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Hiring and Firing Costs, Adverse Selection and Long-term Unemployment

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ABSTRACT

Hiring and Firing Costs, Adverse Selection and Long-Term Unemployment *

In this paper, we present a matching model with adverse selection that explains why flows into and out of unemployment are much lower in Europe compared to North America, while employment-to-employment flows are similar in the two continents. In the model, firms use discretion in terms of whom to fire and, thus, low quality workers are more likely to be dismissed than high quality workers. Moreover, as hiring and firing costs increase, firms find it more costly to hire a bad worker and, thus, they prefer to hire out of the pool of employed job seekers rather than out of the pool of the unemployed, who are more likely to turn out to be `lemons'. We use microdata for Spain and the U.S. and find that the ratio of the job finding probability of the unemployed to the job finding probability of employed job seekers was smaller in Spain than in the U.S.. Furthermore, using U.S. data, we find that the discrimination of the unemployed increased over the 1980's in those states that raised firing costs by introducing exceptions to the employment-at-will doctrine.

JEL Classification: E24, J41, J63, J64, J65, J71

Keywords: Adverse selection, turnover costs, unemployment, worker flows, matching models, discrimination

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NON TECHNICAL SUMMARY

Worker flows between employment and unemployment provide a picture of rigid labor markets in Europe compared to North America. Both the inflow and outflow rates from unemployment are much lower in Europe than in North America. Thus, while in Europe the risk of becoming unemployed is lower, the chance of finding another job is also much lower. On the contrary, in North America, there is a greater risk of becoming unemployed, but an unemployed person has a much better chance of being rehired quickly. In contrast, employment-to-employment flows appear to be quite similar in the two continents, indicating more dynamism in European labor markets than is often inferred from looking only at flows into and out of unemployment.

Our paper contributes to explaining the large differences between the flows into and out of unemployment but similar employment-to-employment flows in North America and Europe by linking this pattern of flows to labor market institutions. We present a model of adverse selection, in which hiring and firing costs reduce the hiring of both unemployed and employed job seekers, but in which the hiring of the former is more sensitive to increases in turnover costs than that of the latter. The matching model with adverse selection presented in this paper shows that being exposed to unemployment stigmatizes workers because, absent other signals, firms infer that unemployed workers are of lower quality. To the extent that wages move less than one to one with worker productivity, which is the case for most models of non-competitive wage formation, jobs held by high ability workers generate higher profits for the firm than jobs held by low ability workers. Consequently, when the firm faces a bad shock, the latter are more likely to be dismissed than the former. The market, thus, infers that the average quality of the unemployed is lower than the average quality of employed workers and, at the time of hiring, firms prefer to hire out of the pool of employed job seekers rather than out of the pool of the unemployed. The cost to the firm of having to regret its hiring choice because worker quality turns out to be too low is greater, the greater are hiring and firing costs. This is essentially an option value effect. Consequently, discrimination against unemployed job seekers is likely to be increasing in turnover costs. In the extreme case where hiring and firing costs are zero, firms always have the option of hiring a worker to observe his quality and getting rid of him if he turns out to be inadequate. In our model, we measure discrimination against the unemployed as the inverse of the ratio between the job finding rate of an unemployed job seeker and the job finding rate of an employed job seeker. We show that this ratio is typically decreasing with turnover costs, i.e., discrimination increases with hiring and firing costs.

In addition to their option value effect, turnover costs also have an effect on the composition of the inflow into unemployment. An increase in firing costs reduces the inflow of both good and bad workers into unemployment. If, at the margin, the inflow of bad workers is reduced more than that of good workers, then this composition effect tends to improve the quality of the pool of unemployed job seekers, and to reduce discrimination against the unemployed. In that case, the net effect of firing costs on discrimination is ambiguous. In the opposite case, the composition effect reinforces the option value effect and firing costs unambiguously increase discrimination against the unemployed. We show that, under reasonable assumptions about the distribution of firm-specific productivity shocks, this is indeed the case. Moreover, we show that the composition effects of turnover costs have the opposite sign from those of other labor costs.

This model helps to explain the functioning of European and North American labor markets. In North America, low firing costs make firms less choosy in terms of whom to hire and fire and firms are, thus, less likely to discriminate between employed job seekers and unemployed workers. This is consistent with the high flows into and out of unemployment in North America. In Europe, where hiring and firing costs are high, firms use employment status as a signal of worker quality and they prefer hiring employed job seekers instead of the unemployed. This is consistent with our evidence from microdata for the U.S. and Spain, the two OECD countries with the least and most strict job-security provisions. Our results indicate that, controlling for a number of characteristics, the job finding probability of unemployed workers relative to employed job seekers, our inverse measure of discrimination of the unemployed, is smaller in Spain than in the U.S.. Moreover, we use the temporal variation in job-security provisions in the U.S., together with the variation in legislative changes across states, to examine how the job finding probabilities of the unemployed relative to employed job seekers changed as firing costs increased in the U.S. over the 1980's. We find that discrimination increased over the 1980's in the U.S. in those states that raised firing costs by introducing exceptions to the employment-at-will doctrine.

1 Introduction

Worker flows between employment and unemployment provide a picture of rigid labor markets in Europe compared to North America. Both the inflow and outflow rates from unemployment are much lower in Europe than in North America.[1] Thus, while in Europe the risk of becoming unemployed is lower, the chance of finding another job is also much lower. On the contrary, in North America, there is a greater risk of becoming unemployed, but an unemployed person has a much better chance of being rehired quickly.[2] In contrast, employment-to-employment flows appear to be quite similar in the two continents, indicating more dynamism in European labor markets than is often inferred from looking only at flows into and out of unemployment.[3]

Our paper contributes to explaining the large differences between the flows into and out of unemployment but similar employment-to-employment flows in North America and Europe by linking this pattern of flows to labor market institutions. We present a model of adverse selection, in which hiring and firing costs reduce the hiring of both unemployed and employed job seekers, but in which the hiring of the former is more sensitive to increases in turnover costs than that of the latter. The matching model with adverse selection presented in this paper shows that being exposed to unemployment stigmatizes workers because, absent other signals, firms infer that unemployed workers are of lower quality. To the extent that wages move less than one to one with worker productivity, which is the case for most models of non-competitive wage formation, jobs held by high ability workers

[1] The inflow rates are 2.1% and 1.8% and the outflow rates are 37% and 23% in the U.S. and Canada, respectively. These inflow and outflow rates compare to 0.6% and 2% in Spain, 0.4% and 6% in Italy, 0.3% and 4% in France, 0.2% and 6% in the Netherlands, 0.6% and 9% in Germany, 0.2% and 19% in Portugal, 1.7% and 18% in Denmark, 0.4% and 10% in Belgium and 0.7% and 10% in the U.K. (OECD, 1995).

[2] In fact, it is these very large differences in outflow rates which are very important in explaining the incidence of long-term unemployment in Europe compared to North America. The shares of the long-term unemployed (defined as those unemployed for more than a year) are 50.1% in Spain, 57.7% in Italy, 34.2% in France, 52.3% in the Netherlands, 40.3% in Germany, 43.4% in Portugal, 25.2% in Denmark, 52.9% in Belgium, and 42.5% in the U.K.. In contrast, the long-term unemployed account for only 11.7% and 14.1% of all unemployed workers in the U.S. and Canada, respectively (OECD, 1995).

[3] Yearly employment-to-employment flows as a percentage of total employment are 18.4% in Spain, 6.2% in Italy, 8.7% in France, 11.6% in the Netherlands, 11.4% in Germany, 15.8% in Portugal, 13.3% in Denmark, 9.5% in Belgium, 10.2% in the U.K., and 12.6% in Canada (Boeri, 1999).

generate higher profits for the firm than jobs held by low ability workers. Consequently, when the firm faces a bad shock, the latter are more likely to be dismissed than the former. The market, thus, infers that the average quality of the unemployed is lower than the average quality of employed workers and, at the time of hiring, firms prefer to hire out of the pool of employed job seekers rather than out of the pool of the unemployed. The cost to the firm of having to regret its hiring choice because worker quality turns out to be too low is greater, the greater are hiring and firing costs. This is essentially an option value effect. Consequently, discrimination against unemployed job seekers is likely to be increasing in turnover costs. In the extreme case where hiring and firing costs are zero, firms always have the option of hiring a worker to observe his quality and getting rid of him if he turns out to be inadequate. In our model, we measure discrimination against the unemployed as the inverse of the ratio between the job finding rate of an unemployed job seeker and the job finding rate of an employed job seeker. We show that this ratio is typically decreasing with turnover costs, i.e., discrimination increases with hiring and firing costs.

In addition to their option value effect, turnover costs also have an effect on the composition of the inflow into unemployment. An increase in firing costs reduces the inflow of both good and bad workers into unemployment. If, at the margin, the inflow of bad workers is reduced more than that of good workers, then this composition effect tends to improve the quality of the pool of unemployed job seekers, and to reduce discrimination against the unemployed. In that case, the net effect of firing costs on discrimination is ambiguous. In the opposite case, the composition effect reinforces the option value effect and firing costs unambiguously increase discrimination against the unemployed. We show that, under reasonable assumptions about the distribution of firm-specific productivity shocks, this is indeed the case. Moreover, we show that the composition effects of turnover costs have the opposite sign from those of other labor costs.

This model helps to explain the functioning of European and North American labor markets. In North America, low firing costs make firms less choosy in terms of whom to hire and fire and firms are, thus, less likely to discriminate between employed job seekers and unemployed workers. This is consistent with the high flows into and out of unemployment in North America. In Europe, where hiring and firing costs are high, firms use employment status as a signal of worker quality and they prefer hiring employed job seekers instead of the unemployed. This is consistent with our evidence from microdata for the U.S. and Spain, the two OECD countries with the least and most strict job-security provisions. Our results indicate that, controlling for a number of characteristics, the job finding probability of unemployed workers relative to employed job seekers, our inverse measure of discrimination of the unemployed, is smaller in Spain than in the U.S.. Moreover, we use the temporal variation in job-security provisions in the U.S., together with the variation in legislative changes across states, to examine how the job finding probabilities of the unemployed relative to employed job seekers changed as firing costs increased in the U.S. over the 1980's. We find that discrimination increased over the 1980's in the U.S. in those states that raised firing costs by introducing exceptions to the employment-at-will doctrine.

The rest of the paper proceeds as follows. In Section 2, we describe the related literature. In Section 3, we present and solve the matching model with asymmetric information. In Section 4, we contrast the comparative statics of the discrimination of the unemployed with respect to hiring and firing costs and with respect to wages. In Section 5, we present empirical evidence on the relation between hiring and firing costs and the discrimination of the unemployed described above. We conclude in Section 6.

2 Related Literature

The matching model with adverse selection developed in this paper contributes to the growing literature on the role of information asymmetries in the labor market. Previous papers that have studied the implications of private information by current employers vis-a-vis the market include Greenwald (1986), Gibbons and Katz (1991), Montgomery (1999), and Canziani and Petrongolo (1999).

Greenwald (1986) and Gibbons and Katz (1991) introduce the possibility that an employer has private information about the ability of current employees, vis-a-vis the market, and explore its implications for wages. In Greenwald's model, current employers with private information about the ability of their workers would focus on retaining 'good' workers. Thus, workers willing to move signal lower ability and future employers are only willing to hire them at lower wages. Instead of focusing attention on the branding effect faced by job-changers, Gibbons and Katz (1991) concentrate on the signal obtained by the market when workers are laid-off. Since being displaced by plant-closings provides no signal to prospective employers, Gibbons and Katz (1991) claim that these workers should suffer smaller wage losses than laid-off workers. They, then, present empirical evidence from the Displaced Workers Supplements of the CPS showing that, indeed, laid-off workers suffer greater wage losses and endure longer spells of unemployment than equivalent workers displaced by plant-closings. Our work is complementary to these papers, but it differs in that we develop a model that allows to study the implications of adverse selection on the flows into and out of unemployment. Moreover, while Gibbons and Katz (1991) contrasts the experience of laid-off workers with that of workers displaced by plant closings, this paper contrasts the experience of job-to-job switchers with that of workers going through unemployment.

Montgomery (1999) and Canziani and Petrongolo (1999) are closer to our paper. Both of these papers present equilibrium search models with asymmetric information and explore the role that hiring and firing costs play (Montgomery and Canziani and Petrongolo, respectively) on the level and composition of unemployment. As in Greenwald (1986) and Gibbons and Katz (1991), in these papers current employers have better information about workers than prospective employers and, thus, as they gather information they decide either to retain or to fire a worker. Prospective employers, thus, expect the pool of the unemployed to be of lower quality and this reduces firms' incentives to hire. Montgomery (1999) solves his model numerically and shows that firms always hire if the hiring cost is low enough, but that for higher levels of hiring costs there are cycles with periods over which firms do not hire at all and periods over which firms hire. Our paper differs from these papers in that the focus of these two papers is solely on the unemployed, in our paper we explore the consequences of adverse selection on the unemployed's job finding probability relative to employed job seekers and more generally on worker flows.

While the paper by Levine (1991) does not concentrate on the role of private information by current employers vis-a-vis the market, this paper considers asymmetric information between firms and workers when there are job-security provisions and is, thus, related to our paper. This paper provides an explanation for why it may be optimal to introduce just-cause employment policies when there is adverse selection. According to Levine (1991), firms may not have an incentive to introduce just-cause individually, because they may attract a disproportionate share of 'lemons' (who are then hard to fire). Thus, in Levine's paper, firms applying just-cause employment policies individually generate positive externalities on other firms and they may be reluctant to adopt them, although society may benefit as a whole from such policies. In contrast to Levine (1991), in our paper just-cause employment policies applied to all firms generate negative externalities on other firms since current employers with superior information about workers' abilities hug the good workers. Thus, hiring firms only have access to the poorer pool of unemployed workers and to the few good workers who move for exogenous reasons.

This paper also relates to the extensive literature that examines the link between firing costs and labor market performance. Unlike standard models of firing costs, however, our model can explain why the ratio of employment-to-employment flows to unemployment-to-employment flows is greater in Europe than in North America. Our adverse selection model with hiring and firing costs, thus, complements Bertola and Rogerson (1997) and Boeri (1999), which provide alternative models to explain why similar job reallocation in the two continents more often takes the form of employment-to-employment flows in Europe and of flows into and out of unemployment in North America.[4]

3 The Model

In the asymmetric information model presented in this Section, firms use discretion in terms of whom to fire and, thus, low quality workers are more likely to be dismissed than high quality workers. Therefore, the proportion of low quality workers is greater among the unemployed than among the employed, and prospective employers know it.

The model we present is based on Mortensen and Pissarides (1994), where, on the one hand, we have simplified some aspects to preserve analytical tractability, and, on the other hand, we have introduced dismissal costs and imperfect observability of worker quality in order to capture the phenomena discussed in the introduction.

[4]Bertola and Rogerson (1997) solve this puzzle by showing that if higher firing costs are accompanied by greater wage compression, this would tend to increase gross job turnover. They argue, however, that countries with stricter job security provisions would have lower flows into and out of unemployment because advance notice allows the better workers to find a new job before being displaced while the rest would have to pass through unemployment. Boeri (1999), instead, argues that high job turnover in Europe is consistent with low unemployment turnover, because many worker flows are shifts from job-to-job by workers holding temporary jobs who compete with the unemployed.

3.1 Assumptions

We make the following basic assumptions with regards to the information structure, the matching process, the production technology, firing costs and wages.

3.1.1 The Information Structure

The total labor force is normalized to one and split between two types of workers, 'good' and 'bad'. The proportion of workers who are 'good' is denoted by z. Prior to hiring, firms do not observe the quality of applicants, nor do they observe their past labor history. The only thing they observe is whether the applicant is currently employed or not. Immediately after hiring, however, firms observe the productivity of a worker.[5] We assume that the productivity of good workers is $\eta = \eta_H$ and the productivity of bad workers is $\eta = \eta_L$ for bad workers, with $\eta_H > \eta_L$.

3.1.2 The Matching Process

Workers are matched to firms and together they produce output. This matching process takes time. A job seeker meets a vacant job with probability a per unit of time, while a position meets a worker with probability λ per unit of time. For simplicity, we assume that a is exogenous, which corresponds to a matching function linear in the number of job seekers. If n is the total number of job seekers and v is the stock of vacancies, we then have $m(n, v) = m_0 n$ meetings per unit of time, so that $a = \frac{m(n,v)}{n} = m_0$, while $\lambda = \frac{m_0 n}{v}$. A more general matching function would yield a negative relationship between λ and a, while here that relationship boils down to a constant value of a.

3.1.3 Entry and Production

Firms freely enter the market by creating vacant positions. There is a fixed setup cost of creating a position equal to C. Because of free entry, the value

[5] This assumption is not meant to be realistic, but is simply made for convenience, as it reduces the number of individual states one has to keep track of. Ideally, one should specify a learning process about the worker's productivity as in the papers by Jovanovic (1979a, 1979b). However, given that we are not dealing with learning aspects, we keep that part of the model as simple as possible.

of an empty position must always be equal to C in equilibrium.

Once a position is filled, production takes place. The firm's output is $m + \eta$, where m is a firm-specific component and η is worker-specific. When the match is initially formed, the firm-specific component is equal to $\bar{m}$. Then, with probability γ per unit of time the firm is subjected to a shock such that the productivity of the firm changes. Every time such a shock occurs, the new productivity is drawn from a distribution over the interval $[\underline{m}, \bar{m}]$. We denote by $G(m)$ the cumulative density function and by $g(m)$ its derivative.[6]

3.1.4 Firing Costs

Production takes place until either the firm decides to close the position or the worker quits voluntarily. When hit by a shock, firms can decide to fire the worker, in which case they have to pay a tax F. This tax is dissipated, i.e. paid to a third party. When a firm decides to fire, the position is closed and the firm's value drops to zero. Moreover, production may also end when workers quit voluntarily. A fraction π of workers are constantly looking for another job. The day they leave to another job, the position becomes vacant and its value falls back to C. In addition, in the case of voluntary quits firms do not have to pay the tax, F.

3.1.5 Wages

Workers are paid a fixed wage w. More generally, it could also reflect their quality as well as the firm-specific component m. What really matters is that firms make lower profits out of good workers than out of bad quality ones.

In order to solve for the model, we first characterize the firm's firing decisions given the exogenous idiosyncratic shocks and the quality of workers. Then, given the firing rules, we determine the firms' entry decisions and their decisions of whether to hire employed and unemployed applicants. We always limit ourselves to steady states.

[6] New matches, thus, start at the highest possible productivity level as in Mortensen and Pissarides (1994).

3.2 Firing Decisions

Let $J(m, \eta)$ be the value to the firm of a job with worker-specific productivity η and firm-specific productivity m. Given that the residual value of firing the worker is zero, the firm will get rid of him whenever it is in a situation such that $J(m, \eta) < -F$.

Then, $J(m, \eta)$ evolves according to the following Bellman equation,

$$rJ(m,\eta) = (m+\eta-w)+\pi a(C-J(m,\eta))+\gamma\left[E_{m'}\max\{J(m',\eta),-F\} - J(m,\eta)\right]. \tag{1}$$

The second term of the RHS of (1) is the expected capital loss experienced by the firm if the worker quits, which happens with probability πa per unit of time. The last term is the expected capital gain associated with the next productivity shock, which shifts the value of m to m'.

Clearly, firing will take place if and only if m is lower than some critical value, which we call $m_c(\eta)$. If $J(\underline{m}, \eta) < -F$ then $m_c(\eta)$ is interior and satisfies $J(m_c(\eta), \eta) = -F$, otherwise $m_c(\eta) = \underline{m}$. The probability of firing a worker with quality η, conditional on having just being hit by a shock, is, thus, $G(m_c(\eta))$. Therefore, we have,

$$E_{m'}\max\{J(m',\eta),-F\} = -FG(m_c(\eta)) + \int_{m_c(\eta)}^{\bar{m}} J(m',\eta)g(m')dm'.$$

Integrating both sides of equation (1) between $m_c(\eta)$ and $\bar{m}$ we get that,

$$E_{m'}\max\{J(m',\eta),-F\} = \frac{\int_{m_c(\eta)}^{\bar{m}} (m'+\eta-w+\pi aC)\,g(m')dm' - (r+\pi a+\gamma)FG(m_c)}{r+\pi a+\gamma G(m_c)}. \tag{2}$$

Substituting this formula into equation (1) and computing it at $m = m_c(\eta)$, we get an equation that determines the optimal firing point $m_c(\eta)$, in the case when it is interior:

$$\begin{aligned} -F &= \frac{(r+\pi a+\gamma G(m_c(\eta))(m_c(\eta)+\eta-w+\pi aC)}{(r+\pi a)(r+\pi a+\gamma)} \\ &\quad + \frac{\gamma\int_{m_c(\eta)}^{\bar{m}} (m'+\eta-w+\pi aC)\,g(m')dm'}{(r+\pi a)(r+\pi a+\gamma)}. \end{aligned} \tag{3}$$

One can check that the critical value of m for both types of workers is interior if and only if:

$$-F < \frac{-\eta_H + w - \pi a C)}{(r+\pi a)} - \frac{(r+\pi a)\underline{m} + \gamma \int_{\underline{m}}^{\bar{m}} m' g(m') dm'}{(r+\pi a)(r+\pi a+\gamma)}, \qquad (4)$$

an assumption that we shall make since this is the only case of interest.

PROPOSITION 1 - Assume equation (4) holds. Then the firing margin, $m_c(\eta)$, that triggers the firm to fire a worker of quality η is determined uniquely. Furthermore, m_c is falling with η, falling with F, falling with C and increasing with w. Moreover, the firing margin of good workers is more responsive to changes in F, C, and w than the firing margin of bad workers,

$$\left|\frac{dm_c(\eta_L)}{dC}\right| < \left|\frac{dm_c(\eta_H)}{dC}\right|,$$

$$\left|\frac{dm_c(\eta_L)}{dw}\right| < \left|\frac{dm_c(\eta_H)}{dw}\right|,$$

and

$$\left|\frac{dm_c(\eta_L)}{dF}\right| < \left|\frac{dm_c(\eta_H)}{dF}\right|.$$

Equation (3) determines the firing points $m_c(\eta_H)$ and $m_c(\eta_L)$ as a direct function of the model's exogenous parameters. The greater sensitivity of the firing margin of good workers than of bad workers' with respect to changes in parameters comes from a discount effect. Because good workers are less likely to be fired, the income flows associated with employing a good worker are discounted less heavily, so that their total profitability is more sensitive to changes in parameters.

3.3 Hiring Decisions

We now compute the hiring decision of a firm faced with an applicant. The quality of the applicant is unobservable, but the status of the applicant is observable and provides a signal to the firm. Let z_e, respectively z_u, be the proportion of good workers among employed, respectively unemployed, job seekers. Then, the expected present discounted values associated with hiring an employed and an unemployed job seeker are,

$$\Pi_e = z_e J(\bar{m}, \eta_H) + (1 - z_e) J(\bar{m}, \eta_L),$$

$$\Pi_u = z_u J(\bar{m}, \eta_H) + (1 - z_u) J(\bar{m}, \eta_L).$$

One should note that J is increasing with η, while z_e must be greater than z_u, since as shown in Proposition 1 bad workers lose their jobs more often than good workers, i.e., $G(m_c(\eta_L)) > G(m_c(\eta_H))$. Consequently,

$$\Pi_e - \Pi_u = (z_e - z_u) \left(J(\bar{m}, \eta_H) - J(\bar{m}, \eta_L) \right) > 0 \Longrightarrow \Pi_e > \Pi_u.$$

As the average quality of employed workers is better than the average quality of the unemployed, the expected profits from hiring an employed job seeker are greater than those from hiring an unemployed worker. The firm will decide to hire the worker whenever $\Pi_i > C$, it will not hire him if $\Pi_i < C$, and it is indifferent if $\Pi_i = C$. Furthermore, in any reasonable steady state, some unemployed workers must be hired, otherwise unemployment will end up being equal to 100 % as long as there is some job destruction. Consequently, we must have $\Pi_u \geq C$ and we must, thus, distinguish between two regimes:

Regime 1 - If $\Pi_e > \Pi_u > C$, then all employed and unemployed applicants are hired.

Regime 2 - If $\Pi_e > \Pi_u = C$, then all employed applicants are hired, while unemployed applicants are only hired with probability p_u. There is discrimination against unemployed applicants.[7]

It is regime 2 which is of interest to us. In that regime, the quality of the unemployed z_u is pinned down by the requirement that $\Pi_u = C$.

It is useful to represent the hiring behavior in the (p_u, z_u) plane. There exists a unique value of z_u such that $\Pi_u = C$. This defines a horizontal line PP. Above that line, we have $\Pi_u > C$, implying that all unemployed applicants are always hired, and we are in Regime 1. Below that line we have $\Pi_u < C$, so that $p_u = 0$. Consequently, the economy must lie on the EB (economic behavior) locus as illustrated in Figure 1. Note, however,

[7] The lower hiring rate of the unemployed relative to employed workers reflects statistical discrimination against the unemployed, because firms use information about the average characteristics of this group and the group of employed job seekers to make their hiring decisions. In particular, firms use employment status as an imperfect predictor of actual productivity. For this reason, firms may fail to hire 'good' workers belonging to the pool of the unemployed, but they may end up hiring 'bad' workers belonging to the pool of employed job seekers.

that as argued above, the vertical portion $p_u = 0$ is of little interest, since it is associated with a 100% unemployment. The following Proposition shows the derivation of the EB locus.

PROPOSITION 2 - The optimal hiring behavior of the unemployed is given by a vertical portion at $p_u = 0$ for $\Pi_u < C$, a flat line at a unique $\overline{z}_u$ that satisfies $\Pi_u = C$, and a vertical portion at $p_u = 1$ for $\Pi_u > C$.

In regime 2, any parameter change that reduces profits increases the required quality for the unemployed to be hired. In particular, economic behavior requires for the quality of the unemployed to increase when labor costs increase in order for the profits out of an unemployed applicant to continue to cover the hiring costs. Proposition 3 proves this formally.

PROPOSITION 3 - The EB curve shifts upwards whenever F, C, or w increase.

Thus, an increase in labor costs increases the average quality of the unemployed that is required for firms to be willing to hire them. As we shall see below, in equilibrium these shifts must also be associated with greater discrimination in hiring against the unemployed, i.e., a fall in p_u.

3.4 Entry Decisions

Finally, the entry decision of firms determines the number of vacant jobs. The value of a vacant job V satisfies,

$$rV = \lambda_e(\Pi_e - C) + \lambda_u p_u(\Pi_u - C) \tag{5}$$

where λ_e and λ_u are the arrival rates of employed and unemployed job seekers, respectively. In equilibrium there are u unemployed workers and $\pi(1-u)$ employed job seekers. Therefore, $\lambda_e = \frac{\pi(1-u)}{u+\pi(1-u)}\lambda = \frac{\pi(1-u)}{u+\pi(1-u)}\frac{an}{v} = a\frac{\pi(1-u)}{v}$, while $\lambda_u = au/v$. In regime 2 the above equation boils down to,

$$rV = \lambda_e(\Pi_e - C), \tag{6}$$

since $\Pi_u = C$.

In equilibrium one must have $V = C$. If $V > C$, then, firms create more vacancies up to the point where the arrival rate of applicants has fallen to bring down V back to C. If $V < C$, vacancies are destroyed which increases the application rate of remaining vacancies, up to the point where the inequality is restored. The free entry condition therefore determines the vacancy rate v. Given the linearity of the matching function, it does not play any role in the rest of the analysis. Therefore, we can ignore equations (5) and (6), which simply determine v once the other endogenous variables have been solved for.[8]

3.5 Steady State Analysis

In the previous Section, we derived a relationship between p_u and z_u based on the economic behavior of firms. The joint determination of p_u and z_u is then completed by deriving a steady state relationship between the two. In steady state inflows into unemployment must be equal to outflows for each group of workers. The two steady state conditions for good and bad workers are,

$$\gamma G_H z_e (1-u) = a p_u u z_u, \tag{7}$$

$$\gamma G_L (1-z_e)(1-u) = a p_u u (1-z_u). \tag{8}$$

The left hand side of equation (7) is the inflow into unemployment for good workers. It is equal to the product of the arrival rate for shocks, γ, times the probability of a good worker of losing his job if his firm is hit by a shock, $G_H = G(m_c(\eta_H))$, times the number of good employed workers, $z_e(1-u)$. The right hand side is the outflow of good workers out of unemployment. It is equal to the product of the probability of finding an employer, a, times the probability of being hired if such an employer has been found, p_u, times the number of good unemployed workers, uz_u. A similar interpretation holds for equation (8), which applies to bad workers.

Finally, there must be a relationship between z_e, z_u, and u for the equilibrium to be consistent with the distribution of worker types in the workforce:

$$z_u u + z_e(1-u) = z \tag{9}$$

Equation (9) tells us that when adding the number of employed and unemployed good workers, we must find that it is equal to the total number of good workers in the economy, z.

[8] In the case where the economy is in Regime 2, for instance, we get:

$$v = \frac{\pi a (1-u) [z_e J(\bar{m}, \eta_H) + (1-z_e) J(\bar{m}, \eta_L)] - C}{rC}.$$

Equilibrium is then determined by conditions (3), equations (7)-(9), and the conditions $p_u = 1$ and (5) or $\Pi_u = C$ and (6), depending on whether we are in Regime 1 or Regime 2. These are seven equations, given that (3) yields one condition for each type of worker, and they determine the endogenous variables $m_c(\eta_H), m_c(\eta_L), z_u, z_e, p_u, u$, and v.

Eliminating z_e and u in (7)-(9) allows us to derive a steady state relationship that must hold between p_u and z_u.

$$z_u = z \frac{\gamma + ap_u/G_L}{\gamma + (z/G_L + (1-z)/G_H)ap_u}. \tag{10}$$

This equation determines the steady state (S-S) locus, which provides a condition between p_u and z_u, such that the composition of employed and unemployed workers remains time invariant. Proposition 4 shows that the S-S locus is downward sloping.

PROPOSITION 4 - Equation (11) determines a downward sloping steady state (S-S) locus in (p_u, z_u) space.

Why is S-S downward sloping? A downward sloping S-S curve implies that the more choosy employers are (the lower p_u), the better the quality of the unemployed in steady state. This is because a lower exit from unemployment makes the steady state composition of the unemployment pool more similar to its source population - the employed. In the extreme case where $p_u = 0$, no unemployed worker ever finds a job, and eventually all the employed end up on the dole, including all of the good ones. Thus, the economy ends up in a situation where the whole workforce is unemployed, and z_u is equal to its maximum value, z.

The equilibrium is determined by the point where the S-S curve crosses the EB curve. Thus, which regime prevails depends on whether the S-S locus cuts the EB locus along its horizontal or vertical portions. If the S-S curve cuts the EB curve along its horizontal portion, then the equilibrium is as in Figure 2.a. In this case, firms are less willing to hire unemployed applicants than employed job seekers. If the S-S locus cuts the EB locus above its horizontal portion PP, however, then as shown in Figure 2.b firms would never discriminate against the unemployed, i.e., $p_u = 1$. Finally, if the S-S locus starts below PP, then as shown in Figure 2.c even if the quality of the unemployed were as high as z, firms would not recoup their job creation costs. Then, no unemployed worker would ever be hired, i.e., $p_u = 0$, and the equilibrium would be associated with a 100 % unemployment rate. We assume that the η's are large enough to rule out this uninteresting situation.

4 Labor Costs and Discrimination of the Unemployed

In this section, we perform some comparative statics exercises to examine how discrimination against the unemployed responds to changes in hiring and firing costs as well as wages. In the previous Section we showed that bad workers are fired more often than good workers and, thus, the pool of the unemployed is disproportionately composed of 'lemons'. For this reason, at the time of hiring firms use employment status as a signal of quality and they are more reluctant to hire unemployed workers compared to employed job seekers. In this Section, we show that increases in hiring and firing costs exacerbate the discrimination against the unemployed, while large enough reductions of hiring and firing costs may completely eliminate discrimination against unemployed workers. The reason for this is that if hiring and firing costs are nil, firms can always hire workers to sample their quality and fire them at no cost. In contrast, when hiring and firing costs are high, firms are reluctant to hire unemployed workers who are more likely to turn out to be 'lemons' and, thus, to have to be fired eventually when hit by a shock. As shown in this Section, however, the impact of hiring and firing costs on the discrimination of the unemployed contrasts with the impact of wages on discrimination.

4.1 Comparative Statics of Hiring and Firing Costs

We start by considering comparative statics exercises with respect to hiring and firing costs, C and F. As proved in Proposition 3, increases in C and F shift the EB curve upwards. This reflects the fact that to be compensated for the increase in costs, firms require a better average quality of unemployed applicants. As Figure 2.a makes clear, if the S-S locus did not move, in steady state this can only occur if p_u falls, i.e., if firms discriminate more against the unemployed. However, the S-S locus does move, because increases in C and F affect the firing margins $m_c(\eta_H)$ and $m_c(\eta_L)$ and, consequently, the composition of the inflow into unemployment. Both the inflow of good workers and the inflow of bad workers are reduced. If the latter were reduced much more than the former, then this would tend to increase the quality of the unemployed. The S-S locus would then move up and while z_u would unambiguously increase, p_u might either rise or fall. That is, the increase in firing costs makes firms more choosy but at the same time it improves the average quality of job losers by enough so that they do not have to discriminate more against the unemployed. Whether this occurs or not clearly depends on the local density of good and bad workers around the firing margins. However, we are able to prove that, under reasonable conditions, the S-S curve actually shifts downwards, so that an increase in firing cost unambiguously reduces p_u.

PROPOSITION 5 - If the distribution G satisfies the nonincreasing hazards property, i.e.,

$$\frac{g(m)}{G(m)} \text{ is nonincreasing with } m,$$

the S-S locus moves down when the hiring and firing costs, C and F, increase.

Proposition 5 tells us that an increase in hiring and firing costs would lower the quality of the pool of the unemployed, absent any change in firm's hiring policies. This is because, in relative terms, the job loss rate of good workers falls more than the job loss rate of bad workers. This comes from two effects. First, as we saw in Proposition 1, the firing margin for good workers is more sensitive to changes in F and C than the firing margin for bad workers, because of the lower discounting of the option value. Second, if the nonincreasing hazards assumption holds, a given change in the firing margin has a greater relative effect on the number of people being fired, the lower that number of people. Because a lower fraction of good workers is fired, if the nonincreasing hazards assumption holds, a given reduction in the cutoff firing productivity will lower that fraction proportionately more for good workers than for bad workers, which contributes to reducing the average quality of job losers. Of course, the nonincreasing hazards assumption need not hold, but it holds for a wide range of distributions, including the uniform distribution and any distribution such that the density $g(.)$ is decreasing with m (more generally, any distribution that does not have an accentuated interior mode).

Figure 3 shows how the hiring rate of the unemployed changes when the hiring and firing costs increase, under the nonincreasing hazards assumption. In this case, higher hiring and firing costs make firms more reluctant to hire the unemployed and reduce the job finding rate of the unemployed relative to that of employed job seekers. Thus, increases in hiring and firing costs exacerbate discrimination in hiring against unemployed workers (i.e., lower p_u).

In contrast, the following Proposition shows that if hiring and firing costs are low enough, discrimination against the unemployed would disappear.

PROPOSITION 6 - Assume $\bar{m} + \eta_H > w$. There exists $\bar{C}, \bar{F} > 0$ such that if $C \leq \bar{C}$ and $F \leq \bar{F}$, then in equilibrium $p_u = 1$.

The property that $\bar{m} + \eta_H > w$ implies that it is at least profitable for firms to employ good workers in the best possible state, otherwise nobody is ever hired and p_u is indeterminate. Thus, Propositions 5 and 6 together tell us that a large enough reduction in hiring and firing costs would eliminate the discrimination against unemployed workers. Figure 4 shows that a large reduction in hiring and firing costs would shift the EB curve sufficiently downwards and move the S-S curve sufficiently upwards to eliminate discrimination, (i.e., $p_u = 1$).

4.2 Comparative Statics of Wages

The impact of hiring and firing costs on the hiring rate of the unemployed contrasts with the impact of recurrent labor costs, such as wages, on the hiring rate of unemployed workers. An increase in wages, as increases in hiring and firing costs, shifts the EB locus upwards as it requires an increase in the average quality of the unemployed. If the S-S locus did not move, then the rise in wages would imply an increase in discrimination against the unemployed in equilibrium, i.e., a fall in p_u. However, the increase in wages also changes the firing margins for good and bad workers. In particular, the inflow into unemployment of both good and bad workers increases. If the inflow of the former increased by more, then the increase in wages would increase the quality of the unemployed and this would reduce the need to discriminate against them. Proposition 7 shows that when the nonincreasing hazards assumption holds, the increase in wages improves the quality of the unemployed and moves the S-S locus upwards.

PROPOSITION 7 - If the distribution G satisfies the nonincreasing hazards property, i.e.,

$$\frac{g(m)}{G(m)} \text{ is nonincreasing with } m,$$

the S-S locus moves up when wages, w, increase.

Proposition 7 tells us that an increase in wages would raise the quality of the pool of unemployed workers absent any change in firm's hiring policies. Contrary to increases in turnover costs, wage increases rise the firing margins and since the job loss rate is more sensitive for 'good' than for 'bad' workers the average quality of the unemployed improves. Figures 5.a and 5.b show how the hiring rate of the unemployed changes when wages increase, under the assumption of nonincreasing hazards. In this case, higher wages may make firms more or less choosy in terms of hiring and may thus reduce (see Figure 5.a) or increase (see Figure 5.b) the job finding rate of the unemployed relative to employed job seekers. This is because higher wages make firms more careful at the time of hiring (i.e., the upward shift of the EB locus), but higher wages also improve the pool of the unemployed thus reducing the need to discriminate against them (i.e., the upward movement of the S-S locus). Thus, wage increases exacerbate the discrimination against the unemployed (i.e., reduce p_u) if the EB locus shifts more than the S-S locus. This may occur if there is a substantial productivity differential between 'good' and 'bad' workers, which makes the hiring behavior respond more strongly to changes in labor costs. However, a rise in wages may also end up reducing discrimination against the unemployed (i.e., increasing p_u) if the S-S locus moves more than the EB locus. This may occur if the arrival rate of job opportunities is large, since the improvement in the pool of the unemployed would then make it easier for firms to find one of these 'good' workers. Thus, while greater hiring and firing costs unambiguously increase discrimination, the effect of higher wages on the discrimination of the unemployed is ambiguous. For this reason, in the next Section we focus our empirical analysis on the impact of turnover costs on the hiring probabilities of the unemployed relative to employed job seekers.

5 Empirical Analysis of Unemployed-Employed Differences in Job Finding Probabilities

In this Section, we provide evidence that the ratio of job finding probabilities of unemployed workers relative to employed job seekers decreases as firing costs increase. This ratio is equal to the parameter p_u in our model.[9] In

[9] To be precise, the job finding probability for an unemployed is ap_u and the job finding probability for an employed worker is $a\pi p_e$, where π is the probability that an employed worker seeks new employment and $p_e = 1$ since firms make strictly positive profits out of hiring employed job seekers. Thus, the ratio of the job finding probability of unemployed workers over the job finding probability of employed job seekers is $\frac{ap_u}{a}$, which is simply the parameter p_u.

Section 4, we showed that, discrimination disappears, i.e., $p_u = p_e = 1$, for low enough levels of hiring and firing costs and that, under general conditions about the distribution of the shocks, discrimination against the unemployed becomes greater as hiring and firing costs increase, i.e., p_u decreases as C and F increase.

In the empirical analysis below, we examine how the difference in the job finding probabilities of unemployed workers and employed job seekers responds to increases in firings costs. First, using U.S. data, we exploit the temporal variation in just-cause dismissal legislation together with the variation in the strictness of the legislation across states to study how the unemployed-employed difference in job finding probabilities changed over the 1980's with these changes in firing costs. Second, using microdata for the U.S. and Spain, the two OECD countries with the least and most strict job security legislation, we compare the difference in the job finding probability of unemployed workers relative to employed job seekers between the two countries.

5.1 Reduced-form Specification

In this section, we present a reduced form specification that allows us to estimate the difference in the job finding probability of unemployed workers relative to unemployed workers and, more importantly, to examine the change in this difference as firing costs increase.

In the discrete choice model we estimate below, the dependent variable y takes the value of 1 if the person was successful in finding a job within a given time interval and the value of zero otherwise.[10] In the model in Section 3, success in finding a job depends on the contact rate (a), on the offer rate (p_u and p_e for unemployed and employed workers, respectively), and on the acceptance rate (which is simply equal to 1 in the model). According to the model, thus, what generates differences in job finding rates between the two groups is the difference in the offer probabilities between the two groups, p_e and p_u.[11] Moreover, as explained in Section 3, firms extend a job offer if the expected profits out of hiring an applicant are greater than or equal to the

[10] In the empirical analysis below, we consider transitions within yearly intervals.

[11] Of course, in reality there are also differences in the contact rate and the acceptance rate between unemployed workers and employed job seekers, which must be taken into account. In the analysis below, thus, we control for a number of variables that affect the contact and the acceptance rates.

hiring cost, and it does not make a job offer if the expected profits fall below the hiring cost:

$$y = \begin{array}{ll} 1 & \text{if } EJ_s \geq C. \\ 0 & \text{otherwise.} \end{array}$$

Letting $EJ_s - C$ be a continuous random variable, it can be expressed as a linear function of a vector of explanatory variables, X, and an indicator of whether the job applicant is unemployed, U, and a random term, v, i.e., $EJ_s - C = y^* = \beta X + \delta U + \nu$. Then,

$$y = \begin{array}{ll} 1 & \text{if } y^* = \beta X + \delta U + \nu \geq 0, \\ 0 & \text{if } y^* < 0. \end{array}$$

Thus, if ν is assumed to be normally distributed, the probability of finding a job is,

$$\Pr(y = 1) = \Pr(\beta X + \delta U + \nu \geq 0) = \Phi(\beta X + \delta U).$$

The vector of $X's$ includes individual characteristics affecting the contact rate, the offer rate, and the acceptance rate of workers, including: age, education, occupation, industry, union status, tenure, gender, race, marital status, number of children, the wage (wage in the current job for employed job seekers and wage in the last job for the unemployed), and other income of the household. In addition, the local unemployment rate and gross domestic product are both included because they should affect the contact rate. The unemployment dummy is included because the model above tells us that employment status should affect the expected profits out of a new hire and, thus, the offer rate. In addition, employment status may also affect the contact rate if the unemployed can search more intensively for jobs than employed job seekers and it may affect the acceptance rate if the unemployed have different reservation wages from employed workers.[12]

More importantly, the results in Section 4 indicate that the cost of having to regret the hiring of a 'lemon' rises as hiring and firing costs increase. Moreover, since firms use employment status as a signal of quality, then the offer rate to the unemployed should fall relative to the offer rate to employed job seekers as firing costs rise. To examine whether in fact firing costs increase discrimination against the unemployed, we include an interaction of

[12]Note, however, that we try to include as many factors as are available in the data to control for differences in contact rates and acceptance rates among individuals.

the unemployment dummy with a job security legislation dummy. Thus, we estimate the following specification,

$$\Pr(y = 1) = \Phi(\beta X + \delta_0 U + \delta_1 U \text{x} JSL),$$

where JSL is a dummy which takes the value of 1 if the unemployed person is protected by job security legislation and 0 if the person is not covered by job security legislation. Since job security legislation increases severance payments and/or indemnities for unjust dismissals, then we should expect the coefficient on this interaction term to be negative.

5.1.1 Sources of Variation in Firing Costs

We take two approaches to study the impact of firing costs on the discrimination of the unemployed. First, we explore the impact of firing costs on the unemployed-employed differences in job finding probabilities by exploiting the varying strictness in job-security provisions across states over the 1980's in the United States. Second, we combine microdata from the U.S. and Spain, the two OECD countries with the least and most strict job security legislation, to compare the unemployed-employed differences in job finding probabilities between the two countries.

The rapid adoption of unjust dismissal legislation in different states in the United States over the 1980's implied a significant increase in firing costs for firms that had previously being subject to the employment-at-will doctrine. According to Dertouzos and Karoly (1992), the employment-at-will doctrine which was first introduced in the U.S. in 1895 determined that "when the hiring is for an indefinite period of time, the employment relationship can be terminated at any time by either party for good cause, for bad cause or for no cause at all." This rule has dominated the employment relationship in the U.S. since the end of the 19th century. However, the late 1970's and especially the 1980's have witnessed a rapid increase in the introduction of exceptions to this rule that imposed dismissal costs differently across states. Moreover, the timing in the introduction of these exceptions has varied widely across states. While by 1979 only 20 states including, California, Idaho, Illinois, Indiana, Massachusetts, Michigan, New Hamphire, New York, Oklahoma, Oregon, Pennsylvania, Vermont, Washington State, and West Virginia had introduced some sort of exception to the employment-at-will doctrine, today only 6 states including, Delaware, the District of Columbia, Florida, Georgia, Louisiana, and Mississippi are still fully governed by the employment-at-will rule.

In addition, exceptions differ by whether the employee can recover compensatory damages associated with the employment contract (Contract Cause of Action) or whether the employee can also recover punitive damages and compensatory damages associated with emotional distress (Tort Cause of Action). Since Tort law is likely to impose a greater firing cost on the employer in the event that the court rules in favor of the worker, it is under Tort law that cases are more likely to be settled out of court. In our empirical analysis below, thus, we distinguish between these two types of exceptions by including an interaction of the unemployment dummy with a Contract dummy and another interaction with a Tort dummy. In addition, we include an specification that distinguishes among: Implied Contract exceptions, Public-Policy exceptions, and Good Faith exceptions. The Implied Contract exception determines that the "employment relationship is governed by contractual provision that place restrictions on the ability of the employer to terminate the employee under the employment-at-will rule." The Public-Policy exception instead imposes limits on dismissals by forbidding employers to terminate employees for refusing to commit unlawful acts. Finally, Good Faith exceptions while potentially the most far reaching are probably the hardest to prove in court since they rule that the covenant of good-faith and fair dealing must apply to any employment relationship governed by a contract. Thus, in our empirical analysis, we also distinguish among these different types of exceptions by including interactions of the Implied Contract, Public-Policy, and Good Faith dummies with the unemployment dummy.

In addition, we complement the analysis for U.S. states by using the large variation in firing costs between the U.S. and Spain, the two countries with the lowest and highest firing costs among OECD countries. The ILO ranks regulatory constraints as insignificant (0), minor for termination of regular contracts and for use of fixed-term contracts (1), serious (2), or fundamental (3). According to these rankings, the U.S.'s strictness is ranked at 0.4 and Spain's is ranked at 3.0 (Garibaldi, 1998).[13] Given the much higher restrictions on firing for Spanish employers compared to American employers, we should expect the difference in the job finding probability of the unemployed

[13]Italy and Portugal, like Spain, are also ranked at 3.0.

relative to employed job seekers to be greater in Spain.[14] We, thus, include an interaction term between the unemployment dummy and a Spanish dummy which captures stricter job security legislation.

5.1.2 Robustness Checks

In the specifications presented above, it is possible that the unemployed may have lower job finding probabilities relative to employed job seekers for reasons unrelated to firing costs. This may certainly be the case if the unemployed search less intensively or have higher reservation wages because of the receipt of generous unemployment benefits. To control for this possibility, we include an interaction term of the unemployment dummy with a dummy indicating whether the unemployed person received unemployment benefits. More importantly, however, our prediction is not on the ratio of job finding probabilities of the unemployed relative to employed job seekers, but on how this ratio responds to changes in firing costs. Thus, our test requires looking at the unemployment dummy interacted with firing costs rather than simply at the unemployment dummy.

It may be, however, that unemployed workers living in high firing cost states have lower job finding probabilities because of the high crime rates in these states or because of other factors present in these states but unrelated to firing costs. In order to control for this possibility, we introduce state fixed-effects in our specifications.

5.2 Data Description

We use panel data for the U.S. and Spain to examine how the difference in the job finding probability between unemployed and employed job seekers responds to changes in firing costs.

5.2.1 U.S. Data

The U.S. Data comes from the random sample of 6,111 individuals from the National Longitudinal Survey of Youth (NLSY) for the years 1979-84 and 1996. These years are chosen because in these years employed workers were

[14]This difference should be reduced, however, to the extent that firing costs increased in the U.S. with the introduction of the exceptions mentioned above and that firing costs fell in Spain with the introduction of temporary contracts.

asked about their job search activities. In particular, during these years the NLSY asked currently employed workers whether they were looking for another job. This data, thus, allows us to contrast employed and unemployed job seekers.

Moreover, the NLSY's work history file allows us to track employer-specific data and, thus, employment-to-employment switches can be correctly identified. For multiple job holders, the 'main job' was identified as the job in which the worker earned the most during that week. Moreover, we eliminated from our sample all observations with a real wage less than one dollar in 1979 dollars. Workers in the public sector and agriculture were also eliminated from the sample since we want to concentrate on workers employed by profit-making firms and subject to the exceptions described above when applicable. Those serving in the military were also excluded from the sample. In addition, while the youngest person in the NLSY enters the sample at 14, we restrict our sample to include workers 17 years of age or older. The oldest workers reach age 39 in our sample period. Since observations are defined by search spells of employed and unemployed workers, an individual worker can contribute more than one observation if, for example, the worker is unemployed during two or more sample years or if the worker is an employed job seeker in one sample year and unemployed in another.[15] For this reason, in the estimations below we correct for heteroskedasticity and we present robust standard errors.

Very importantly, we use the 1979 NLSY Geocode file which was released with special permission from the Bureau of Labor Statistics under their confidentiality policy. The Geocode file is crucial to generate the job security legislation dummies as it identifies the state of residence of each individual at the time of the interview. Moreover, the Geocode file provides information on the 'unemployment rate for the labor market of current residence', which corresponds to the unemployment rate in the metropolitan statistical areas for those living in these areas and to the unemployment rate in the state, calculated using the population in the state and substracting those living in metropolitan statistical areas, for those living outside of them. In addition, we include an aggregate measure of Gross Domestic Product obtained from the OECD's Main Economic Indicators, which is imputed for each of the

[15] In our U.S. estimations, which control for all factors mentioned above, the sample is restricted to 4,776, while in our joint U.S.-Spain estimations the U.S. sample has 10,172 observations.

years used in order to control for aggregate trends.

Finally, the NLSY not only includes information on education, and demographic and family characteristics, but it also includes detailed information about jobs including the wage, union status, industry, occupation, and tenure in the current and previous jobs. We use the information about the wage in the current and previous job for employed job seekers and unemployed workers, respectively. Finally, we include a measure of other household income which substracts the wage and unemployment benefits of the individual. Table 1 presents descriptive characteristics for the U.S. sample.

5.2.2 Spanish Data

The Spanish data come from the Spanish Labor Force Survey ('Encuesta de Población Activa') conducted every quarter on 60,000 households for six consecutive quarters. The survey is a rotating panel which replaces one sixth of the sample every quarter. Our sample corresponds to individuals who entered between 1987:2 and 1995:4 and who remained in the sample a year later. As in the NLSY, the Spanish Labor Force Survey asks currently employed workers whether they were looking for a new job. Thus, we extract data for those who are either unemployed or employed and currently looking for another job. Moreover, since the Survey asks for tenure in the current job, we can determine whether employed workers looking for another job a year before switched jobs or stayed in the same job. As for the U.S. sample, workers in the public sector and agriculture are eliminated, as well as those serving in the military. Even dropping those in the public sector and agriculture and those serving in the military, the Spanish sample has 64,211 observations.[16] Since this sample is a lot larger than the U.S. sample, we keep a 20% random subsample.[17] Table 2 reports descriptive characteristics for this random sample.

[16]For the joint U.S.-Spanish sample we are not able to include all of the explanatory variables mentioned above, since the Spanish Labor Force Survey does not include information on union status, wages, household income, and number of children for all of the survey years used.

[17]The Spanish random subsample has 9,628 observations with information on all of the variables needed to estimate the discrete choice model.

5.3 Results

In this Section we first present the results from the U.S. sample alone, which exploits the temporal and cross-section variation in firing costs in the U.S. over the 1980's. Then, we present the results from the U.S.-Spain comparison, which exploits the difference in firing costs between the two countries.

5.3.1 Exceptions to Employment-at-will in the U.S.

Table 3 presents the results of the reduced-form model for the U.S.. Column (1) shows the results for the baseline specification that includes the Contract and Tort law distinction, while Column (2) shows the results of the baseline specification with the distinction among Implicit Contract, Public-Policy, and Good Faith doctrines. Column (1) shows that unemployed workers living in Contract and Tort law states have a harder time finding employment relative to employed job seekers. In particular, the results indicate that unemployed workers living in Contract law states are 5.1% less likely to find employment relative to employed job seekers compared to unemployed workers living in states without exceptions (p-value 2.7). Also, unemployed workers living in Tort law states are 1.3% less likely to find a new job relative to employed job seekers compared to unemployed workers in states without exceptions, although the difference is not statistically significant at conventional levels. However, unemployed workers living in states where both Contract and Tort law applies are 6.4% less likely to find a job relative to employed workers compared to unemployed workers in states without any exceptions (p-value 5.1). Similarly, unemployed workers living in states where the Implicit Contract, Public-Policy and Good Faith doctrines all apply are 7.9% less likely to find a job than employed job seekers compared to unemployed workers in employment-at-will states (p-value 3.5).

Columns (3) and (4) show the results for the Contract-Tort law distinction and the distinction among doctrines, respectively, but now allowing for unemployment benefits to affect the job finding probability of the unemployed. As expected, the unemployed who receive unemployment benefits have a lower probability of finding jobs, but the difference with respect to non-recipients is only marginally significant (p-values of 11.4 and 12.6, respectively). More importantly, the difference between the job finding probability of the unemployed relative to employed job seekers between those in states with and without exceptions remains very similar. Column (3) shows that unemployed workers in states covered by Contract and Tort law are 6.3% less likely to find jobs than employed workers compared to the unemployed in employment-at-will states (p-value 6.4). Furthermore, even controlling for the receipt of unemployment benefits, we find that the job finding probability of unemployed workers where all doctrines apply is 7.7% lower relative to that of employed job seekers compared to unemployed workers in employment-at-will states (p-value 4.6).

Finally, in Table 4 we control for state fixed-effects, as it may be the case that unemployed workers are discriminated in states that have introduced unjust-dismissal legislation for reasons other than the presence of firing costs. The results show, however, that controlling for these fixed-effects strengthens our results. Column (1) in Table 4 shows that unemployed workers in Contract law and Tort law states are 5.5% and 4.6% less likely to find new jobs, respectively, than employed job seekers compared to the unemployed in states without exceptions. Both differences are now significant at conventional levels (p-values of 5 and 10, respectively). Moreover, unemployed workers in states where both Contract and Tort law applies are 10.1% less likely to find a job relative to employed workers compared to unemployed workers in employment-at-will states (p-value 1.75). Column (2) in Table 4 shows equivalent results allowing for distinctions of different doctrines. The results show that unemployed workers covered by the Implied Contract doctrine are 8.7% less likely to find employment than employed workers compared to unemployed workers not covered by any doctrine (p-value 0.4). Also, unemployed workers covered by Public-Policy doctrine and Good Faith doctrine are 1.6% and 1.4% less likely to find a new job than employed workers compared to those not covered by these doctrines, although the differences are not statistically significant at conventional levels. Nonetheless, unemployed workers covered by all three doctrines are 12.8% less likely to find new employment than employed job seekers compared to the unemployed not covered by any doctrine (p-value 0.7).

To summarize, our results indicate that the unemployed found it increasingly hard to find employment relative to employed workers over the 1980's in the U.S. in those states that introduced exceptions to the employment-at-will doctrine. The results, thus, suggest that discrimination against the unemployed increased in the U.S. as firing costs increased during the 1980's.

5.3.2 U.S.-Spain Comparison

Table 5 presents the results from the combined samples for the U.S. and Spain. Column (1) presents the results for the baseline model including all those variables which can be controlled for and a country fixed-effect. The results indicate that unemployed workers in Spain are 13.5% less likely to find a job relative to employed job seekers compared to American unemployed workers (p-value 0). Column (2) shows similar results but controlling for the possibility that unemployed workers are less likely to find a job simply because they receive unemployment benefits. The results show that Spanish unemployed workers are now 13.6% less likely to find new jobs relative to employed workers compared to American unemployed workers (p-value 0). Finally, since unemployment benefits are more generous in Spain, in Column (3) we allow for the effect of unemployment benefits to have a different effect on Spanish and American workers. Column (3) shows that the Spanish unemployed are now even less likely to find jobs relative to employed job seekers than the American unemployed. This is because unemployment benefits in Spain appear to help exiting unemployment faster than in the U.S., although the difference is not statistically significant. These results indicate that the Spanish unemployed are 14.1% less likely to find new employment than employed job seekers compared to American unemployed workers (p-value 0).[18] This evidence, thus, suggests that the unemployed are discriminated more in Spain than in the U.S., the two countries with the most and least strict job security provisions.

6 Conclusion

The matching model with asymmetric information presented in this paper shows that, under general assumptions about the distribution of the shocks, hiring and firing costs exacerbate the discrimination against the unemployed when there is adverse selection in the labor market. In contrast, wage increases may increase or reduce the discrimination against the unemployed. Our model, thus, predicts that employment-to-employment turnover should be large relative to unemployment turnover in states with high hiring and

[18] Althougth the ratio of job finding probabilities of unemployed to employed job seekers is significantly lower in Spain than in the U.S., this difference is likely to be mitigated by the extensive use of temporary contracts in Spain which allow firms to reduce firing costs.

firing costs. Evidence from microdata for Spain and the U.S. shows that the job finding probability of the unemployed relative to employed job seekers, our inverse measure of discrimination of the unemployed, was lower in Spain than in the U.S.. Moreover, we find that the discrimination of the unemployed increased in the U.S. over the 1980's in those states that raised firing costs by introducing exceptions to the employment-at-will doctrine.

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Appendix A: Theoretical Appendix

A.1. Proofs of Propositions

PROOF OF PROPOSITION 1 - The RHS of equation (3) is increasing in the firing margin $m_c(\eta)$, so that equation (3) determines m_c uniquely. Differentiating the RHS of equation (3) with respect to the firing margin, $m_c(\eta)$, we get $r + \pi a + \gamma G(m_c(\eta)) > 0$. Differentiating, then, with respect to F, C, w, and η we get,

$$\frac{dm_c}{dF} = -\frac{(r + \pi a + \gamma)(r + \pi a)}{(r + \pi a + \gamma G(m_c(\eta))} < 0,$$

$$\frac{dm_c}{dC} = -\frac{(r + \pi a + \gamma)\pi a}{(r + \pi a + \gamma G(m_c(\eta))} < 0,$$

$$\frac{dm_c}{dw} = \frac{(r + \pi a + \gamma)}{(r + \pi a + \gamma G(m_c(\eta))} = -\frac{dm_c}{d\eta}.$$

This proves the signs of the derivatives. Furthermore, given that $\frac{dm_c}{d\eta} < 0$ and, thus, $m_c(\eta_H) < m_c(\eta_L)$, the denominators are greater for $\eta = \eta_L$ than for $\eta = \eta_H$, which proves that there is a greater response of $m_c(\eta_H)$ to changes in F, C, and w than of $m_c(\eta_L)$. Q.E.D.

PROOF OF PROPOSITION 2 - Π_u can be written as a function of z_u and the exogenous parameters of the model. $J(m, \eta)$ can be computed by substituting equation (2) into equation (1), and it only depends on $m_c(\eta)$ and on exogenous parameters. Given that $m_c(\eta)$ is a sole function of such parameters, Π_u can be written as a function of z_u and exogenous parameters,

$$\begin{aligned}
\Pi_u &= z_u J(\bar{m}, \eta_H) + (1 - z_u) J(\bar{m}, \eta_L) \\
&= z_u \Big[\frac{(\bar{m} + \eta_H - w + \pi aC)}{(r + \pi a + \gamma)} + \frac{\gamma \int_{m_c(\eta)}^{\bar{m}} (m' + \eta_H - w + \pi aC)\, g(m')dm'}{(r + \pi a + \gamma)\,(r + \pi a + \gamma G(m_c(\eta_H))} \\
&\quad - \frac{\gamma F G(m_c(\eta_H))}{(r + \pi a + \gamma G(m_c(\eta_H))}\Big] \\
&\quad + (1 - z_u)\Big[\frac{(\bar{m} + \eta_L - w + \pi aC)}{(r + \pi a + \gamma)} + \frac{\gamma \int_{m_c(\eta)}^{\bar{m}} (m' + \eta_L - w + \pi aC)\, g(m')dm'}{(r + \pi a + \gamma)\,(r + \pi a + \gamma G(m_c(\eta_L))} \\
&\quad - \frac{\gamma F G(m_c(\eta_L))}{(r + \pi a + \gamma G(m_c(\eta_L))}\Big] \qquad (11)
\end{aligned}$$

Furthermore, $\frac{\partial \Pi_u}{\partial z_u} = J(\bar{m}, \eta_H) - J(\bar{m}, \eta_L) > 0$. Therefore, in regime 2 there exists a unique value of $\overline{z}_u$ such that the condition $\Pi_u = C$ is matched. Q.E.D.

PROOF OF PROPOSITION 3 - Totally differentiating the expression $\Pi_u = C$ from Proposition 2, we obtain that the derivatives of the second and third terms in the brackets with respect to $m_c(\eta)$ cancel each other out. Thus, the effects of F, C,and w on z_u reduce to the direct effects of these parameters on profits,

$$\frac{\partial z_u}{\partial F} = \frac{\gamma \left[z_u \frac{G(m_c(\eta_H))}{(r+\pi a+\gamma G(m_c(\eta_H))} + (1-z_u) \frac{G(m_c(\eta L))}{(r+\pi a+\gamma G(m_c(\eta_L))} \right]}{(J(\bar{m}, \eta_H) - J(\bar{m}, \eta_L))} > 0,$$

$$\frac{\partial z_u}{\partial C} = \frac{1 - \pi a \left[z_u \frac{1}{(r+\pi a+\gamma G(m_c(\eta_H))} + (1-z_u) \frac{1}{(r+\pi a+\gamma G(m_c(\eta_L))} \right]}{(J(\bar{m}, \eta_H) - J(\bar{m}, \eta_L))} > 0,$$

$$\frac{\partial z_u}{\partial w} = \frac{\left[z_u \frac{1}{(r+\pi a+\gamma G(m_c(\eta_H))} + (1-z_u) \frac{1}{(r+\pi a+\gamma G(m_c(\eta_L))} \right]}{(J(\bar{m}, \eta_H) - J(\bar{m}, \eta_L))} > 0. \text{ Q.E.D.}$$

PROOF OF PROPOSITION 4 - Differentiating equation (11) with respect to p_u, shows that the sign of the slope is equal to the sign of the following expression,

$$\frac{\partial z_u}{\partial p_u} \propto \gamma a z (1-z) \left(\frac{1}{G_L} - \frac{1}{G_H} \right),$$

which is negative since $G_H < G_L$. Q.E.D.

PROOF OF PROPOSITION 5 - Differentiating equation (10), while holding p_u constant, we find that the direction of the move of the S-S locus in response to an increase in F and an increase in C are of the same sign as,

$$\frac{\partial z_u}{\partial F} \propto -\gamma \left[\frac{g_L}{(G_L)^2} \frac{\partial m(\eta_L)}{\partial F} - \frac{g_H}{(G_H)^2} \frac{\partial m(\eta_H)}{\partial F} \right] - \frac{a p_u}{G_H G_L} \left[\frac{g_L}{G_L} \frac{\partial m(\eta_L)}{\partial F} - \frac{g_H}{G_H} \frac{\partial m(\eta_H)}{\partial F} \right],$$

$$\frac{\partial z_u}{\partial C} \propto -\gamma \left[\frac{g_L}{(G_L)^2} \frac{\partial m(\eta_L)}{\partial C} - \frac{g_H}{(G_H)^2} \frac{\partial m(\eta_H)}{\partial C} \right] - \frac{a p_u}{G_H G_L} \left[\frac{g_L}{G_L} \frac{\partial m(\eta_L)}{\partial C} - \frac{g_H}{G_H} \frac{\partial m(\eta_H)}{\partial C} \right].$$

We know from Proposition 1 that $0 > \frac{\partial m(\eta_L)}{\partial F} > \frac{\partial m(\eta_H)}{\partial F}$ and $0 > \frac{\partial m(\eta_L)}{\partial C} > \frac{\partial m(\eta_H)}{\partial C}$. Thus, given that $G_L > G_H$ and the nonincreasing hazards assumption, $\frac{\partial z_u}{\partial F}$ and $\frac{\partial z_u}{\partial C}$ are clearly negative. Q.E.D.

PROOF OF PROPOSITION 6 - At $C = F = 0$, One has $J(\bar{m}, \eta_H) > -F = 0 = C$ and $J(\bar{m}, \eta_L) \geq -F = 0 = C$, implying $\Pi_e > 0 = C$ for all z_e.[19] Therefore one is always in Regime 1. By continuity, this property holds in the neighborhood of $\bar{C} = \bar{F} = 0$. Q.E.D.

PROOF OF PROPOSITION 7 - Differentiating equation (10), while holding p_u constant, we find that the direction of the shift of the S-S locus in response to an increase in w is of the same sign as,

$$\frac{\partial z_u}{\partial w} \propto -\gamma \left(\frac{g_L}{(G_L)^2} \frac{\partial m(\eta_L)}{\partial w} - \frac{g_H}{(G_H)^2} \frac{\partial m(\eta_H)}{\partial w} \right) - \frac{a p_u}{G_H G_L} \left(\frac{g_L}{G_L} \frac{\partial m(\eta_L)}{\partial w} - \frac{g_H}{G_H} \frac{\partial m(\eta_H)}{\partial w} \right).$$

We know from Proposition 1 that $\frac{\partial m(\eta H)}{\partial w} > \frac{\partial m(\eta_L)}{\partial w} > 0$. Thus, given that $G_L > G_H$ and the nonincreasing hazards assumption, $\frac{\partial z_u}{\partial w}$ is clearly positive. Q.E.D.

[19] Equation (1) was derived in the case where $J(m, \eta) \geq -F$. If applying equation (1) yields a value lower than $-F$, then $J(m, \eta) = -F$.

A.2. The EB and S-S Curves

Figure 1: EB Locus

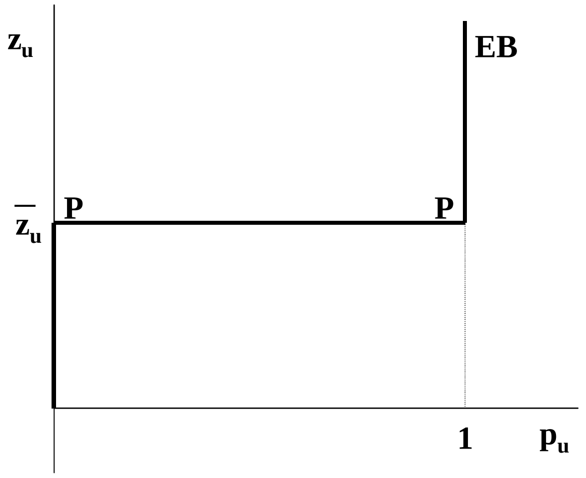


Figure 2.a: Equilibrium

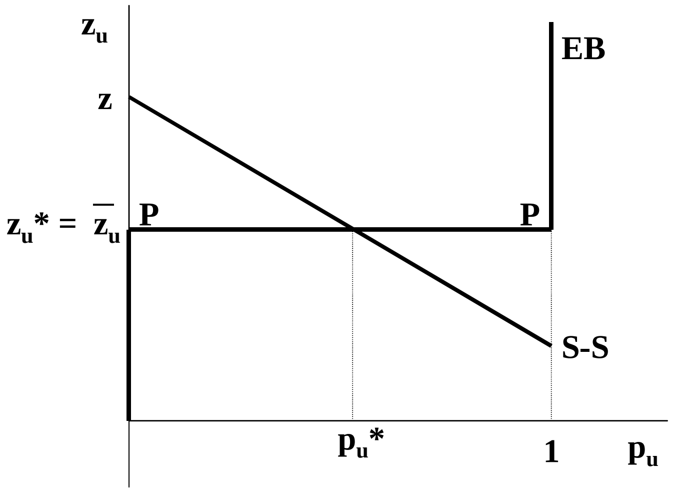


Figure 2.b: Equilibrium

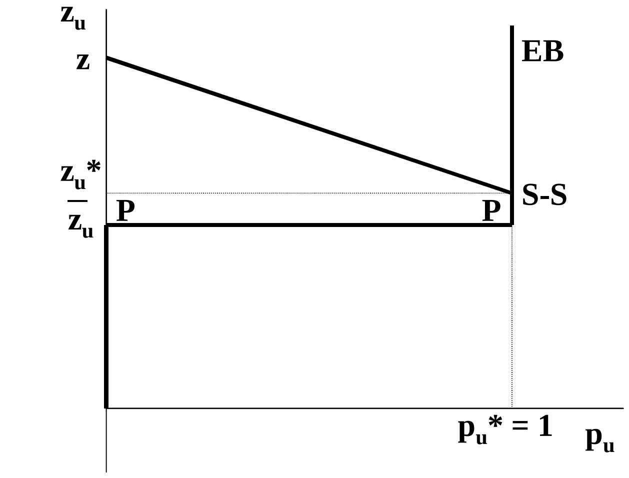


Figure 2.c: Equilibrium

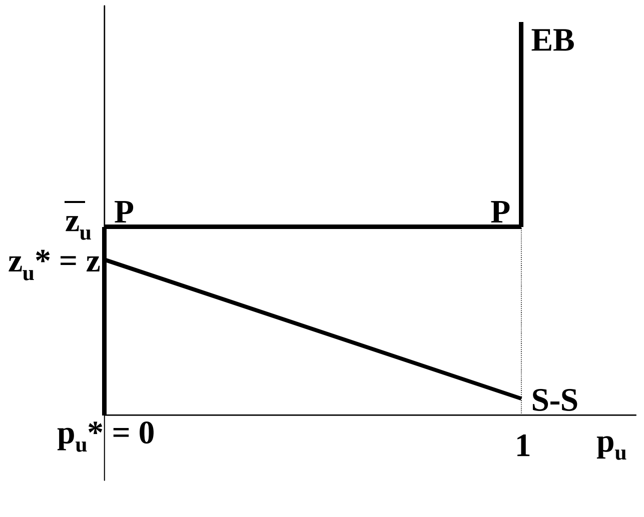


Figure 3: Comparative Statics of Increases in C and F

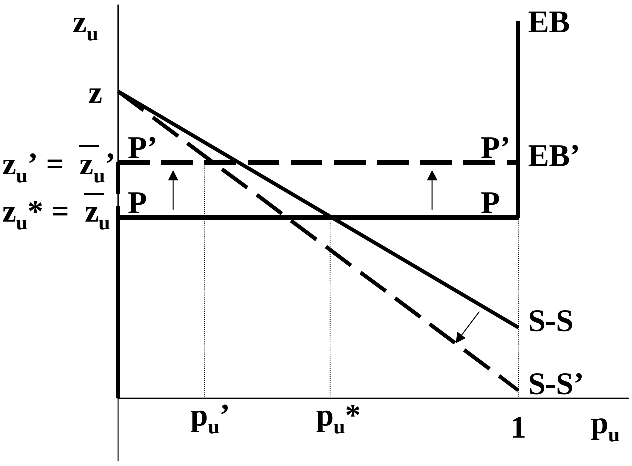


Figure 4: Comparative Statics of Reductions in C and F

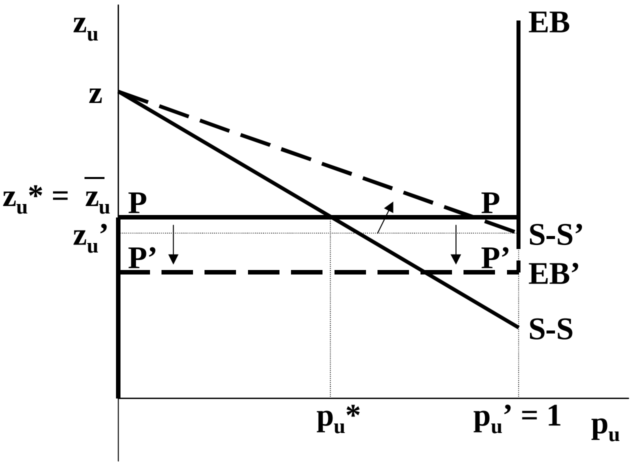


Figure 5.a: Comparative Statics of Increases in w

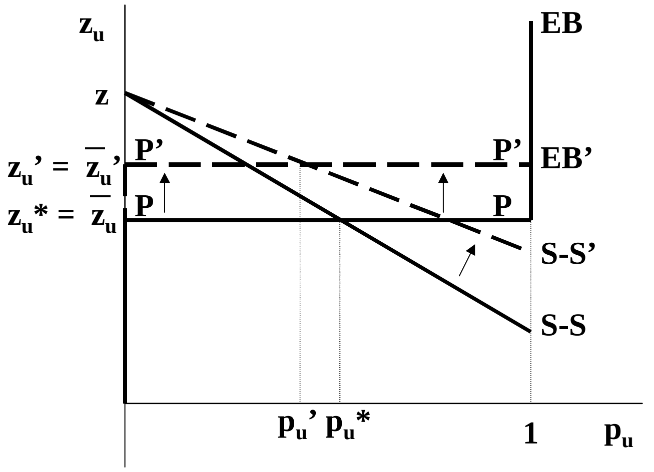
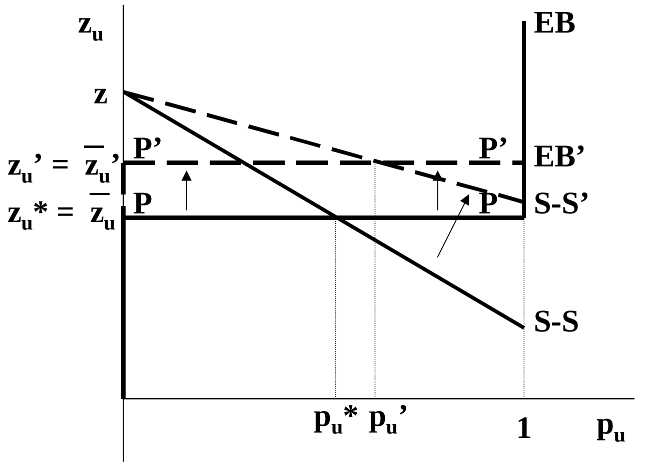


Figure 5.b: Comparative Statics of Increases in w



Appendix B: Empirical Appendix

Table 1: Descriptive Statistics from the Geocode NLSY

Variable	Mean or Proportion	Std. Dev.
Age	22.2584	(4.5564)
Age 16-19 Years	27.22	
Age 20-34 Years	68.06	
Age $>$ 35 Years	4.72	
Years of Education	12.0819	(1.9401)
Elementary Education	4.03	
High School Education	69.52	
University Education	26.45	
Male	58.98	
Married	22.04	
No. of Children	44.6501	(0.8769)
White-Collar	60.07	
Manufacturing Workers	28.57	
Unionized	16.31	
Tenure in Weeks	40.0435	(25.8064)
Real Weekly Wage	520.7971	(474.9081)
Other Household Income	16,183.97	(25,438.35)
Unemployed	41.47	
Local Unemployment Rate	8.8118	(3.5994)
GDP	9,711,181	(131,000,000)
Covered by Contract Law	40.37	
Covered by Tort Law	43.03	
Covered by Implicit Contract Doctrine	35.71	
Covered by Public-Policy Doctrine	49.23	
Covered by Good-Faith Doctrine	16.59	

Table 2: Descriptive Statistics from the Spanish Labor Force Survey

Variable	**Proportion**
Age 16-19 Years	9.03
Age 20-34 Years	35.01
Age > 35 Years	55.96
Elementary Education	53.54
High School Education	38.90
University Education	7.56
Male	47.92
Married	56.30
White-Collar	50.48
Manufacturing Workers	38.87
Unemployed	86.55

Table 3: Job Finding Probabilities in the U.S.[20]

Variable	(1)	(2)	(3)	(4)
Age 20-34	0.0347**	0.0350**	0.0371**	0.0373**
	(0.0178)	(0.0177)	(0.0178)	(0.0178)
Age 35	0.1530*	0.1545*	0.1545*	0.1559*
	(0.0425)	(0.0425)	(0.0425)	(0.0426)
Man	0.0124	0.0122	0.0118	0.0117
	(0.0163)	(0.0164)	(0.0164)	(0.0164)
Married	0.0189	0.0188	0.0211	0.0209
	(0.0194)	(0.0194)	(0.0194)	(0.0194)
Education	0.0079†	0.0078†	0.0080†	0.0079†
	(0.0046)	(0.0046)	(0.0046)	(0.046)
White-Collar	-0.0233	-0.0228	-0.0264	-0.0254
	(0.0190)	(0.0190)	(0.0191)	(0.0191)
Manufacturing	-0.0573*	-0.0574*	-0.0546*	-0.0547*
	(0.0573)	(0.0183)	(0.0184)	(0.0184)
Local	-0.0007*	-0.0007*	-0.0007*	-0.0007*
Unemployment	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Unemployed	0.4014*	0.4008*	0.4114*	0.4108*
	(0.0271)	(0.0273)	(0.0288)	(0.0291)
Unemployed x	-0.0514**		-0.0497**	
Contract Law	(0.0225)		(0.0225)	
Unemployed x	-0.0135		-0.0127	
Tort Law	(0.0225)		(0.0225)	
Unemployed x		-0.0644*		-0.0622**
Implicit Contract		(0.0246)		(0.0247)
Unemployed x		-0.0039		-0.0038
Public-Policy		(0.0251)		(0.0250)
Unemployed x		-0.0114		-0.0392
Good-Faith		(0.0327)		(0.0249)
Unemployed x			-0.0403	-0.0392
UI Benefits			(0.0249)	(0.0249)
Log-Likelihood	-2,629.77	-2,628.19	-2,628.32	-2,626.82

[20] The reported probits also include: a white dummy, other race dummy, number of children, union status, tenure, wage, other income, and GDP. The sample size is 4,776. Robust standard errors are in parenthesis. * denotes significance at the 1% level, ** denotes significance at the 5% level, and † denotes significance at the 10% level.

Table 4: Fixed-Effects Job Finding Probabilities in the U.S.[21]

Variable	(1)	(2)
Age 20-34	0.0386**	0.0392**
	(0.0178)	(0.0178)
Age 35	0.1556*	0.1577*
	(0.0429)	(0.0429)
Man	0.0092	0.0088
	(0.0166)	(0.0181)
Married	0.0252	0.0242
	(0.0196)	(0.0196)
Education	0.0078†	0.0077†
	(0.0046)	(0.0046)
White-Collar	-0.0297	-0.0293
	(0.0194)	(0.0194)
Manufacturing	-0.0522*	-0.0522*
	(0.0186)	(0.0186)
Local	-0.0009*	-0.0009*
Unemployment	(0.0003)	(0.0003)
Unemployed	0.4307*	0.4288*
	(0.0298)	(0.0302)
Unemployed x	-0.0554**	
Contract Law	(0.0273)	
Unemployed x	-0.0464†	
Tort Law	(0.0277)	
Unemployed x		-0.0871*
Implicit Contract		(0.0281)
Unemployed x		-0.0168
Public-Policy		(0.0303)
Unemployed x		-0.0137
Good-Faith		(0.0416)
Unemployed x	-0.0444†	-0.0432†
UI Benefits	(0.0248)	(0.0248)
Log-Likelihood	-2,606.03	-2,603.67

[21] The reported probits also include: a white dummy, other race dummy, number of children, union status, tenure, wage, other income, and GDP. The sample size is 4,773. Robust standard errors are in parenthesis. * denotes significance at the 1% level, ** denotes significance at the 5% level, and † denotes significance at the 10% level.

Table 5: **U.S.-Spain Comparison of Job Finding Probabilities**[22]

Variable	**(1)**	**(2)**	**(3)**
Age 20-34	0.0862	0.0861	0.0868
	(0.0649)	(0.0647)	(0.0654)
Age 35	0.1059	0.1059	0.1065
	(0.0804)	(0.0809)	(0.0803)
Man	0.1203	0.1201	0.1201
	(0.0959)	(0.0959)	(0.0959)
Married	0.0607†	0.0606†	0.0609†
	(0.0323)	(0.0322)	(0.0323)
High School	0.1491*	0.1489*	0.2118*
Education	(0.0179)	(0.0179)	(0.0109)
University	0.2113*	0.2116*	0.2118*
Education	(0.0106)	(0.0110)	(0.0109)
White-Collar	0.0078*	0.0076*	0.0074*
	(0.0001)	(0.0001)	(0.0001)
Manufacturing	0.0026*	0.0029*	0.0029*
	(0.0001)	(0.0002)	(0.0002)
Unemployed	0.3023*	0.3025*	0.3051*
	(0.0029)	(0.0033)	(0.0007)
Spain	0.0463	0.0470	0.0470
	(0.0476)	(0.0479)	(0.0478)
Unemployed x	-0.1352*	-0.1358*	-0.1409*
Spain	(0.0071)	(0.0065)	(0.0026)
Unemployed x		-0.0012	-0.0139
UI Benefits		(0.0028)	(0.0171)
Unemployed x			0.0184
UI Benefits x Spain			(0.0181)
Log-Likelihood	-11,578.49	-11,572.24	-11,571.79

[22] The sample size is 19,790. Robust standard errors are in parenthesis. * denotes significance at the 1% level, ** denotes significance at the 5% level, and † denotes significance at the 10% level.

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