

Relative demand shifts and unemployment

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The third factor often mentioned in discussions of European unemployment is **relative demand shifts**. The basic argument is the following:

Everywhere in the OECD, there has been a shift in relative labor demand away from low-skill workers towards high-skill workers. In the United States, this has led to a decrease in the relative wage of low-skill workers. In Europe, constraints on the relative wage of low-skill workers have led instead to an increase in their unemployment rate, and thus an overall increase in unemployment. As Krugman has put it, facing a tradeoff between letting low-skill workers go jobless or penniless, Europe has chosen the first, the US the second.

Variations on the theme replace “less skilled” by “less competent”. Increased returns to increased competence (unobservable to econometricians, but observable by firms) have led to larger within cell dispersion in the United States, larger unemployment for the less competent in Europe. Or they replace “less skilled” by “living in less productive regions”. Increased returns to geographical location have led to higher local wages and inter-state migration in the United States, but to high unemployment in excentric regions in Europe (the south of Italy for example).

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Like the arguments we saw earlier about the role of unemployment benefits, or employment protection, this can again be seen as a “time bomb” argument. Wage compression, across skills or across regions, is not new in Europe. In the past, it did not lead to unemployment. But, the argument goes, in conjunction with a shift in relative demand, it has led in the past 15-20 years to a large increase in unemployment.

Start with the basic facts about the minimum wage and wage compression across skills.

Facts about the minimum wage are given in the OECD Jobs Study, Chapter 5, section 5 (see also Dolado et al, Economic Policy, October 1996, 319-372). The time series for the minimum wage in six countries (the United States, Canada, France, New Zealand, the Netherlands and Spain), from 1960 on, are given in Chart 5.14, which is reproduced here. There are both large movements over time and drastic differences across countries, but no clear picture emerges. The ratio of the minimum wage to the average wage has decreased in the United States from 0.5 to 0.35, and has recently gone back up to 0.4. The ratio is lower in Spain than in the United States. It is coming down, but from a very high level in the Netherlands.

Focusing on the minimum wage may however be misleading. Strong unions may impose wage compression, with potentially the same effects as the minimum wage in terms of employment, whether or not the minimum wage is high. Evidence on the wage distribution is nicely summarized in Table 4 in Nickell and Bell, also attached. The table reports ratios of wages in the first (lowest) decile to those in the fifth decile, and of wages in the ninth decile to those in the fifth decile. A summary of the table is given below:

Table 1. Earnings dispersion for males. 1987.

Country	D1/D5	D9/D5
Sweden	0.76	1.56
France	0.66	2.09
Germany	0.71	1.65
Italy.	0.75	1.56
Canada	0.45	1.71
United States	0.38	2.10

The table shows clearly more wage compression in the bottom half of the distribution in Europe than in either Canada and the United States. The evidence about the top half is less clear cut: France and the United States have roughly the same D9/D5 ratio.

The full table gives a sense of evolutions over time: the United States and the United Kingdom have seen increasing inequality, increasing D9/D 1 ratios. In contrast, France, Germany, Italy, Sweden show little change over the period.

What about unemployment rates by skill? Skill, as opposed to sex or age, is not unambiguously defined, and there are no off-the-shelf time series. Table 2 in Nickell and Bell puts together a lot of information from national sources. It is attached. The table below summarizes the essential characteristics of the full table. It gives the change in the unemployment rate for low-skill and for high-skill workers, with skills being defined according to education level or occupation (for Germany) from the mid to late 1970s to the early 90s. The exact dates vary across countries. The exact definitions vary also, leading to different percentages of workers in the low skill group (from 14.5% in the United States to 42.5% for France).

Table 2. Change in the unemployment rates of low-skill and high-skill workers, from the late 70s to the early 90s.

Country	Change in rates		Change in ratio
	Low skill	High skill	
France	7.1	3.8	3.1 to 2.3
Germany	3.1	0.8	1.9 to 2.6
Spain	16.3	6.2	1.7 to 2.2
United Kingdom	10.5	4.6	3.2 to 2.6
United States	0.6	2.4	3.9 to 3.9

The table suggests three main conclusions.

- In all five European countries, both low-skill and high-skill unemployment rates have increased. The fact that the high-skill unemployment rate has increased clearly implies that the increase in overall unemployment cannot be attributed only to a relative demand shift.
- In all European countries, the low-skill unemployment rate has increased much more in percentage points than the high-skill unemployment rate. Put another way, the difference between the two unemployment rates has increased. This may be interpreted as a sign of a strong relative demand shift.
- But the ratio of the low-skill to the high-skill unemployment rate has **actually** decreased in a number of countries, for example France and the United Kingdom.

This raises an obvious and central question. Take the basic stylized fact as a roughly proportional increase in the low-skill and high-skill unemployment rates, leaving their ratio roughly constant? Should we interpret this as a sign of a neutral decrease in the demand for labor, or of a shift in relative demand? Or put differently: should we expect a general increase in the unemployment rate to come with equal or with proportional increases in the unemployment rates of the various skill groups?

Thus, the first order of business is to think about the effects of neutral shifts in labor demand on relative unemployment rates. I do this in two steps. The first uses a conventional model of supply and demand for two types of labor. The second returns to thinking in terms of flows, and shows how, relative to this conventional model, neutral shifts can lead to much larger effects on the unemployment rate of the less skilled workers.

1 Supply and demand

(This largely follows Nickell and Bell 1995. A related exercise is performed in the paper by Jackman et al 1997)

Think of firms as having a CES production function in two types of labor, type 1 (low-skill) and type 2 (high-skill):

$$y^{(\sigma-1)/\sigma} = x (a_1 n_1^{(\sigma-1)/\sigma} + a_2 n_2^{(\sigma-1)/\sigma})$$

where $a_1 + a_2 = 1$, and σ is the elasticity of substitution, and x is a parameter. The first-order conditions, that the wage equal marginal product, give:

$$w_i = a_i x \left(\frac{n_i}{y} \right)^{-1/\sigma} \quad i = 1, 2 \quad (1.1)$$

Define a neutral shift in demand as a change in x . Taking the ratio of the two wages gives

$$\frac{w_1}{w_2} = \frac{a_1}{a_2} \left(\frac{n_1}{n_2} \right)^{-1/\sigma} \quad (1.2)$$

The neutral shift no longer appears. At a given wage ratio, a neutral shift does not affect the employment ratio.

Let's now look at the supply side. To discuss the implications of alternative func-

tional forms, keep the two wage equations general:

$$w_i = f_i(u_i) \quad i = 1, 2 \quad (1.3)$$

where f_i is decreasing in the unemployment rate u_i . Let l_i be the labor force of type i so that $n_i - u_i = n_i/l_i$. Using equations (1.2) and (1.3) and rearranging gives an implicit relation between the two unemployment rates:

$$\frac{f_1(u_1)}{f_2(u_2)} = \frac{a_1}{a_2} \left(\frac{1 - u_1}{1 - u_2} \right)^{-1/\sigma} \left(\frac{l_1}{l_2} \right)^{-1/\sigma} \quad (1.4)$$

Differentiating with respect to u_1 and u_2 and rearranging gives:

$$\frac{d \log(u_1)}{d \log(u_2)} = \frac{\eta_2 + u_2/(\sigma(1 - u_2))}{\eta_1 + u_1/(\sigma(1 - u_1))} \quad (1.5)$$

where $\eta_i \equiv -(u_i f'_i(u_i) / f_i(u_i))$ is the elasticity of the wage w_i with respect to u_i .

Suppose first that **supply is very elastic**, that $\eta_i = 0, i = 1, 2$ is close to zero. The equation above tends to:

$$\frac{du_1}{du_2} = \frac{1 - u_2}{1 - u_1}$$

As the fraction on the right-hand side is close to one, this says that neutral shocks will increase both unemployment rates roughly by the same amount in percentage points.

Suppose instead that **demand is very elastic**, that σ is very large. Then, the equation above tends to:

$$\frac{d \log(u_1)}{d \log(u_2)} = \frac{\eta_2}{\eta_1}$$

If $\eta_1 = \eta_2$, then neutral shocks increase both unemployment rates proportionally. If wages are less sensitive to unemployment for low-skill (type 1) workers (as we would expect from the fact that low-skill workers have a wage already close to their reservation wage, or because of minimum wage constraints), then $\eta_1 < \eta_2$ and the unemployment rate of low-skill workers will increase more than proportionately in response to a neutral shock.

Thus, the answer as to what the right statistic to look at (difference or ratio) depends on the relative elasticities of labor supply and demand.

Nickell and Bell offer a numerical calibration: From estimation of wage curves for low and high skill workers, they get $\eta_1 = .054, \eta_2 = .062$ (both a bit on the low side relative to Blanchflower and Oswald, and the dynamic specification in Blanchard and Katz). They use $\sigma = 3$ (Katz and Murphy (QJE 1992) estimate σ to be 1.4 in the US). They take $u_1 = .10, u_2 = .03$. This gives $(d \log u_1 / d \log u_2 = 0.83)$. This is not too far from 1.0, and suggests that looking at the ratio is the right approach, and that there is not much evidence of relative demand shifts.

How robust is this conclusion to parameter values? Increasing η_1 and η_2 in the same proportion leads to an increase in $d \log u_1 / d \log u_2$ asymptotically to 1.15. A value of σ of 1.4 decreases the ratio to 0.64.

The exercise is useful. But this model leaves out something important, namely the fact that very often skilled and less skilled workers compete for the same jobs. In a tight labor market (from the point of view of workers), firms are willing to employ those who are less qualified. In a depressed labor market, firms are more choosy, and look only at the most qualified. Thus, a neutral shock, a shock that depresses the labor market overall, may have strong relative demand effects. The flow model

we developed earlier is well fit to think about these issues more formally. This is what I do in the next section.

2 Ranking and ladder effects

Consider an economy with two types of workers, 1 and 2. Workers of type 1 are good and have productivity y . Workers of type 2 are less good -call them bad for short. When hired, they need to be trained at cost F before they are as productive as the good workers.

Consider the problem of a firm that receives over time applications from both types of workers. The instantaneous probability that they meet a type 1 worker is a_1 , the instantaneous probability that they meet a **type 2** worker is a_2 .

Suppose that the firm cannot extract payments from bad workers before training. Then, even if the wage is set before training, bad (more precisely “initially bad but now trained and therefore good”) workers will want to reopen bargaining. And, at that point, their labor prospects will look identical to those of previously good workers. The implication is straightforward: whether it hires good or bad workers, the firm has to pay them the same wage, w .

Given this assumption, it is clear that the firm will always hire workers of type 1 (assuming obviously that $w \leq y$). What is less clear is whether and when they will hire a worker of type 2. Let $\pi \in [0, 1]$ be the probability that they hire a worker of **type 2** if they meet one; if $\pi = 0$, it never hires type 2 workers; if $\pi = 1$, it always hire them. It is also clear that once type 2 workers have been trained and the training cost has been sunk, there is no reason to want to lay them off and replace them by type 1 workers.

Assume finally that jobs end with instantaneous probability δ .

Let V_V be the value of a vacancy. Let V_F be the value of a filled job, after training. In steady state, the two values are given by:

$$rV_V = 0 + a_1(V_F - V_V) + a_2\pi(V_F - V_V - F) - \delta V_V \quad (2.1)$$

$$rV_F = (y - w) - \delta V_F \quad (2.2)$$

We can ask for what parameter values the firm will decide to always hire and train the bad workers, i.e. under what conditions we get $V_F - V_V - F \geq 0$ and $\pi = 1$. Using the equations above, these two conditions are satisfied iff:

$$y - w \geq (r + \delta + a_1)F \quad (2.3)$$

Note that, absent a_1 , this is simply the condition that the present value of hiring a bad worker be non negative. But because of the presence of a_1 , the condition is much more stringent. This is because of the option value in not hiring a bad worker, not spending the training cost and waiting for a good worker to show up instead. The higher a_1 , the more it makes sense for a firm to wait for a good worker.

Suppose that a_1 is initially low enough that the firm is willing to hire and train the bad workers. Now consider an increase in a_1 . When a_1 increases above the critical value that makes the equation above hold as an equality, the firm will prefer to wait for good workers. The bad workers will no longer be hired.

In words, any factor that depresses the labor market makes it more likely that firms will discriminate against less skilled workers, leading to a potentially large increase in their unemployment rate. In this sense, a neutral shift may lead to very large increase in the unemployment rate of the less skilled.

The argument has been a partial equilibrium argument so far. In general equilibrium, a_1, a_2 and w are endogenous and will adjust as firms change their hiring

decisions. I shall let you close the model.’ But it is easy to state the solution. In general, as the labor market gets more depressed, the probability that firms hire bad workers will go from being equal to one to decreasing continuously to zero. Thus, the relative unemployment rate of bad workers will increase as the labor market gets more depressed.

One may wonder how much the result depends on the assumptions that lead to equal wages for both types. The answer is that it does not depend on them, but that the result survives a number of extensions.

In particular, if bonding is possible, if firms can extract payment from bad workers before training them, this does not imply that, in equilibrium, firms will always hire bad workers. The equilibrium may still be one in which firms hire them only with probability less than one. How much bad workers will be willing to pay will depend on their labor market prospects. If firms hire them for sure, their labor market prospects might be too good to induce them the up-front fee, leading them not to pay the full fee, and firms not want to hire them, a contradiction. Indeed, the result above survives. When the labor market is tight, firms hire bad workers for sure. The more depressed the market, the lower the probability that they do so. (This conclusion comes from reinterpreting the results in “The plight of the long-term unemployed”, by relabeling short-term unemployed workers “good workers”, and long-term unemployed workers “bad workers”.)

More generally, thinking of workers as having different productivities (rather than different training costs) what is needed for firms to hire the more skilled in preference to the less skilled is that the wage be increasing less than one for one with productivity. This is likely to hold under a wide set of assumptions about wage determination. (For more on this, look at two papers by Robert Shimer, not on

1. My paper with Diamond on ranking does that, but for a more complex matching process than we have seen so far. The model in my note on “The plight of the long-term unemployed” is simpler and can be used straightforwardly. I have put the note in the lecture folder on the net.

the reading list: “Do good guys come in first? How wage determination affects the ranking of job applicants?”, mimeo Princeton 1997, and “Why is the U.S. unemployment rate so much lower?”, mimeo Princeton, 1998).

3 Back to the data

In short, neutral shocks may have large effects on the relative unemployment rate of bad workers. How much larger depends both on production parameters and wage elasticities, and on the degree of ranking in the economy. It is thus difficult to know what benchmark to use in looking at the data.

One way of making some progress empirically is to look at fluctuations in aggregate unemployment which we believe to be largely due to neutral shifts, and look at the behavior of unemployment rates for different groups of workers. I have done this for the United States.

Let the high-skill unemployment rate u_H be proxied by the unemployment rate for managers and professionals. Let the low-skill unemployment rate u_L be proxied by the rate for operators, fabricators and laborers. Let u be the overall unemployment rate. For the sample as a whole, (1982-1995), $u_H/u = 2.6/6.9 = .37$, and $u_L/u = 10.8/6.9 = 1.56$.

Regressions of u_H and u_L on u and a time trend, using quarterly data, give:

$$u_H = 0.38u + 0.01t$$

$$u_L = 1.82u - 0.01t$$

Regressions of $\log u_H$ and $\log u_L$ on $\log u$ and time give:

$$\log u_H = 1.00 \log u + 0.006t$$

$$\log u_L = 1.12 \log u - 0.001t$$

In all cases, the coefficients on unemployment and time are highly significant, and the \bar{R}^2 are roughly equal for the linear and the log specification.

This suggests an elasticity close to one for both groups, and thus roughly constant ratios of unemployment rates in response to neutral shifts in demand. If so, it **suggests** relatively small relative demand shifts in Europe. But can we apply this time series result' to the cross section of European countries?

As in the previous notes, I shall let Marianne Bertrand present the bits of micro-evidence we have on both relative demand shifts (larger in the U.S than in Europe?), and on the effects of the minimum wage on unemployment (is there more evidence of adverse effects in Europe, where the wage bites more, than in the United States?) Let me just note one point **about** estimation of relative demand shifts: The discussion of ranking indicates the dangers of simply doing production function estimation in this context. In a depressed labor market, we may see firms firms using relatively more skilled workers at the same relative wage. This is not the result of a relative demand shift, but of the combination of ranking and a depressed market. I suspect that the best way to make progress in assessing the role of ranking is to look at a firm based data set and track the qualifications of workers in a given job as a function of the state of the labor market.