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INSTITUTIONS AND LABOR REALLOCATION

Giuseppe Bertola
Richard Rogerson

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ABSTRACT

Despite stringent dismissal restrictions in most European countries, rates of job creation and destruction are remarkably similar across European and North American labor markets. This paper shows that relative-wage compression is conducive to higher employer-initiated job turnover, and argues that wagesetting institutions and job-security provisions differ across countries in ways that are both consistent with rough uniformity of job turnover statistics and readily explained by intuitive theoretical considerations. When viewed as a component of the mix of institutional differences in Europe and North America, European dismissal restrictions are essential to a proper interpretation of both similar patterns in job turnover and marked differences in unemployment flows.

Giuseppe Bertola
Dipartimento di Economia
Università di Torino
Via Po 53
I-10124 Torino
ITALY
and NBER
bertola@csi.it

Richard Rogerson
Department of Economics
University of Minnesota
Minneapolis, MN 55455
rogerson@plato.econ.umn.edu

1 Introduction

Much has been written about institutional differences between European and North American labor markets, and about their role in determining the large and persistent differences between European and U.S. unemployment rates over the last fifteen-twenty years. A conclusion common to many policy studies of European unemployment is that there is a need for increased "flexibility" in European labor markets. One dimension along which these labor markets differ is with regard to regulations regarding worker dismissal. Lazear (1990), for example, documents differences in regulations regarding advance notice and severance, and finds that such regulations are positively related to unemployment levels in panel estimation. Formal modeling of the effects of worker protection on employment, however, has not been so conclusive. It is easy to show that such restrictions affect hiring and firing in such a way as to induce opposing effects on total employment, and in fact the calibrated models of Bentolila and Bertola (1991) and Hopenhayn and Rogerson (1993) have opposite predictions as to the net employment effects of firing costs. Theory, however, offers unambiguous predictions as to the impact of such policies on labor market flows: both job creation and job destruction rates should be decreased by firing restrictions.

While aggregate cross-country evidence gives some support to such theoretical predictions,[1] available evidence on disaggregated job and worker flows is somewhat at odds with them. The intensity of labor reallocation is only very loosely related to other observable variables, and remarkably uniform across labor markets with very different job-security institutions (Garibaldi *et al.*, 1994; Alogoskoufis *et al.*, 1995). In light of the unambiguous predictions of theory, such findings may cast doubt on the quality of available data, or on the specification of theoretical models, or on the real-life relevance of job-security provisions. As shown by Lazear (1990), in a complete-market setting it would be possible to design a contract which effectively "undoes" legal restrictions mandating payments to workers upon dismissal. Besides such severance payments, job-security regulations often impose administrative costs on employers, and experience-rated payments to third-party agencies also induce deadweight losses from the perspective of a firm's relationship with its employees; still, the observed similarity of employment flows might be taken to indicate that Europe is

[1]Bertola (1990) finds that an index of job-security provisions is empirically associated to less pronounced employment fluctuations and to more pronounced cyclical productivity changes, which he interprets as resulting from labor-hoarding behavior by employers. Job security provisions have no strong empirical association to long-run unemployment levels across countries, to indicate that Lazear's (1990) findings along time-series dimensions may reflect reverse causation.

not as rigid in practice as the letter of its institutions would make it, perhaps because firms and workers successfully work around laws and regulations.

This paper argues that even if one's reading of the evidence is that turnover rates on either side of the Atlantic are roughly similar, it does not follow that worker dismissal regulations in Europe are irrelevant. The logic of our argument is very simple: all else being equal, dismissal restrictions should indeed lead to lower gross job turnover, but this need not be evident in the data if other institutional differences have the opposing effect. In actual fact, labor-market institutions differ across the Atlantic in important respects other than dismissal restrictions, and it is misleading to focus on a unidimensional characterization of institutional differences across European and North American labor markets.

Of particular importance is the fact that European wage negotiations are much more centralized and, inspired by the "equal pay for equal work" principle, naturally lead to greater uniformity of wages across employment establishments. We show that such wage compression would, by itself, tend to *increase* the the rate of job creation and destruction. The intuition for this is straightforward: if an individual firm's relative wage cannot depend on its relative business conditions, then its wage cannot decrease upon realization of a negative labor-demand shock, nor increase upon realization of a positive shock. In the absence of restrictions on layoffs, such idiosyncratic wage rigidity would imply more intense labor shedding (and more intense hiring) than in an otherwise similar economy where relative wage differentials and wage fluctuations are relatively unregulated. When institutions affecting employment and wages are jointly considered, therefore, the apparent similarity of job turnover rates across labor markets need not have any implications for whether dismissal restrictions alone do affect labor market allocations. Furthermore, we argue that cross-country differences in unemployment flows support the notion that firing restrictions do affect allocations. Whereas job turnover rates are similar across economies, the rate at which workers enter and leave unemployment is significantly greater in the U.S. as compared to Europe, and this is arguably consistent with more stringent advance-notice laws in Europe.

The outline of the paper follows. Section 2 sets up a model of idiosyncratic labor demand variability, formalizing in a simple setting the intuition for why the well-known international differences in the stringency of job security provisions should have important effects on job turnover. Section 3 briefly reviews available cross-country evidence on job turnover. Section 4 briefly discusses evidence on wage differentials in the U.S. and Europe, and Section 5 extends the model to allow for costly labor mobility and thereby generate wage dispersion across establishments in the absence of regulation. Within this setting we examine how

both firing costs and wage compression affect labor turnover, and derive our main result concerning the opposing effects of these two features on turnover. Section 6 argues that wage compression and dismissal restrictions may be thought of as complementary policies, and discusses the apparent effects of these policies for phenomena other than job creation and job destruction. Section 7 concludes.

2 Standard View of Firing Costs

In this section we lay out a simple model of job turnover and analyze the effects of firing costs on steady-state job turnover across establishments. Given our goal of illustrating the interaction of some very basic forces relevant to job turnover, we choose to carry out the analysis in an environment which is as simple as possible.

We begin with a discussion of the labor demand problem of a representative firm, or, equivalently from our perspective, a representative plant. We assume that there are a large number (in fact a continuum) of firms. Each firm has an identical production function which uses labor to produce a homogeneous good, but is subject to shocks to its marginal product of labor.[2] The process for these shocks is the same for all firms, but purely idiosyncratic: its realizations, denoted by α_t^i for firm i in period t, are independent across firms. The marginal product of labor at firm i and time t is denoted $\pi(l_t^i, \alpha_t^i)$, and is a decreasing function of (homogeneous) employment l_t^i. We let dismissal regulations take a very simple form: in each period a firm must pay a firing cost F per unit of employment decrease relative to the previous period, i.e., the firm incurs a cost equal to $\max(0, l_{t-1}^i - l_t^i)F$. We shall work under the assumption that F does not have a direct counterpart in direct payments to workers, although what matters is simply that this cost is not internalized by the employer-employee relationship. For simplicity we abstract from any costs associated with hiring or firing that do not reflect institutional differences across labor markets. We assume that each firm maximizes the expected present discounted value of profits net of firing costs, using an interest rate of r. We assume that workers are perfectly mobile across firms, so that in the competitive equilibrium there will be a single wage rate for all labor services. Our analysis will focus on a steady-state equilibrium in which aggregates, in particular the wage rate and interest rate, are constant over time.

Suppose for concreteness that the profit-maximizing employment level at given wages

[2]These shocks might reflect technological features of the economy, or fluctuations in the price of factors other than labor (e.g., energy) if factor intensities differ across firms. Alternatively, we could assume that firms produce differentiated products and shocks to consumer preferences generate relative price shocks.

is an increasing function of α, and let α follow a two-state Markov chain with symmetric transition probability p:

$$\alpha_{t+1}^i = \begin{cases} \alpha^G & \text{with prob. } p \text{ if } \alpha_t^i = \alpha^B, \text{ with prob. } (1-p) \text{ if } \alpha_t^i = \alpha^G \\ \alpha^B & \text{with prob. } (1-p) \text{ if } \alpha_t^i = \alpha^B, \text{ with prob. } p \text{ if } \alpha_t^i = \alpha^G. \end{cases} \tag{1}$$

Let the employment levels corresponding to $\alpha = \alpha^G$ and $\alpha = \alpha^B$ be l^G and l^B, respectively. We shall proceed under the assumption that parameters are such as to yield positive employment in both states and to generate job turnover, i.e., $l^G > l^B > 0$.

If the wage and the interest rate are fixed at $\bar{w}$ and r then, by (1), the expected present value of marginal revenue product minus the wage also follows a two-state Markov process. Its values V^G and V^B at a good and a bad firm, by definition, satisfy the relationships

$$\begin{aligned} V^G &= \pi(l^G, \alpha^G) - \bar{w} + \frac{1}{1+r}\left[(1-p)V^G + pV^B\right] \\ V^B &= \pi(l^B, \alpha^B) - \bar{w} + \frac{1}{1+r}\left[pV^G + (1-p)V^B\right]. \end{aligned} \tag{2}$$

The expressions V^G and V^B for the shadow value of labor are a sufficient statistic for a risk neutral employer's labor demand policy. At the margin, profit maximization implies that the shadow loss of net revenues from dismissing workers equals the actual cost of firing them ($V^B = -F$), and that $V^G = 0$. The equations in (2) can be solved to yield

$$\begin{aligned} \pi(l^G, \alpha^G) &= \bar{w} + \frac{p}{1+r}F, \\ \pi(l^B, \alpha^B) &= \bar{w} - \frac{r+p}{1+r}F. \end{aligned} \tag{3}$$

The above discussion focused on the decisions made by a particular firm which does reduce employment upon receiving a negative shock (but does not set it to zero), and increases it back upon the opposite transition. We next turn to characterizing the properties of some of the aggregates. In the steady-state of this economy, $\alpha_t^i = \alpha^G$ for 50% of the firms, and $\alpha_t^i = \alpha^B$ for the others. These frequencies correspond to the ergodic probability distributions of the symmetric Markov chain (1) and, since firms form a continuum, remain stable over time. In every period, a proportion p of the firms experience a change in productivity: at the same time as $p/2$ firms suffer a transition from high to low productivity, $p/2$ other firms enjoy the opposite transition. Net additions to employment at expanding establishments (i.e., job creation) is equal to $p(l^G - l^B)/2$, which is also equal to the net deletions to employment at

contracting establishments (i.e., job destruction).[3] The sum of job creation and destruction divided by total employment (N), denoted $\mathcal{M}$ and referred to as the rate of job turnover, is given by

$$\mathcal{M} \equiv \frac{p(l^G - l^B)}{N}. \tag{4}$$

Since in the steady-state there is no change in total employment, this measure is also equal to excess job turnover rate, which is the rate of job turnover less the absolute value of the change in total employment.

Until now we have made no mention of the labor supply side of the market. In a steady state, aggregate labor supply will be some function of the wage rate and the amount of transfers, e.g. profits, received by workers. The wage $\bar{w}$ may or may not be set so as to equate labor demand and supply at the aggregate level. Our analysis could handle any specification of income and substitution effects implicit in a labor supply function and, if combined with a suitable model of noncompetitive wage determination, it could account for persistent unemployment. Since our focus is on turnover rather than employment, however, we shall simply take as given the aggregate labor supply function and aggregate unemployment (if any), normalize N to unity, and abstract from any effects of F on steady-state employment.[4]

To illustrate the effects of firing costs on gross employment flows, it is simplest to use a linear specification for $\pi(\cdot,\cdot)$. As in Bertola and Ichino (1995), let the derivative of every firm's marginal revenue product with respect to employment be a constant β, i.e., $\pi(l_t^i, \alpha_t^i) = \alpha_t^i - \beta l_t^i$. We can then invert the labor-demand relationship in (3) to obtain

$$l^G = \frac{1}{\beta}[(\alpha^G - \bar{w}) - \frac{pF}{1+r}], \qquad l^B = \frac{1}{\beta}[(\alpha^B - \bar{w}) + \frac{(r+p)F}{1+r}], \tag{5}$$

and turnover, as defined in (4), is conveniently linear in F:

$$\mathcal{M} \;=\; \frac{p}{\beta}[(\alpha^G - \alpha^B) - \frac{2p+r}{1+r}F]. \tag{6}$$

The effect of firing costs upon gross job turnover is straightforward: a higher F is associated with a lower $\mathcal{M}$. In the next section we examine the empirical support for this prediction. Before looking at the evidence, however, we note a few simple extensions. Clearly, one could assume that the cost of dismissals consists of two components, one that reflects

[3] In the model there is no entry or exit of establishments, but in principle job creation and destruction do include employment changes associated with entry and exit.

[4] The employment effects of firing costs have been studied in isolation in several papers. See, for example, Bentolila and Bertola (1990) and Hopenhayn and Rogerson (1993).

the costs of making employment adjustments that are unrelated to government regulations, and the other part that reflects government regulations. Assuming that the first component is common across countries, the result obviously holds. Hiring costs could also be added without altering the conclusion. In the model above, there is no turnover of workers in excess of that required by job creation and job destruction. While this obviously oversimplifies reality, adding an exogenous component of labor turnover would not affect the qualitative prediction.[5]

Lastly, the model presented does not have entry and exit of establishments. If in reality it is possible for firms to at least partly avoid firing costs by closing down completely, then abstracting from entry and exit would overstate the extent of the effect of firing costs.[6]

3 Cross-national evidence on turnover intensity

A comparison of turnover in Europe and North America would seem to provide a good opportunity to assess the empirical relevance of the prediction obtained in the previous section, since it is well documented that European countries have much more stringent regulations concerning worker dismissal.[7] In this section we summarize what existing studies have to say about turnover levels in Europe vis-a-vis North America.

Most countries report information that relate to two different concepts of turnover. The first, denoted worker turnover, uses worker and/or establishment surveys to measure the movement of workers across establishments, and the second, denoted job turnover, uses establishment surveys to measure the movement of employment positions across establishments. It is important to stress that these two measures are not the same. For example, if two workers at different establishments switch places, then no change of employment positions is recorded across establishments, whereas there clearly is a change in workers across establishments. More generally, any worker separations that are replaced within the sample period do not show up as job turnover in establishment surveys.

[5]See, for example, Bentolila and Bertola (1990). Voluntary (costless) quits do matter for the quantitative effect of firing costs; in the limit, exogenous labor turnover could be so intense as to make firing costs irrelevant to the firm's problem. As argued by Davis and Haltiwanger (1992), however, job destruction is so concentrated and intense that it could not plausibly be accomodated by exogenous worker turnover.

[6]In fact, the available data do suggest that in some European countries creation and destruction are more heavily concentrated among closures and startups. As we discuss in the next section, however, serious measurement problems must be taken into account when interpreting such evidence.

[7]We do not attempt to review here the many legislative and contractual provisions that makes it difficult for European employers to dismiss redundant workers: see, among others, Lazear (1990), Bentolila and Bertola (1990), Bertola (1990).

As an empirical matter, the turnover of workers is much larger than the turnover of jobs. For example, Davis and Haltiwanger (1992) estimate for the US manufacturing sector that job creation and destruction account for between one third and one half of all worker turnover. A similar result was found by Lane, Stevens, and Burgess (1996) in an analysis of all private sector establishments in Maryland. Hamermesh, Hassink and van Ours (1994) found a similar result for a small random sample of establishments in the Netherlands.

Many factors may affect the excess of worker turnover over job turnover. The demographic characteristics of the labor force, for example, may have a large impact on the number of workers that move in and out of the labor force. The cross-sectional variance in wages for workers of a given type could also matter for worker quit rates, as wider wage dispersion would increase the returns to search beyond one's current job. Such factors are likely to differ across European and North American economies: we briefly comment on some comparative aspects of worker turnover below and in Section 6. The simple model of Section 2, however, takes as given (and normalizes to zero) the excess of worker turnover over job turnover. To evaluate the predictions of the model, accordingly, job turnover statistics are the appropriate measure of labor reallocation.

We focus on the largest industrial countries (excluding Japan, in consideration of its peculiar industrial organization and labor-market institutions) and on a period, the mid to late 1980s, for which the relevant data are readily available. As in Bertola (1990), the countries considered are ranked by job-security and general labor-market regulation in the Tables and Figures below. Grubb and Wells (1993, Table 9, "Protection of regular workers against dismissals") provide a suitable summary ranking for European countries, based on a careful evaluation of a variety of specific legal provisions. Consistently with common perceptions, the Italian and British labor markets are the most and least stringently regulated in this group; Germany and France are assigned intermediate ranks, the former appearing more regulated than the latter. In our analysis of the data, we proceed under the assumption that American labor markets are less regulated than European ones, and classify the Canadian labor market as no less regulated than the essentially fully flexible U.S. limit case.

Table 1 reports summary statistics for these countries. Both the rate of job creation (JC) and job destruction (JD) are generally much larger than net employment changes (ΔE), reflecting idiosyncratic labor demand variability. The data reveal no obvious cross-country differences in either the rate of gross job turnover (JT), or the rate of excess job turnover (ET). In Figure 1, gross job turnover statistics hover around 20% per year in all countries considered, without revealing any pattern when plotted against labor-market

regulation ranks.

There are some important measurement issues to be considered before too much weight is placed on this conclusion. First, there are many reasons to be concerned about idiosyncratic differences in data collection methods that may affect the reported statistics. A more detailed discussion of these issues is available elsewhere, e.g., the OECD Employment Outlook (1994) and Boeri (1996). Measurement criteria that differ across surveys in potentially important ways are the reporting agency (government vs. private firm); the unit of measurement (firm vs. plant); the definition of employment (all workers vs. full-time workers, point in time vs. time average); the frequency of measurement (which may give different weights to more or less persistent employment fluctuations); coverage of the sample (which may or may not include public enterprises, and smaller employment units). Unfortunately, it is difficult to gauge how important these factors may be.[8] Entry and exit of plants is an important components of overall job turnover in reality, as in the model of Hopenhayn and Rogerson (1993). Data including plant closures and openings, however, are more likely to be measured with error than data on employment contraction or expansion by existing plants only, since administrative sources may mistakenly register a simultaneous entry and exit when a plant changes ownership or classification.[9]

A related issue is that there may be important compositional effects that bias cross-country comparisons of aggregates. For example, job creation and destruction are lower in manufacturing, higher in services, and decreasing in establishment size and age. Again, however, it is difficult to gauge how important these factors may be. Data reported in the OECD Employment Outlook (1994) for manufacturing and services separately reinforces the message in Table 1, but all of the above mentioned caveats remain. Existing cross-country data on the size distribution of employment is not particularly comparable; there are problems of consistent definitions across countries and differences in sampling units. What data do exist suggest some differences. For example, Italy seems to have a relatively large share of employment accounted for by small establishments.[10]

[8]For the US there are several additional sources of information that provide a check on the number in Table 1. Leonard (1987) finds similar numbers for Wisconsin over the period 1978-1981. Based on a national manufacturing sample, Davis and Haltiwanger (1992) find numbers for manufacturing that are similar to those found by Leonard.

[9]Interestingly, when job turnover is measured on continuing firms only and some smaller European countries are included, the resulting pattern is somewhat clearer than that displayed in our Figure 1, and more supportive of standard predictions (Garibaldi *et al.*, 1994). This may indicate that measurement errors are indeed very important in entry and exit data, or that job security provisions lead firms to substitute more frequent entry and exit for (costly) labor turnover at existing firms.

[10]This may support the view that firing costs do have effects, since in many countries there a is a threshold

Although we believe that job turnover is the appropriate measure for assessing the model of the previous section, it is of interest to note some cross-country data on worker turnover. Some worker turnover measures do tell a slightly different story. For example, among manufacturing workers, the US does have much higher rates of worker turnover than do the European countries (see e.g., Tables 6.1 and 6.2 in the OECD Jobs Study). Furthermore, if one looks at distributions of job tenures, then one also finds that average job tenure is lower in the US and Canada than it is in European countries (see e.g., Table 6.3 in the OECD Jobs Study). Both of these statistics support the notion that there is less mobility of workers in Europe. However, data in Burda and Wyplosz (1994) for gross flows of workers finds little difference among the US, France, Germany and Italy. All of the same caveats mentioned above with regard to job turnover measures should be repeated here.

To summarize, although there is some evidence that the more highly regulated European economies do exhibit less worker mobility, there is no evidence that these differences are accounted for by differences in job creation and destruction. One cannot, however, rule out the possibility that better cross-country data would change this conclusion. There are many conclusions one may draw vis-a-vis the data just described and the model prediction in the last section. One may conclude that the job creation and destruction numbers are badly measured, and hence not place much weight on them. Or, one may conclude that the data support the view that regulations are not enforced and/or that workers and firms are able to circumvent them. Alternatively, since the prediction of the model in the previous section is a ceteris paribus result, one may argue that there are other differences across countries that are relevant to the pattern of job creation and destruction. These differences could take many forms, e.g., differences in the stochastic environment facing individual firms, or differences in other institutional features. Without discounting the first two possible conclusions, we think it is of interest to pursue the third conclusion. In what follows, we shall do so, and stress institutional differences relevant to firm level wage dynamics. In the next section we begin by presenting some evidence to motivate our analysis.

size before which many regulations do not apply. There is also evidence that larger firms have more stable employment in Italy than in the US. See e.g., Contini and Revelli (1993), and Gavosto and Sestito (1993).

4 Cross-country evidence on wage variability

If the technological characteristics parameterized by the shocks' size ($\alpha^G - \alpha^B$) and frequency p are similar in the U.S. and Europe, but the job-security provisions parameterized by F are much more stringent in the latter, why is it that measures of gross job turnover are so similar across the Atlantic? The view we put forward here is that it is misleading to characterize the differences between European and North American labor markets as only consisting of higher firing costs in Europe. Even a casual reading of the literature on cross country differences in institutions makes it clear that there are also very different practices regarding wage determination. In particular, wage setting is much more centralized in most European countries. These cross country differences in wage determination may lead to very different average wages, and thus potentially explain some of the differences in total employment across economies. The aspect on which we focus our study of turnover, however, is that greater centralization of wage setting is likely to imply greater uniformity of wages across firms for a given type of labor. This notion is certainly in line with much that has been written about labor market institutions in Europe.[11] Here, we just provide some simple quantitative indicators of the extent to which Europe and North America differ along this dimension.

Table 2 presents measures of cross country differences in overall wage dispersion. This evidence, like that on labor market flows in previous tables, is not immune from statistical problems. Observed wages, of course, depend on individual workers' characteristics: both the distribution of worker characteristics and the extent to which wages depend on them may differ across countries and over time, and it would be desirable to account for this before interpreting the evidence from the standpoint of a model which—like the one outlined above—treats all workers as homogeneous labor. Unfortunately, the quality of wage data does not make it possible to control appropriately for worker characteristics, particularly in European countries. What evidence is available on wage differentials "within" comparable worker groups, however, does not overturn the basic picture offered by the raw statistics in Table 2: wage inequality (especially at the low end of the distribution) is indeed higher in less regulated labor markets.[12]

[11] See, for example, the OECD Employment Outlook 1994 for comparisons of cross country differences in wage-setting institutions. The detailed country-specific studies in Freeman and Katz (1995) also provide information on such institutions and on the resulting extent of wage compression.

[12] See Bertola and Ichino (1995) and the papers in Freeman and Katz (1995) for evidence on "within" wage inequalities, and for discussions of inequality changes (which we disregard in our steady-state analysis).

While the wage-inequality evidence displayed in Table 2 and Figure 2 cannot be considered as definitive, available evidence is at least consistent with the notion that wages are more compressed in Europe.[13] In the next section we explore the consequences of a particular aspect of wage compression for gross job turnover. We postpone further discussion of the empirical support for this aspect of wage compression until after the model has been presented.

5 Policy Analysis With Costly Mobility

5.1 The Model

In this section we extend the model of Section 2 by assuming that mobility is costly for workers. Given that we will continue to assume competitive behavior on the part of workers and firms, a natural framework for our analysis is the "island" economy of Lucas and Prescott (1974). Each island would have a large number of firms, and idiosyncratic shocks are island specific. Moving from one island to another imposes a cost on the worker. To simplify the exposition, we shall normalize the number of firms on each island to one, and refer to the island specific shock as a firm specific shock.[14] The significance of this extension is that it generates the result that wages earned by homogeneous workers in equilibrium depend on the business conditions of the specific firm employing them.

With the above normalization, the demand side of the model is identical to that of the previous section, and we again normalize total employment to unity, abstracting from all issues of aggregate labor supply and unemployment determination. The labor force consists of a continuum of individual workers, each supplying one unit of homogeneous labor. As before, our analysis is concerned solely with steady-state equilibria. Previously, this entailed time invariant employment levels associated with the state of a firm, i.e., l^G and l^B. In the current environment, there will also be time invariant wages associated with the state of a firm, i.e., as in Lucas and Prescott (1974), in equilibrium there will be wage differentials associated with idiosyncratic shocks. We assume that workers take as given the wages w^G and w^B paid by "good" and "bad" firms and can move instantaneously across firms, but bear a cost κ if they do move.

[13] Recent work by Blau and Kahn (1996) finds similar results.

[14] As an alternative to this framework, one may suppose that productivity shocks are perfectly correlated across two or more independently managed firms engaging in Bertrand competition, and that intertemporal contracts cannot be enforced.

Mobility choices are made at the beginning of each period, after productivity states for the current period are revealed for each of the firms.[15] Workers are assumed to be risk neutral and infinitely lived, and we denote by W_t^j the human capital of a worker currently attached to a firm with shock j as of time t, i.e., the present discounted (at rate r) expected stream $\{w_t^j\}$ of his or her wages net of mobility costs.[16] In the remainder of this section we characterize the steady state wage and employment levels associated with the two productivity states. First note that, by definition,

$$W_t^j = \begin{cases} w_t^j + \frac{1}{1+r} E_t \left[W_{t+1}^j \right] & \text{if worker } j \text{ stays,} \\ w_t^j - \kappa + \frac{1}{1+r} E_t \left[W_{t+1}^j \right] & \text{if worker } j \text{ moves.} \end{cases} \tag{7}$$

Clearly, the option to move and pay the mobility cost κ may be attractive if moving increases current net income (i.e., $w^B < w^G - \kappa$) and/or increases the likelihood of "good" wages in the future (which is the case if $p < 1/2$, i.e., if the productivity-shock process has positive persistence).

The human capital W^B of a worker currently at a firm with a bad realization satisfies:

$$W^B = w^B + \frac{1}{1+r} \left[pW^G + (1-p)W^B \right] \tag{8}$$

if they choose to stay, and

$$W^B = w^G - \kappa + \frac{1}{1+r} \left[(1-p)W^G + pW^B \right] \tag{9}$$

if they choose to move.

If equilibrium entails positive employment at each firm type and positive turnover (i.e. $l^G > l^B > 0$), then wage differentials can be determined entirely from considering the worker's mobility decision. Indeed, if mobility (turnover) does take place in equilibrium and some workers choose to remain at firms with "bad" states, then both (8) and (9) must hold true, and simple manipulation gives:

$$w^G - w^B = k - \frac{1-2p}{1+r}(W^G - W^B). \tag{10}$$

[15] This is the same timing convention adopted in Bertola and Ichino (1995).

[16] Equivalently, we could assume that workers are risk averse but have access to complete markets and hence act so as the maximize the expected present discounted value of income. Below, we briefly discuss the implications of relaxing such convenient, but clearly unrealistic assumptions.

Thus, the equilibrium wage differential equals the mobility cost if $p = 0.5$, which is intuitive since the future then looks identical at both types of firms. In the more interesting case of positive persistence ($p < 1/2$), the "capital gain" term $W^G - W^B$ is also relevant and is readily computed. It is never optimal for a worker at a firm experiencing a good shock to move, so the human capital W^G of a worker in this situation satisfies

$$W^G = w^G + \frac{1}{1+r}\left[(1-p)W^G + pW^B\right]. \tag{11}$$

Equations (11) and (9) then yield

$$W^G - W^B = \kappa. \tag{12}$$

If mobility occurs in equilibrium, it does so up to the point where the mobility cost κ equals the "capital gain" reflecting (the expectation of) higher labor income in the future. Workers are effectively arbitraging across the income streams associated with the different types of firms, and in equilibrium the only differential in expected present discounted values that can exist are those less than or equal to the mobility cost.

Inserting (12) in (10), the wage differential between good and bad firms is

$$w^G - w^B = \frac{2p+r}{1+r}\kappa. \tag{13}$$

If $\kappa = 0$, this model reduces to the model discussed in the previous section; in particular there are no wage differentials. In the limit as p approaches 0 then $w^G - w^B = \kappa r/(1+r)$, the annuity value of the mobility cost. As p gets closer to 0.5, the mobility investment is more and more likely to be wasted ex-post, while the option to remain in a currently "bad" firm and hope for a positive productivity shock becomes increasingly attractive. Hence, as already noted above, current wage differentials must fully compensate for the moving cost in the $p = 1/2$ limit case.

Given the wage differentials derived above, the steady state employment levels of "good" and "bad" firms are readily computed from the firm's optimization problem. Under the convenient assumption that labor-demand schedules are linear, the procedure outlined in Section 2 can be slightly modified to allow for state contingent wages, and we obtain the following characterization of gross job turnover in the case of no firing costs:

$$\mathcal{M} = \frac{p}{\beta}[(\alpha^G - \alpha^B) - (w^G - w^B)], \tag{14}$$

or, using (13),

$$\mathcal{M} = \frac{p}{\beta}[(\alpha^G - \alpha^B) - \frac{2p+r}{1+r}\kappa]. \tag{15}$$

In the analysis that follows we will treat this as the benchmark case, i.e. we will think of the expression in (15) as the amount of gross job turnover that would occur in the absence of institutional restrictions on labor market price and quantity outcomes. We see that turnover is decreasing in the size of the wage differentials (or decreasing in the size of the moving cost since, all else being given, the wage differential is increasing in the size of the mobility cost). Before analyzing specific labor market policies, we note that the wage differentials generated by such a model are "dynamic", in the sense that they reflect individual workers' wage instability rather than permanent differences across heterogeneous workers' earnings potential. As suggested by Bertola and Ichino (1995), such phenomena may have become increasingly important in the United States, where both cross-sectional wage dispersion and the innovation variance of individual wage profiles have increased over the 1980s and 1990s (see, e.g., Gottschalk and Moffitt, 1994).

5.2 Policy Analysis

We examine two different policies in the context of the above model. One of the policies is the firing cost policy examined earlier; the second is a policy that restricts the size of the wage differential that is allowable across firms. One could motivate this restricted differential in several ways. One possibility is that wages are determined through a centralized system and all establishments in a given sector are required to pay the same wage, or wages within some prespecified band. Alternatively, it may be that unions simply place a wage floor on what wages can be paid by an establishment in a given industry: normalizing employment to one across policy regimes, we abstract from any effect policies might have on average wages and total employment, and in our thought experiments binding wage floors for bad firms induce wage ceilings for good firms. Similarly, the restricted wage differential may reflect the ability of a firm to extract wage concessions from its workers when hit with a low productivity shock. As we shall see, our theoretical model predicts that what matters is the size of the wage differential, and not the particular mechanism that gives rise to it. In the case in which policy restricts wage differentials, we shall characterize steady-state turnover in terms of the firms' optimal dynamic labor demand programs for given firing costs and wage differentials: in other words, the derivations below will let all employment decisions be made by firms.

When dismissing a unit of labor entails a cost F for employers, the wage differential across good and bad firms is w^D, and labor demand schedules are linear, then a procedure

similar to that in Section 2 yields:

$$\mathcal{M} = \frac{p}{\beta}[(\alpha^G - \alpha^B) - w^D - \frac{2p+r}{1+r}F]. \tag{16}$$

Note that to completely specify the equilibrium, wage levels should be consistent with the (given) employment level that our model normalizes to unity. In the simple linear specification, however, only differentials matter in (16), and there is no need to compute levels to analyze the model's implications for turnover.

A few points deserve mention here. As in Section 2, mobility is quite intuitively more intense the larger are productivity innovations $(\alpha^G - \alpha^B)$, and a larger firing cost F is associated with lower turnover. In fact, a comparison of (16) with (6) reveals that these effects on gross job turnover are exactly the same here as when wages were equalized across firms, so that one's intuition about the effects of firing costs is valid regardless of whether mobility is costly for workers.[17] Further, and crucially for our argument, a smaller wage differential is predicted to increase the amount of job turnover generated by our model's firms. Hence, dynamic wage compression has an opposing effect on gross job turnover than does a firing cost.

To see why dynamic wage rigidity enhances the turnover effects of any given variability in labor demand schedules, consider Figure 3. In each panel of the Figure, possible levels of labor demand are identified by the intersections of two downward-sloping labor demand schedules with two different wage levels. As indicated by their labels, the labor demand schedules of good and bad firms account for the wedge between labor's marginal product and wage induced by F, as in equation (3); clearly, a larger F would decrease the vertical distance between them, and reduce turnover at different wages. The two panels of the Figure highlight the turnover implications of cross-sectional wage rigidity for a given F. If the wage levels associated to the higher and lower labor demand schedules do not differ much from each other, as in the top panel of the Figure, then the employment levels are more distant from each other than in the bottom panel, where wages are more sharply different. This comparative-statics point has an equally obvious dynamic application. If a firm suffers a worsening of business conditions, then the extent to which it lowers its demand for labor depends upon the extent to which wages fall to compensate for the drop in productivity; conversely, if a firm experiences an improvement in business conditions and wages do not

[17] As noted in Bertola and Ichino (1995), the effect of more pronounced volatility (p closer to 0.5) is ambiguous: while a larger measure of firms experience productivity transitions in each period, fewer units of labor are reallocated out of and into each of them.

rise, it will have a greater increase in demand for workers than it would if wages were to increase. Hence, cross-sectional wage compression is associated with more pronounced hiring and firing as a given firm goes through a business-conditions cycle, and to more intense labor reallocation in a steady-state situation where all business-conditions uncertainty is idiosyncratic.

We close this section with a brief discussion of the empirical support for the form of wage compression assumed above. Earlier we presented evidence to support the claim that wages are more compressed in Europe than in North America. Even at this level, there are serious measurement issues that preclude drawing strong conclusions. It is perhaps not surprising that it is very difficult to draw sharp conclusions about the factors that give rise to these differences. Nonetheless, it is of interest to mention a few possible sources of information.

One of the predictions of the model is that large establishments pay higher wages.[18] In the extreme case of forced wage equalization, the model predicts a larger wage/size premium in North America than in Europe. There is a very large literature on wages and firm size in the US (see, e.g., Brown and Medoff (1989)) and some studies for European countries as well. Table 5.24 in the OECD Jobs Study summarizes some of the international findings. The studies find no clear pattern across countries, but it should again be noted that the studies surveyed are in general not comparable since different controls are used. More generally there is a large literature on inter-firm wage differences (see e.g., Groshen (1991)). In our model, firms paying high wages are also more profitable. Restricted wage differentials affect the relationship between profitability and wages. Although there is a sizeable literature on profitability and wages (see e.g., Blanchflower et al (1996) and Abowd and Lemieux (1993)), this literature is not yet able to offer a consensus on the size of this affect within a given country, let alone across countries.

Another implication of our model is that individual workers should experience less labor-income volatility when wages are compressed along the dynamic dimension crucial to our model as well as across workers with different characteristics. Once again, lack of internationally comparable panel data with appropriate control variables makes it difficult to test this proposition. Some indirect evidence available from expectational surveys does suggest that uncertainty about future wages is much lower for Italian than for American workers (Guiso, Jappelli, and Terlizzese, 1992; Dominitz and Manski, 1994). One study, Flinn (1996), contrasts dynamic wage volatility at the individual level for a sample of young individuals from

[18]See also Bertola and Garibaldi (1996) for a more detailed analysis of this issue in a slightly different context.

both the US and Italy. He finds that there is more dynamic volatility at the individual level for individuals from the US. This greater volatility, however, is completely accounted for by greater job mobility in the US sample. This is not inconsistent with our story, although beyond our model. One would expect increased differentials across firms for a given type of labor to lead to greater on the job search, and possibly more worker turnover in excess of that accounted for by job creation and destruction.

To summarize this discussion, the type of wage compression that we have assumed is not inconsistent with available data on wage inequality across countries or descriptions of labor market institutions (see e.g. Blau and Khan (1996)). Moreover, studies using US data do find that there is a significant amount of wage volatility at the individual level. Since, however, little direct evidence available on how this varies across countries, at present this form of wage compression must be assigned the label of "plausible." We note, however, that for our argument to hold together it is not at all important that dynamic wage compression be a dominant factor in accounting for the cross country patterns; what matters is simply that this dynamic compression exists.

6 Discussion

To summarize the main finding of the analysis, we have shown that if dynamic wage compression policies and firing cost policies are implemented together then the effect on gross job turnover is qualitatively ambiguous. Any reading of institutional differences between European and North American labor markets would stress differences in both employment protection measures and wage setting practices: to the extent that higher job security is associated with more compressed wage differentials, our simple model identifies one feature that may help to explain the otherwise puzzling similarity of idiosyncratic employment variability across different institutional settings.

Informal considerations on the political economy of labor market institutions in more complex and realistic models suggest that wage compression and dismissal restrictions should indeed arise together naturally. To see this, recall that when job finding is a resource-consuming activity for workers, then an unregulated equilibrium is supported by dynamic wage differentials across "good" and "bad" firms. Identical workers may earn different wages at a point in time simply because their different dynamic histories have brought them to different employers, but this is an equilibrium phenomenon: the wage processes facing indi-

reallocation by internalizing mobility costs to the workers' problems. Under risk neutrality, the resulting equilibrium is efficient and, as in Lucas and Prescott (1974), policies which affect mobility must reduce the welfare of the economy's representative agent. Imagine, however, a model where risk-averse workers do not have access to perfect insurance or credit markets to finance their mobility across jobs. In this setup, it is certainly plausible that workers would support policies aimed at decreasing labor-income fluctuations. Suppose to begin with that wages were forced to be equal across all establishments. Wage compression would obviously produce smoother incomes for workers who work continuously but, as shown in the previous section, would also lead firms to increase the intensity of labor reallocation. Thus, job losers would be faced with increased variability in earnings, and increased turnover would be all the more disagreeable for them if reallocation is costly (at least in terms of time opportunity costs) and wage compression makes it impossible for mobility costs to be offset in expectation by higher wage offers at hiring firms. While this could be dealt with in different ways, at least one way to partially reduce this variability is to reduce the amount of labor reallocation by making it costly for firms to dismiss workers.

Alternatively, imperfectly insured workers may successfully lobby for firing restrictions to reduce income variability associated with turnover. Absent policies regarding wages, however, nothing would prevent firms from reducing wages so as to make current employment levels profitable, or induce quits and circumvent the dismissal cost. The equilibrium upshot of job security and unrestrained wage differentials would be a more variable wage process, thus leading again to undesirable labor-income variability—and to political pressure for wage-compression legislation.

To summarize, our theoretical work assumed that countries with more stringent dismissal regulations also have more stringent wage compression policies. The above arguments suggest that it is indeed intuitive to see these two policies in place together.

Until now the paper has focussed on the general impression of similar job turnover rates across industrial countries. In other respects, however, labor market flows are markedly different across countries. We proceed to consider one such aspect, and suggest that this pattern is at least qualitatively consistent with differences in labor market policies. As is apparent in Table 3, flows into and out of unemployment are much smaller in Europe than in the United States and, as a consequence, the duration of unemployment is much longer in the former than in the latter. These marked unemployment-flow differences indicate that, despite the fact that compressed wage distributions should discourage on-the-job search, in heavily regulated European countries a similar amount of job reallocation much more

frequently takes the form of direct job-to-job mobility on the part of workers, as opposed to transitions through unemployment or non-labor force status. Moreover, conditional upon becoming unemployed, the likelihood of leaving unemployment is much higher in the U.S. than in Europe.[19]

How is this consistent with our simple characterization of labor market interactions and of the effects of institutional regulation? As mentioned above, individual workers are likely to have a rather passive role in a heavily regulated labor market's turnover dynamics: when compressed wage differentials cannot be relied upon to stimulate individual mobility, job loss is forced upon a firm's redundant employees. Accordingly, most of our analysis was based on a characterization of firms' optimal dynamic labor demand. From this point of view, of course, all that matters is the total cost of dismissing a unit of labor, conveniently indexed by the single parameter F, rather than its decomposition in terms of administrative costs, redundancy payments, or a variety of other employment-protection provisions. Most if not all worker protection laws, however, mandate a specific lapse of time between advance written notice of individual or mass dismissals and their actual implementation. From the employer's perspective, it is qualitatively reasonable to capture such constraints by the firing cost F. When analyzing labor market regulations' implications for worker flows, however, advance notice provisions have distinctive implications, and their effect on unemployment flows is arguably consistent with the above mentioned facts. The argument is as follows. Evidence for the U.S. clearly suggests that the vast majority of workers who become unemployed find a new job within a relatively short period of time. Job-finding hazard rates, however, are rather sharply declining in the early months of unemployment, and subsequently become flat (see, e.g., the evidence reviewed by Wolpin, 1994). In other words, even the unregulated U.S. labor market does not seem capable of eliminating long-term unemployment altogether: the unemployment spells facing workers who fail to find a job quickly are much longer than those facing the average worker entering unemployment.

A straightforward reading of this evidence indicates that, in real-life labor markets, heterogeneity across individual workers (or their careers) is such that job-finding and exit from unemployment is much more difficult for some workers relative to others. Given advance notice requirements, workers in the latter group are likely to line up alternative employment before they are actually dismissed, and hence will not show up as a flow through unemploy-

[19]See Alogoskoufis *et al.* (1995) for further discussion of relevant evidence. In the model proposed by Boeri (1995), labor-market regulation increases the proportion of job turnover accounted for by job-to-job moves triggered by successful on-the-job search, at the same time as it decreases job losses and job findings triggered by labor-demand shocks.

ment. Those who do enter unemployment, conversely, are more likely to belong to the former group, who more often experience long unemployment spells in unregulated labor market.

A precise analysis of the mechanism outlined here would require formal modeling of unemployment and worker heterogeneity, neither of which is explicitly featured in our theoretical framework. Unemployment insurance and "active labor market" policies would also be very relevant in cross-country comparisons, of course, along with the aggregate level and duration of unemployment; in segmented labor markets, particularly grim job-finding prospects for new entrants in the labor market may well coexist with intense job-to-job reallocation of more experienced workers within the primary sector of the labor market. Still, employment-protection legislation in the particular form of mandated notice periods is qualitatively consistent with longer unemployment spells in more heavily regulated markets. Further work may try and specify more realistic if less tractable models to see whether advance-notice provisions account for a significant part of the observed differences in unemployment flows.

7 Concluding comments

Many researchers have noted that although dismissals are much more regulated in Europe than in North America, rates of job creation and destruction are remarkably similar. Two standard responses to this are that either the data are bad or that firms and workers find ways to get around the regulations. There is little doubt that there are very serious measurement issues involved in comparing job creation and destruction data across countries. There is also little doubt that in some instances firms and workers may make arrangements that offset the effect of regulations. The main point of this paper is that existing analyses have overlooked a third possibility, namely that there are other differences across countries that suggest opposing effects on job creation and destruction.

Any reading of the evidence should take into account regulation of both quantity and price aspects of real-life markets, and important interactions between them. We use a simple model to argue that employment protection legislation and relative wage compression at the firm level have opposite effects on job turnover rates arising from idiosyncratic uncertainty.

Such covariation across the components of labor-market policy packages is consistent with standard discussions of labor market institutions, which typically identify firing costs and wage compression as the most important differences across European and North American

economies.[20] More direct evidence supporting our hypothesis is not readily available. Our theoretical perspective, however, suggests many ways in which further empirical work on internationally homogeneous data sets might shed further light on dynamic interactions between various labor market phenomena and institutions.

Moreover, the apparent empirical association of wage equalization and job security provisions can be intuitively rationalized in terms of simple politico-economic considerations. When implemented in isolation, neither wage compression nor dismissal restrictions can fulfill a likely aim of intervention in the labor market—namely, stabilization of labor incomes in the face of idiosyncratic (yet uninsurable) labor-demand shocks. Our simple theoretical and empirical work, of course, begs the question of whether jointly implemented equal-wage and job-security laws do in fact succeed in isolating labor incomes from idiosyncratic market shocks, and indeed of whether such isolation is an appropriate policy objective. Constraints on dismissals or wages certainly tend to decrease an economy's productive efficiency in equilibrium models such as Hopenhayn and Rogerson's (1993). Models where worker behavior is treated on a risk-neutral basis, however, are obviously inadequate to evaluate the possible welfare-enhancing role of labor market institutions in an incomplete-markets setting, and a formal analysis of these important and difficult issues must await further research.

[20]By contrast, no empirical linkage is apparent between the stringency of labor-market regulation and the cyclical behavior of real wages at the aggregate level, on which the evidence—as surveyed by Abraham and Haltiwanger (1995) and by Brandolini (1995)—is at best inconclusive in all countries. As in the implicit contract literature, employers may provide insurance to the aggregate labor force against relatively mild and temporary aggregate shocks—choosing employment levels efficiently in the absence of regulation, but hoarding labor under job-security provisions (consistently with the aggregate evidence discussed in our footnote 1 above). In the absence of regulation, conversely, implicit contracts would not be operative in the face of idiosyncratic and fairly persistent shocks, as workers could not be prevented from leaving during bad times to find higher wages elsewhere.

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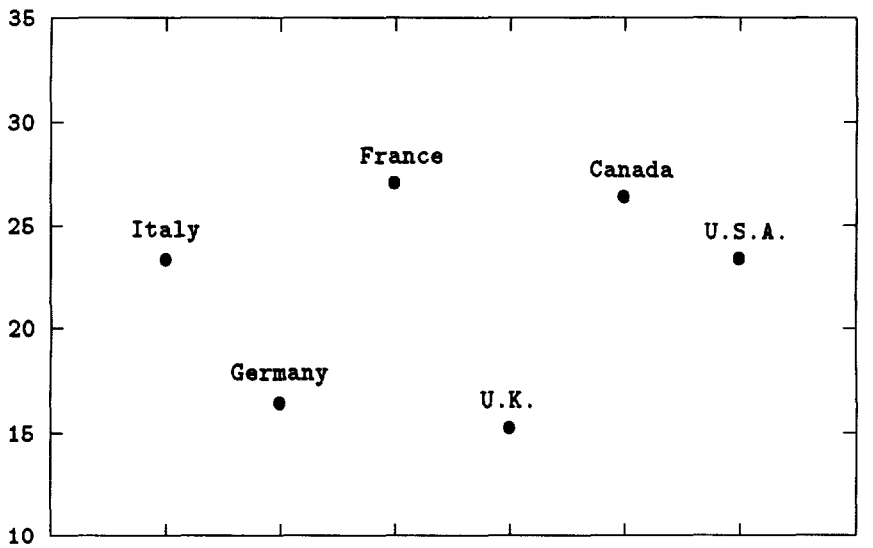

Figure 1: Gross job turnover

Table 1: Job turnover

	JC	JD	ΔE	JT	ET
Italy (1984-92)	12.3	11.1	1.3	23.4	22.1
Germany (1983-90)	9.0	7.5	1.5	16.5	15.0
France (1984-92)	13.9	13.2	0.6	27.1	26.5
United Kingdom (1985-91)	8.7	6.6	2.1	15.3	13.2
Canada (1983-91)	14.5	11.9	2.6	26.4	23.8
United States (1984-91)	13.0	10.4	2.6	23.4	20.8

Source: OECD Employment Outlook (1994);
Note: percentages of total employment; annual averages; "establishments" are legal entities (firms) for Canada, Italy, and the United Kingdom, organizational units (plants) in the other countries. JC is job creations, JD is job destruction, ΔE is net employment change, JT is gross job turnover, and ET is excess job turnover.

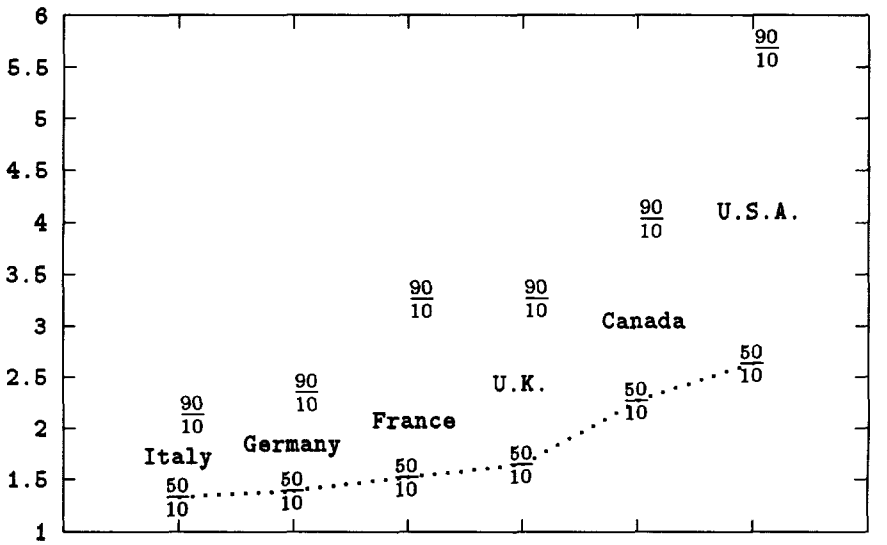

Figure 2: Wage inequality (90-10 and 50-10 percentile ratios)

Table 2: Wage inequality in the late 1980s

	p^{90}/p^{50}	p^{50}/p^{10}
Italy	1.56	1.33
Germany	1.65	1.39
France	2.11	1.52
U.K.	1.96	1.64
Canada	1.75	2.27
U.S.	2.14	2.63

Source: OECD Employment Outlook (1993).
Notes: The "p^{90}/p^{50}" columns report the ratio of the upper limit of the 9th decile of the male earnings distribution to the upper limit of the 5th decile; similarly, "p^{50}/p^{10}" refers to the ratio of the upper limit of the 5th decile to the upper limit of the 1st decile. Larger figures indicate more inequality.

Table 3: Unemployment flows

	Unemployment inflows (a) 1988	Unemployment outflows (a) 1988	Long-term unemployment (b) 1983	1993
Italy	0.18	2.3	57.7	58.2
Germany	0.26	6.3	39.3	33.5
France	0.33	5.7	42.4	34.2
United Kingdom	0.68	9.5	47.0	35.4
Canada	1.89	30.8	9.9	14.1
United States	1.98	45.7	13.3	11.7

Source: OECD Employment Outlook (1990, 1994).
Notes: a: average monthly flows as a percentage of source population; b: percentage of total unemployment.

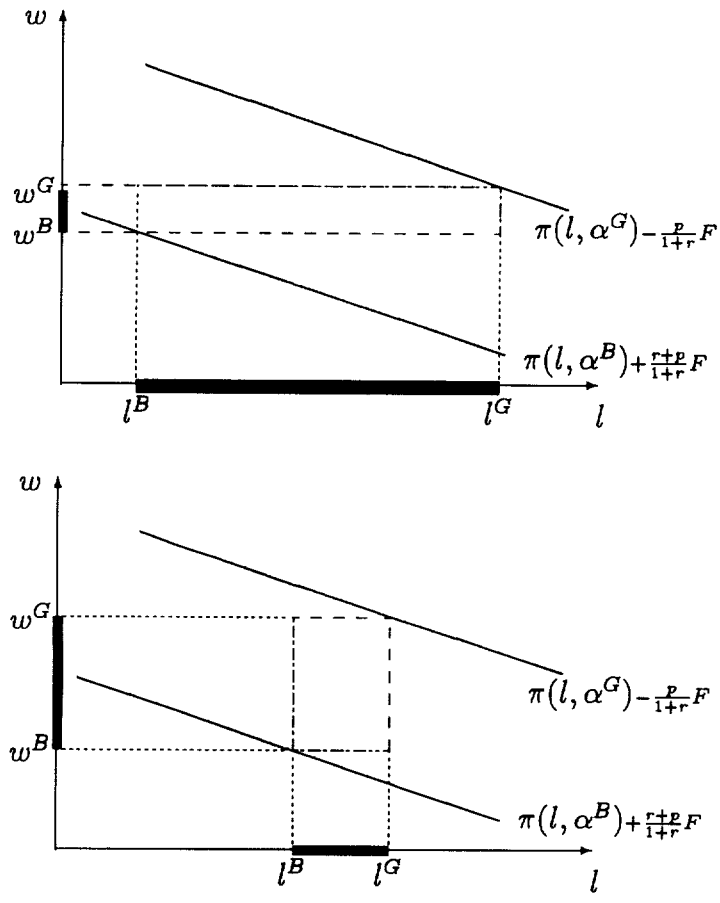

Figure 3: Wage differentials and labor reallocation