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Working Paper

Reducing severance costs or subsidizing permanent job creation: Which policy is more effective to reduce duality?

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Reducing Severance Costs or Subsidizing Permanent Job Creation: Which Policy is More Effective to Reduce Duality?

Victoria Osuna

Abstract

This paper uses the job creation and destruction model of the search and matching type proposed by García-Pérez and Osuna (2014) to study the effectiveness of subsidizing permanent job creation as a strategy to reduce labour market segmentation between permanent and temporary contracts. The 2006 and 2012 Spanish labour market reforms are used as a benchmark to compare the effects of subsidizing permanent job creation with that of reducing the severance cost gap between permanent and temporary contracts. The change in the degree of duality is measured in terms of the changes in job destruction rates and the tenure distribution. The steady-state results show that, from a fiscal point of view, reducing the severance cost gap between these two type of contracts may be more effective than subsidizing permanent job creation, provided dismissals for objective reasons are effectively made easier to justify and firms make use of that option instead of agreeing to an indemnity closer to the amount paid for unfair dismissals. The model also points to the relevance of designing appropriate penalties for those firms that do not comply with the obligations that subsidies involve. Finally, the sensitivity analysis reveals the importance of the magnitude of training costs and the relative differences in productivity between temporary and permanent workers for the effectiveness of policies involving subsidies for permanent job creation.

JEL J23 J32 J63 J64 J65 J68

Keywords Subsidies; Severance Costs gap; Permanent and Temporary Contracts; Duality; Unemployment; Tenure Distribution; Job Destruction

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1 Introduction

Over the last three decades, the world economy has experienced an intense process of globalization and technological progress. Some Southern European countries, with Spain as the best example, reacted to these changes by introducing labor market flexibility at the margin through temporary contracts with very low severance costs. This strategy, together with the low degree of internal flexibility present in these labour markets, has generated dual labour markets with very perverse consequences in terms of volatility of employment, persistency of labour market segmentation, productivity growth and fiscal externalities (See, for instance, Costain et al. (2010) and Dolado et. al (2012) for further details). Triggered by the enormous increase in unemployment rates during the “Great Recession” and by the perverse consequences of duality, governments in these countries have recently opted for combining reductions in the severance costs gap between PCs and TCs with some fiscal measures, such as tax rebates for job conversions of TCs into PCs or subsidies for permanent job creation (See OCDE (2014)).

For instance, Spanish governments have introduced major changes concerning external and internal flexibility in the reforms that took place in 2010 and 2012, and some of these measures have been coupled with subsidies. Concerning external flexibility there has been a substantial reduction in the severance cost gap for unfair dismissals, from 37 to 21 days of wages p.y.o.s.¹ In addition, the reform introduced a new PC, which is referred to as the “entrepreneurs’ permanent contract” (EPC), with a one-year probationary period, zero severance costs during such period and large wage subsidies for younger and older workers hired by small firms. Regarding internal flexibility, these reforms have allowed for an internal devaluation by facilitating the adjustment of hours and wages to changes in a firm’s economic conditions as an alternative to job destruction. In particular, short-time work (STW) mechanisms have been made easier to implement and, again, they have been partially subsidized.

The idea of subsidizing permanent job creation seems to be deeply rooted in Southern European countries. For instance, Spanish governments have lunched several labour market reforms over the last twenty years that have involved the provision of subsidies, either by directly hiring workers under PCs or by converting TCs into PCs with substantial rebates in social security contributions (See Bentolila et. al (2008) for a summary of these reforms). Also the recent Italian labour market reform (the “Jobs Act”) envisages, not only a substantial reduction in the severance costs of permanent workers, but also the availability of subsidies for three years in

¹ The indemnity of workers with PCs decreased from 45 to 33 days of wages p.y.o.s. in case of unfair dismissal and became closer to the mean OECD compensation, which is 21 days of wages p.y.o.s, (See OCDE (2013)), whereas the indemnity of workers with TCs increased from 8 to 12 days of wages p.y.o.s.

order to provide incentives for permanent job creation. The problem with subsidizing job creation is that it creates fiscal imbalances, which are not desirable in the actual economic context, and also their effectiveness is not clear because of the substitution and deadweight effects that they may induce. In fact, García-Pérez and Rebollo (2009) find that the permanent employment promotion contracts (PEPCs) introduced in the 1997 and 2006 labour market reforms, which qualified for social security rebates, have recorded a much higher job destruction rate than ordinary PCs.

The objective of this paper is to use the job creation and destruction model of the search and matching type proposed by García-Pérez and Osuna (2014) to study the effectiveness of subsidizing permanent job creation as a strategy to reduce duality. The Spanish case will be used as a benchmark to compare the effects of subsidizing permanent job creation, both in the 2006 and in the 2012 labour market reforms, with the effects of merely reducing the severance cost gap between permanent and temporary contracts as it has been the case in the 2012 labour market reform. The metric that will be used to measure the change in the degree of duality in the steady-state will be the changes in job destruction rates and the changes in the tenure distribution.

The model shows that the subsidies implemented in the 2006 reform reduce steady-state unemployment and the temporary job destruction rates by 11% and 17%, mainly through an increase in the job conversion of TCs into PCs. On the other hand, the 2012 labour market reform, which lowered the severance cost gap and subsidized permanent job creation through the introduction of the EPC, further reduces steady-state unemployment and the temporary job destruction rates, by 21.3% and 39.5%, respectively. The model also shows that the introduction of the subsidized EPC may have involved substantial deadweight effects. In fact, the reduction in the severance cost gap may generate the same effects, provided dismissals for objective reasons are effectively made easier to justify and firms make use of that option instead of agreeing to an indemnity closer to the amount paid for unfair dismissals. In addition, the model shows the relevance of designing appropriate penalties for those firms that do not comply with the obligations that subsidies involve. Finally, the sensitivity analysis reveals the importance of the magnitude of training costs and the relative differences in productivity between temporary and permanent workers for the effectiveness of policies involving subsidies for permanent job creation.

The paper is organized as follows. The model, which relies heavily on the model in García-Pérez and Osuna (2014), is presented in Section 2. In Section 3, the calibration strategy of the benchmark model is discussed. In Section 4, the steady-state analysis of the policies of interest is performed. Finally, some conclusions are drawn in Section 5.

2 The model

2.1 Population

The economy is populated by a continuum of workers with a unit mass and a continuum of firms. Workers can either be employed or unemployed. Hence, out of the labour force is not considered as an additional state. Unemployed workers look for employment opportunities; employed workers produce and do not search for jobs. Firms post vacancies or produce. The cost of having a vacancy open is c_v . Posting a vacancy is not job creation unless it is filled. Each firm is a one-job firm, and the job may be occupied and producing or vacant. Free entry is assumed. The source of heterogeneity is due to the existence of matches with different quality levels and durations. Therefore, the state space that describes the situation of a particular worker is $S = \{0, 1\} \times \mathcal{E} \times D$, where $\mathcal{E} = \{\varepsilon_1, \dots, \varepsilon_n\}$ is a discrete set for the quality levels and $D = \{1, \dots, N\}$ is also a discrete set denoting the duration of a job (worker's seniority). Each triple indicates whether the worker is unemployed (0) or employed (1), the quality and the duration of the match.

2.2 Preferences

Workers have identical preferences, live infinitely and maximise their utility, which is taken to be linear in consumption. It is assumed that they supply work inelastically, that is, they will accept any opportunity that arises. Thus, each worker has preferences defined by $\sum_{t=1}^{\infty} \beta^t c_t$, where β is the discount factor ($0 \leq \beta < 1$) and c_t is individual consumption. Firms are further assumed to be risk neutral.

2.3 Technologies

Production technology

Each job is characterised by an irreversible technology and produces one unit of a differentiated product per period whose price is $y(\varepsilon_t)$, where $\{\varepsilon_t\}$ is an idiosyncratic component, i.e., the quality of the match. This idiosyncratic component is modelled as a stationary and finite Markov chain. This process is the same for each match, and the realisations ε_{t+1} are independent and identically distributed with conditional transition probabilities $\Gamma(\varepsilon'|\varepsilon) = Pr\{\varepsilon_{t+1}|\varepsilon_t\}$, where $\varepsilon, \varepsilon' \in \mathcal{E} = \{1, 2, \dots, n_{\varepsilon}\}$. Each new match starts with the same entry level ε_e , and from this initial condition, the quality of the match evolves stochastically due to these idiosyncratic shocks. It is assumed that agents know the law of motion of the process and observe their realisations at the beginning of the period.

Matching Technology

In each period, vacancies and unemployed workers are stochastically matched. It is assumed that there exists an homogeneous of degree one matching function $m = m(u, v)$, increasing and concave in both arguments, where v is the number of vacancies and u is the number of unemployed workers, both normalised by the fixed labour force. Given the properties of the matching function, the transition rates for vacancies, q , and unemployed workers, α , depend only on $\theta = v/u$, a measure of tightness in the labour market. The vacancy transition rate, q , is defined as the probability of filling a vacancy, and the transition rate for unemployed workers, α , is defined as the probability of finding a job. These are given by

$$q(\theta) = \frac{m(v,u)}{v} = m\left(1, \frac{u}{v}\right); \alpha(\theta) = \frac{m(v,u)}{u} = m\left(\frac{v}{u}, 1\right).$$

2.4 Equilibrium

The concept of equilibrium as used herein is recursive equilibrium. Before showing the problems that agents solve, it is convenient to explain the timing and the agents' decisions. At the beginning of the period, firms' idiosyncratic shocks are revealed for existing matches. Firms and workers then renegotiate wages. Given these wages, firms choose between two options: i) to continue producing with the current match or ii) to terminate the match and dismiss the worker. The nature of the problem depends on whether the firm has a PC or a TC. PCs entail high severance costs that depend on the quality of the match and on the duration of the contract, while severance costs for TCs depend also on both dimensions but are, in comparison, very low. In addition, the problem is not the same for all firms with a TC. Let d denote the duration of the contract. It is assumed that a TC cannot last more than d_{max}^t periods, and thus, the maximum number of renewals is $d_{max}^t - 1$. Therefore, firms whose TCs cannot be renewed decide between these two options: i) to convert the TC into a PC, taking into account the consequences regarding future severance costs or ii) to terminate the match. Once all these decisions have been made, production starts both in firms where workers have not been fired during this period and in those that were matched with unemployed workers at the end of the last period. Finally, search decisions are made, and firms post vacancies for which the unemployed workers apply. This search process generates new matches that will be productive over the next period. Accordingly, there follows a formal description of the problems faced by both firms and workers.

Vacancy Creation

Every job is created as a temporary job according to the following equation:

$$V = -c_v + \beta[q(\theta)J^{tc}(\varepsilon_e, 1) + (1 - q(\theta))V], \quad (1)$$

where V is the value of a vacant job, $J^{tc}(\varepsilon_e, 1)$ is the value function of a firm with a first-period TC, and ε_e is the entry level match quality. All vacancies lead to TC jobs, which may later be transformed to PC jobs.

The Firm's Problem

The problem of firms with TCs

The problem of a firm with a TC, whose length at the end of the last period was less than d_{max}^t , is

$$J^{tc}(\varepsilon, d) = \max\{y(\varepsilon)(1 - \gamma) + \zeta - w^{tc}(\varepsilon, d)(1 + \xi^{tc}) + \beta \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon)J^{tc}(\varepsilon', d'), \\ -s^{tc}(\varepsilon, d - 1) - \kappa(d) - c_v + \beta(q(\theta)J^{tc}(\varepsilon_e, 1) + (1 - q(\theta))V)\} \quad (2)$$

$$g^{tc}(\varepsilon, d) = \begin{cases} 1 & \text{if the match continues} \\ 0 & \text{if the worker is fired} \end{cases}$$

where $J^{tc}(\varepsilon, d)$ and $J^{tc}(\varepsilon', d')$ are, respectively, the firm's value function for this period and the next period when having a TC, $y(\varepsilon)(1 - \gamma)$ is output, ζ is a subsidy that the firm may receive if she qualifies to, $w^{tc}(\varepsilon, d)$ is the wage, ξ^{tc} represents social security taxes paid by the firm, $\Gamma(\varepsilon'|\varepsilon)$ is the conditional transition probability for the match quality, $s^{tc}(\varepsilon, d - 1)$ is the severance cost and $\kappa(d)$ is a penalty that the firm may have to pay if the TC is destroyed before being converted to a PC, provided a subsidy was given for that purpose. As in García-Pérez and Osuna (2014) and based on Spanish evidence (See, for instance, Albert et. al (2005) and Dolado et. al (2012)), it is assumed that temporary workers are less productive than permanent workers, and we introduce this feature through a productivity gap, γ . Note that a greater value of ε increases output. In contrast, wages and severance costs are both increasing in ε and d .

If it is more profitable to continue with the actual match (first row greater than second row in Equation 2), the decision rule will be $g^{tc}(\varepsilon, d) = 1$ and the match will continue. Otherwise, $g^{tc}(\varepsilon, d) = 0$, and the worker will be fired, whereby the firm

incurs the severance cost, $s^{tc}(\varepsilon, d - 1)$, the penalty if she qualified for the subsidy, $\kappa(d)$, the vacancy cost and, with probability $q(\theta)$ at the end of this period, the firm will fill the vacant job with a TC that will be productive in the next period.

The problem of firms with prospective permanent contracts (PPCs)

The problem is slightly different for a firm whose TC has reached its maximum length at the end of the previous period. If the worker is not fired at the beginning of this period, the TC will be automatically transformed into a PC. Note that in this case $d = d_{max}^t + 1$, where $d_{max}^t + 1$ denotes the first period in a PC, and that severance costs are given by $s^{tc}(\varepsilon, d - 1)$ because if the worker is not promoted, the severance cost corresponds to the period the worker has spent on a TC. As in García-Pérez and Osuna (2014), based on Spanish evidence (See Albert et. al (2005), for example), it is assumed that firms incur a training cost, τ , in the first period of a PC that reduces the productivity of the job in that period. This problem can thus be written as

$$J^{ppc}(\varepsilon, d) = \max\{y(\varepsilon)(1 - \tau) + \zeta - w^{ppc}(\varepsilon, d)(1 + \xi^{pc}) + \beta \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon)J^{pc}(\varepsilon', d'), \\ -s^{tc}(\varepsilon, d - 1) - \kappa(d) - c_v + \beta(q(\theta)J^{tc}(\varepsilon_e, 1) + (1 - q(\theta))V)\} \quad (3)$$

$$g^{ppc}(\varepsilon, d) = \begin{cases} 1 & \text{if the firm promotes the worker} \\ 0 & \text{if the worker is fired} \end{cases}$$

where $J^{ppc}(\varepsilon, d)$ and $J^{pc}(\varepsilon', d')$ are, respectively, the firm's value function for this and the next period, $y(\varepsilon)(1 - \tau)$ is output, ξ^{pc} represents social security taxes paid by the firm and $w^{ppc}(\varepsilon, d)$ is the wage. This equation has an analogous interpretation to the previous one. If it is more profitable to continue with the actual match, the decision rule will be $g^{ppc}(\varepsilon, d) = 1$, and the TC will be converted to a PC. Otherwise, $g^{ppc}(\varepsilon, d) = 0$, and the worker will be fired.

The problem of firms with existing PCs

A firm with a PC must decide whether to continue with the actual match or to dismiss the worker and search for a new one. This problem can be written as

$$J^{pc}(\varepsilon, d) = \max\{y(\varepsilon)\Lambda(d) - w^{pc}(\varepsilon, d)(1 + \xi^{pc}) + \beta \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon)J^{pc}(\varepsilon', d'), \\ -s^{pc}(\varepsilon, d - 1) - c_v + \beta(q(\theta)J^{tc}(\varepsilon_e, 1) + (1 - q(\theta))V)\} \quad (4)$$

$$g^{pc}(\varepsilon, d) = \begin{cases} 1 & \text{if the match continues} \\ 0 & \text{if the worker is fired} \end{cases}$$

where $J^{pc}(\varepsilon, d)$ and $J^{pc}(\varepsilon', d')$ are, respectively, the firm's value function for this period and the next period when having a PC, $y(\varepsilon)$ is output, $\Lambda(d)$ is an experience function, $w^{pc}(\varepsilon, d)$ is the wage and $s^{pc}(\varepsilon, d - 1)$ is the severance cost. As in García-Pérez and Osuna (2014), based on Spanish evidence (See Albert et. al (2005), for example), it is assumed that permanent workers are more productive as tenure increases. This feature is introduced through the experience function $\Lambda(d)$. Therefore, for a given value of ε , more tenure on the job makes the job even more productive. The interpretation of this equation is again analogous to the previous ones. If it is more profitable to continue with the actual match, the decision rule will be $g^{pc}(\varepsilon, d) = 1$, and the match will continue. Otherwise, $g^{pc}(\varepsilon, d) = 0$, and the worker will be fired.

The Worker's Problem

The value functions of workers in TCs, PPCs and PCs can be written as follows

$$\begin{aligned} W^{tc}(\varepsilon, d) &= \tilde{\Phi}(g^{tc} = 1)[w^{tc}(\varepsilon, d) + \beta \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon)W^{tc}(\varepsilon', d')] + \\ &\quad \tilde{\Phi}(g^{tc} = 0)[U + s^{tc}(\varepsilon, d - 1)] \end{aligned} \quad (5)$$

$$\begin{aligned} W^{ppc}(\varepsilon, d) &= \tilde{\Phi}(g^{ppc} = 1)[w^{ppc}(\varepsilon, d) + \beta \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon)W^{ppc}(\varepsilon', d')] + \\ &\quad \tilde{\Phi}(g^{ppc} = 0)[U + s^{ppc}(\varepsilon, d - 1)] \end{aligned} \quad (6)$$

$$\begin{aligned} W^{pc}(\varepsilon, d) &= \tilde{\Phi}(g^{pc} = 1)[w^{pc}(\varepsilon, d) + \beta \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon)W^{pc}(\varepsilon', d')] + \\ &\quad \tilde{\Phi}(g^{pc} = 0)[U + s^{pc}(\varepsilon, d - 1)] \end{aligned} \quad (7)$$

where $W^{tc}(\varepsilon, d)$, $W^{ppc}(\varepsilon, d)$ and $W^{pc}(\varepsilon, d)$ denote worker's value functions in TCs, PPCs and PCs, $\tilde{\Phi}(x)$ is an indicator function that takes value 1 if the assessment

is true and zero otherwise, and U is the value function of an unemployed worker, whose equation is

$$U = b + \beta(\alpha(\theta)W^{tc}(\varepsilon_e, 1) + (1 - \alpha(\theta))U) \quad (8)$$

where $W^{tc}(\varepsilon_e, 1)$ is the value function of a worker in a first-period TC and the parameter b can be interpreted as an unemployment subsidy. Hence, an unemployed worker receives b today and, by the end of the period, the probability that the worker will find a job is $\alpha(\theta)$ whereas the probability that the worker will remain unemployed is $1 - \alpha(\theta)$.

Law of Motion for Unemployment

Given the previously shown policy rules, the law of motion for unemployment is

$$U_t = U_{t-1} + \sum_{i=1}^{N_{t-1}^{pc}} (1 - g_i^{pc}(\varepsilon, d)) + \sum_{i=1}^{N_{t-1}^{ppc}} (1 - g_i^{ppc}(\varepsilon, d)) + \sum_{i=1}^{N_{t-1}^{tc}} (1 - g_i^{tc}(\varepsilon, d)) - \alpha(\theta)U_{t-1}, \quad (9)$$

where N_{t-1}^{pc} , N_{t-1}^{ppc} and N_{t-1}^{tc} denote the beginning of period- t employment levels in PCs, PPCs and TCs, respectively, and U_t is the level of unemployment at the end of period t . The interpretation of the equation is the following: unemployment at the end of period t , U_t , is given by the sum of the stock of unemployment at the beginning of period t , U_{t-1} , plus the inflows into unemployment (the three terms with indicator functions) during period t minus the outflow from unemployment during period t , $\alpha(\theta)U_{t-1}$. Note that the second RHS term sums up the values of the $g_i^{pc}(\varepsilon, d)$ for every worker holding a PC at the beginning of period t , when the decision to continue or to fire takes place. For instance, for those workers fired at the beginning of period t , $g_i^{pc}(\varepsilon, d) = 0$; therefore, they will be part of the unemployment pool. The third and fourth RHS terms have a similar interpretation, but for workers with prospective PCs and TCs, respectively.

Wage Determination

Wages are the result of bilateral bargaining between the worker and the firm, unless the legally imposed minimum wage, w_{min} , is binding.² Bargaining is dynamic, i.e., wages are revised for each period based upon the occurrence of new shocks. The

² Downward wage rigidity is modelled here as a lower bound on the outcome of the wage negotiations. A wage floor needs to be imposed in order to prevent too much internalisation of severance payments.

assumption of bilateral bargaining is reasonable due to the existence of sunk costs (search costs) once the match has been produced. This creates local monopoly power and generates a surplus to be split among the participants in the match. In TCs, this surplus is defined as

$$S^{tc}(\varepsilon, d) = [J^{tc}(\varepsilon, d) - (V - s^{tc}(\varepsilon, d - 1))] + [W^{tc}(\varepsilon, d) - (U + s^{tc}(\varepsilon, d - 1))] \quad (10)$$

Wages are the result of maximising the following Nash product with respect to the wage

$$[J^{tc}(\varepsilon, d) - (V - s^{tc}(\varepsilon, d - 1))]^{1-\pi} [W^{tc}(\varepsilon, d) - (U + s^{tc}(\varepsilon, d - 1))]^{\pi} \quad (11)$$

The first order condition of this maximisation is such that the surplus is split into fixed proportions according to the worker's bargaining power, π

$$(1 - \pi)S^{tc}(\varepsilon, d) = J^{tc}(\varepsilon, d) + s^{tc}(\varepsilon, d - 1) \quad (12)$$

$$\pi S^{tc}(\varepsilon, d) = W^{tc}(\varepsilon, d) - (U + s^{tc}(\varepsilon, d - 1)) \quad (13)$$

By making the appropriate substitutions of firms' and workers' value functions, the wage in TCs can be computed as

$$w^{tc}(\varepsilon, d) = \max\{w_{min} \ , \ \pi y(\varepsilon)(1 - \gamma) + (1 - \pi)U + s^{tc}(\varepsilon, d - 1) + \beta(\pi \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon) J^{tc}(\varepsilon', d) - (1 - \pi) \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon) W^{tc}(\varepsilon', d))\}$$

Following the same procedure, the wage in firms with PPCs turns out to be

$$w^{ppc}(\varepsilon, d) = \max\{w_{min} \ , \ \pi y(\varepsilon)(1 - \tau) + (1 - \pi)U + s^{tc}(\varepsilon, d - 1) + \beta(\pi \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon) J^{pc}(\varepsilon', d) - (1 - \pi) \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon) W^{pc}(\varepsilon', d))\}$$

And, finally, in firms with PCs

$$w^{pc}(\varepsilon, d) = \max\{w_{min}, \pi y(\varepsilon)\Lambda(d) + (1 - \pi)U + s^{pc}(\varepsilon, d - 1) + \beta(\pi \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon)J^{pc}(\varepsilon', d) - (1 - \pi) \sum_{\varepsilon'} \Gamma(\varepsilon'|\varepsilon)W^{pc}(\varepsilon', d))\}$$

Note that wages in PPCs are lower than those prevailing in the following periods because of the associated training costs and because, as in Osuna (2005), firms try to internalise higher future wages (due to higher future severance costs) by pushing down wages in first-period PCs. Moreover, for any given productivity level, wages in TCs are lower than in existing PCs because of the assumed productivity gap.

Definition of Equilibrium

A recursive equilibrium is a list of value functions $J^{tc}(\varepsilon, d)$, $J^{ppc}(\varepsilon, d)$, $J^{pc}(\varepsilon, d)$, $W^{tc}(\varepsilon, d)$, $W^{ppc}(\varepsilon, d)$, $W^{pc}(\varepsilon, d)$, V , U , transition rates $q(\theta)$, $\alpha(\theta)$, wages $w^{tc}(\varepsilon, d)$, $w^{ppc}(\varepsilon, d)$ and $w^{pc}(\varepsilon, d)$, and decision rules $g^{tc}(\varepsilon, d)$, $g^{ppc}(\varepsilon, d)$, $g^{pc}(\varepsilon, d)$ such that³

1. *Optimality*: Given functions $q(\theta)$, $\alpha(\theta)$, $w^{tc}(\varepsilon, d)$, $w^{ppc}(\varepsilon, d)$ and $w^{pc}(\varepsilon, d)$ the value functions $J^{tc}(\varepsilon, d)$, $J^{ppc}(\varepsilon, d)$, $J^{pc}(\varepsilon, d)$, $W^{tc}(\varepsilon, d)$, $W^{ppc}(\varepsilon, d)$ and $W^{pc}(\varepsilon, d)$ satisfy the Bellman equations.
2. *Free entry*: This condition and the profit maximisation condition guarantee that, in equilibrium, the number of vacancies adjusts to eliminate all the rents associated with holding a vacancy; that is, $V = 0$, implying $c_v = \beta q(v)J^{tc}(\varepsilon_e, 1)$.
3. *Wage bargaining*: The equilibrium conditions from maximising the surplus in existing TCs are given in equations (12) and (13). Similar conditions hold for other types of contracts.

3 Calibration

In this section, the data set, the procedure for assigning values to the model's parameters and the selection of functional forms is explained.

³ Cole and Rogerson (1999) show that an equilibrium always exists when wages do not depend on the unemployment rate but only on the idiosyncratic shock. The intuition is that, given free entry, vacancies adjust to the number of unemployed, and the relevant variable becomes the ratio of unemployed workers to vacancies.

3.1 The Data Set and Model Period

To calibrate the main parameters of the model, Spanish administrative data from the “*Muestra Continua de Vidas laborales*” (MCVL) are used. The calibration sample comes from the 2006 to 2011 waves and includes the complete labour career for a sample of more than 700,000 workers for the 2004 to 2011 period, a reasonable time span for measuring job transitions in steady state given that it comprises four years of expansion (2004-2007) and another four years of crisis (2008-2011). All employment and unemployment spells lasting more than six months are used. The model period is chosen to be a year for consistency with these data and because this choice is reasonable from a computational perspective.

3.2 Calibrated Parameters and Functional Forms

In this model there are two types of calibrated parameters: those that have a clear counterpart in the real economy and those that do not. For the former, I use the implied parameter values. For some of the latter, I use the values estimated in empirical studies, and for the rest, I use the simulated method of moments to calibrate their values.

Preferences

The utility function is linear in consumption, as is usual in this literature. The value of the discount factor, $\beta = .97$, is fixed so that it is consistent with the mean annual real interest rate in the reference period, 3%.

Production Technology

The production function is assumed to be linear in the idiosyncratic shock, $y(\varepsilon) = \varepsilon$. The idiosyncratic shock is modelled as a Markov chain, $\Gamma[(\varepsilon')|(\varepsilon)]$. In addition, five possible quality levels are assumed. In general, these two assumptions would imply 20 restrictions to fix the values of the conditional transition probabilities between different quality levels. Assuming that the expected duration of good and bad idiosyncratic shocks coincides, $\Gamma[(\varepsilon_1)|(\varepsilon_2)] = \Gamma[(\varepsilon_2)|(\varepsilon_1)]$, it is only necessary to estimate 15 transition probabilities. Given that there is no direct information on the quality of the match, the Tauchen (1986) procedure is used to parameterise the five quality levels and the transition probabilities. To apply this procedure, we need to know the mean (μ), the standard deviation (σ) and the autocorrelation coefficient (ρ) of the underlying idiosyncratic process. Wages for the 2004 to 2011 period are used to approximate this process, generating the following values for these parameters: $\mu = .33$, $\sigma = .11$ and $\rho = .75$. Finally, μ is normalised to the value of 1 to make the calibration more intuitive and more easily interpretable. Using the calibration sample, the productivity gap parameter is set to 14% based on the ratio

between wages for permanent and temporary workers with equal experience (See García-Pérez and Osuna (2014) for a discussion on the robustness of this choice). Finally, the positive experience effect on the productivity of permanent workers is parametrized through the function $\Lambda(d) = (1 + \lambda(d - 3))$ for $d > 3$.

Matching Technology

A Cobb-Douglas homogeneous of degree one matching function, $m = m(v, u) = Av^\eta u^{1-\eta}$, is assumed, where A is the degree of mismatch and η is the value of the elasticity of the number of matches with respect to vacancies.

Unemployment Benefits

The parameter b is interpreted as the income flow of unemployment. I obtain $b = .2$ as the product of unemployment benefits and coverage for the 2004-2011 period, normalised by average productivity.⁴

Social Security

Social security taxes in permanent and temporary contracts are, respectively, 29.9% and 31.1% of the wage.

Minimum Wage

The parameter w_{min} is set using information on the average minimum wage set in collective agreements (see Lacuesta et. al (2012)). For the 2004-2011 period, this minimum wage is 860 Euros. Given a median wage of 1200 Euros, the ratio between the two is 0.72, which is the ratio that is imposed in the model to parameterise $w_{min} = .72$.

To summarise, the calibration exercise involves the assignment of values to two types of parameters. The discount rate, β , the parameters of the idiosyncratic process, (μ , σ and ρ), the productivity gap parameter, γ , unemployment benefits, b , and the minimum wage, w_{min} , are set independently from the rest as they have clear counterparts in the real economy (See Table 1). In contrast, the workers' bargaining power, π , the value for the elasticity of new matches with respect to the vacancy input, η , and the cost of posting a vacancy, c_v , are set using the values estimated in the empirical studies. Abowd and Lemieux (1993) estimate $\pi = 0.33$, the value for η usually lies in the range of $[0.4 - 0.6]$, and c_v is set as 26% of the average

⁴ In the 2004-2011 period, the monthly average unemployment benefits and coverages are, respectively, 758 euros and 31%. The sources of these data are the Bulletin of Labour Statistics edited by the Ministry of Labour and Social Affairs, the Spanish Labour Force Survey, and the National Employment Office.

Table 1: Calibrated Parameters

Discount factor	β	0.97
Productivity shock (mean)	μ	1
Productivity shock (autocorrelation)	ρ	0.75
Productivity shock (standar deviation)	σ	0.11
Productivity gap	γ	0.14
Unemployment benefit	b	0.2
Minimum wage	w_{min}	0.72
Bargaining power	π	0.33
Matching elasticity	η	0.51
Vacancy cost	c_v	0.26
Training cost	τ	0.6
Experience effect on productivity	λ	0.007
Mismatch degree	A	0.64

worker productivity, which is roughly the midpoint of the estimates suggested in the literature (see Costain et al. (2010)).

The three remaining parameters, training cost, τ , experience, λ , and mismatch, A , are calibrated using the method of simulated moments. Table 2 displays the three conditions that are imposed to set these parameters. This calibration exercise shows that the initial steady-state of the model (status quo) is a good starting point for investigating the behaviour of this economy because it matches the Spanish data fairly closely.

Table 2: Calibration results

Statistics	Spanish Data	Status Quo
JDp	8.1	7.4
JDt	26.6	26.6
u_{dur}	11.1	12.3

JDp and JDt denote permanent and temporary job destruction, respectively.
 u_{dur} denotes unemployment duration.

3.3 Policy parameters: Severance cost functions and Subsidies

Severance Cost Function in the Status Quo

To compute equilibrium, I need a severance cost function that represents the severance costs in Spain for the period under study. I use the following pieces of information to estimate the severance cost function in PCs: legal compensation in fair dismissals (20 days of wages p.y.o.s. with a maximum of 12 monthly wages) and unfair dismissals (45 days of wages p.y.o.s. with a maximum of 42 monthly wages), procedural wages⁵ of approximately two months, and the fact that, on average, 74.3% of all severance processes were declared unfair during the 2004-2011 period.⁶ Regarding the dismissal distribution, on average, 7% were collective dismissals, 20.9% were agreed upon at the units of mediation, 57.6% followed the procedure specified in Spain's Law 45/2002, and only 14.5% involved litigation.⁷ Using these observations and after rearranging terms, the following final expression of the severance cost function for PCs is obtained: $s^{pc} = 44.1 \frac{w}{365}(d - 1) + 23.2 \frac{w}{365}$, where d and w denote a worker's seniority and annual wage, respectively.⁸ Note, in particular, that the second additive term of the severance cost function displayed in the main text is not multiplied by tenure because this term reflects procedural wages, and legal severance costs depend on the wage. Because making the severance cost function depend on wages is computationally very difficult, I take the quality of the match as an approximation of the wage.

Regarding TCs, they entail a severance cost of eight days of wages p.y.o.s and no procedural wages. Therefore, the severance cost function for TCs is $s^{tc} = 8 \frac{w}{365}(d - 1)$. Following Güell and Petrongolo (2007), d_{max}^t is set to three periods, which has been the usual practice in Spain since the introduction of TCs in 1984.

⁵ Procedural wages are those wages associated with the interim period between a workers dismissal, contested in court, and the judge decision declaring it unfair.

⁶ The distribution of dismissals is taken from the Bulletin of Labour Statistics.

⁷ The number of days actually agreed upon is not made public, but this number is presumed to be very close to the legal limit. In contrast, the 2002 reform (Law 45/2002) abolished the firm's obligation to pay procedural wages when dismissed workers appeal to labour courts as long as the firm acknowledges the dismissal as unfair and deposits the corresponding severance pay within two days of the dismissal.

⁸ To obtain the equation displayed in the text, one needs to rearrange terms in the following expression: $s^{pc} = 7\%[45 \frac{w}{365}(d - 1) + 60 \frac{w}{365}] + 20.9\%[45 \frac{w}{365}(d - 1) + 60 \frac{w}{365}] + 57.6\%[45 \frac{w}{365}(d - 1)] + 14.5\%[74.3\%(45 \frac{w}{365}(d - 1) + 60 \frac{w}{365}) + 25.7\%(20 \frac{w}{365}(d - 1))]$, which takes into account all the information provided above.

Subsidies in the 2006 labour market reform

This reform basically enlarged the group of workers that were eligible for subsidies, either through the Permanent Employment Promotion Contracts (EPCs) that were introduced in 1997, or through job conversion of TCs into PCs. In particular, firms were allowed to hire workers in the age bracket 31-45 under PEPCs until the end of 2007. This reform entitled the firm to a rebate of 2400 euros in payroll taxes provided the EPC last for at least four periods or the TC was converted to a PC.

Severance costs and subsidies in the 2012 labour market reform

The 2012 reform implies some changes both in the PC and in the TC severance cost function. The ordinary PC severance cost function must be adjusted in two dimensions. First, the 45 days of wages p.y.o.s are replaced with 33 days of wages p.y.o.s.; second, procedural wages are eliminated because the 2012 reform abolished them. This implies the following severance cost function in PCs: $s^{pc} = 33 \frac{w}{365} (d - 1)$.⁹ In addition, the TC severance cost function must be adjusted to the current level of severance costs, that is, 12 days of wages p.y.o.s., because of the progressive increase in TC severance costs (one day a year until 12 days of wages p.y.o.s. in 2015), which was introduced in the 2010 reform. This implies the following severance cost function in TCs: $s^{tc} = 12 \frac{w}{365} (d - 1)$.

On the other hand, Law 3/2012, on urgent measures for reforming the Spanish labour market, introduced a new PC, which is referred to as the "entrepreneurs' permanent contract" (EPC), with a one-year probationary period, zero severance costs during such period and large wage subsidies for younger and older workers hired by small firms (those with fewer than 50 workers).¹⁰ Under the EPC, once the first period has expired, the indemnity is the same than in ordinary PCs, that is, 33 days of wages p.y.o.s., implying the following severance cost function $s^{pc} = 33 \frac{w}{365} (d - 1)$.

⁹ Based on the fact that most firings in the past reached an amount very close to the legal limit, 33 days of wages p.y.o.s are set for every firing regardless of whether the dismissal is fair or unfair.

¹⁰ Small firms receive an annual subsidy of approximately 1,167 euros during the first 3 years if they hire under the EPC younger than 30 years of age workers or long-term unemployed over the age of 44.

4 Main Findings

This section reports the answers to the questions posed. Section 4.1 shows the status quo (SQ) values of the set of statistics of interest. Section 4.2 shows the predicted steady-state effects of the 2006 labour market reform concerning the provision of subsidies for permanent job creation. Section 4.3 shows the predicted steady-state effects of the 2012 labour market reform concerning the reduction in the severance cost gap between PCs and TCs and the introduction of the EPC. Section 4.4 discusses the need of designing penalties when subsidizing permanent job creation. And, finally, Section 4.5 shows some sensitivity analysis.

4.1 The Status Quo

Table 3 shows the status quo values of the statistics of interest: the unemployment rate and tenure distribution. The unemployment rate, u , is slightly higher when compared with the actual data.¹¹ Regarding tenure distribution, the model reproduces reasonably well the average tenure for those employed with a tenure equal to or under six years, $\bar{d}_{d \leq 6}$, in the SQ. In fact, the model is able to reproduce quite accurately the proportion of workers, n_d , with seniorities $d = 2$, $d = 3$, $d = 4$ and $d = 5$, but it underestimates the proportion of workers with a tenure equal to or under one year, $n_{d=1}$.¹²

4.2 Steady-state Effects of the 2006 Labour Market Reform

This section shows the steady-state effects of the 2006 labour market reform (R-2006) focusing on the effects on unemployment rates, job destruction and tenure distribution. Column 3 in Table 4 indicates that the 2006 labour market reform generates a 11% reduction of unemployment, from 17.2% to 15.3%. The main force driving this result is the increase in job conversion, which translates into a lower job destruction rate at the beginning of period four, $JD_{d=4}$, which falls from 30.4% to 10.9%. As a result, the temporary job destruction rate decreases by 17.3%, from 26.6% to 22%, and the tenure distribution becomes smoother (See Figure 1). In particular, the proportion of workers with a tenure of more than three years increases by almost 10%, from 52.8% to 58.0%.

¹¹ For comparability with the data, which include only workers affiliated with social security, the unemployment rate is computed by excluding from the employment series public servants who do not contribute to social security (those affiliated with MUFACE, the special regime for public servants).

¹² This underestimation may be because, in reality, some low productivity matches may be destroyed immediately once their productivity is realised and not after one year, as assumed in our model.

Table 3: Data and Status Quo

Statistics	Data	Status Quo
u	14.6	17.2
JD	11.5	12.6
$n_{d=1}$	25.8	20.3
$n_{d=2}$	15.7	15.8
$n_{d=3}$	11.4	11.1
$n_{d=4}$	8.6	7.7
$n_{d=5}$	6.8	7.6
$\bar{d}_{d \leq 6}$	1.94	1.96
$\bar{d}_{d \leq 10}$	3.05	3.83

$n_{d=i}$ stands for the proportion of workers in period i and $\bar{d}_{d \leq 6}$ stands for the average tenure for those employed with a tenure equal to or under six years.

In fact, from the date the 2006 labour market reform was approved until 2008 there was a substantial reduction in the temporary employment rate, from 34.4% in 2006 to 29.4% in 2008. However, it is hard to disentangle whether this drop in the temporary job destruction rate was actually due to the rebates that were awarded during that transitory period or to the large destruction of temporary jobs in the construction industry, due to the burst of the housing bubble.

4.3 Steady-state Effects of the 2012 Labour Market Reform

This section shows the steady-state effects of the 2012 labour market reform (R-2012) concerning the changes in PCs and TCs employment protection and the introduction of a new subsidized permanent contract, the EPC. Column 4 in Table 4, indicates that the reduction in the severance cost gap from 37 to 21 days of wages p.y.o.s reduces unemployment by 14.8%, from 17.2% to 14.7%. On the other hand, aggregate job destruction, JD , decreases by 12% as a result of a simultaneous increase in the permanent job destruction rate (JDp) and a decrease in the temporary job destruction rate (JDt). In fact, the temporary job destruction rate decreases by 25.3%, from 26.6% to 20%, as a result of two forces. First, the lower gap in severance costs makes firms more prone to convert TCs into PCs. The reduction in the severance cost gap diminishes the pervasive incentives to destroy jobs at the beginning of period four: the job destruction rate $JD_{d=4}$ changes from 30.4% to 27.0%. And second,

Table 4: Effects of the 2006 and 2012 Labour Market Reforms

Statistics	SQ Sev. Cost Gap 45 – 8	R-2006 Subsidies	R-2012 Sev. Cost Gap 33-12	R-2012 EPC	R-2012 Sev. Cost Gap 20-12	R-2012 Sev. Cost Av. Gap
<i>u</i>	17.2	15.3	14.7	13.7	12.4	13.6
<i>JD</i>	12.6	11.8	11.1	10.5	9.3	10.2
<i>JD_p</i>	7.4	8.0	7.8	8.2	8.2	8.0
<i>JD_t</i>	26.6	22.0	19.9	16.8	12.3	16.1
<i>JD_{d=2}</i>	22.5	22.3	22.4	22.4	6.6	14.5
<i>JD_{d=3}</i>	29.4	29.5	10.3	10.3	14.6	12.5
<i>JD_{d=4}</i>	30.4	10.9	27.0	16.1	16.9	21.9
<i>n_{d=1}</i>	20.3	18.1	17.2	15.9	14.2	15.7
<i>n_{d=2}</i>	15.8	14.0	13.4	12.4	13.3	13.3
<i>n_{d=3}</i>	11.1	9.9	12.0	11.1	11.3	11.7
<i>n_{d=4}</i>	7.7	8.8	8.7	9.3	9.4	9.0
<i>n_{d=5}</i>	7.6	8.4	8.3	8.8	8.9	8.6
<i>n_{d=6}</i>	7.1	7.7	7.7	8.1	8.2	7.9
<i>n_{d=7}</i>	6.5	7.0	7.0	7.3	7.4	7.2
<i>n_{d=8}</i>	5.8	6.3	6.3	6.6	6.7	6.5
<i>n_{d=9}</i>	5.3	5.7	5.7	6.0	6.0	5.9
<i>n_{d=10}</i>	4.8	5.2	5.1	5.4	5.4	5.3
<i>n_{d>3}</i>	52.8	58.0	57.5	60.6	61.2	59.3
<i>n_{d>10}</i>	8.1	8.8	8.8	9.2	9.3	9.0

JD_{d=i} stands for job destruction at the beginning of period *i*.

n_{d=i} stands for the proportion of workers in period *i*.

the higher TCs severance costs also induces less job destruction at the beginning of the last period in a TC: $JD_{d=3}$ changes from 29.4% to 10.3%. The opposite happens, however, for the permanent job destruction rate, which increases by 5.7%, from 7.4% to 7.8%, because firing permanent workers has become cheaper. These changes in job destruction rates have an impact on tenure distribution (See Figure 1). The proportion of workers with tenure equal to or under one year, $n_{d=1}$, is 15.4% lower than in the SQ, and the proportion of workers with tenure of more than three years, $n_{d>3}$, increases by 9%, from 52.8% to 57.5%.

On the other hand, Column 5 in Table 4 indicates that the introduction of the EPC reduces the unemployment rate by one additional point with respect to the previous scenario (Column 4), from 17.2% in the SQ to 13.7%. Also the probability of being fired in contracts with a tenure equal to or below three years declines by three additional points with respect to the previous scenario, from 26.6% in the SQ to 16.8%¹³. These additional reductions in the unemployment and in the probability of being fired in contracts with a tenure equal to or below three years are the result of an additional decrease in the job destruction rate at the beginning of period four, $JD_{d=4}$, since the subsidy that firms receive for the EPC is made contingent on keeping the worker for at least four periods in the firm. Otherwise, the firm is penalized by having to return the subsidy received.

Column 6 in Table 4 shows the results of a further reduction in the severance cost gap from 37 to 8 days of wages p.y.o.s. The reason why this scenario may be of interest is because the 2012 labour market reform, in addition to the reduction in the severance cost gap in the case of unfair dismissals and the introduction of the EPC, has also made economic dismissals easier to prove. The new definition of dismissals due to economic reasons will allow firms with financial difficulties to make use of them more easily. Assuming an extreme situation, in which all the dismissals took place following this route, the reduction in the unemployment rate and in the temporary job destruction rate would be 27.8% and 53.7%, respectively. This additional reductions in the unemployment and in the temporary job destruction rate with respect to the scenario where the gap in severance cost is 21 days of wages p.y.o.s. (See Column 4) is mainly due to the reduction in the job destruction rates at the beginning of periods two and four, $JD_{d=2}$ and $JD_{d=4}$, generated by the fact TCs have become relatively more expensive and PCs relatively cheaper, which tends to increase job conversion. Of course, these changes have an important impact on the tenure distribution, which becomes even smoother (See Figure 1). The proportion of workers with tenure equal to or under one year, $n_{d=1}$, is 21.6% lower than in the SQ,

¹³ Note that, strictly speaking, we cannot talk about JDt in the EPC scenario because the EPC is a PC. The equivalent concept is the probability of being fired in contracts with a tenure equal to or below three years.

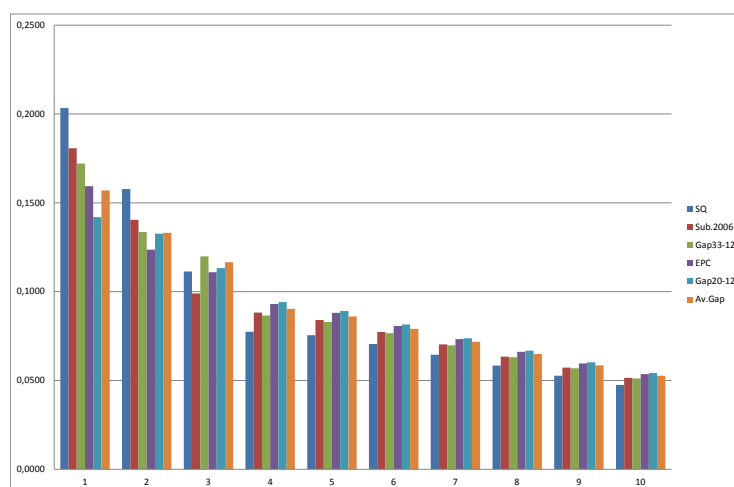


Figure 1: Tenure Distribution

and the proportion of workers with tenure of more than three years, $n_{d>3}$, increases by 15%, from 52.8% to 59%.

The results shown in Column 6 could be considered as an upper bound of the effects the 2012 labour market reform concerning the adjustments on the external margin. Based on recent data on economic dismissals, a more reasonable assumption would be to consider that only half of them take this route. The last column in Table 4 displays the results for this case. In terms of the unemployment and the temporary and permanent job destructions rates, the changes are very similar to those obtained for the EPC case. The differences can only be appreciated by comparing the job destruction rates at the beginning of period two and four, $JD_{d=2}$ and $JD_{d=4}$. The job destruction rate at the beginning of period two is much higher in the case of the EPC because this contract do not entail severance costs at the end of the first period, which induces a lot of turnover. On the contrary, the fact that the subsidy depends upon keeping the worker for at least four periods in the firm makes firms more prone to keep the match operating at the beginning of period four implying a lower job destruction rate, $JD_{d=4}$, than that displayed in the last column scenario.

At first sight it would seem that introducing the EPC does not make much sense. On one hand, the aggregate effects displayed in Columns 5 and 7 are very similar, implying substantial deadweight costs. On the other hand, the EPC is costlier, since it involves the provision of subsidies. Of course, in order to make a definite assessment one should perform the transition to compute the cost and benefits implied by

these policies as it is done in García-Pérez and Osuna (2015) when they study the effectiveness of Short-time work policies. But, just as a first approximation, one could say that if the 2012 labour market reform was effective in making dismissals for objective reasons easier to implement and, therefore, effectively reduced the severance cost gap between PCs and TCs, the introduction of the EPC may have been unnecessary. In fact, the data seems to confirm this assertion, because, on one hand the number of EPC contracts signed since the introduction of the 2012 labour market has been quite low and, on the other hand, economic dismissals have substantially increased.

4.4 Designing an appropriate Penalty

As was mentioned in the modelling Section, under the subsidy policies analyzed in this paper, firms are assumed to pay a penalty if they do not keep the subsidized contract operating for a sufficiently long number of periods, or if they do not convert the TC into a PC. In fact, without penalties, the results would have been different. For the 2006 labour market reform, Table 5 shows that the unemployment rate, the aggregate job destruction rate and the permanent and temporary job destruction rates are not very dissimilar if we compare the scenarios with and without penalties (See Columns 3 and 4). However, a closer look to the job destruction rates period by period reveals important differences. If there is no penalty, job destruction at the beginning of periods three and four, $JD_{d=3}$ and $JD_{d=4}$, are much higher than in the scenario where there exists a penalty, because firms do not have to give back the subsidy if they destroy those jobs. On the contrary, when there is a penalty to be paid, firms are much more demanding at the beginning of period two, which translates into a higher continuity productivity threshold, in other words, higher job destruction rate, $JD_{d=2}$, in order to guarantee that with a high probability the match will not be destroyed in the near future and, therefore, that giving back the subsidy is a relatively unlikely event.

What it is also very interesting is that, for the job conversion subsidies of the 2006 labour market reform, delaying the subsidy until the job conversion period (period four) or providing it on a yearly basis with penalties for job destruction in periods lower or equal than four, generates the same results. The reason is that the delay of the subsidy until the job conversion period induces firms to destroy fewer TCs in order to get advantage of the subsidy.

Even the design of the penalty is not innocuous. For instance, in the case of the 2012 labour market reform, the results when the penalty is imposed on a yearly basis (See Column 5 in Table 5) are different from the results when the penalty is only due if the contract does not last for at least four periods (Column 6). In this last case, job destruction at the beginning of period three, $JD_{d=3}$, is much higher

Table 5: Penalty Design in the 2006 and 2012 Labour Market Reforms

Statistics	SQ	R-2006 penalty	R-2006 no penalty	R-2012-EPC yearly penalty	R-2012-EPC end penalty
u	17.2	15.3	15.7	13.7	15.3
JD	12.6	11.8	11.6	10.5	11.8
JD_p	7.4	8.0	7.4	8.2	8.0
JD_t	26.6	22.0	23.1	16.8	22.0
$JD_{d=2}$	22.5	22.3	6.6	22.4	22.3
$JD_{d=3}$	29.4	29.5	35.6	10.3	29.5
$JD_{d=4}$	30.4	10.9	30.9	16.1	10.9
$n_{d=1}$	20.3	18.1	18.7	15.9	18.1
$n_{d=2}$	15.8	14.0	17.4	12.4	14.0
$n_{d=3}$	11.1	9.9	11.2	11.1	9.9
$n_{d=4}$	7.7	8.8	7.7	9.3	8.8
$n_{d=5}$	7.6	8.4	7.6	8.8	8.4
$n_{d=6}$	7.1	7.7	7.0	8.1	7.7
$n_{d=7}$	6.5	7.0	6.4	7.3	7.0
$n_{d=8}$	5.8	6.3	5.8	6.6	6.3
$n_{d=9}$	5.3	5.7	5.3	6.0	5.7
$n_{d=10}$	4.8	5.2	4.8	5.4	5.2
$n_{d>3}$	52.8	58.0	52.7	60.6	58.0
$n_{d>10}$	8.1	8.8	8.1	9.2	8.8

$JD_{d=i}$ stands for job destruction at the beginning of period i .

$n_{d=i}$ stands for the proportion of workers in period i .

because firms know that job destruction in period three is not penalised. However, the fact that the job is destroyed one period later (at the beginning of period four) may have huge consequences in terms of the penalty, since the subsidies received would have to be given back. Thus, in terms of the match productivity, firms are much more demanding at the beginning of period three ($JD_{d=3}$ is higher) because they want to maximize the probability that they will not have to return the subsidy enjoyed. On the contrary, when the penalty is imposed on a yearly basis, firms are less reluctant to continue operating with the temporary worker in period three ($JD_{d=3}$ is lower) but, at the same time, it is less likely that the EPC lasts for four periods ($JD_{d=4}$ is higher) because the penalty is just the one associated with not having maintained the working relationship for one additional year. In the end, balancing these countervailing effects, it turns out that the temporary job destruction rate is higher under the Scenario shown in Column 6 and, therefore, also the tenure distribution is less smooth in that case.

4.5 Robustness

In this section, I explore whether the findings of the previous sections are specific to the baseline model economy or also hold for some variations of the model. In particular, the results of the sensitivity analysis for lower values of the productivity gap parameter (γ) and for different values of the training cost (τ) are shown in Table 6 and Table 7, since these parameters are the most difficult to justify because their calibration relies on the association of productivity and wages¹⁴.

If the productivity gap parameter (γ) falls within the range $[0.1 - 0.14]$ the qualitative results of the steady-state analysis are very similar to those of the baseline scenario. As the value of the productivity gap parameter decreases, there is more unemployment, fewer job conversions of TCs into PCs and more temporary job destruction because job conversion does not pay as much as before. That is, the incentives to convert TCs into PCs diminish because permanent and temporary workers are more similar in terms of productivity and because job conversion into a PC implies both, having to incur the training cost and higher severance costs in the future. All this implies a higher temporary job destruction rate, especially at the beginning of period four. Table 6 also shows that for lower productivity gaps than in the baseline, the EPC generates lower unemployment, lower temporary job destruction and a smoother tenure distribution than the sole reduction in the severance cost gap accomplished by the 2012 labour market reform. That is, the deadweight effects of introducing an EPC are lower than in the baseline because

¹⁴ The rest of the sensitivity analysis is trivial because it follows the same line of reasoning than in García-Pérez and Osuna (2015). It is available upon request.

Table 6: Robustness of parameter γ

Statistics	SQ Sev. Cost Gap 45 – 8	R-2006 Subsidies	R-2012 Sev. Cost Gap 33-12	R-2012 EPC	R-2012 Sev. Cost Gap 20-12	R-2012 Sev. Cost Av. Gap
Baseline: $\gamma = 0.14$						
<i>u</i>	17.2	15.3	14.7	13.7	12.4	13.6
<i>JD</i>	12.6	11.8	11.1	10.5	9.3	10.2
<i>JD_p</i>	7.4	8.0	7.8	8.2	8.2	8.0
<i>JD_t</i>	26.6	22.0	19.9	16.8	12.3	16.1
<i>JD_{d=2}</i>	22.5	22.3	22.4	22.4	6.6	14.5
<i>JD_{d=3}</i>	29.4	29.5	10.3	10.3	14.6	12.5
<i>JD_{d=4}</i>	30.4	10.9	27.0	16.1	16.9	21.9
<i>n_{d=1}</i>	20.3	18.1	17.2	15.9	14.2	15.7
<i>n_{d>3}</i>	52.8	58.0	57.5	60.6	61.2	59.3
Robustness: $\gamma = 0.12$						
<i>u</i>	16.9	16.9	16.3	13.7	12.4	14.4
<i>JD</i>	12.6	12.6	12.1	10.5	9.3	10.7
<i>JD_p</i>	7.4	7.4	7.4	8.2	8.2	7.8
<i>JD_t</i>	26.7	26.7	24.9	16.8	12.4	18.7
<i>JD_{d=2}</i>	22.4	22.4	22.4	22.4	6.6	14.6
<i>JD_{d=3}</i>	29.5	29.5	20.1	10.3	14.6	17.4
<i>JD_{d=4}</i>	30.5	30.5	34.1	16.1	17.1	25.6
<i>n_{d=1}</i>	20.4	20.4	19.4	15.9	14.2	16.8
<i>n_{d>3}</i>	52.7	52.7	53.5	60.6	61.2	57.3
Robustness: $\gamma = 0.1$						
<i>u</i>	17.0	17.8	17.0	13.7	12.4	14.7
<i>JD</i>	12.6	14.1	12.6	10.5	9.3	11.0
<i>JD_p</i>	7.4	9.4	7.4	8.2	8.2	7.8
<i>JD_t</i>	26.7	26.7	26.7	16.8	12.4	19.6
<i>JD_{d=2}</i>	22.5	22.6	22.5	22.4	6.6	14.6
<i>JD_{d=3}</i>	29.6	29.4	29.6	10.3	14.6	22.6
<i>JD_{d=4}</i>	30.5	30.4	30.5	16.1	17.1	23.8
<i>n_{d=1}</i>	20.4	21.7	20.4	15.9	14.2	17.3
<i>n_{d>3}</i>	52.6	49.7	52.6	60.6	61.2	56.9

Table 7: Robustness of parameter τ

Statistics	SQ Sev. Cost Gap 45 – 8	R-2006 Subsidies	R-2012 Sev. Cost Gap 33-12	R-2012 EPC	R-2012 Sev. Cost Gap 20-12	R-2012 Sev. Cost Av. Gap
Baseline: $\tau = 0.6$						
<i>u</i>	17.2	15.3	14.7	13.7	12.4	13.6
<i>JD</i>	12.6	11.8	11.1	10.5	9.3	10.2
<i>JD_p</i>	7.4	8.0	7.8	8.2	8.2	8.0
<i>JD_t</i>	26.6	22.0	19.9	16.8	12.3	16.1
<i>JD_{d=2}</i>	22.5	22.3	22.4	22.4	6.6	14.5
<i>JD_{d=3}</i>	29.4	29.5	10.3	10.3	14.6	12.5
<i>JD_{d=4}</i>	30.4	10.9	27.0	16.1	16.9	21.9
<i>n_{d=1}</i>	20.3	18.1	17.2	15.9	14.2	15.7
<i>n_{d>3}</i>	52.8	58.0	57.5	60.6	61.2	59.3
Robustness: $\tau = 0.5$						
<i>u</i>	17.2	13.7	12.4	13.7	12.4	12.4
<i>JD</i>	12.6	10.5	9.3	10.5	9.3	9.3
<i>JD_p</i>	7.4	8.2	8.2	8.2	8.2	8.2
<i>JD_t</i>	26.6	16.9	12.3	16.8	12.3	12.3
<i>JD_{d=2}</i>	22.5	22.6	6.4	22.4	6.5	6.5
<i>JD_{d=3}</i>	29.4	10.4	14.6	10.3	14.6	14.6
<i>JD_{d=4}</i>	30.4	15.6	16.9	16.1	17.0	17.0
<i>n_{d=1}</i>	20.3	15.9	14.2	15.9	14.2	14.2
<i>n_{d>3}</i>	52.8	60.7	61.2	60.7	61.2	61.2
Robustness: $\tau = 0.7$						
<i>u</i>	18.1	16.9	16.9	13.7	12.4	14.7
<i>JD</i>	12.6	12.6	12.6	10.5	9.3	11.0
<i>JD_p</i>	7.4	7.4	7.4	8.2	8.2	7.8
<i>JD_t</i>	26.7	26.6	26.7	16.8	12.3	19.5
<i>JD_{d=2}</i>	22.4	22.3	22.3	22.4	6.5	14.5
<i>JD_{d=3}</i>	30.0	30.0	30.0	10.3	14.6	22.1
<i>JD_{d=4}</i>	30.4	30.5	30.5	16.1	17.0	23.7
<i>n_{d=1}</i>	20.4	20.4	20.4	15.9	14.2	17.3
<i>n_{d>3}</i>	52.6	52.7	52.7	60.6	61.2	57.0

the reduction in the severance cost gap by itself is not as effective as in the baseline parametrization to induce job conversion. For instance, for $\gamma = .12$, the subsidies provided in the 2006 labour market reform would not be enough to compensate for the large gap in severance costs (the same as in the status quo) and the low productivity gains once the TC is converted into a PC.

Regarding the training cost parameter, τ , the results are also quite robust for plausible parameter values, falling within the range $[0.5 - 0.7]$. For lower values of τ job conversion tends to be higher and there is also less temporary job destruction because the cost of upgrading a temporary job into a permanent one has decreased. The opposite happens, however for higher values of this parameter. As to the effectiveness of job creation subsidies, as the value of this parameter decreases, they tend to be less effective in reducing duality compared to the sole reduction in severance costs because the reduction in the training cost makes firms more prone to convert TCs and, therefore, there is less need of subsidies. The opposite is true for the alternative scenario where τ is larger than in the baseline. In that case, subsidies are more effective because firms are very reluctant to convert jobs given the high training costs that must be paid.

To sum up, this is a very interesting exercise because it reveals the importance of the relative differences in productivity of temporary and permanent workers and also the relevance of the magnitude of training costs for the effectiveness of policies involving subsidies for permanent job creation.

5 Conclusion

Triggered by the enormous increase in unemployment rates during the “Great Recession” and by the perverse consequences of duality in some Southern European countries, governments in these countries have recently opted for combining reductions in the severance costs gap between permanent (PCs) and temporary contracts (TCs) with some fiscal measures, such as tax rebates in the case of job conversion of TCs into PCs or subsidies for permanent job creation. This paper has evaluated the effectiveness of these measures in reducing the unemployment rate and the degree of segmentation in dual labour markets. For this purpose, an equilibrium search and matching model and the Spanish labour market reforms have been used as a benchmark. This rich structural model allows us to understand firms’ labour adjustment decisions in the face of temporary shocks to demand when dismissal costs and those associated with losing firms’ human capital are relevant.

The results point to fact that subsidizing permanent job creation may not be the best option from a fiscal point of view to reduce labour market segmentation between PCs and TCs. It is true that subsidies may have proved successful in the case of the

2006 labour market reform, by partly accounting for the decrease in the temporary job destruction rate, as the model shows. However, the model also suggests that a much more efficient way to fight against the duality in the labour market would be to reduce the gap in severance costs between these two type of contracts. The model shows that it is not enough to simply reduce the legal severance costs that firms must pay in the case of unfair dismissals. It is, in fact, necessary that the effective gap falls even further, so that the effective indemnity be closer to the mean European indemnity, which is around 20 days of wages p.y.o.s. It is probably too early to judge whether the 2012 labour market reform has been successful in that respect. It is true that economic dismissals have increased, but this is not surprising given the bad economic situation that the Spanish economy has suffered. It remains to be seen whether during the recovery the tendency for firms to pay indemnities closer to those for unfair cases has really changed.

The model also shows the relevance of designing appropriate penalties for those firms that do not comply with the obligations that the subsidies involve. Finally, the sensitivity analysis reveals the importance of the magnitude of training costs and the relative differences in productivities between temporary and permanent workers for the effectiveness of policies involving subsidies for permanent job creation.

There is an important caveat that should be mentioned. In this paper adjustments along the intensive margin were not allowed. As was stated in the introduction, the 2012 labour market reform also introduced important changes in the degree of internal adjustment. In a companion paper, García-Pérez and Osuna (2015) find that the availability of short-time work schemes, if properly subsidized, further reduces unemployment and the degree of segmentation between TCs and PCs (See the reference for further details). Of course, then the question is whether the increase in welfare may compensate for the fiscal cost, a question that the authors address by computing the transition in order to perform a cost benefit analysis.

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