Centre de Referència en Economia Analítica

Barcelona Economics Working Paper Series

Working Paper nº 18

Fixed-term Contracts and Unemployment: and Efficiency Wage Analysis

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July 2003

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Barcelona Economics WP n^o 18

July 2003

Abstract

I analyze the e¤ects of introducing …xed-term contracts, leaving existing labor market regulations unchanged, on unemployment and labor market segmentation. I use an e¢ciency wage model in which the …rm's choice of contracts and the renewal rate of …xed-term contracts into permanent ones are endogenous. The renewal rate of …xed-term contracts is lower the higher the …ring costs of permanent contracts are. Introducing …xed-term contracts can imply higher unemployment even in a world where reducing …ring costs would reduce it. Moreover, when the two-tier system does not generate higher employment compared to the system with only permanent contracts, the segmentation of the labor market is socially too large.

Keywords: Fixed-term and permanent contracts, renewal rate, e¢ciency wage, unemployment.
JEL Classi…cation codes: J41, J42, J63.

¤I am especially grateful to Alan Manning and Gilles Saint-Paul for their valuable comments. Charlie Bean, Samuel Bentolila, Alberto Bennardo, Antonio Cabrales, Patrizia Canziani, Piero Cipollone, Jan Eeckhout, Giulio Fella, Leonardo Felli, José Galdón, Maitreesh Ghatak, Nobu Kiyotaki, Ricardo Lagos, Javier Ortega and Bernard Salanié provided very helpful discussions and suggestions. Address: Universitat Pompeu Fabra, Department of Economics and Business, Ramon Trias Fargas 25-27, 08005 Barcelona, Spain. Tel: +34 93 5422717. Fax: +34 93 5421746. E-mail: maia.guell@upf.edu

1 Introduction

Since the mid-1970s, Europe has had much higher and persistent unemployment levels than the US. At the same time, European labor markets have typically been characterized by a wide use of permanent contracts with high regulated …ring costs. In the mid-1980s, a common way to increase ‡exibility in many European countries was to allow employers the option of hiring workers using …xed-term contracts with negligible …ring costs upon expiration, while leaving the existing labor market regulations unchanged.[1] Since their introduction, …xed-term contracts have been widely used. They account for most new hirings in all sectors and occupations (see OECD, 1993).[2] But, unemployment has remained as high as before the reforms and the labor market has become segmented.[3] In this paper, I propose an e¢ciency wage model that explains these two facts in which the …rm's choice of contract and its labor market implications are endogenous.

There is a growing literature on the impact of …xed-term contracts on several aspects of the labor market.[4] Regarding the e¤ects on employment, the literature has been dominated by partial equilibrium models of labor demand.[5] In these models, the introduction of …xed-term contracts is equivalent to reducing …ring costs, and therefore their e¤ect on aggregate employment is ambiguous because they increase both hirings and …rings (as, for instance, in Bentolila and Bertola, 1990). So, these models implicitly suggest that, given that …ring costs

[1] See Grubb and Wells (1993) and OECD (1993, 1994 and 1999) for a detailed description of …xed-term contracts regulations in Europe.

[2] In Spain, between 1986 and 1992, an average of 98% of newly registered contracts were …xed-term contracts (see Bentolila and Saint-Paul, 1992). In France, in 1992, 80% of all entries were hirings on …xed-term contracts (see Goux, Maurin and Pauchet, 2001).

[3] The share of …xed-term contracts in Spain went from 11% to 35% between 1983 and 1995 (see Güell and Petrongolo, 2000). In France, it went from 3.3% to 12% during this period (see Goux et al., 2001). In Italy, from 1993 to 2000, it went from 6% to 10% (see Cipollone and Guel…, 2002).

[4] See, for example, Aguirregabiria and Alonso-Borrego (1999), Alba (1994, 1996 and 1998), Alonso-Borrego, Fernandez-Villaverde and Galdón-Sánchez (2002), Bentolila and Dolado (1994), Blanchard and Landier (2002), Booth, Francesconi and Frank (2002), Cabrales and Hopenhayn (1997), Cahuc and Postel-Vinay (2002), Dolado, García-Serrano and Jimeno (2002), Jimeno and Toharia (1993 and 1996), Saint-Paul (1996) and Wasmer (1999).

[5] An exception of this is Alonso-Borrego et al. (2002).

do not necessarily reduce employment in the …rst place, it is not surprising that …xed-term contracts have not been successful in reducing unemployment.

However, this explanation ignores an important dimension of …xed-term contracts, namely their possible conversion into permanent contracts. In most countries, the job for which the worker is hired with a …xed-term contract is not required to be a seasonal one. So, after the introduction of …xed-term contracts, for a given vacancy, …rms can choose between a …xed-term contract or a permanent one. Fixed-term contracts cannot be used continuously and forever. At their expiration, …rms have to decide to convert them into a permanent contract or to …re the worker. This decision is particularly important to explain the degree of labor market segmentation as well as to understand the employment e¤ects of …xed-term contracts. More generally, the link between …xed-term contracts and permanent contracts allows to understand that, despite the introduction of "‡exibility at the margin", …xed-term contracts are a¤ected by the unchanged regulations of the labor market and this partly constraints their potential to increase employment while generating labor market segmentation.

In the existing literature, the link between …xed-term contracts and permanent contracts has typically been ignored or assumed exogenous. In the "dual labor market" approach (for instance, see Saint-Paul, 1996), it is assumed that …xed-term workers are ex-ante di¤erent from permanent workers and are paid at the competitive wage. This does not allow to analyze why in Europe most of the out‡ows from unemployment are …xed-term contracts, or why …xed-term contracts are renewed into permanent ones, something that my model can analyze.

E¢ciency wage models are best suited to examine the two main di¤erences between …xed-term contracts and permanent contracts, namely, …ring costs and contract duration. High wages are the standard way to provide incentives with permanent contracts, but …xed-term contracts are cheaper. Introducing an incentive problem implies that a link between

…xed-term contracts and permanent contracts emerges endogenously. I will show that the instrument that allows the provision of incentives with …xed-term contracts is not their wage, but the renewal rate of these contracts into permanent ones. In an e¢ciency wage model, duration of contracts is an important source of incentives. For e¢ciency reasons, it is necessary to have a positive renewal rate. This will imply that to the extent that …ring costs reduce employment in the system with only permanent contracts, higher …ring costs imply lower renewal rates of …xed-term contracts into permanent ones.

Wages of …xed-term contracts have no incentive role, and thus workers hired under these contracts are paid the legal minimum wage. This is crucial for the employment results and can explain why the introduction of …xed-term contracts in a regulated labor market may not decrease unemployment through a pecuniary externality. Incentive-compatible …xed-term contracts are cheaper than permanent contracts. Consequently, …rms chose these contracts and hire more workers. But they fail to take into account that this implies an increase in out‡ows from unemployment, reducing the punishment of becoming unemployed. In turn, the e¢ciency wages of workers renewed into permanent contracts must be higher. For a high enough minimum wage, this e¤ect is strong enough and total employment turns out to be lower than it would have been with only permanent contracts. Moreover, in this case, the optimal renewal rate of …xed-term contracts from the social point of view is one; that is, the segmentation of the labor market is socially too large.

My model also features the standard result that the introduction of …xed-term contracts increases both in‡ows and out‡ows from unemployment. However, it suggests that the e¤ects of hirings on employment have been overestimated in the previous literature. To the extent that the introduction of …xed-term contracts a¤ects the wages of permanent contracts, their potential to reduce unemployment is reduced. Similarly, it suggests that the e¤ects of …rings on employment have also been underestimated. If long labor relationships are important (for

instance, due to incentive reasons), it constrains …rings and thereby reduces unemployment.

Finally, this paper highlights the links between di¤erent rigidities in the labor market. Employment and the share of …xed-term contracts are a¤ected in the same way by the …ring costs associated with permanent contracts and the ‡exibility of wages of …xed-term contracts. The mechanism by which the creation of employment and, more precisely, permanent employment are discouraged is the combination of both factors. The introduction of …xed-term contracts does not completely remove the e¤ect of …ring costs unless the wage of …xed-term contracts is perfectly ‡exible. For a given level of …ring costs, economies with a higher legislated minimum wage, it is more di¢cult that …xed-term contracts are successful in bringing down unemployment. Moreover, they generate a more segmented labor market.

The paper is organized as follows. In section 2, the model is introduced. First, I consider an economy in which only permanent contracts are available and …ring costs reduce employment (section 2.1). Then, the introduction of contracts with no …ring costs (…xed-term contracts) in such economy is analyzed (section 2.2). The optimal incentive-compatible contract is described, the …rm's choice of contracts is analyzed and then the market outcome is derived. In section (2.3), the two-tier system is compared to the situation where only permanent contracts are available . Section 2.4 presents a welfare analysis of the two-tier system. Finally, in section 3 the conclusions are drawn.

2 The model

The model is a modi…ed version of the shirking model of Shapiro and Stiglitz (1984) with two types of contracts, …xed-term contracts (or temporary contracts, TCs) and permanent contracts (PCs).[6] Contracts di¤er in length and …ring costs. To simplify, I assume that TCs last one period and that PCs can last an in…nite number of periods. A worker can only be hired once by the same …rm under a TC. After the one period TC, the …rm has to decide

[6] The terms …xed-term contract and temporary contracts are used interchangeably here.

whether to renew the worker into a PC or to …re him.[7] A TC is going to be renewed into a PC with an (endogenous) probability R. In most European countries, …xed-term contracts were introduced leaving the existing labor market regulations unchanged. In the model, mandated …ring costs of PCs and the legal minimum wage are not modi…ed by the arrival of TCs.

The model is set in discrete time and workers decide in each period whether or not to shirk. Workers are risk neutral and their instantaneous utility function is: $U(w;e) = w - e$; where w is the wage and e is the e¤ort. The required e¤ort is the same in any contract because there is only one type of job. Workers' e¤ort choices are discrete. If they shirk, they expend zero e¤ort and production is zero. The e¤ort required to perform in the job is $e > 0$. Worker's e¤ort is not perfectly observable and there is a detection technology that catches shirking workers (never erroneously) with some probability q (where $q < 1$). When a worker is found shirking, he is dismissed for disciplinary reasons and becomes unemployed. Workers also face an exogenous, per unit of time, probability b of being separated from their job for economic reasons.[8] All workers are identical.[9]

2.1 Only permanent contracts available

In this section I characterize the incentive compatible permanent contracts and derive the labor market implications when …rms hire workers under these contracts. This will provide

[7] Assuming that TCs can be renewed into further TCs would not alter the results because, as will be shown, it is necessary that at some point TCs get renewed into PCs.

[8] The terms economic dismissals, redundancies and negative shocks are used interchangeably here. Since I concentrate on the renewal decisions at the end of TCs, this other source of job separation is kept exogenous. I discuss why this is not a restrictive assumption both in the context in which only PCs are available (see section (2.1)) and in the two-tier system (see section (2.2)). Similarly, I discuss in Appendix 2 why considering di¤erent separation rates for PCs and TCs in the two-tier system would not alter the results of the paper.

[9] I do not consider the possible use of TCs to observe workers' characteristics. Since in most countries, any contract can include a "probation" period with no …ring costs, I implicitly assume that this period has already elapsed and has been useful for this matter. In Spain, a worker can be in the same …rm under a TCs for a maximum of three years. Most renewals of TCs into PCs occur at this legal limit which suggests that …rms are using TCs because they provide a cheaper option than PCs rather than for screening purposes (see Güell and Petrongolo, 2000).

the status quo situation in which …xed-term contracts will be introduced.

2.1.1 Firing costs

Typically, European employment protection legislation (EPL) requires …rms that …re workers for economic reasons, to compensate them with severance payments (the fair indemnity). But if …rms …re workers for disciplinary reasons, no compensation is required. However, another important aspect of the EPL is the workers' right to sue employers in case of disagreement, regardless the nature of the dismissal. Firms are always required to provide reasons for the dismissal and if these are considered unfair by court, …rms have to pay a higher indemnity to workers, i.e. the unfair indemnity (see OECD, 1999).[10]

I assume that the cost of …ring a worker is given by dC, where $d \in (0;1)$ is the probability that a case taken to court is declared unfair and C is the legislated (unfair) indemnity.[11] To simplify, I assume the same cost for any type of dismissal. Assuming that redundancies have the same cost as disciplinary dismissals is innocuous for the results of the model.[12] Let F be the actual cost of …ring a worker, where $F = dC$.[13]

As mentioned, EPL applies to permanent contracts, but not to temporary contracts.[14] Therefore, workers under a PC will receive a payment F upon dismissals while temporary workers will receive no payment.

[10] This dimension of EPL is typically ignored in the literature, which implies that disciplinary dismissals are costless. However, this is at odds with reality (see Galdón-Sánchez and Güell (2003) for some evidence).

[11] See Galdón-Sánchez and Güell (2003) for a model in which dismissal con‡icts are considered explicitly in an e¢ciency wage framework and the actual cost of …ring is derived. Also, see Galdón-Sánchez and Güell (2000) for a model in which the probability of going to court for any dismissal case and the court outcomes are endogenized.

[12] The reason is that the cost of redundancies is neutral on employment (see (2.1.4)). This is the well-known result of Lazear (1990).

[13] In section (2.2.2), I return to the distinction between the di¤erent components of …ring costs (d and C) when analyzing the empirical relationship between the renewal rate of temporary contacts and …ring costs.

[14] I am considering that, when the contract expires, indemnities are zero, which is the case in most countries. Also, as TCs can be made su¢ciently short, it can be realistically assumed that they do not involve …ring costs, because the …rm always waits for the end of the contract whenever it wants to adjust employment. Moreover, workers under TCs cannot sue employers when their contract is not renewed. Firms always wait until the end of the contract whenever they have to dismiss workers. In practice, workers under TCs can never sue employers in court.

2.1.2 No-shirking condition

In this section, I analyze the wage workers must be paid in order to provide the optimal effort on the job. Let V_P^i be the present discounted utility of an employed worker under a PC when shirking ($i = s$) and not shirking ($i = n$). When a worker under a PC does not shirk, he gets a utility equal to

$$V_P^n = w_P - e + \frac{1}{1+r}[(1-b)V_P^n + b(V_U + F)]; \tag{1}$$

where r is the discount rate, w_P is the wage of a PC and V_U is the present value of utility of an unemployed worker. If the worker decides to shirk, his utility is

$$V_P^s = w_P + \frac{1}{1+r}[(1-b-q)V_P^s + b(V_U + F) + q(V_U + F)]: \tag{2}$$

Using equations (1) and (2), the no-shirking condition of a permanent contract, NSC_P, in form of utilities can be written as

$$V_P^n - V_U \geq \frac{e(1+r)}{q} + F \equiv K: \tag{3}$$

This condition states that in order to provide incentives, the punishment of losing a job must be at least equal to the opportunity cost of shirking, denoted by K. Substituting this condition into equation (1), the incentive-compatible wage of a PC can be written as

$$w_P \geq e - \frac{bF}{1+r} + \frac{rV_u}{1+r} + K\frac{(r+b)}{(1+r)} \equiv w_P: \tag{4}$$

In this wage equation, it is possible to distinguish between the reservation wage (first three terms) and the rent linked to the incentive problem (last term). It is possible to distinguish two types of effects of firing costs: those directly related to the incentive problem and those not. Firing costs affect the incentive problem: to the extent that disciplinary dismissals are declared unfair (i.e., $F > 0$), legal severance payments reduce the cost of shirking. This implies that firms have to pay higher rents in order to prevent shirking (see equation (3)).

At the same time, independently of the incentive problem, the introduction of mandated severance payments allows the employer to reduce the wage exactly by the same proportion that the present discounted utility of an employee is increased, without a¤ecting incentives. This can be seen in the …ring cost element of the reservation wage (see equation (4)).[15] The idea is that lower wages today, together with compensation when being …red for shocks, leave the present discounted utility of being employed unchanged (see Lazear, 1990).

I assume that the existing legal minimum wage, denoted by w_{min}, is a slack constraint when …rms have to pay e¢ciency wages, that is $w_P > w_{min}$. If PCs satisfy the NSC_P, that is, if the worker is paid at least w_P, he will choose to expend the e¤ort e. Let V_P be the expected utility of holding a PC in equilibrium. The …rm chooses the lowest wage at which the worker will not shirk, that is, in equilibrium the NSC_P is binding and $V_P = V_P^n = V_P^s$:

2.1.3 Hiring decisions

All …rms in the model are identical. Let $¦_P$ be the present discounted value of pro…ts from a job …lled with a permanent worker. When a worker shirks, production is zero. Then

$$¦_P = f'(L_P) - w_P + \frac{1}{(1+r)}[-bF + (1-b)¦_P]$$

where L_P is permanent employment and $f(L_P)$ is a CRS production function with $f'(L_P) = m$: There is no cost of posting vacancies, so …rms hire workers to the point where $¦_P = 0$. Labor demand is given by

$$m = w_P + \frac{bF}{(1+r)} \tag{5}$$

This equation shows that, for given wages, …ring costs reduce labor demand proportionally to their expected present value.

[15] The presence of a legal minimum wage could imply that this wage reduction is not feasible. However, it is not restrictive to allow this since otherwise the (negative) e¤ect of …ring costs on employment would be even larger (see section (2.1.3)).

2.1.4 Market equilibrium

Equilibrium occurs when each …rm, taking as given all other …rms' wages and employment, …nds it optimal to o¤er the going wage rather than a di¤erent wage. The key market variable that determines …rm individual behavior is the present value utility of an unemployed worker, V_U. Let a be the rate of exit from unemployment. To simply, suppose that unemployment bene…ts are zero. Then, $V_U = (aV_P + (1 - a)V_U)/(1 + r)$. Given that the NSC_P is satis…ed, in equilibrium

$$rV_U = aK: \tag{6}$$

Substituting equation (6) into equation (4), the e¢ciency wage curve in equilibrium can be written as

$$w_P^{\alpha} = e - \frac{bF}{1+r} + K\frac{(r+b+a)}{(1+r)}: \tag{7}$$

As in Shapiro and Stiglitz (1984), in equilibrium, the incentive-compatible wage is higher the higher the exit rate from unemployment. This is because the higher a is, the less becoming unemployed is a penalty. This e¤ect will be crucial in the two-tier system.

Aggregate employment, L_P, is derived from the steady state ‡ow condition. In steady state, in‡ows to unemployment are given by bL_P. Out‡ows are given by $a(N - L_P)$, where N is the total of workers in the economy. Thus $a(N - L_P) = bL_P$. Therefore,

$$L_P = \frac{aN}{a+b}: \tag{8}$$

Combining equations (5) and (7), the equilibrium out‡ow rate from unemployment, a^{α}, can be written as

$$m = e + K\frac{(r+b+a^{\alpha})}{(1+r)}: \tag{9}$$

In equation (9), it can be seen that the second type of e¤ect of severance payments mentioned before can be fully undone. The idea is that if markets are complete and perfect, and …ring costs are fully transferred to workers, then they are neutral on employment because

the wage is reduced by the same proportion as the increased shadow cost of labor (see Lazear, 1990).

However, in this model, even if …ring costs are fully received by workers, they are not neutral because they a¤ect the rent, K. The e¤ects of severance payments on the e¢ciency wage setting have no counteracting e¤ects through the non-wage component of the shadow cost of labor.[16] Therefore, the wage schedule is shifted implying lower equilibrium employment. This is represented in …gure 1. Firing costs have a real e¤ect because they reduce the cost of shirking.[17] As in Shapiro and Stiglitz (1984), full employment is incompatible with incentives.[18] But, as will be shown, full employment is not necessarily incompatible with incentives when TCs are introduced, to the extent that the legal minimum wage would be removed. However, if this is not the case, the introduction of TCs can imply lower equilibrium employment than in the system with only PCs.

2.2 Temporary and permanent contracts available

In this section, I analyze the employment e¤ects of introducing temporary contracts in an economy where …ring costs reduce employment (as described above). For a given vacancy, …rms can now choose a contract free of …ring costs or a PC to hire a worker. Incentive-compatible PCs are as in the previous section. Fixed-term incentive-compatible contracts are characterized in the following section.

[16] Following Bertola (1990), Galdón-Sánchez and Güell (2003) and Katz (1986) among others, I assume that the presence of minimum wage implies that workers cannot post bonds that could remove the e¤ect of e¢ciency wages (including the additional rent due to …ring costs).

[17] It can be proved that endogenizing …ring decisions would not change the result that …ring costs reduce aggregate employment. This is di¤erent from Fella (2000) and Saint-Paul (1996) mainly because I allow for dismissal con‡icts. As mentioned, this implies that …ring costs increase the rent to be paid to workers for both …rms that are hiring and …rms that are …ring. In turn, compared to the mentioned models: i) …ring costs would reduce employment at …rms in the good state and ii) the potential increase in employment at …rms in the bad state would not be not as high.

[18] The aggregate NSC_P can be written in terms of the unemployment rate, u. Replacing equation (8) into equation (7), the condition can be written as $w_P^{\alpha} = e - bF/(1+r) + K(r+b/u)/(1+r)$, where $u = (N - L_P)/N$. As $u \to 0$, the permanent wage, $w_P \to 1$.

2.2.1 No-shirking condition in a temporary contract

Since TCs have a non-stationary structure, it is convenient to use time subscripts to study them. The incentive problem to examine is that of a worker holding a TC at period t which can be renewed into a PC at period (t + 1) with probability R: Let $NSC_{T;j}$ be the no-shirking constraint of a TC at period j. At the end of period t, if the TC is not renewed, the worker becomes unemployed. Thus, the incentive problem of a TC at (t + 1) is exactly the same of that in a PC. That is, $NSC_{T;t+1} = NSC_P$. Let $\hat{V}_P$ ($\hat{V}_U$) be the present discounted utility of an employed worker under a PC (unemployed worker) in the two-tier system. The $NSC_{T;t+1}$ is given by $(\hat{V}_{P;t+1} - \hat{V}_{U;t+1}) \geq K$ (see condition (3)).

Provided that the $NSC_{T;t+1}$ is satisfied, then expected present discounted utility of being employed under a TC at period t of not shirking and of shirking is given respectively by

$$V^n_{T;t} = w_{T;t} - e + \frac{1}{1+r}\left[R(1-b)\hat{V}_{P;t+1} + [b + (1-R)(1-b)]\hat{V}_{U;t+1}\right] \tag{10}$$

and

$$V^s_{T;t} = w_{T;t} + \frac{1}{1+r}\left[\begin{array}{c} R(1-b-q)\hat{V}_{P;t+1} + \\ [b + (1-R)(1-b-q) + q]\hat{V}_{U;t+1} \end{array}\right]; \tag{11}$$

where w_T is the wage of the TC.

Again, shirking implies saving the disutility of effort today but implies a higher risk of becoming unemployed tomorrow. Moreover, in a TC, not being caught shirking is a necessary condition in order to be renewed into a PC. It has been assumed that all workers are identical and that there is a "hidden action" problem but not a "hidden information" one. Expenditure of effort does not give any additional information about the worker's characteristics that could influence renewal. But, expenditure of effort in a TC makes renewal more likely than when if the worker shirks.

A first important remark is that if there is no renewal of TC into PC at the end of period t, then shirking is always strictly preferred (if R = 0, then $V^n_{T;t} - V^s_{T;t} = -e < 0$). The idea

behind this is simple: if a worker always becomes unemployed independently of the effort expended, there is no way to give incentives to the worker by paying him a higher wage. The only way to induce workers not to always shirk in a TC is that the firm commits to a sufficiently high renewal rate. In other words, that hiring is not automatic after the end of a TC.[19]

Using equations (10) and (11), the no-shirking condition of a temporary contract at t, $NSC_{T;t}$, can be written as

$$R(V^e_{P;t+1} - V^e_{U;t+1}) \geq \frac{e(1+r)}{q}. \tag{12}$$

This condition states that incentives in a TC can be given by the renewal rate of a TC into a PC and/or by the rent associated with holding a PC (K). The wage w_T plays no incentive role. To use future wages as an incentive is the standard idea of efficiency wages. The renewal rate is also related to the incentive problem. For given K, R needs to be higher: the higher the cost of effort (e), the more inefficient the control technology (q), the higher the interest rate (r).

These two mechanisms are (non-perfect) substitutes: the higher the renewal rate, the lower the wage of a PC can be, given the incentive problem. And vice versa. But, as intuitively thought, for given wages of PCs the renewal rate cannot be zero. Also, for given R, workers under a PC must enjoy some rent, as in the standard efficiency wage models.

If TCs satisfy the $NSC_{T;t}$ and NSC_P, that is, if the worker has a positive renewal rate according to equation (12) and if he is paid at least a rent K when he is renewed into a PC, he will chose to expend the optimal effort e. Let V_T be the expected utility of a TC in equilibrium. In the next section the firm's objective function is introduced and its choice of contracts as well as the complete characterization of the incentive-compatible TCs are

[19] I am considering an extreme case in which TCs last only one period and thus the wage paid does not affect incentives. But still, in a more general case, even if TCs were for a longer period, when unemployment is certain at the end of the contract, wages have no incentive role in the last period. That is, wages have an incentive role only conditional on the continuation of the contract.

analyzed.

2.2.2 Choice of contracts in the two-tier system

When the …rm hires a new worker, it can choose between a PC (as the one described in section 2.1) or a TC (as the one described in the previous section). The …rm compares the present discounted value of pro…ts from a job …lled with each of the two di¤erent types of contracts, taking into account their respective incentive constraints. Let $\Pi_{i;t}$ be the present discounted value of marginal pro…ts from a job …lled with a worker under type i contract $(i = T; P)$. That is

$$\Pi_{i;t} = f'(L_i) - w_{i;t} + \frac{1}{1+r}[\Pi_{i;t+1}] \tag{13}$$

where $$\Pi_{i;t+1} = \begin{cases} (1-b)R\overline{\Pi}_{P;t+1} & \text{for } i = T \\ -bF + (1-b)\Pi_{P;t+1} & \text{for } i = P \end{cases}$$

and $\overline{\Pi}_P$ is the present discounted value of pro…ts from a job …lled with a permanent worker in the two-tier system.

Firms always get the net product instantaneously with any type of contract. TCs last one period. If there is a shock or if a worker is caught shirking, the contract ends and, unlike with a PC, this is not costly for the …rm. The …rm renews those temporary workers not …red into a PC with probability R. Otherwise, the contract ends and this is not costly for the …rm.

Lemma 1. The optimal contract in a two-tier system is a …xed-term contract that is renewed into a permanent contract with probability R.

Proof: Note that the permanent contract problem $(i = P)$ is just the subproblem at $(t + 1)$ of the temporary contract problem $(i = T)$ at t. Since the wage during the TC, w_T, has no incentive role (implying that it will not be higher than the e¢ciency wage of a PC) and there are no …ring costs, the …rm cannot be made worse o¤ by starting with a …xed-term

contract.[20] ■

The characterization of incentive compatible TCs, and in particular the fact that wages of TCs play no incentive role, provides a rational for the …rm's choice of TCs instead of PCs in the two-tier system. Given this choice of contracts, the …rm decides the wage to be paid during the TC, the renewal rate of TCs into PCs and the wage to be paid during the PC. Firms maximize the present discounted value of marginal pro…ts of a TC (Π_T) subject to the $NSC_{T;t}$, the $NSC_{T;t+1}$ and the minimum wage constraint. Given that the latter is a slack constraint when …rms have to pay e¢ciency wages, it can only a¤ect wages during the TC.

The complete characterization of the incentive-compatible TC is given by

$$\begin{aligned} \underset{w_T;R;w_P}{Max} \quad & \Pi_T(w_T;R;w_P) \\ s.t: \quad & \begin{cases} w_T \geq w_{min} \\ R \geq e(1+r)=q(\tilde{V}_{P;t+1} - \tilde{V}_{U;t+1}) \\ w_P \geq \tilde{w}_P \end{cases} \end{aligned}$$

where $\tilde{w}_P$ is the wage of PCs in the two-tier system. This wage di¤ers from the wage in the system with only PC to the extent that $\tilde{V}_U$ is di¤erent from V_U (see equation (4)).

Firms always pay the lowest possible wage. They pay the legal minimum wage to workers under the TC, that is $w_T = w_{min}$.[21] Similarly, as in the system with only PCs, workers under PCs are paid the minimum rent incentive-compatible. In the model, identical workers performing the same job will receive a lower wage if they are under a TC than if they are under a PC.[22] Given that the NSC_P is binding, combining equations (3) and (12), the

[20] If the wage of a TC is higher than the wage of a PC, the two-tier system would not be an equilibrium (see Proposition 2).

[21] I implicitly assume that the legislated minimum wage is set such that the participation constraint is slack, that is, $V_T > V_U$.

[22] Jimeno and Toharia (1993) …nd that, in Spain, …xed-term employees earn about 9-11% less than permanent employees after controlling for personal and job characteristics. Booth et al. (2002) perform a similar exercise for the UK and …nd that the gap is of 17% for men and 14% for women. Blanchard and Landier (2002) …nd that, for France, given age and education, TCs earn 20% less than PCs. Cipollone and Guel… (2002) perform a similar exercise for Italy and …nd that the wage gap between …xed-term contracts and PCs is 12% for men, while it is not signi…cant for women; and the wage gap between temporary jobs (workers hired by Temporary Help Agencies) and PCs is 21% for both men and women.

$NSC_{T;t}$ can be written as

$$R \geq \frac{e(1+r)}{e(1+r)+qF} = R^{\alpha}: \tag{14}$$

Figure 2 represents the two no-shirking constraints of a TC. The thicker line in the graph represents the different values of R such that the $NSC_{T;t}$ is satisfied and the NSC_P is binding. And R^{α} is the renewal rate for which both NSC are binding. Note that if firing costs have a negative effect on employment in the system with only PCs (i.e. $F > 0$), then $R^{\alpha} < 1$. Instead, if they were neutral on employment, firms would always renew TCs into PCs. The analysis of the choice of renewal rate leads to the following proposition:

Proposition 1 If there is a legal minimum wage, then the firm chooses the lowest renewal rate incentive compatible, that is, R^{α}:

Proof: see appendix 1. ■

The idea is the following. Firing costs have a real effect on wages of PCs which, as discussed in the previous section, cannot be undone due to the presence of a minimum wage. This is relevant for TCs because, for incentive reasons, firms need to renew TCs into PCs. Firms chose TCs because they have lower labor costs. But, the presence of a minimum wage, implies that the optimal renewal rate is the lowest possible compatible with incentives, that is R^{α}. The mechanism that is preventing higher renewal rates is the non-neutral effect of firing costs on the efficiency wage, which cannot be undone by the imposition of a wage floor. This implies that the labor market is segmented in the two-tier system. As will be discussed in section (2.3), this also affects equilibrium employment in the two-tier system.

An important feature of the optimal renewal rate of TCs is that the higher the firing costs are, the lower the conversion of TCs into PCs is (see equation (14)), where firing costs include severance payments as well as the effect of dismissal conflicts. Table 1 provides some evidence of this for some European countries.

2.2.3 Hiring decisions

From the previous section, …rms chose to hire workers under the incentive-compatible TC, characterized by $\{w_T; R; w_P\} = \{w_{min}; R^{\alpha}; \tilde{w}_P\}$. In this section, I derive the labor demand for such contract. From equation (13), the present discounted value of pro…ts from a job …lled with a worker under the incentive-compatible TC is given by

$$\Pi_T = f'(\tilde{L}) - w_{min} + \frac{1}{(1+r)}\left[(1-b)R^{\alpha}\tilde{\Pi}_P\right];$$

where $\tilde{L}$ is total employment in the two-tier system. There is no cost of posting vacancies, so …rms hire workers to the point where $\Pi_T = 0$. Labor demand is given by

$$m = \bar{\gamma} w_{min} + (1-\bar{\gamma})\left[\tilde{w}_P + \frac{bF}{(1+r)}\right] \tag{15}$$

where $\bar{\gamma} = (r+b)/[r+b+(1-b)R^{\alpha}]$. In a two-tier system, the marginal product of labor is equalized to a weighted sum of the marginal cost of a TC and the marginal cost of a PC. The weights correspond to the actualized share of TC, ($\bar{\gamma}$); and PC, ($1-\bar{\gamma}$); respectively. A more detailed discussion on $\bar{\gamma}$ is done in the next section.

2.2.4 Market equilibrium

Again, the key market variable is $\tilde{V}_U$. In a two-tier system, all contracts start with a TC. Therefore,

$$\tilde{V}_U = \frac{\tilde{a} V_T}{(r+\tilde{a})} \tag{16}$$

where $\tilde{a}$ is the exit from unemployment in the two-tier system. Replacing equation (10) into (16), in equilibrium

$$\frac{r\tilde{V}_U}{1+r} = \frac{\tilde{a}}{(1+r+\tilde{a})}\left[w_{min} - e + \frac{(1-b)}{(1+r)}\frac{e(1+r)}{q}\right] \tag{17}$$

where the term $e(1+r)/q$ denotes the importance of the shirking problem in a TC, that is, $R^{\alpha}(\tilde{V}_P - \tilde{V}_U)$; given by equation (12).

The equilibrium efficiency wage of a PC in a two-tier system can be obtained by combining equations (4) and (17), such that

$$w_P^{\alpha} = e - \frac{bF}{(1+r)} + K\frac{(r+b)}{(1+r)} + \frac{a}{(1+r+a)}\left(w_{min} - e + \frac{(1-b)e}{q}\right): \tag{18}$$

Total employment in the two-tier system is given by temporary employment, L_T, plus permanent employment, $\hat{E}_P$. Again, $\hat{E}$, is derived from the steady state flows conditions. Inflows and outflows into employment have basically the same structure as in the system with only PCs. There are also the flows from the renewal and non-renewals of TC. Figure 3 represents all these flows. In steady state, the outflow from unemployment is given by $a(N - \hat{E})$ workers. The inflow to unemployment comes from all those who are fired, $b\hat{E}$; and from those whose TC is not renewed, $(1-b)(1-R^{\alpha})L_T$. Thus,

$$a(N - L_T - \hat{E}_P) = (1-R^{\alpha})(1-b)L_T + b(L_T + \hat{E}_P): \tag{19}$$

At any time, a proportion R^{α}, among those TCs that are not fired are renewed into PCs, while a proportion b of those already under PCs become unemployed. Therefore,

$$(1-b)R^{\alpha}L_T = b\hat{E}_P: \tag{20}$$

Combining conditions (19) and (20), temporary and permanent employment in the two tier-system can be written as

$$L_T = \frac{aNb}{b + a[b + (1-b)R^{\alpha}]}; \tag{21}$$

$$\hat{E}_P = \frac{aN(1-b)R^{\alpha}}{b + a[b + (1-b)R^{\alpha}]}: \tag{22}$$

Therefore, the proportion of TCs is given by

$$\Phi = \frac{b}{b + (1-b)R^{\alpha}}: \tag{23}$$

Combining (15) and (18), the equilibrium out‡ow rate of unemployment in a two-tier system, e^{α}, can be written as

$$m = \bar{w}_{min} + (1 - \bar{\alpha}) \left[e + K \frac{(r+b)}{(1+r)} + \frac{e^{\alpha}}{(1+r+e^{\alpha})} \left(w_{min} - e + \frac{(1-b)e}{q} \right) \right] \qquad (24)$$

It is important to know if the introduction of TCs generates higher employment or not despite the fact that, in general, it creates a higher segmentation of the labor market. Comparing conditions (24) and (9), it is possible to distinguish two e¤ects at play. On the one hand, for given wages, employment is higher in a two-tier system due to a composition e¤ect.[23] Firing costs still a¤ect employment because they increase the rent to be paid to permanent workers, but to a lesser extent due to the lower share of PCs in the two-tier system. On the other hand, w_P^{α} is not necessarily equal to w_P^{α}: This also has an e¤ect on employment. In the next section I compare employment levels in the two systems.[24]

2.3 Comparing two systems: two-tier vs only permanent contracts

I start with the equilibrium conditions for each system. For a system to be an equilibrium, it has to be the case that …rms cannot make higher pro…ts by o¤ering the other type of contract within that system.

Lemma 2. The equilibrium conditions for each system depend on the level of the minimum wage.

Proof: see appendix 1. ■

Proposition 2 For $w_{min} > m$, the system with only permanent contracts is the only equilibrium. For $w_{min} < m$, the two-tier system is the only equilibrium.

[23] The weight $\bar{\alpha}$ corresponds to an actualized share of TC given by ® (equation 23). If $r = 0$; then $f'(\tilde{e}) = \mathbb{R} w_{min} + (1 - \mathbb{R})[w_P^{\alpha} + bF]$. Also, if $r \to 1$; then $f'(\tilde{e}) = w_{min}$. That is, if …rms are patient, they equalize the marginal product of labor to the average cost of labor. In the opposite extreme case, …rms only perceive the cost of the present labor force which is always holding a TC.

[24] In this model, all the e¤ects of TCs on the wages of PCs come through the structure of labor demand and there is no e¤ect of TCs on the rent that permanent workers receive (K). See Bentolila and Dolado (1994) for a model in which wages are set by insiders (workers under PCs) and the presence of TCs a¤ects insiders' wage growth.

Proof: see appendix 1. ■

The idea behind this result is the following. Given that in the system with only PCs workers are paid their marginal product,[25] when the minimum wage is above m, TCs are more costly than PCs. Therefore, …rms would o¤er only PCs. On the contrary, when the minimum wage is below m, TCs are "cheap" and …rms end up in a two-tier system.

Lemma 3. The di¤erence in employment levels in the two systems depends on the level of the minimum wage.

Proof: see appendix 1. ■

Intuitively, the two e¤ects mentioned above depend on the level of the minimum wage. For given $\bar{}$, the higher the minimum wage, the more expensive TCs are and the lower employment in the two-tier system would be. Also, the di¤erence in the wages of PCs in the two systems depends on the level of the minimum wage. The higher this is, the higher the wage of PCs in the two-tier system, and the lower the employment in the two-tier system would be. This comes from the fact that in the two-tier system all contracts start as TCs which are paid at the minimum wage (see equation (16)). In order to further understand the employment e¤ects of TCs, it is useful to …rst analyze the extreme situation in which there would be no legal minimum wage. The analysis of this situation brings the following result:

Proposition 3 If wages of …xed-term contracts were perfectly ‡exible, then:

i) …rms would be indi¤erent among any incentive-compatible renewal rate of TCs into PCs, that is $R \in (R^{\alpha}; 1)$; ii) full employment could be reached ; iii) it would always be a "mixed" full employment.

Proof: see appendix 1. ■

It is important to understand how the characterization of TCs would change in the absence of a legal minimum wage and how this would a¤ect equilibrium employment. If wages

[25] In the presence of …ring costs, risk-neutral workers are paid $w_P = m - bF/(1+r)$ and then upon dismissal they get F:

of TCs were perfectly ‡exible, …rms would be indi¤erent among any incentive-compatible renewal rate because pro…ts could always be kept constant by adjusting w_T. In other words, all the e¤ects of …ring costs on the wage setting of PCs would be undone with the wage of the …rst period while the worker is under a TC. This would imply that despite the fact that …rms have to renew TCs into PCs for incentive reasons, the negative e¤ect of …ring costs on employment would be neutralized.

In the absence of a wage ‡oor, the economy would be at a "mixed" full employment, in other words, with both types of contracts coexisting. In this case, unlike in the system with only one type of contract (as in Shapiro and Stiglitz, 1984), full employment would be compatible with incentives. The reason is that each type of contract would give incentives to the other: workers under TCs would be motivated by the possibility of getting a better contract, that is, a PC. And workers under PCs would be motivated to work in order to avoid restarting with a TC.[26]

This result provides an interesting and paradoxical explanation of the use of TCs: when TCs are very "cheap", the …rm is actually indi¤erent among TCs or PCs. While when TCs are more "expensive", the …rm actually chooses the minimum share of PCs given the incentive constraints. Figure 4 represents the iso-pro…ts curves for the two cases in the space $(R, \Psi_P - \Psi_U)$:

An interesting conclusion from Proposition 3 is that if the legislation imposes …rms to convert TCs into PCs, as it is the case in many countries, this constraint would not be binding for …rms which can lower w_T. Similarly, policies that promote conversion of TCs into PCs can be successful if the subsidy o¤ered is such that the actual wage …rms pay

[26] Although wages of TCs are lower than wages of PCs, workers under a TC get incentives from the renewal prospects into higher utility contracts. Firing costs make workers with a TC worse o¤ not only because …red workers are not paid an indemnity, but also because $R^{\alpha} < 1$. If there were no …ring costs, then $R^{\alpha} = 1$ and the only potential di¤erence between contracts would be their wage. In this case, an upward sloping wage pro…le would not generally be a perfect substitute for a …rst-best contract with an upfront fee, as argued by Akerlof and Katz (1989).

satis…es the participation constraint.

This situation is in sharp contrast with that in which a legal minimum wage is present. As analyzed in proposition 1, …rms choose the lowest renewal rate because the neutrality of …ring costs cannot be restored. And the higher the minimum wage, the higher is the e¤ect of …ring costs on pro…ts. Additionally, as mentioned above, the higher the minimum wage, the lower the equilibrium employment in the two-tier system can be through the composition e¤ect and the e¤ect on permanent wages. More precisely the following proposition can be formulated.

Proposition 4 There exists a value w^{α}_{min} such that in the range of values $w_{min} \in [w^{\alpha}_{min}; m]$, employment is higher in a system with only permanent contracts, even though the two-tier system is the resulting equilibrium. In this range, the minimum wage constraint corresponding to w_{min} is slack in the system with only PC.

Proof: see appendix 1. ■

When the minimum wage is below m, …rms hire workers under the optimal TCs described in section (2.2.2) because, for given wages, this contract is cheaper than a PC. Firms tend to hire more, given the reduction in labor costs. But, they fail to take into account that this implies an increase in out‡ows from unemployment, a, which reduces the punishment of becoming unemployed. This does not a¤ect the wages during the …rst period of the contract (because it is the legal minimum wage). But, it a¤ects the e¢ciency wage of those workers whose contract is renewed into a PC, since, as explained above, wages of PCs are higher the higher the minimum wage because all exits from unemployment start with a TC. This e¤ect is particularly important when the minimum wage is high enough (higher than w^{α}_{min}) because the fact that a two-tier system has less workers under PCs is not compensated by their higher labor cost. This increase in out‡ows from unemployment implies that V^{e}_{u} is higher than in the system with only PCs and, in turn, increases w^{α}_{P} so much that total

employment turns out to be lower than it would have been with only PCs.[27]

For the range of values of the minimum wage $w_{min} \in [w^{\alpha}_{min}; m]$, employment would be higher if TCs had not been introduced.[28] In this range, the minimum wage is high enough to make employment in the two-tier system lower, but it is not as high as to make labor costs directly higher in the two-tier system.[29] Indeed, it is possible to have higher employment in the system with only PCs even though workers under a PC are still paid above the minimum wage constraint. That is, the composition e¤ect is not eliminated.[30]

The interaction between the di¤erent rigidities in the labor market is important to understand the employment results. In the system with only PCs, to the extent that there is a legal minimum wage, the non-neutral e¤ect of …ring costs on the wage setting cannot be undone and they reduce employment. The employment results found above suggest that the neutrality of …ring costs cannot necessarily be restored with the introduction of TCs unless the minimum wage constraint is removed. In the two-tier system, again, …ring costs a¤ect the rent of permanent contracts, but to a lesser extent. Firing costs also a¤ect the renewal rate. The higher they are, the lower the incentive-compatible renewal rate, R^{α}, needs to be.[31] This further reduces the e¤ect of …ring costs in the two-tier system, but it is not completely

[27] In the absence of a legislated minimum wage, since the participation constraint would be binding, then $V_U = 0$ which would imply that $w^{\alpha}_P < w^{\alpha}_P$.

[28] This market externality is somehow similar to the one present in Shapiro and Stiglitz (1984). However, here it a¤ects wages as well as the choice of contracts among the set of incentive compatible contracts.

[29] For $w_{min} > m$, TCs are so expensive that …rms choose PCs (see proposition 2). By the same token the system with only PCs generates higher employment.

[30] Endogenizing …ring decisions in the two-tier system would not alter the employment results found for di¤erent reasons. First, from the partial equilibrium literature, it is well understood that the introduction of TCs increases overall …rings at …rms in the bad state, which in turn reduces employment. In my model, a higher …ring rate of TCs would imply a lower share of TCs in the bad state than in the good state. Thus, the composition e¤ect would be lower. Second, as Fella (2000) shows, e¢ciency wages at …rms in the bad state do not depend on the …ring rate (b). Third, as explained above, a higher hiring rate (a) would also increase permanent wages in the bad state. For all these reasons, it is not restrictive to focus on hiring …rms since considering …rms in the bad state would reinforce the negative employment e¤ects of TCs found in proposition 4.

[31] This e¤ect could make insiders holding a PC push for higher …ring costs and …rms accept it since it would allow them to o¤er lower renewal rates to new entrants under a TC.

eliminated if there is a wage ‡oor.[32] This explains why the introduction of TCs keeping PCs unchanged (that is, leaving the non–neutral e¤ects of …ring costs unchanged) leads to a substitution of TCs for PCs and it can imply lower equilibrium employment. For a given level of …ring costs, the higher the legal minimum wage, the lower the employment e¤ects of introducing TCs are.[33]

2.4 Welfare Analysis

Finally, it is important to know if the equilibrium allocation of the two-tier system is constrained Pareto e¢cient or not. The social planner maximizes aggregate welfare, that is, $L_P(V_P + \mu_P) + L_T(V_T + \mu_T) + (N - L)V_U$. In steady state, the in‡ows and out‡ows from each group are such that maximizing aggregate welfare across agents is equivalent to maximize the expected utility of a representative individual that gets all the resources in the economy, that is, $L_P(w_P - e) + L_T(w_T - e) + L_P(m - w_P) + L_T(m - w_T)$. Simplifying, aggregate welfare becomes $\Phi(m - e)$. Therefore, the social planner maximizes total output minus the social cost of production (the e¤ort, e). The central planner is only concerned with total employment. From Proposition 4, the two-tier system is not always socially optimal.

The social planner maximizes employment in a two-tier system subject to the NSCs and the minimum wage constraint. The social allocation must be pro…table from the private

[32] It is easy to check that $\frac{\partial \Phi}{\partial F} < 0$, for any legal minimum wage that implies $V_T > \Psi_U$.

[33] In France, Portugal and Spain, TCs were …rst introduced in 1979, 1976 and 1980, respectively, and, in each country, the regulation of TCs has modi…ed during the 1980s and 1990s. In France and in Spain, the unemployment rate did not decrease between the mid-80s and mid-90s. Instead, in Portugal, the unemployment rate decreased over this period (see OECD, 2001). The minimum wage (per hour) is higher in France (6.58 US $) than in Spain (2.53 US $), see OECD (1998). However, the higher …ring costs in Spain (see table 1) could explain why, ceteris paribus, TCs could have had a similar e¤ect in both countries. The minimum wage in Portugal is much lower (1.78 US $). Severance payments in Portugal are also much lower (20 days per year worked). This could explain why, ceteris paribus, TCs could have had a higher potential to reduce unemployment. Bover et al. (1998) …nd that unemployment bene…ts, minimum wages and, in practice, …ring costs are higher in Spain than in Portugal. They conclude that a key explanation of the di¤erence in Portuguese and Spanish unemployment rates is the wage adjustment process. Berlot and van Ours (2000) analyze the evolution of the unemployment rate among some OECD countries during 1960-1996. The group of unsuccessful countries in bringing the unemployment down is constituted by some continental European countries. They conclude that these countries have high minimum wages and high employment regulation (an index that includes …ring costs as well as the regulation of TCs).

point of view, that is aggregate profits must be non-negative. The social planner solves

$$\max_{R,e,w_T,w_P} (m - e)L_{(e,R)}$$

$$\text{s.t.:} \begin{cases} R \geq R^{\alpha} \quad (\lambda_1) \\ R \leq 1 \quad (\lambda_2) \\ w_P - e + \dfrac{bF}{(1+r)} - K\dfrac{(r+b)}{(1-R)} - \dfrac{e}{(1+r-R)}\left[w_T - e + \dfrac{(1-b)RK}{(1+r)}\right] \geq 0 \quad (\lambda_3) \\ mL_{(e,R)} - w_T L_{T(e,R)} - \left[w_P + \dfrac{bF}{(1+r)}\right] L_{P(e,R)} \geq 0 \quad (\lambda_4) \\ w_T \geq w_{min} \quad (\lambda_5) \end{cases}$$

The solution to this problem leads to the following proposition:

Proposition 5 There exists a value $w_{min}^{\alpha\alpha}$ such that: for $w_{min} > w_{min}^{\alpha\alpha}$, the socially optimal renewal rate of fixed-term contracts is $R = 1$, where $w_{min}^{\alpha\alpha} > w_{min}^{\alpha}$.

Proof: see appendix 1. ■

From the social point of view, there are gains from reducing the segmentation of the labor market because this increases total employment. When the two-tier system does not generate higher employment compared to the system with only PCs, the socially optimal renewal rate is larger than the private one. The intuition is the following. Firms do not take into account that when they increase the rate of renewal, the wages of PCs will fall. They chose the minimum incentive-compatible renewal rate because they take the wages of PCs as given.

3 Conclusion

In this paper, I have analyzed the effects of fixed-term contracts in an efficiency wage model to study their effect on unemployment and labor market segmentation. In the two-tier system, there are more hirings and more firings. An important feature that my model incorporates is the renewal of fixed-term contracts into permanent contracts. Incentive-compatible fixed-term contracts must be renewed into permanent contracts with a positive probability. In the

presence of a legislated minimum wage, it is costly for …rms to renew …xed-term contracts because permanent contracts are subject to non-neutral …ring costs. The renewal rate is lower the higher the (negative) e¤ect of …ring costs is. I have provided some evidence of this fact for some European countries.

It is often stated that the argument for introducing …xed-term contracts is that this is "the price to pay to get full employment". But higher employment at the expense of segmentation of the labor market only arises if wages are very ‡exible. Moreover, the introduction of …xed-term contracts leaving the existing labor market regulations unchanged (that is, leaving the non–neutral e¤ects of …ring costs unchanged) leads to a substitution of …xed-term contracts for permanent contracts and it can also imply lower equilibrium employment. If this is the case, from the social point of view, market segmentation is too large. Higher renewal rates of …xed-term contracts into permanent contracts would lead to higher employment levels. For a given level of …ring costs, in economies with a higher legal minimum wage, it is more di¢cult that …xed-term contracts are successful in bringing down unemployment. Moreover, they generate a more segmented labor market.

I have showed that the relationship between …ring costs and …xed-term contracts is not as straightforward as is assumed in the partial equilibrium literature. In this sense, the results are more interesting: introducing …xed-term contracts in a world where …ring costs would reduce employment does not necessarily increase employment.

The general equilibrium analysis of policies that introduce ‡exibility "at the margin" suggests that these do not generate a second tier of the labor market that is isolated from the unchanged regulations that a¤ect the …rst tier of the labor market. In turn, the e¤ects of such policies can be undesirable. Policies on the employment protection legislation tackling the core labor contracts can be more e¢cient in motivating the creation of employment and, more precisely, the creation of permanent employment.

4 Appendix 1

4.1 Proof of proposition 1

Proof. If the wage of TCs is …xed exogenously, this is not a¤ected by the renewal rate. There is only a direct e¤ect of the renewal rate on temporary pro…ts. That is, From equation (13), $\frac{@\Pi_T(w_{min}; R; w_P)}{@R} = \frac{(1-b)}{1+r}\pi_P$. And, $\text{sign}\left[\pi_P\right] = \text{sign}\left[m - w_P - \frac{bF}{1+r}\right]$: In the two-tier system, $m = \bar{\alpha} w_{min} + (1-\bar{\alpha})\left[w_P + \frac{bF}{(1+r)}\right]$ (see equation (15)). This implies that $\text{sign}\left[\frac{@\Pi_T}{@R}\right] = \text{sign}\left[w_{min} - w_P - \frac{bF}{1+r}\right] < 0$; since $w_{min} \cdot w_P$. So, the …rm chooses the minimal renewal rate incentive-compatible. ■

4.2 Proof of lemma 2

Proof. A system with only PCs is an equilibrium i¤

$$\Pi_P(w_P) \geq \Pi_T(w_{min}; R^{\alpha}; w_P): \tag{A1}$$

A two-tier system is an equilibrium i¤

$$\Pi_T(w_{min}; R^{\alpha}; w_P) \geq \Pi_P(w_P): \tag{A2}$$

From equation (13), condition (A1) is satis…ed i¤ $w_{min} \geq w_p^{\alpha}(\,) \Leftrightarrow w_{min} \geq m$ (see condition (5)). From equation (13), condition (A2) is satis…ed i¤ $w_{min} \cdot w_p^{\alpha}(\,) \Leftrightarrow w_{min} \cdot m$ (see condition (15)). ■

4.3 Proof of proposition 2

Proof. From lemma 2, for every value of w_{min}, the equilibrium is de…ned as follows: if $w_{min} < m$; the two-tier system is the only equilibrium; if $w_{min} > m$; the system with only PCs is the only equilibrium. ■

4.4 Proof of lemma 3

Proof. Employment in the system with only PCs is given by $L_P = \frac{aN}{a+b}$ (see equation (8)). Combining equations (21) and (22), employment in the two-tier system is given by

$$L = \frac{aN\left[b + (1-b)R^{\alpha}\right]}{b + a\left[b + (1-b)R^{\alpha}\right]}: \tag{A3}$$

From equation (9), $a^{\alpha} = \frac{(m - e)(1+r) - K(r+b)}{K} \equiv \frac{J}{K}$: And from equation (24), $\mathbf{a}^{\alpha} = \frac{X(1+r)}{1-X}$; where $X \equiv \frac{J - \beta J^{0}}{[(w_{min} - e)(1+r) + (1-b)R^{\alpha}K](1-\beta)}$ and $J^{0} \equiv J - (m - w_{min})(1+r)$.

The difference in employment in the two systems is given by: $sign(L_P - \bar{L}) = sign(a^{\alpha} - \mathbf{a}^{\alpha}[b + (1-b)R^{\alpha}])$; where $\mathbf{a}^{\alpha} = \mathbf{a}^{\alpha}(w_{min})$. If $w_{min} = w^{\alpha}_{min} =)\ L_P - \bar{L}(w^{\alpha}_{min}) = 0$, where

$$w^{\alpha}_{min} = \frac{[KMJr + r\beta JK(1-b)(1-R^{\alpha}) + KMm(1+r)^{2-\beta} + J(J + e(1+r) + Kb)]}{(1+r)[J + \beta MK(1+r)]}; \quad (A4)$$

and $M = b + (1-b)R^{\alpha}$. Therefore, if $w_{min} > w^{\alpha}_{min}$, then $L_P > \bar{L}$. But if $w_{min} < w^{\alpha}_{min}$, then $L_P < \bar{L}$. ■

4.5 Proof of Proposition 3

Proof. i) The firm chooses to pay the lowest wage that satisfies the participation constraint, that is w_T such that $V_T = \mathbf{V}_U$: Using equation (10), in equilibrium, this wage is given by

$$w_T = e - \frac{(1-b)}{1+r}R(\mathbf{V}_P - \mathbf{V}_U) + \frac{r\mathbf{V}_U}{1+r}: \quad (A5)$$

This implies that $\frac{\partial w_T}{\partial R} < 0$: Therefore, from equation (13), $\frac{\partial \Gamma_T(R; w_T(R;:);:)}{\partial R} = \frac{\partial \Gamma_T}{\partial R} + \frac{\partial \Gamma_T}{\partial w_T}\frac{\partial w_T}{\partial R}$: The first element shows the direct effect of the renewal rate (as in the presence of a legal minimum wage). The second element shows the indirect effect of the renewal rate through the wage setting of TCs: an increase in the renewal rate implies an increase of the utility of holding a TC proportional to the rent of PCs, $(\mathbf{V}_P - \mathbf{V}_U)$; which allows to reach the participation constraint with a reduction of the wage of TCs (and therefore increase profits) by the same amount.

The above expression reduces to: $sign\left[\frac{\partial \Gamma_T(R; w_T(R;:);:)}{\partial R}\right] = sign\left[(\mathbf{\Gamma}_P + \mathbf{V}_P) - \mathbf{V}_U\right]$. The first term corresponds to the total surplus of a match with a worker under a PC (S_P). In the two-tier system, $\Gamma_T = 0$. In the absence of a minimum wage, $V_T = \mathbf{V}_U$. This implies that $\mathbf{V}_U = 0$ (see equation (16)). Therefore, the second term corresponds to the total surplus of a match with a worker under a TC, which is zero. Combining equations (13) and (1), the surplus of a PC is $S_P = m - e$. Combining equations (A5) and (15), $m = e$. This implies that $\frac{\partial \Gamma_T(R; w_T(R;:);:)}{\partial R} = 0$. Therefore, the firm is indifferent among any pair of w_T and incentive-compatible R that satisfies the participation constraint.

ii) Replacing (20) into (19), the out‡ow rate from unemployment can be written as $a = \theta(1 - u)/u$, where $u = (N - L_T - \bar{L}_P)/N$ is the unemployment rate in the two-tier system. Replacing a into (18) gives the e¢ciency wage curve in equilibrium, that is

$$w_P^{\alpha} = e - \frac{bF}{1+r} + K\frac{(r+b)}{(1+r)} + \frac{\theta(1-u)}{\theta(1-u)+u(1+r)}\left(w_{min} - e + \frac{(1-b)e}{q}\right):$$

The incentive-compatible wage for zero unemployment rate is …nite.

iii) The optimal contract (lemma 1) implies that both types of contracts coexist in the two-tier system. ■

4.6 Proof of Proposition 4

Proof. From proposition 2, the two-tier system is an equilibrium if $w_{min} < m$: From lemma 3, if $w_{min} > w_{min}^{\alpha}$, then $L_P > \bar{L}$.

To check if the minimum wage constraint is binding in the system with only permanent contracts, $(w_P^{\alpha} - w_{min}^{\alpha})$ needs to be calculated. From equations (5) and (A4),

$$\text{sign}(w_P^{\alpha} - w_{min}^{\alpha}) = \text{sign}(m - w_{min}^{\alpha}) =$$

$$\text{sign}\begin{array}{c} m(1+r)J - m(1+r)^2KM^{-} - KMJ(1-\bar{}) r \\ \hline -KMm(1+r)^2 - JKr^{-} - J(J+e(1+r)+Kb) \end{array} =$$

$$\text{sign}[J(J+Kr-J) - JKr(M(1-\bar{}) + \bar{})] =$$

$$\text{sign}[JKr(1-\bar{})(1-M)] =$$

$$\text{sign}[JKr(1-\bar{})(1-b)(1-R^{\alpha})] > 0.$$

Since $\text{sign}(w_P^{\alpha} - w_{min}^{\alpha}) = \text{sign}(m - w_{min}^{\alpha}) > 0$, then for $w_{min} \in [w_{min}^{\alpha}; m]$, $L_P > \bar{L}$ and the resulting equilibrium is the two-tier system. ■

4.7 Proof of Proposition 5

Proof. The …rst order conditions of the social planner problem are:

$$(m-e)\frac{\partial \bar{L}}{\partial R} + \lambda_1 - \lambda_2 - \frac{\lambda_3 a(1-b)K}{(1+r+a)(1+r)} + \lambda_4\left(\frac{\partial \bar{L}}{\partial R}m - \frac{\partial L_T}{\partial R}w_T - \frac{\partial \bar{L}_P}{\partial R}\left(w_P + \frac{bF}{1+r}\right)\right) = 0 \quad \text{(A6)}$$

$$(m-e)\frac{\partial \bar{L}}{\partial a} - \frac{\lambda_3(1+r)}{(1+r+a)^2}\left(w_T - e + \frac{(1-b)RK}{1+r}\right)$$

$$+\lambda_4\left(\frac{\partial \bar{L}}{\partial a}m - \frac{\partial L_T}{\partial a}w_T - \frac{\partial L_P}{\partial a}\left(w_P + \frac{bF}{1+r}\right)\right) = 0 \quad \text{(A7)}$$

$$\lambda_3 - \lambda_4 \bar{L}_P = 0 \quad \text{(A8)}$$

$$\lambda_5 - \lambda_3 \frac{\alpha}{1+r+\alpha} - \lambda_4 L_T = 0 \qquad \text{(A9)}$$

Conditions (A8) and (A9) imply that either $\lambda_3 = \lambda_4 = \lambda_5 = 0$ or $\lambda_3 > 0$; $\lambda_4 > 0$; and $\lambda_5 > 0$: The first case implies a contradiction (from (A7), R would be negative). Therefore these multipliers are positive implying that the three constraints associated are binding.

Employment (see equation (A3)) is then given by: $L^S(a^S; R; w^*_{min}) = \dfrac{\alpha^S N[b+(1-b)R]}{b+\alpha^S[b+(1-b)R]}$;

where α^S is given by $a^S(R; w^*_{min}) = \dfrac{J(1-\beta)}{J(1-\beta)+\gamma K(r+M)(1-\beta)}$.

If $w_{min} \geq w^{**}_{min}$) $L^S(a^S; 1; w^{**}_{min}) - L^S(a^S; R^*; w^{**}_{min}) \geq 0$, where this minimum wage constraint is not binding in the system with only permanent contracts, that is

$$m - w^{**}_{min} = \frac{JKr(1-\bar{\beta})(1-M) + JK\left(M - rb(1-\beta) + \dfrac{r^2R(1-b)}{r+M}\right)(1-R^*(1-b))}{(1+r)(1-M)[J+Kb(1+\beta r)]}; \text{ where}$$

$M = b + (1-b)R^*$.

Therefore, when $w_{min} \in [w^{**}_{min}; m]$, i.e. when the market solution is not optimal, the socially efficient renewal rate of TCs is 1. From Proposition 3, $m - w^*_{min} = \dfrac{JKr(1-\bar{\beta})(1-M)}{(1+r)[J+\bar{\beta}MK(1+r)]}$. Therefore, $w^{**}_{min} < w^*_{min} < m$. ■

5 Appendix 2: Separation rate of PCs in the two-tier system

As suggested by the partial equilibrium literature, the firing rate of PCs decreases in the two-tier system. In what follows, I show that allowing this fact would not change the results of Proposition 4.

Let b_P be the firing rate of PCs in the two-tier system, where $b_P < b$. This implies that $(w^*_P - w^*_P) = r(V_U - V_U)/(1+r) - K\varepsilon/(1+r)$, where $\varepsilon = b - b_P$: That is, the difference in permanent wages in the two systems is not as high. However, this is compensated by the fact that the difference in V_U in the two systems is higher by exactly the same magnitude. That is, $r(V_U - V_U)/(1+r) = \bar{\beta}(m - w_{min})/(1-\bar{\beta}) + K\varepsilon/(1+r)$. Thus, the difference in wages of PCs in the two systems, which is what drives the results, would not be modified by the lower separation rate of PCs in the two-tier system.

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Table 1. Renewal rate of temporary contracts and …ring costs

	C	d	F	R	years
Spain	35	0.72	25.2	0.11	1987-96
Italy	32.5	0.55	17.8	(0.21,0.36)[1]	1999
France	15	0.74	11.1	0.33	1988-92
UK	8	0.45	3.6	(0.36,0.38)[2]	1991-97

Note: C denotes the unfair severance payment; d denotes the probability that a dismissal is declared unfair in court and F = dC;
[1]The …rst (second) number refers to renewal after 3 (5) years of a TC.
[2]The …rst (second) number refers males (females) in Britain.
Sources: OECD (1999), Galdón-Sánchez and Güell (2000), Güell and Petrongolo (2000), Cipollone and Guel… (2002), Goux et al. (2001), and Booth et al. (2002).

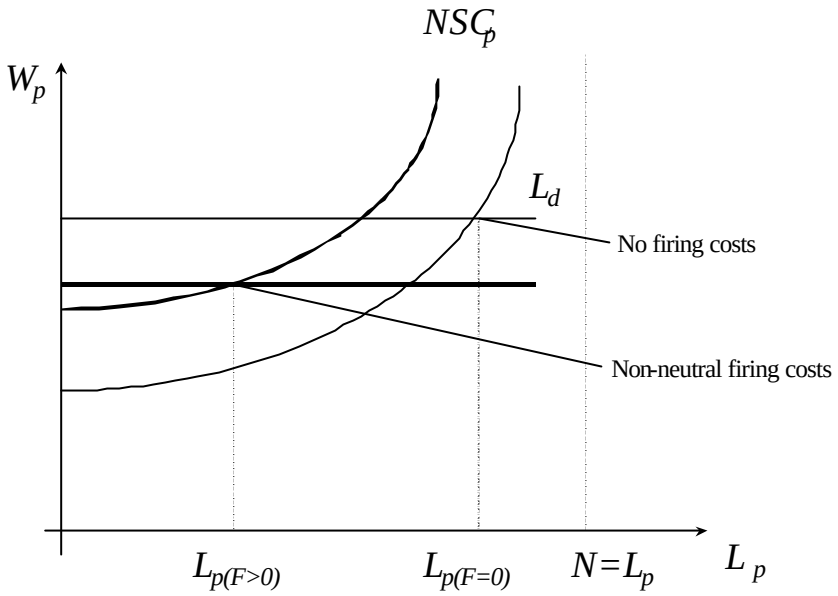

Figure 1: Market equilibrium with non-neutral …ring costs.

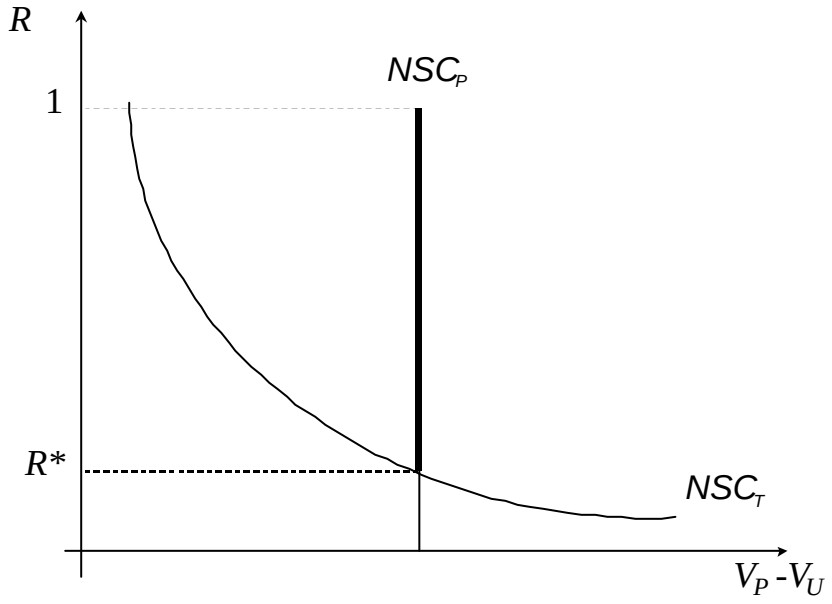

Figure 2: No-shirking conditions of a temporary contract

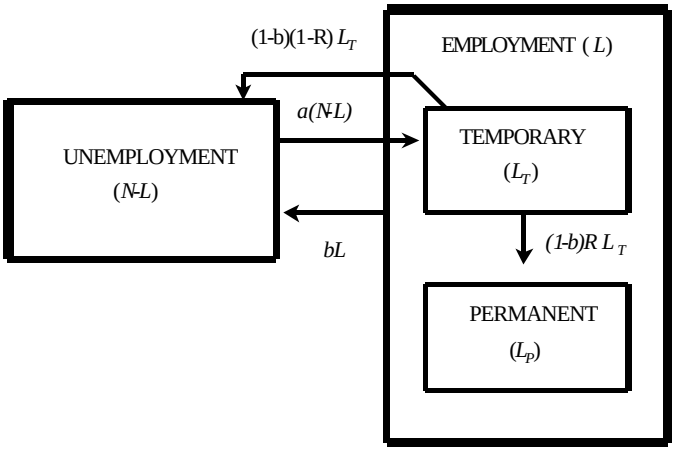

Figure 3: Flows of the labor market in a two-tier system.

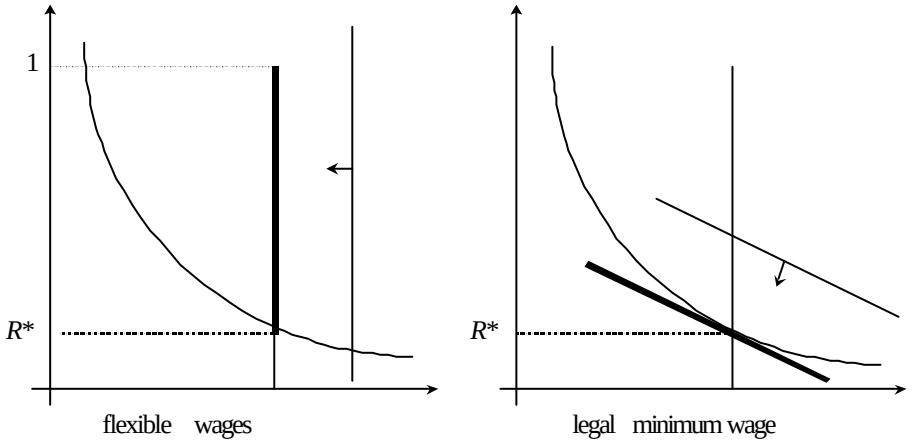

Figure 4: Optimal renewal rate with ‡exible and non-‡exible wages.