Targeted employment policies and partial labor market reforms: Theory and some empirical evidence*

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Abstract

Many countries implement employment policies aiming at improving the labor market prospects of particular population groups with specific characteristics (young workers, women, unskilled workers, etc.) Moreover, in many occasions, labor market reforms only change regulations to be applied to population groups who face more disadvantages in the labor market. An example is the introduction of atypical employment contracts (temporary contracts, determined-duration contracts) which ease firing restrictions for new entrants in the labor market and are usually forbidden for hiring adult prime-age male workers. Another example is the use of employment subsidies for hiring of workers with some specific individual characteristics.

This paper discusses the likely effects of this type of policies. First, it surveys the literature on partial labor market reforms and reviews some empirical evidence regarding the impact of temporary contracts and the introduction of employment subsidies for particular population groups. Then, it uses an extension of Mortensen-Pissarides (1994) model in order to identify the channels through which targeted employment policies may have an impact on equilibrium unemployment and on the incidence of unemployment across population groups. Some simulation results show that the impact of targeted reforms depends upon the initial state of the labor market and on the relative incidence of shocks affecting each type of worker.

1. Introduction

In many European countries labor market reforms are often framed as employment promotion policies aimed at favoring disadvantaged groups in the labor market. One example is the liberalization of "atypical" employment contracts (part-time, fixed-term, seasonal, etc.) which typically excludes prime-age workers to be eligible for being hired under such contracts.[1] Other examples are employment subsidies targeted at specific population groups, for instance, at young, low-skilled or long-term unemployed workers. Differentiated or dual labor market policies with rules more stringent for high-wage jobs are pervasive across the labor regulation in many countries.

While there may be good political economy reasons for reforming the labor market through two-tier schemes (see Saint-Paul, 2000), the economic consequences of these reforms in markets with heterogeneous agents are not fully understood. As far as we know, most papers analyzing the effects of partial reforms have done so without taking into account that policies (i.e, reductions of firing costs, employment subsidies, etc.) are targeted to some population groups with lower prospects in the labor market. In this respect, this paper aims at providing a set-up where differentiated employment policies in labor markets with heterogeneous workers can be analyzed. In particular, our analysis allows us to derive the impact of such policies on: equilibrium unemployment (and its distribution among workers of different types), job creation and job destruction, and on productivity, wages, wage inequality and welfare.

Our analysis builds on previous literature on equilibrium unemployment in labor markets with workers and jobs heterogeneity starting with the seminal paper by

[1] See Booth, Dolado and Frank (2002).

Mortensen and Pissarides (1994).[2] It complements the analysis of partial reforms focusing on the conversion of fixed-term employment contracts into permanent ones (e.g., Blanchard and Landier, 2002, Cahuc and Postel-Vinay, 2002), which stresses that these reforms may increase turnover and, hence, equilibrium unemployment. For instance, in Blanchard and Landier (2002), after a reduction of firing costs in entry-level jobs, firms find attractive to hire more workers, yet they are also more reluctant to convert them into regular permanent employment contracts as, with low firing costs, taking the chance of matching with another worker may be attractive. Hence, this stream of the literature stresses one important feature of dual labor markets, namely the consequences of having the option of converting jobs from one segment to the other ones[3]. However, it misses another important feature of dual labor markets, namely the fact that employment policies are targeted to specific group of workers.[4] Changing the regulation in one segment of the market may affect other segments, for instance through a change in the overall labor market tightness, which determines the exit rate out of unemployment for all workers as well as the profits from creating all types of vacancies. Furthermore, in as far as these changes in the labour market tightness affect workers outside option values we may also expect a change in firms' hiring and firing decisions. An exhaustive analysis of partial reforms therefore requires a model with endogenous job creation and job destruction.

[2] In contrast to Mortensen and Pissarides (1994) we only allow for workers' heterogeneity. However, in contrast to their paper, we relax the assumption that the labor market is totally segmented.

[3] Belot, Boone and van Ours (2002) analyze the trade-off between productivity and flexibility that may also influence the firm's decision to convert a temporary job into a permanent one when job stability is productivity-enhancing.

[4] Some theoretical analyses of fixed-term contracts (e.g. Cahuc and Postel-Vinay, 2002, and Nunziata and Staffolani, 2001) assume that there are some restrictions on the use of fixed-term contracts and impose a maximum value for the proportion of fixed-term employees that firms can hire. However, this restriction does not capture the targeted nature of "employment promotion contracts".

The motivation for this paper comes from our previous work on labor markets with heterogeneous jobs and workers. Dolado, Jansen and Jimeno (2003) show that it is possible that differentiated firing costs can reduce equilibrium unemployment in labor markets with on-the-job search and workers and jobs heterogeneity. They analyze a matching model with two-sided heterogeneity (skilled and unskilled jobs and low-educated and high-educated workers), where high-educated workers may be mismatched (i.e, can occupy unskilled jobs) and, if so, they can exert on-the-job search. Mismatch of high-educated workers implies a negative externality of on-the-job seekers on low-educated workers when both types of workers are equally productive at unskilled jobs since, having a higher quit rate, make those jobs more unstable.[5] To the extent that larger firing costs for workers in skilled jobs reduces job creation and job destruction of skilled jobs, in the presence of skilled-biased technological change this type of targeted employment protection policy may end up reducing mismatch and the unemployment rates of both types of workers.[6]

In this paper, we abstract from on-the-job search by considering a single type of job. However, we highlight the interactions between heterogeneous workers (now labeled as low and high-productivity workers), to learn what is needed for partial labor market reforms to become successful. Our main finding is that the effects of partial reforms on unemployment rates and welfare of different types of workers depend on the initial state of the labor market. Thus, for instance, in sclerotic labor markets, a reduction of firing costs for low-productivity workers reduces their unemployment rate while it may

[5] There is also a positive externality on the supply of unskilled vacancies since more workers are looking for those jobs. However, the negative externality dominates.

[6] There are other papers using search equilibrium models with worker and/or job heterogeneity to analyze the effects of some policy measures. For instance, Acemoglu (2001) shows that unemployment benefits and minimum wages may raise welfare in a model with good and bad jobs in segmented markets. Albrecht and Vroman (2002) analyze a labour market in which low and high-educated workers can be

increase the unemployment rate of high-productivity workers. By contrast, when labor market tightness is higher, such a reduction of firing cost increases the unemployment rate of low-productivity workers without affecting much the unemployment rate of the high-productivity ones. This difference has to do with the sensitivity of job creation to the increase in the profits from jobs filled with low-productivity workers. In a scelorotic labour market jobs are filled relatively fast. Any change in the expected profits from hiring an L-type worker will therefore translate into a strong increase in job creation and the number of matches. By contrast, in a tight labour market, vacancies remain unfilled for a long time. Changes in the profits of filled jobs therefore have a smaller effect on job creation, while the decrease in firing costs has a similar effect on job destruction.

The rest of the paper is organized as follows. Section 2 starts with a description of recent labor market reforms in several countries. As will be seen, in many countries, not just in Western European, these reforms usually take the form of targeted reductions of firing costs, employment subsidies, etc. but only for workers with worse employment prospects. Next, to search for some indications of the effects of these reforms, Section 3 is devoted to comment some results from the empirical literature on targeted employment policies, both considering cross-country studies and case studies pertaining to specific country experiences. Section 4 contains the main contribution of the paper which lies in the theoretical analysis of these reforms in labor markets with heterogeneous workers. Lastly, Section 5 concludes.

hired for unskilled jobs while only high-educated workers can perform skilled jobs, without allowing for on-the-job-search as in Dolado, Jansen and Jimeno (2003).

2. Partial labor market reforms in the real world

If one looks for a country where partial reforms have been key in changing the nature of the labor market over the last two decades, Spain provides a paradigmatic case study. Faced with an unemployment rate above 20% in 1984, the Spanish government tried to implement a significant change in Employment Protection Legislation (EPL) by liberalizing temporary contracts in two main respects: (i) their use was extended to hire employees performing regular activities (not just seasonal activities or at the probation stage), and (ii) they entailed much lower severance payments than the regular permanent contracts. As a result of this two-tier reform (permanent contracts retained their previous indemnities for "fair" and "unfair" dismissals), the proportion of temporary employees in total (salaried) employment surged in the second half of the 1980s, staying above 30% (35% in 1995) since 1990. During the 1990s and early 2000s (1994, 1997, 2001 and 2002) there have been a series of countervailing labor market reforms aimed at reducing that share by providing a less stringent EPL for permanent contracts and considerable restrictions on the use of fixed-term contracts.[7]

From the perspective of this paper, probably the most important reform was the one taking place in 1997. After the arrival to power of the *Partido Popular* (a center-conservative power) in mid-1996, the employers´ confederation (CEOE) and the two major unions (CC.OO and UGT) reached an agreement to reform the system of work contracts. The agreement called for the creation of new permanent contracts in case of "unfair dismissals" entailing a mandatory firing cost which was lower than that pertaining to the old permanent contracts (33 days of wages per year of seniority with a maximum of 24 months-wages against 45 days of wages and 42 months-wages,

[7] See Dolado, García-Serrano and Jimeno (20032) for a detailed description of those reforms.

respectively). However, introducing the new permanent contracts for all workers raised a constitutional problem which implied constraining its availability to only certain groups of the population. The problem was that it was against the Spanish constitutional rights to have to identical workers having the same open-ended contract except for their severance payments. Thus, the government in accord with the parties in the agreement, made the new contracts only available for specific targeted groups for which it was legal to provide those contracts. They could be used for any hires, with the relevant exception of workers aged 30-44 years with unemployment spells bellow one year. Alternatively, the eligible groups were young workers (aged 18-29), long-term unemployed registered at the public employment office for at least twelve months, unemployed above 45 years of age, disabled people and workers whose contract were transformed from temporary into permanent ones. In the 2001 reform, in an attempt to extend the use of the new contacts, the government managed to add young workers between 16 and 30 years of age, long-term unemployed registered for at least six months, and unemployed women of any age working in sectors where they were under-represented.

But Spain is not the only country that has liberalized atypical employment contracts or reduced firing costs contingent on some workers characteristics. In 1984 Italy also introduced "employment promotion contracts" (*Contratti di Formazione e Lavoro*) aimed at the hiring and firm-based training of young workers (between 15 and 29 years of age). In France, fixed-term contracts were first introduced in 1979 but their scope was very much reduced by the socialist government in 1982. After a reform in 1990, fixed-term contracts can be used only for seasonal activities the replacement of an employee on leave, temporary increases in activity *and* for facilitating employment for

targeted groups, from the young to the long-term unemployed (v.g. Blanchard and Landier, 2002).

In Latin America there have been labor market reforms in many countries, some to decrease firing costs (Colombia and Peru at the end of the 1980s), others to increase them (Brazil, Venezuela, Chile, the Dominican Republic, Nicaragua, and Panama)[8]. However, the only country which significantly liberalized the use of atypical contracts targeted on some demographic groups was Argentina, where a reform in 1991 introduced fixed-term contracts and training contracts for young workers, while a new reform in 1995 introduced special contracts to promote employment of certain population groups.

3. Empirical evidence on targeted employment policies

There are two branches in the empirical literature on the labor market effects of institutions. First, cross-country studies use some quantitative or qualitative indicators representing those institutions to explain international differences in labor market outcomes, such as employment and unemployment rates.[9] Within this literature, recent studies have look at the interactions between institutions and shocks and to the different impact of institutions on the labor market outcomes of different population groups, such as youth and females.[10] Most often in this literature, targeted employment policies or partial labor market reforms are considered, if anything, in the construction of the overall institutional indexes, but not separately as an institutional feature on its own.

[8] See IDB (2003), chapter 7.
[9] See Nickell and Layard (1999).
[10] On interactions, see Blanchard and Wolfers (2000). On the different impact of labor market institutions across population groups, see Bertola, Blau, and Kahn (2003), Jimeno and Rodriguez-Palenzuela (2002), and Neumark and Wascher (2003). On the impact of employment protection legislation on employment adjustment, see Caballero, Engel and Micco (2003).

However, a general reduction of firing costs has not the same labor market effects of a commensurate reduction in the firing costs of a certain group of workers.

Among the studies that estimate the labor market impact of some targeted employment policies, like temporary contracts, separately from aggregate indexes of employment protection legislation, Jimeno and Rodriguez-Palenzuela (2002) find that a less strict regulation of fixed-term employment contract tends to reduce youth unemployment rates without any impact on the prime-age male unemployment rate. Using an unbalanced panel of nine OECD countries during the second half of the 1980s and first half of the 1990s, Nunziata and Staffolani (2001) also estimate the effects of employment protection legislation distinguishing three types of regulations: employment protection legislation regarding firing of permanent employees, regulations regarding fixed-term employees, and temporary work agencies regulations. They find that less stringent fixed term contract regulations had a significant positive impact on temporary and total employment in good states of the economy, with no effects on total permanent employment. In the case of young workers (15-24 years of age), less stringent fixed term contract regulations increase both temporary and permanent employment. On the contrary, with regard to temporary work agencies, they find that less stringent regulations have an incremental effect on temporary employment and total employment in bad states. However, in the case of young workers less stringent regulations of temporary work agencies raise temporary employment but reduce permanent employment.

The second branch of the literature looks at specific country episodes to measure the effect of labor market reforms by analyzing labor market outcomes before and after the

reform. Studies of this type are, for instance, Kugler, Jimeno and Hernanz (2003) on the Spanish 1997 reform, Blanchard and Landier (2002) on France, and Hopenhayn (2001) on the Argentinan reform. In Spain, Kugler et al. find that the reduction of firing costs (and payroll taxes) for young, older workers, and long-term unemployed had a positive effect on hiring, with little effect on dismissals, for young workers, while increased dismissals and hiring for older men. Blanchard and Landier (2002), looking at transitions between temporary and permanent employment, observe increased turnover since 1983 in France, specially at younger cohorts, for whom the probability of holding a fixed-term job has increased, the probability of holding a permanent job has decreased, while the probability of staying becoming unemployment shows no clear trend. As for Argentina, Hopenhayn (2001) also finds that the introduction of fixed-term contract had a very strong impact on labor turnover, inducing an increase in hiring but also some substitution of permanent jobs by temporary jobs.

4. A model of EPL reforms targeted at particular demographic groups

Our model draws on Mortensen and Pissarides (1994) with two extensions. First, we allow for worker heterogeneity. And, secondly, we assume that the initial productivity of jobs is random. The first extension gets at how reforms aimed at easing firings of one type of workers affects unemployment, productivity and welfare of all workers, both those affected and those not affected by the reform. The second extension allows a more detailed analysis of hiring of different types of workers depending on the structure of hiring and firing costs.

As it is conventional, the model is in continuous time and only steady states are considered. The economy is populated by a continuum of workers of measure one.

Workers are risk neutral, infinitely lived, and are of two types depending on their productivity (low, L, and high, H) and firms know the worker's type. L-type workers have lower productivity than H-type workers. The mass of workers of type L is α.

The number of firms is endogenously determined. Each firm offers one job. The cost of opening a job vacancy is *c*. When a worker and a firm with a job vacancy meet, they realize the value of the match. The productivity of the match is a random draw from a c.d.f. $F^i(\varepsilon)$ with support [0, 1], (i=L,H), such that $F^L(\varepsilon)>F^H(\varepsilon)$ for all ε.

Job termination is endogenous. There are i.i.d. productivity shocks with arrival rates λ_i (i=L,H). To terminate the job firms must pay dismissal costs K_i (i=L,H), which are assumed to be a pure waste (not a transfer to the worker). There are no quits. By allowing different termination costs for different types of workers we aim at capturing "targeted employment policies/two-tier labor market reforms". Our intuition is that there are direct and indirect effects of reducing the firing costs for L-type workers. First, the productivity threshold at which L-type workers are dismissed is higher the lower K_L is. The indirect effects arise through the determination of the value of jobs occupied by H-type workers which changes when K_L is reduced.

Matching, hiring, and firing

Job vacancies and unemployed workers meet according to a conventional CRS matching function:

$$m(v,u),$$

where v and u denote, respectively, the masses of job vacancies and of unemployed workers. The matching function is increasing in both arguments and homogeneous of degree one. Labor market tightness is denoted by $\theta = v/u$.

Given the matching function, firms meet with L-type unemployed workers with probability $\delta\, q(\theta)$ and with H-type unemployed workers with probability $(1-\delta)\, q(\theta)$, where δ is the proportion of unemployed workers of type L and $q(\theta)=m(1,1/\theta)$. The matching rate of workers is $\theta q(\theta)$.

After meeting a worker and knowing the match-specific productivity, employers face a hiring decision. Thus, since the surplus of the match is increasing in productivity, there are productivity thresholds (ε_L^h, ε_H^h) above which hiring takes place.

As for the firing decision, after being hit by a productivity shock, employers decide whether or not to terminate the job. Hence, for each worker's type there are productivity thresholds ($\varepsilon_L^d, \varepsilon_H^d$) below which jobs are terminated.

Flows

Given the matching probabilities and the hiring and firing rules, the flow equations are given by:

$$[(1-F^L(\varepsilon_L^h)]\theta q(\theta)\delta u = \lambda_L F^L(\varepsilon_L^d)e_L\,, \tag{1}$$

$$[1-F^H(\varepsilon_H^h)]\theta q(\theta)(1-\delta)u = \lambda_H F^H(\varepsilon_H^d)e_H\,, \tag{2}$$

where e_L and e_H are the masses of L and H- type employed workers, respectively. The left-hand-sides of (1) and (2) give the outflows from unemployment while the right-

hand-sides give the inflows to unemployment (outflows from employment) for L and H-type workers, respectively.

Since $\delta u+e_L = \alpha$ and $(1-\delta)u+e_H = 1-\alpha$, the steady state unemployment rates of both types of workers are:

$$ur_L = \frac{\delta u}{\alpha} = \frac{\lambda_L F^L(\varepsilon_L^d)}{[(1-F^L(\varepsilon_L^h)]\theta q(\theta) + \lambda_L F^L(\varepsilon_L^d)}, \quad (1')$$

$$ur_H = \frac{(1-\delta)u}{1-\alpha} = \frac{\lambda_H F^H(\varepsilon_H^d)}{[1-F^H(\varepsilon_H^h)]\theta q(\theta) + \lambda_H F^H(\varepsilon_H^d)} \quad (2')$$

Bellman equations

Let U_i and $W_i(\varepsilon)$ be, respectively, the value of unemployment and the value of employment with productivity ε, for workers of type i (=L,H). The corresponding Bellman equations are:

$$rU_i = z_i + \theta q(\theta) \int_{\varepsilon_i^h}^{1} [W_i(x) - U_i] dF^i(x) \quad (3)$$

$$rW_i(\varepsilon) = w_i(\varepsilon) + \lambda_i F^i(\varepsilon_i^d)[U_i - W_i(\varepsilon)] + \lambda_i \int_{\varepsilon_i^d}^{1} [W_i(x) - W_i(\varepsilon)] dF^i(x) \quad (4)$$

where *r* is the interest rate, *z* is the flow utility while unemployed, and w is the wage. Notice that wages depend on productivity and are renegotiated every time a productivity shock occurs.

As for the employer's, the value functions of an unfilled vacancy (V) and the value functions of filled vacancies with worker of type i (J_i) are given by the following Bellman equations:

$$rV = -c + \delta q(\theta) \int_{\varepsilon_L^h}^{1} [J_L(x) - V] dF^L(x) + (1-\delta) q(\theta) \int_{\varepsilon_H^h}^{1} [J_H(x) - V] dF^H(x) \quad (5)$$

$$rJ_i(\varepsilon) = \varepsilon - w_i(\varepsilon) + \lambda_i F^i(\varepsilon_i^d)[V - J_i(\varepsilon) - K_i] + \lambda_i \int_{\varepsilon_i^d}^{1} [J_i(x) - J_i(\varepsilon)] dF^i(x) \quad (6)$$

Wage determination

When a match is formed, wages are determined by symmetric Nash bargaining with continuous renegotiation. This implies:

$$J_i(\varepsilon) - V + K_i = W_i(\varepsilon) - U_i \quad (7)$$

Hence, we give insider power to the workers since the beginning of the match to extract the rents from firing costs. As shown by Ljungqvist (2002), this assumption is key for the analysis of the employment effects of firing costs. When firing costs are assumed to reduce the firm's threat point in the initial match (as in equation (7)), firing costs tend to increase equilibrium unemployment, while they tend to increase employment when the worker's relative share of match surplus is assumed to stay constant when varying severance pay.[11]

[11] Mortensen and Pissarides (1999) propose alternative specifications of the bargaining process in which the worker extract rents from firing costs in continuing matches but not in the first match.

Equilibrium

The productivity thresholds at which hiring start to take place are those at which the value of a filled vacancy is equal to the value of an unfilled vacancy. Since there is free entry, V=0 in equilibrium. Likewise, jobs are terminated when the value of the job is equal to the value of an unfilled vacancy minus termination costs. Thus,

$$J_i(\varepsilon_i^h) = V = 0 \tag{8}$$

$$J_i(\varepsilon_i^d) + K_i = V = 0 \tag{8'}$$

Solving the model

The surplus of a job of productivity ε occupied by a worker of type i is

$$S_i(\varepsilon) = J_i(\varepsilon) - V + K_i + W_i(\varepsilon) - U_i$$

Equations (4) and (6) can be rewritten as follows:

$$(r+\lambda_i)[W_i(\varepsilon) - U_i] = w_i(\varepsilon) - z_i + \lambda_i \int_{\varepsilon_i^d}^{1} [W_i(x) - U_i] dF^i(x) - \theta q(\theta) \int_{\varepsilon_i^h}^{1} [W_i(x) - U_i] dF^i(x) \tag{4'}$$

$$(r+\lambda_i)[J_i(\varepsilon) - V + K_i] = \varepsilon - w_i(\varepsilon) + \lambda_i \int_{\varepsilon_i^d}^{1} [J_i(x) - V + K_i] dF^i(x) - r(V - K_i) \tag{6'}$$

and, hence, adding up the two above equations and using (7) yields

$$(r+\lambda_i)S_i(\varepsilon) = \varepsilon - z_i + \lambda_i \int_{\varepsilon_i^d}^{1} S_i(x) dF^i(x) - \frac{\theta q(\theta)}{2} \int_{\varepsilon_i^h}^{1} S_i(x) dF^i(x) - r(V - K_i) \tag{9}$$

Noting that $S_i'(\varepsilon) = \frac{1}{r+\lambda_i}$ and integrating by parts yields

$$\int_{\varepsilon}^{1} S_i(x)dF^i(x) = \frac{1}{r+\lambda_i}\int_{\varepsilon}^{1}[1-F^i(x)]dx \text{ for all } \varepsilon$$

Thus,

$$(r+\lambda_i)S_i(\varepsilon) = \varepsilon - z_i + \frac{\lambda_i}{r+\lambda_i}\int_{\varepsilon_i^d}^{1}[1-F^i(x)]dx - \frac{\theta q(\theta)}{2(r+\lambda_i)}\int_{\varepsilon_i^h}^{1}[1-F^i(x)]dx - r(V-K_i) \qquad (10)$$

This equation gives the productivity thresholds values for hiring and firing. Since $S_i(\varepsilon_i^d) = 0$ and $S_i(\varepsilon_i^h) = 2K_i$, and in equilibrium the value of an unfilled vacancy is nil,

$$\varepsilon_i^d = z_i - \frac{\lambda_i}{r+\lambda_i}\int_{\varepsilon_i^d}^{1}[1-F^i(x)]dx + \frac{\theta q(\theta)}{2(r+\lambda_i)}\int_{\varepsilon_i^h}^{1}[1-F^i(x)]dx - rK_i \qquad (11)$$

$$\varepsilon_i^h = z_i - \frac{\lambda_i}{r+\lambda_i}\int_{\varepsilon_i^d}^{1}[1-F^i(x)]dx + \frac{\theta q(\theta)}{2(r+\lambda_i)}\int_{\varepsilon_i^h}^{1}[1-F^i(x)]dx + (r+2\lambda_i)K_i \qquad (12)$$

so that $\varepsilon_i^h - \varepsilon_i^d = 2(r+\lambda_i)K_i$. These are the job creation and job destruction rules. Notice that they depend on labor market tightness and that they are interrelated.

Finally, in equilibrium the supply of vacancies is determined by

$$\frac{c}{q(\theta)} = \delta\int_{\varepsilon_L^h}^{1}\left[\frac{1}{2}S_L(x) - K_L\right]dF^L(x) + (1-\delta)\int_{\varepsilon_H^h}^{1}\left[\frac{1}{2}S_H(x) - K_H\right]dF^H(x) =$$

$$= \frac{\delta}{2(r+\lambda_L)}\int_{\varepsilon_L^h}^{1}[1-F^L(x)]dx + \frac{1-\delta}{2(r+\lambda_H)}\int_{\varepsilon_H^h}^{1}[1-F_H(x)]dx - \delta[1-F^L(\varepsilon_L^h)]K_L - (1-\delta)[1-F^H(\varepsilon_H^h)]K_H \qquad (13)$$

Simulations

To solve the model we must find for the vector of variables (δ,u,θ,ε_L^h ,ε_L^d, ε_H^h, ε_H^d) satisfying equations (1'), (2'), (11), (12) and (13). Note that equations (11) and (12)

come in pairs, so that we have 7 unknowns and 7 equations. To simulate the model, we assume that ε_L is uniformly distributed in [0,1] for L-type workers and that ε_H is uniformly distributed in $[\varepsilon_H^{\min},1]$ for H-type workers. Thus,[12]

$$F^i(x)=\frac{x-\varepsilon_i^{\min}}{1-\varepsilon_i^{\min}} \qquad \varepsilon_i^{\min}\le x\le 1$$
$$\text{with } \varepsilon_L^{\min}=0 \text{ and } \varepsilon_H^{\min}>0$$

As for the matching function, we take $m(u,v)=\frac{huv}{\left(u^\gamma+v^\gamma\right)^{\frac{1}{\gamma}}}$ where h>0 is a shift parameter.[13] Under these assumptions the system of seven equations to be solved is as follows:

$$ur_L=\frac{\lambda_L\varepsilon_L^d}{(1-\varepsilon_L^h)\theta q(\theta)+\lambda_L\varepsilon_L^d}$$

$$ur_H=\frac{\lambda_H(\varepsilon_H^d-\varepsilon_H^{\min})}{(1-\varepsilon_H^h)\theta q(\theta)+\lambda_H(\varepsilon_H^d-\varepsilon_H^{\min})}$$

$$\varepsilon_L^d=z_L-\frac{\lambda_L(1-\varepsilon_L^d)^2}{2(r+\lambda_L)}+\frac{\theta q(\theta)(1-\varepsilon_L^h)^2}{4(r+\lambda_L)}-rK_L$$

$$\varepsilon_H^d=z_H-\frac{\lambda_H(1-\varepsilon_H^d)^2}{2(r+\lambda_H)(1-\varepsilon_H^{\min})}+\frac{\theta q(\theta)(1-\varepsilon_H^h)^2}{4(r+\lambda_H)(1-\varepsilon_H^{\min})}-rK_H$$

$$\varepsilon_L^h-\varepsilon_L^d=2(r+\lambda_L)K_L$$

$$\varepsilon_H^h-\varepsilon_H^d=2(r+\lambda_H)K_H$$

$$\frac{c}{q(\theta)}=\frac{\delta(1-\varepsilon_L^h)^2}{4(r+\lambda_L)}+\frac{(1-\delta)(1-\varepsilon_H^h)^2}{4(r+\lambda_H)(1-\varepsilon_H^{\min})}-\delta(1-\varepsilon_L^h)K_L-\frac{(1-\delta)(1-\varepsilon_H^h)K_H}{1-\varepsilon_H^{\min}}$$

[12] This assumption simplifies the computation, but at a heavy loss. By assuming uniform distributions for productivity we are minimizing the employment changes after variations in the hiring and destruction thresholds which would be significantly higher with more skewed distributions.

[13] This functional form has been proposed by Den Haan, Ramey and Watson (2000). Note that when $\gamma\uparrow 0$, it becomes $m(u, v)=h\, u^{0.5}\, v^{0.5}$. Furthermore, the elasticity of the matching rate of workers, $\theta q(\theta)$, with respect to θ for this functional form is $(1+\theta^\gamma)^{-1}$. Thus, the higher is γ, the lower will be that elasticity.

Throughout the set of simulations presented below we keep constant the following parameter values: r=3%, α (proportion of L-type workers) = 1/3, h=γ=1, ε_H^{min}=0.25, c (costs of keeping a vacancy unfilled) = 0.25, K_H (firing costs for H-type workers) = 0.5. Then, for different values of z_L, z_H, λ_L and λ_H, we look at how labor market tightness (θ), unemployment rates, the productivity thresholds levels for hiring and firing, asset values, and averages wages for each type of worker change when varying the firing costs for L-type workers (K_L) in the range [0, K_H]. The results of this simulation exercise are depicted in Figures 1 to 4. Hereafter we comment on the main features of the results from some simulations and discuss the economic forces at work.

CASE #1 (Figure 1): In this case, by setting high values of the unemployment flow income (z_L= z_H =0.5), we simulate a very sclerotic labor market, as illustrated by a low value of labor market tightness (θ around 0.11) and the very high unemployment rates of L-type workers (about 44%) and H-type workers (about 11%). As observed in panel 1, a reduction of K_L from 0.5 (the benchmark value) to zero increases tightness, giving rise to a reduction of the unemployment rate of L-type workers by about 10 percentage points, while the unemployment rate of H-type workers slightly increases by about 2 percentage points (panel 2). [14] Also, as K_L falls and the labor market becomes tighter, the firing rate of L-type workers increases (as illustrated by the steep rise in the destruction productivity thresholds) while their hiring threshold hardly changes. Nonetheless, the increase in the labor market tightness dominates the higher destruction rate and ur_L falls. By contrast, for H-type workers we observe a parallel increase in the hiring and firing thresholds (as K_H remains unchanged), resulting in a small rise in ur_H

[14] Note that, in order to follow the correct direction of changes as K_L decreases, the graphs should be looked from right to left since the horizontal axis of the panels display increasing values of K_L .

(panels 2 and 4). Welfare of both types of workers increases, regardless of their employment status (panel 5), the reason being that their wages (conditional on having a job) raise, because of the higher value of being unemployed (higher $\theta q(\theta)$) and the higher average productivity of employed workers. Finally, between-groups wage inequality raises as the expected wage of H-type workers increase more than that of L-type workers (panel 6). This latter feature is due to the loss of insider power for low-productivity workers whose jobs are no longer protected by firing costs.[15]

CASE #2 (Figure 2): In a relatively tight labor market, defined by lower values of the reservation wages ($z_L = z_H = 0.3$), with θ around 0.5 and unemployment rates around 14% and 3% (panels 1 and 2), a reduction in K_L increases ur_L and ur_H by one and two percentage points, respectively (panel 2). Furthermore, the hiring and firing thresholds of L and H-type workers increase (panels 3 and 4). Thus, in this tighter labor market, the turnover effect tends to dominate the increase in job creation and both unemployment rates go up. More precisely, due to the lower firing costs more workers are laid off but the increase in the allocative efficiency translates in few additional jobs as the matching rate in a tight labour market is relatively insensitive to changes in θ.[16] Finally, in a tight market partial reforms raise the welfare of H-type workers (employed and unemployed) while L-type workers incur a welfare loss (panel 5). Again the difference is due to the loss of insider power for L-type workers. Moreover, as shown in panel 6 the welfare changes are accompanied by a widening of the between group wage inequality and an absolute drop in the wage of L-type workers. The fact that welfare effects differ across the two types of worker is obviously relevant for an analysis of

[15] We also simulated a comprehensive reform in a sclerotic market, reducing K_L and K_H to 1/3 (which is commensurate with $K_L = 0$ $K_H = 0.5$). In this case, ur_L only falls to 33.9% while ur_H increases to 17.2%. Hence, a comprehensive labor market reform yields, for these parameter values, higher unemployment rates than a two-tier reform.

targeted reforms from a political- economy perspective. In particular, while H-type workers tend to favor a partial reform[17] all low-productivity workers (including those that are unemployed) would lose from such a reform. Hence, the political feasability of the partial reform will depend on the composition of the labour force.

CASES #3 and #4 (Figures 3 and 4): We now consider how differences in the volatilities of productivity across groups, captured by changes in the Poisson rate of arrival of the shocks (λ_H and λ_L), affect the impact of reductions in K_L. When there is higher volatility in the productivity of matches with L-type workers and lower volatility in the productivity of matches with H-type workers (that is, for a higher λ_L moving from 0.1 to 0.2 and a lower λ_H moving from 0.1 to 0.05), a reduction in K_L reduces the unemployment rates of both types of workers in a sclerotic labor market (Figure 3). Furthermore, the reduction for the L-type workers is larger than in CASE #1, although the initial unemployment rate of low-productivity workers is much higher than before (comparing Figure 1 and 3). Similarly, in the case of a tight labour market we now observe a steep increase in the unemployment rate of L-type workers, while the unemployment rate of H-type workers remains virtually unchanged. The strong decrease in ur_L in Figure 3 is due to the higher sensitivity of profits and job creation to changes in K_L. This results in many more jobs and a high increase in the number of matches. By contrast, in a tight labour market the hiring threshold for L-type workers does not respond very much to changes in K_L. Hence, after a partial reform we obtain

[16] See footnote 10.
[17] Conditional on their employment status, all H-type workers gain from a partial reform. Nonetheless, H-type workers will anticipate the increase in the firing threshold. Some H-type workers will therefore lose their job after the partial reform. We may therefore expect H-type workers with low ε to vote against any partial reform.

much more frequent churning of L-type workers and little additional hiring, resulting in a doubling of of the unemployment rate of these workers.

5. Concluding remarks

One relevant feature of employment policies and labor market reforms is that they are very often targeted at some demographic groups, normally those with more difficulties in finding jobs (youth, female, long-term unemployed, etc). Some empirical studies trying to estimate the effects of this type of policies conclude that the impact on the labor market outcomes for different population groups can be very different, and do not always go in the same direction.

In this paper we have presented a search equilibrium model with worker heterogeneity which illustrates why it may be difficult to precisely estimate the consequences of two-tier labor market reforms. According to some simulation results, the impact of targeted reductions of firing costs on unemployment and welfare of different groups of workers may depend on the initial state of the labor market (more or less tight) and on the volatility of productivity on continuing jobs. An interesting outcome of our analysis is that is that support for partial reforms is likely (subject to our parameter choice) to be larger in sclerotic labor markets than in tight ones since in the former situation, the welfare of all workers increase. There has been some debate in the literature (see, e.g., Saint-Paul, 1996) about the timing of reforms. It is often argued that reductions in firing costs should be taken in expansions rather than in recessions but Saint-Paul (1996) presents compelling evidence that the opposite happens in practice. To the extent that a sclerotic labor market corresponds to "bad" times and a tight labor market to "good" times, the above implication of our model would provide a rationale for that practice.

Finally, although we have analyzed a reduction of firing costs for less productive workers, it is plausible that the effects of other targeted employment policies (like targeted reductions of non-wage costs or differentiated minimum wages) could also be contingent on the initial characteristics of the labor market being analyzed.

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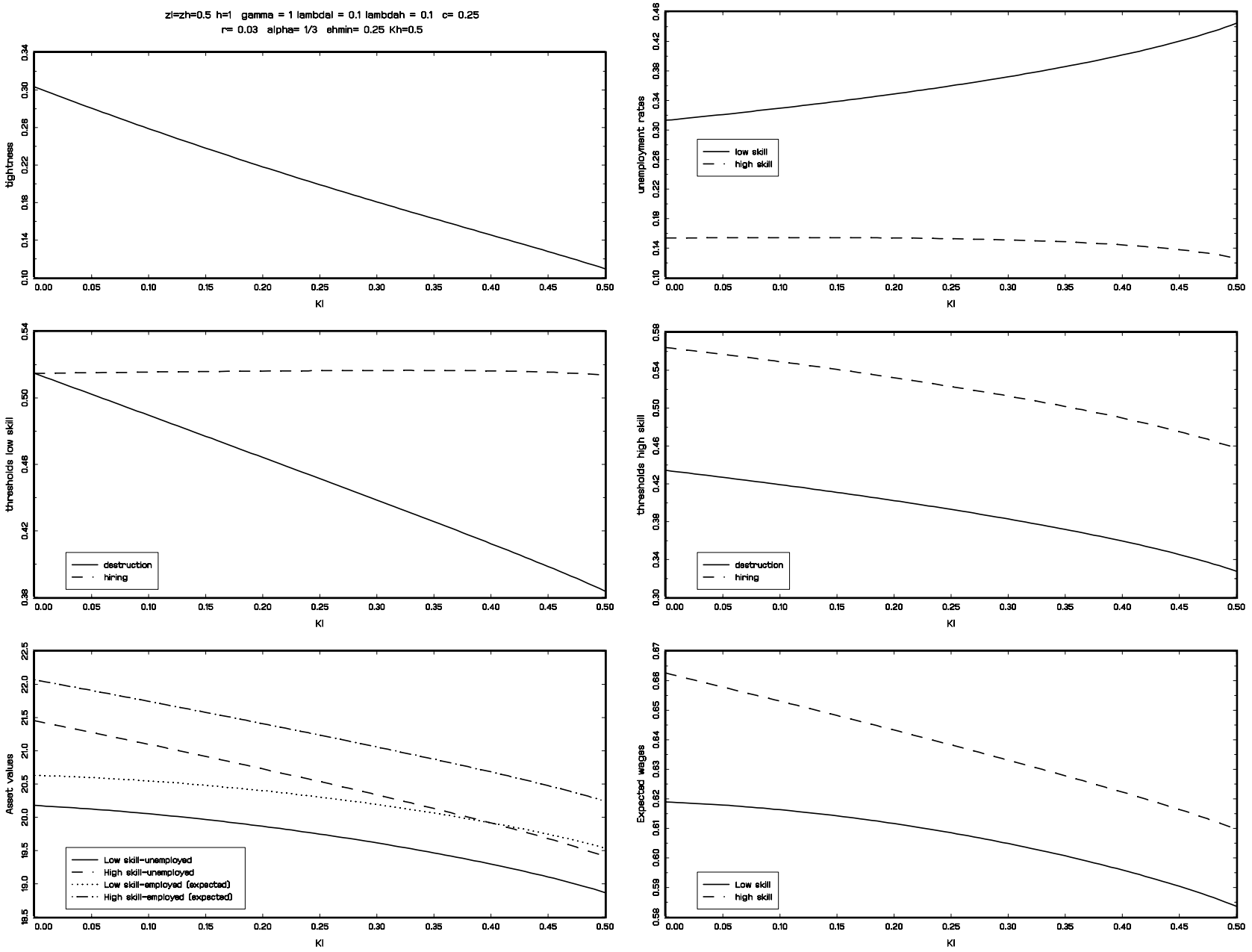
Figure 1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thresholds low skill
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hiring
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High skill-unemployed
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Expected wages
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Figure 2

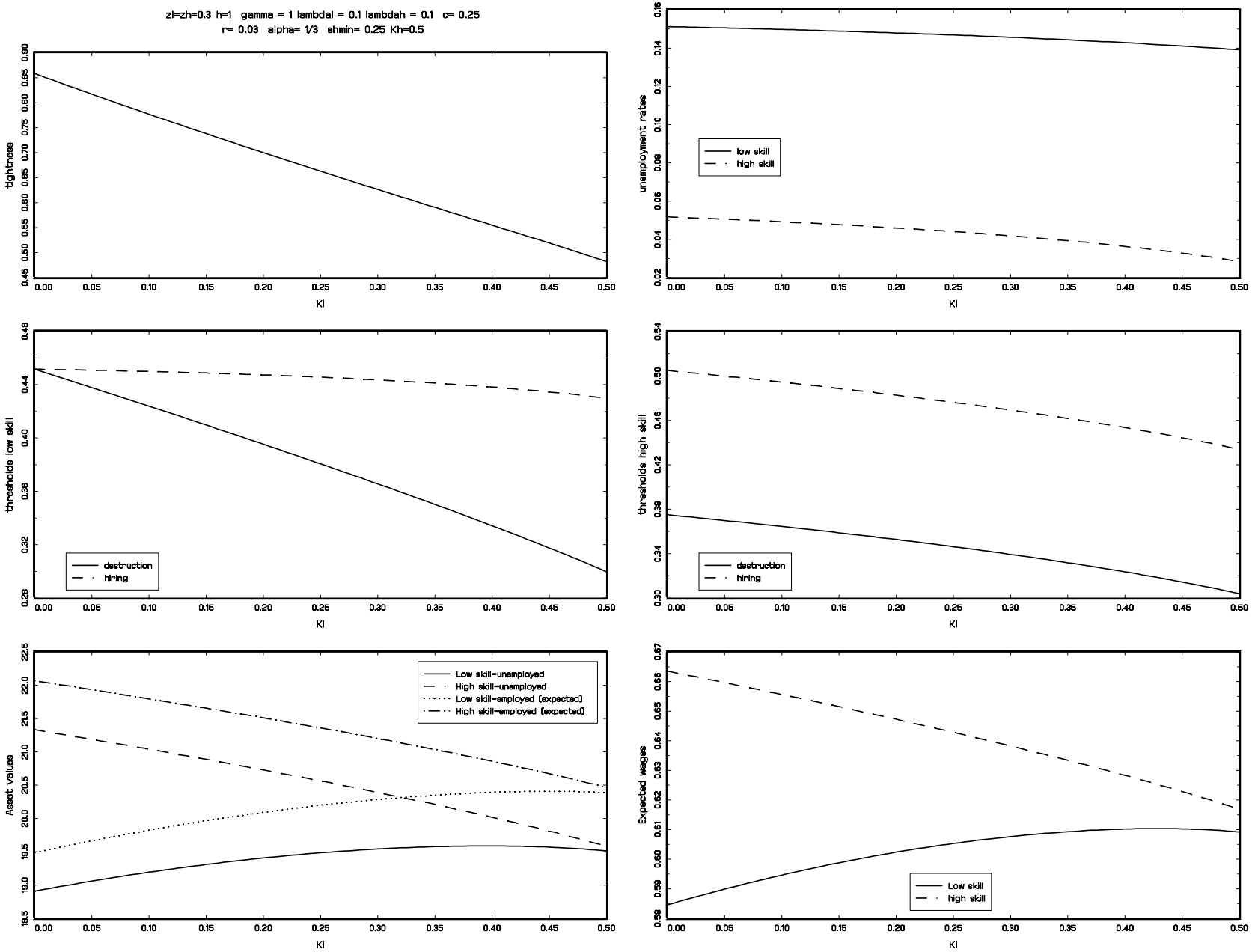
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Figure 3

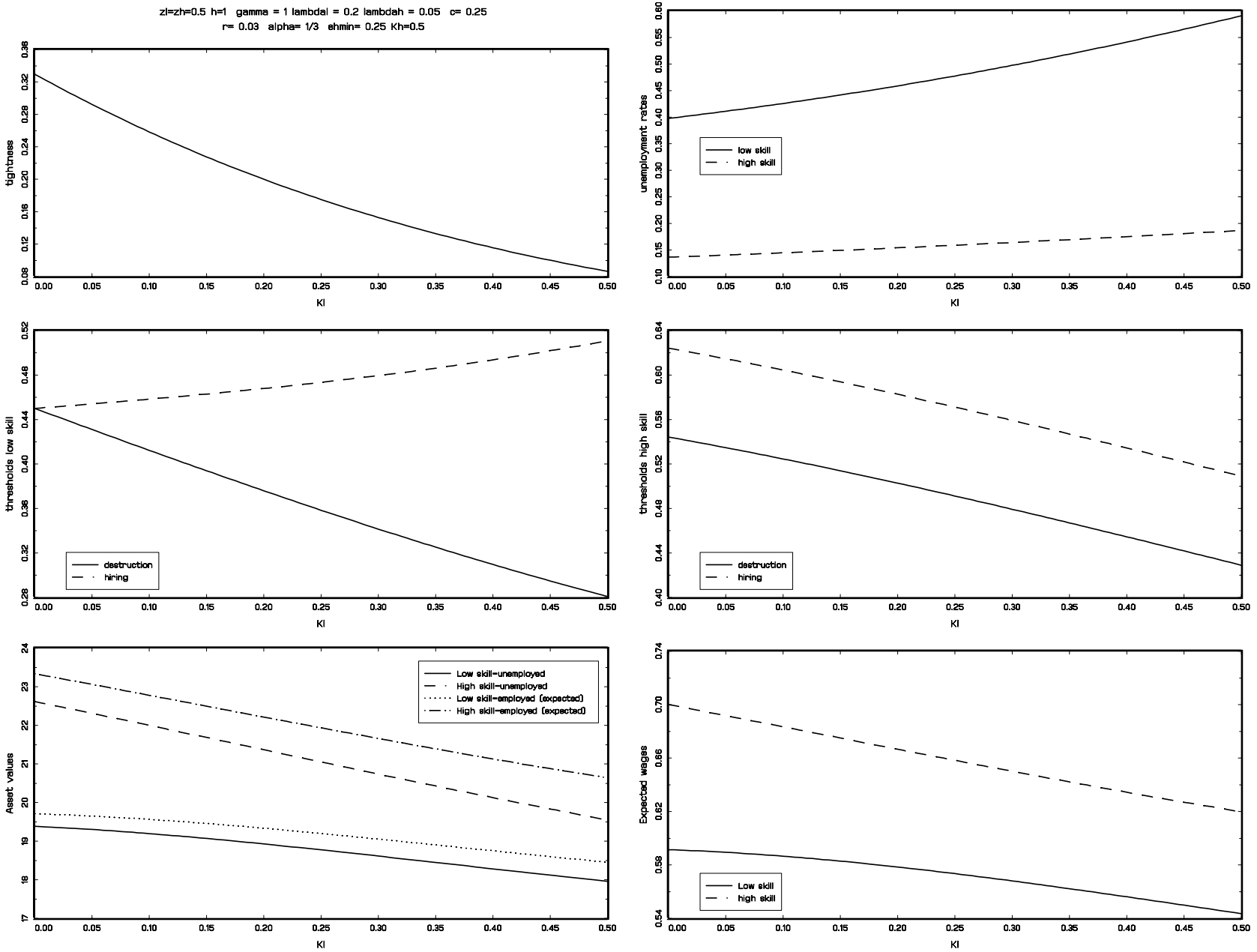
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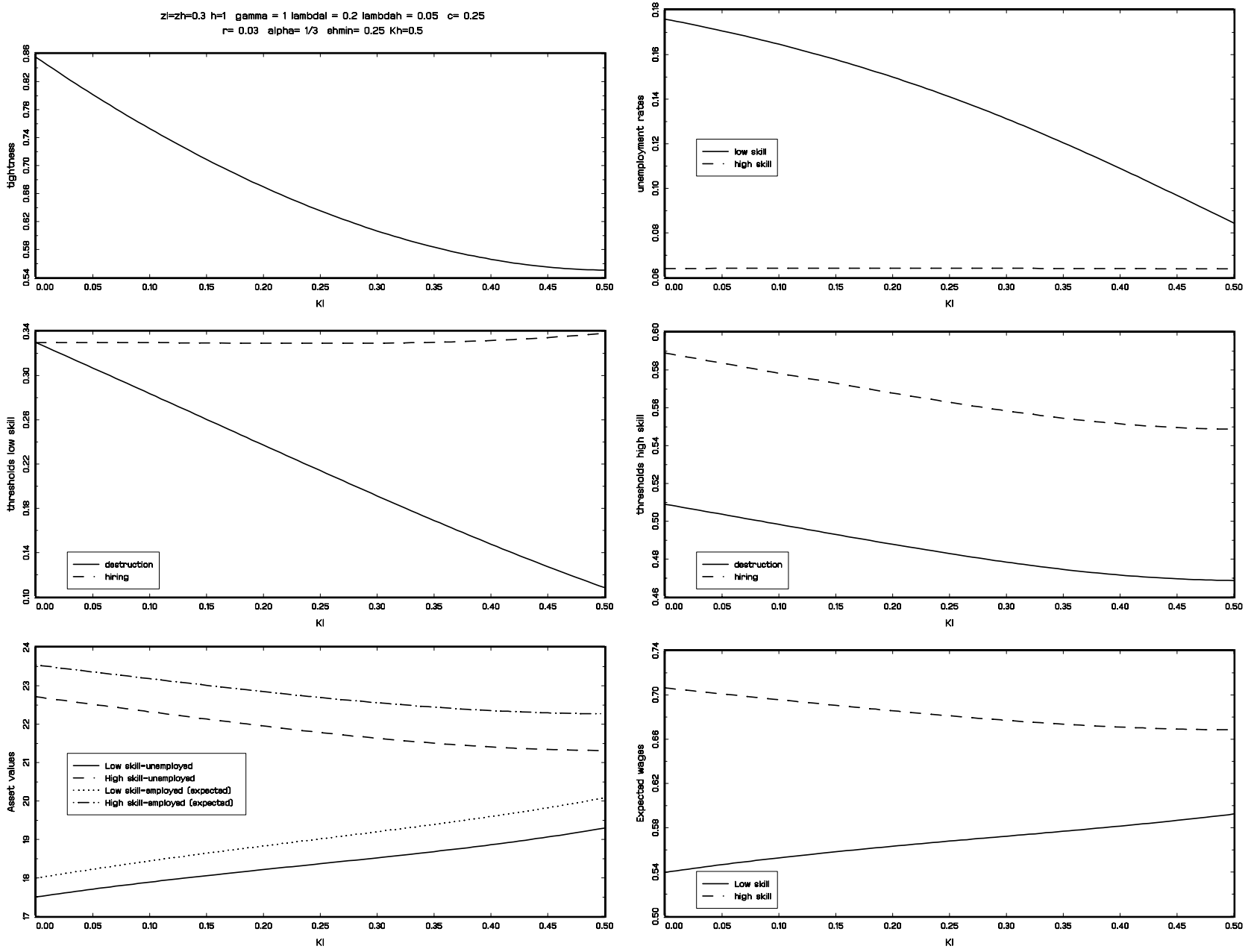
Figure 4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