsilon}}{dF}=\frac{-r+\dfrac{\beta A\left[q(\theta)\right]^2}{q'(\theta)}}{1-\dfrac{\lambda}{r+\lambda}\left(1-G(\bar{\varepsilon})\right)-\dfrac{\beta}{r+\lambda}\dfrac{A\left[q(\theta)\right]^2}{q'(\theta)}}<0$$

This result establishes that EPL reduces job destruction.

To derive the joint effect of *F* and *A,* recall that $\frac{d\theta}{dA}>0$ and $\frac{d\bar{\varepsilon}}{dA}>0$. Thus, denoting $\frac{A\left[q(\theta)\right]^2}{q'(\theta)}\equiv x<0$, with $\frac{dx}{dA}>0$ because $q'<0$ and $\frac{d\theta}{dA}>0$. Hence (neglecting the denominator which is always positive):

$$\frac{d\bar{\varepsilon}}{dFdA}=\beta\left[1-\frac{\lambda}{r+\lambda}\left(1-G(\bar{\varepsilon})\right)-\frac{\beta}{r+\lambda}x\right]dx/dA-\left(-\frac{\beta}{r+\lambda}+\frac{\lambda}{r+\lambda}\left(1-G(\bar{\varepsilon})\right)\frac{d\bar{\varepsilon}}{dA}\right)(\beta$$

$$\frac{d\bar{\varepsilon}}{dFdA}=\beta\left[1-\frac{\lambda}{r+\lambda}\left(1-G(\bar{\varepsilon})\right)-\frac{\beta}{r+\lambda}x+\frac{\beta}{r+\lambda}x+\frac{r}{r+\lambda}\right]dx/dA-\frac{\lambda}{r+\lambda}(\beta x-r)G($$

$$\frac{d\bar{\varepsilon}}{dFdA}=\beta\left[1-\frac{\lambda\left(1-G(\bar{\varepsilon})\right)+r}{r+\lambda}\right]dx/dA-\frac{\lambda}{r+\lambda}(\beta x-r)G(\bar{\varepsilon})\frac{d\bar{\varepsilon}}{dA}dx/dA>0$$

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