

The Economics of Unemployment. Shocks, Institutions, and Interactions.

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*Introduction, Lionel Robbins Lectures, London School of Economics, October 2000. I thank Brendan Whelan and John Fitz Gerald for data and help on Ireland, Rita Ramalho and Pedro Portugal for data and help on Portugal, Lans Bovenberg and Nick Draper for data and help for the Netherlands. I thank John Arditì for help, Francesco Franco and Justin Wolfers for assistance and discussions, Daron Acemoglu, David Autor, Ricardo Caballero, Peter Diamond, Francesco Giavazzi, Augustin Landier, Andrei Shleifer, and Robert Solow for discussions and comments.

Lecture 3. Employment protection, sclerosis, and the effect of shocks on unemployment.

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In the introduction to these lectures, I argued that an interpretation of the evolution of European unemployment required looking at three sets of factors: The effects of shocks on unemployment; this was the subject of the first lecture. The effects of changes in institutions on unemployment; this was the subject of the second lecture. The interactions between shocks and institutions; this is the subject of this lecture.

The general notion that macroeconomics should not be institution-free—in this instance, that labor market institutions determine the impact of shocks on unemployment—is an attractive one. Casual evidence suggests that, in the case of unemployment, it may indeed be relevant: Shocks do not seem to affect unemployment in the same way in, say, the United States and Europe. More formal statistical evidence goes in the same direction. The panel data regressions presented in Blanchard and Wolfers [2000] and discussed in the introduction to these lectures, suggest that, for example, low coordination of bargaining, long lasting unemployment benefits, and high employment protection all lead to larger and/or longer lasting effects of shocks on unemployment.

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In this lecture, I focus on the potential role of employment protection. I choose employment protection for two reasons:

- Because we have made substantial progress in understanding the effects of employment protection on the nature of the labor market. Recent theoretical and empirical research has shown that employment protection indeed changes the nature of the labor market. It makes it more sclerotic: Flows decrease, individual unemployment duration increases, and so does the proportion of long-term unemployed.
- Because we have made much less progress however in understanding the implications of such sclerosis for the effects of shocks on unemployment. There is a long running argument in the literature that, in sclerotic labor markets, adverse shocks have larger and longer lasting effects of shocks on unemployment. In such markets, the argument goes, long term unemployment is high; long term unemployment exerts little pressure on wages, so shocks have long lasting effects on unemployment. Despite its potential importance, the theoretical argument has remained surprisingly loose, and its quantitative importance uncertain.¹ It is urgent to make progress here.

The lecture is thus organized as follows. Sections 1 and 2 review what we have learned, and make the theoretical and empirical cases for the effects of employment protection on the nature of the labor market. Section 3 examines the case for persistence of shocks in sclerotic markets, both theoretically and empirically. It concludes that the case is harder to make, both theoretically and quantitatively, than has been stated: Sclerotic markets indeed have high long term unemployment; but the macroeconomic implications of

¹I plead guilty here. I have used the argument informally many times, but kept postponing the hard work to later.

this fact are less obvious than it may seem. This conclusion (which I do not like...) may not however be the final word, and more work remains to be done here.

1 Employment protection, flows, and unemployment duration

In thinking about employment protection, I shall formalize it as a state-mandated cost that firms have to pay if they want to lay off a worker. I shall think of it as a cost to the firm-worker pair, rather than as a transfer from the firm to the worker: this captures the fact that, in many European countries, firms consider the legal and time costs associated with layoffs to vastly exceed the monetary value of the severance payments.²

Such a cost is likely to have two main effects. First and obviously, it is likely to affect flows—layoffs directly, hirings indirectly. Second, it is likely to strengthen the hand of workers in bargaining, leading, for given labor market conditions, to a higher wage. So, to capture these effects, a model must have at least two elements. It must have endogenous flows of workers in and out of employment, so flows are potentially affected by employment protection. And it must have a bargaining structure where the outcome of

²These assumptions are not innocuous. They, and their implications, are the subject of a very large literature. For the implications of treating firing costs as costs or transfers, see for example Lazear [1990]. For a discussion of why, in the absence of state-mandated protection, firms might offer severance payments as insurance, see for example Akerlof and Miyazaki [1980]. For why firms might want to offer severance payments to give incentives to workers to invest in firm-specific skills, see Caballero and Hammour [1998]. I take the fact that most firms appear strongly opposed to state-mandated employment protection as *prima facie* evidence that, in most European countries, state-mandated protection exceeds what firms would want to offer on those grounds.

wage bargaining potentially depends, among other factors, on employment protection.

One of the major research achievements of the last 20 years has been the development of such a framework. Work started in the early 1980s with the characterization of equilibrium in markets characterized by search, matching, and bilateral bargaining (in particular Diamond [1982] and Mortensen [1982]). The next step was the tailoring of the framework to the labor market by Pissarides (Pissarides [1985] and later on, Pissarides [1990]). More recently, the framework has been fleshed out to integrate specific labor market institutions, from the unemployment insurance system to employment protection legislation (for example, Mortensen and Pissarides [1999], Pissarides [2000]).

The models which have been developed use a number of mathematical tools (value functions, Bellman equations) which, while very convenient, may not be familiar to all. The underlying mechanisms are straightforward however, and can be presented without the mathematical paraphernalia. This is what I shall do here. Having worked out elsewhere various micro-founded versions, I believe the informal model presented here embodies, in a simple way, the essential mechanisms at work.³

1.1 Laying out the model

Think of an economy where jobs are constantly created and destroyed. Workers who lose their jobs become unemployed, and look for new jobs. Firms that create new jobs look for workers by posting vacancies. In equilibrium, there is positive unemployment, positive vacancies, and flows of

³A version of the model presented in this section, but with bells and whistles, is presented in Blanchard and Portugal [2001]. That model is itself a close cousin of Mortensen and Pissarides [1999], .

workers in and out of employment.

To characterize the equilibrium of such an economy, it is easiest to think in terms of four relations: A description of how workers and firms find each other. A condition describing job destruction. A condition describing job creation. A characterization of the wage set in bargaining. Let's take each one in turn.

The matching function.

In a decentralized labor market, workers have to find the right job, firms the right worker. How easy it is depends on the heterogeneity of workers and jobs, the search intensity of workers and firms, and so on. The approach taken in the literature is to summarize this complex process by a “matching function” giving the flow of hires, h , as a function of unemployment u and vacancies v :⁴

$$h = h(u, v) \quad h_u > 0 \quad h_v > 0$$

The higher the number of unemployed or the higher the number of vacancies, the higher the number of hires. It will be convenient to work with a specific functional form, which has actually proven to provide a good description of the data:

$$h = \sqrt{zuv} \tag{1.1}$$

This functional form has two characteristics. First, constant returns: A doubling of the number of unemployed and the number of vacancies leads to a doubling of hires. And second, unemployment and vacancies play equal roles in the determination of hires. The parameter z captures all the factors which affect the efficiency of matching: the higher z , the higher the flow of hires for given unemployment and vacancies. Later on, we shall look at

⁴For a recent assessment of the state of knowledge on the matching function, see Petrongolo and Pissarides [2000].

movements in z due to changes in search intensity. For the moment it is simply a constant.

Define the exit rate from unemployment, and the exit rate from vacancies:

$$x_u \equiv \frac{h}{u} \qquad x_v \equiv \frac{h}{v}$$

The exit rate from unemployment is equal to the ratio of flow of hires to the stock of unemployed; think of it as measuring the ease with which an unemployed worker can find a job. The exit rate from vacancies is equal to the ratio of the flow of hires to the stock of vacancies; think of it as the ease with which a firm can fill a vacancy. Squaring (1.1) and reorganizing, it follows that:

$$x_u x_v = z \tag{1.2}$$

For given z , there is an inverse relation between x_u and x_v : The higher the exit rate from unemployment, the lower the exit rate from vacancies. The easier it is for workers to find a job, the harder it is for firms to find a worker.

Job destruction

At any point in time, some jobs become more productive, others less productive. The reasons are many, from technological change, to shifts in demand, to changes in the quality of the match between the job and the worker on the job. If the shock is bad enough, firms will want to terminate the job, and lay off the worker.

In the aggregate, these idiosyncratic shocks lead to a steady flow of job destruction, a steady flow of layoffs. Call the layoff rate (the ratio of the flow of layoffs to employment) λ . This rate will depend on many factors, among them the distribution function of shocks, and the costs involved in laying off the worker. Employment protection clearly matters here: The higher the firing cost, the lower the threshold level of productivity at which firms will terminate a job and lay off a worker, the lower the layoff rate.

Let c be the firing cost. I write this relation simply as:

$$\lambda = \lambda(c ; \cdot) \quad \lambda_c < 0 \quad (1.3)$$

The layoff rate is a decreasing function of the firing cost; the dot is to remind us that the layoff rate is likely to depend on other variables, in particular the distribution of shocks.

Job creation and the feasible wage

In steady state, employment is constant, so job destruction must be offset by job creation. This requires that firms be willing to create new jobs. This in turn requires that the wage paid by firms be such as to allow new jobs to break even (a condition called the zero net profit or free entry condition in the literature, and the same condition we saw in Lecture 1 when characterizing long run labor demand.) I shall call this wage the feasible wage.

Just as in Lecture 1, the feasible wage will depend on the price of other inputs, in particular on the cost of capital. But it now also depends on the firing cost, through two channels. First, and directly, a higher firing cost increases expected costs: Sooner or later, the firm will want to lay off the worker, and will have to pay the firing cost. Second, the higher the firing cost, the lower the productivity threshold at which jobs are terminated, thus the lower the average expected productivity of a new job. I capture this relation by:

$$w = \phi(c ; \cdot) \quad \phi_c < 0 \quad (1.4)$$

The feasible wage is a decreasing function of the firing cost.⁵ Again, the dot

⁵A formal derivation shows that the feasible wage may also depend on how easy it is for the firm to find a worker to work on the job, thus on x_v . I leave it out because this effect is likely to be small: It typically takes a few weeks to find a worker; jobs last a much

is there to remind us that other variables, such as the user cost of capital for example, also belong to this relation.

The bargained wage

The final step is to specify the wage set in bargaining. In this economy, being unable to agree and so terminating a match is costly to both workers and firms. It is costly to workers because they become unemployed and have to look for another job. It is costly to firms because they have to pay the firing cost and then have to look for another worker.

This implies that the wage will typically depend on at least four factors.⁶ The first two reflect the implications of ending the match from the point of view of the worker:

- The level of unemployment benefits, b : The higher the level of unemployment benefits, the less the workers have to lose from becoming unemployed. The less they have to lose, the stronger they are in bargaining, thus the higher the bargained wage.
- The exit rate from unemployment, x_u . The logic is the same as for unemployment benefits: The higher the exit rate from unemployment, the less the workers lose from becoming unemployed (as they are unlikely to remain unemployed very long), and thus the higher the bargained wage.

The next two reflect the implications of ending the match from the point of view of the firm:

longer time. Putting x_v in would not affect any of the conclusions.

⁶This is true of such apparently different models of wage determination as the Nash bargaining model developed by Diamond [1982], or the efficiency wage model developed by Shapiro and Stiglitz [1984].

- The firing cost, c . The higher the firing cost, the more costly for the firm to lay off the worker, the weaker the firm in bargaining, thus the higher the bargained wage.
- The exit rate from vacancies, x_v . The higher x_v , the easier it is to find a new worker, the stronger the firm is in bargaining, the lower the bargained wage.

I capture this relation by writing:

$$w = b + f\left(\frac{x_u}{x_v}, c; \cdot\right) \quad f(\cdot) \geq 0 \quad f_{x_u/x_v} > 0, f_c > 0 \quad (1.5)$$

The bargained wage is at least equal to unemployment benefits. It is increasing in the exit rate from unemployment, decreasing in the exit rate from vacancies. A formal derivation, as well as intuition shows that what matters here is the ease with which workers can find a job relative to the ease with which firms can find a worker. Thus, x_u/x_v enters as a ratio; this restriction will prove convenient later on. Finally, the bargained wage is increasing in the firing cost. Once again, the dot stands for all other relevant variables, from the interest rate to other institutions which affect the structure of bargaining.

1.2 *Equilibrium unemployment, and the effects of employment protection*

In steady state, flows into and out of unemployment must be equal. Normalize the labor force to equal 1, so u stands both for unemployment and the unemployment rate, and employment is equal to $1 - u$. The following condition must hold:

$$\lambda(1 - u) = x_u u$$

The left side gives the flow into unemployment, which is equal to the flow of layoffs, itself equal to the layoff rate times employment. The right side gives the flow out of unemployment, which is equal to the exit rate from unemployment times the stock of unemployed.

Note that, in steady state, the average individual duration of unemployment—“duration” for short in what follows—is equal to the inverse of the exit rate from unemployment, $1/x_u$. (Similarly, the average duration of a vacancy is given by $1/x_v$). The equilibrium condition can be rewritten as:

$$u = (\lambda(1 - u)) \frac{1}{x_u} \quad (1.6)$$

Equilibrium unemployment is equal to flows times duration.⁷ Take each component in turn:

- Flows into unemployment depend on λ , given by (1.3).
- The equilibrium exit rate—equivalently, its inverse, equilibrium duration—is determined by the condition that the wage set in bargaining be consistent with positive and finite job creation, thus with zero net profit. Equivalently, the bargained wage must be equal to the feasible wage. From equations (1.4) and (1.5), this implies:

$$\phi(c; .) = b + f\left(\frac{x_u}{x_v}, c; .\right)$$

Or replacing x_v by its value from (1.2):

$$\phi(c, .) = b + f\left(\frac{x_u^2}{z}, c; .\right) \quad (1.7)$$

⁷The unemployment rate still appears on both sides of the equation. Solving for the unemployment rate gives $u = \lambda/(x_u + \lambda)$. But it is easier to think of unemployment in terms of equation (1.6).

The equilibrium is characterized graphically in Figure 1, which plots the wage, w , against the exit rate x_u .

The feasible wage, given by (1.4), is independent of x_u , and the relation is thus drawn as the horizontal line FF . The bargained wage is increasing in the exit rate, for two reasons: In a tight labor market (high x_u), unemployment duration is shorter, and it takes longer for firms to find a new worker. For both reasons, workers are stronger in bargaining, and this leads to a higher wage. This relation is drawn as the upward sloping locus, BB . The equilibrium is at point A, with wage w , and exit rate x_u (equivalently, duration $1/x_u$).

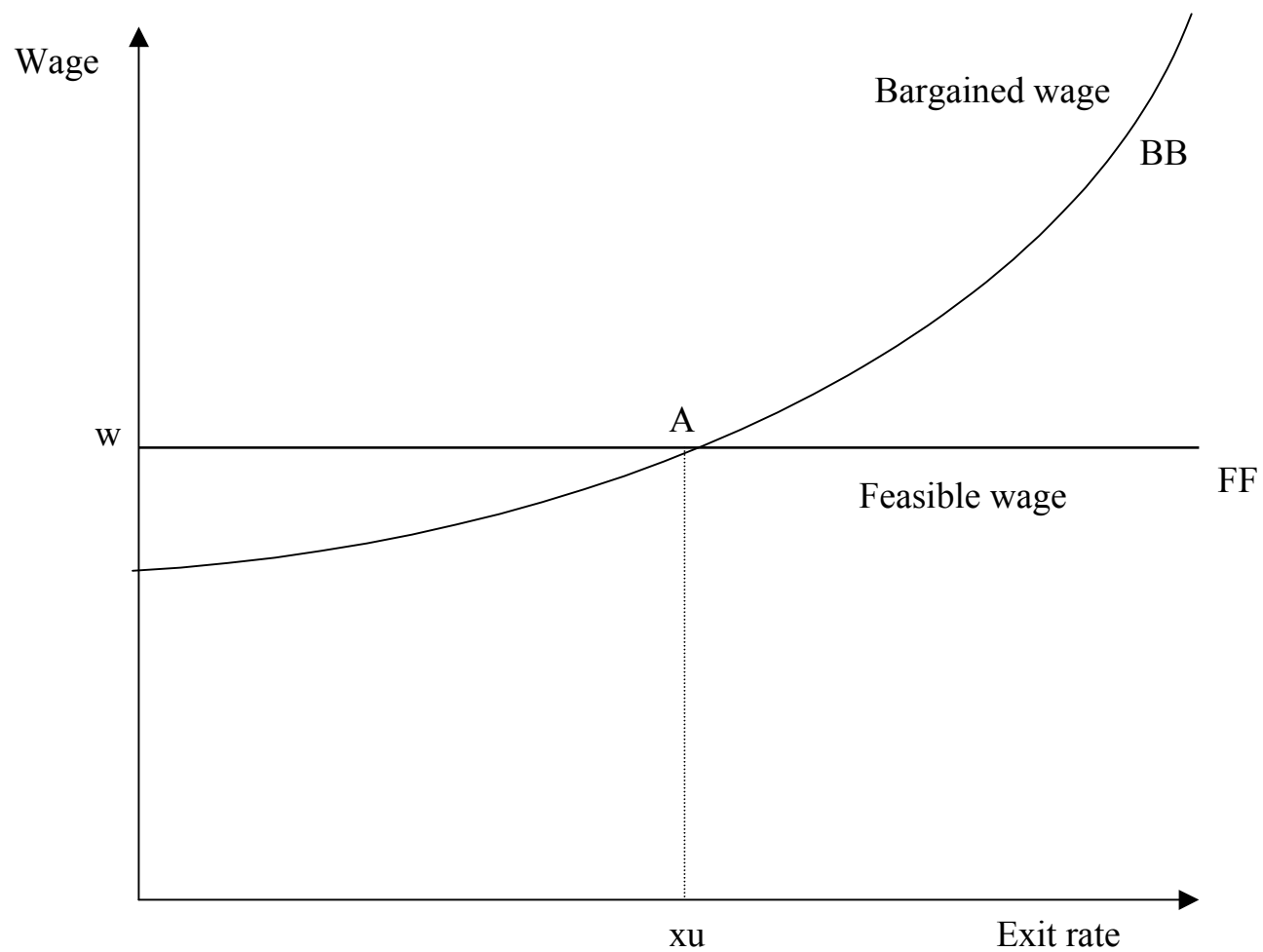
[Figure 1. The equilibrium exit rate]

Given the equilibrium values of x_u and λ , the equilibrium unemployment rate is given by (1.6). We now have everything we need to look at the effects of employment protection on the labor market.⁸

- The effect on the flow into unemployment is straightforward: An increase in c makes it more expensive for firms to lay off workers, reducing the layoff rate, and reducing the flow into unemployment.
- The effect on the equilibrium exit rate is shown in Figure 2. The increase in employment protection shifts both the feasible wage and

⁸The framework can be used at the effects of other institutions, from unemployment benefits, b , to factors which affect z , such as active labor market policies. I have explored elsewhere (for example, Blanchard and Diamond [1989], and Blanchard [1990]) how one can use the joint information from wages, unemployment and vacancies (the “Phillips curve” and the “Beveridge curve”) to get a sense of what shocks or changes in institutions are behind changes in unemployment. Extending the approach to interpret the joint information from duration, flows, vacancies and wages would be useful.

Figure 1. Equilibrium exit rate



the bargained wage relations. The wage that firms can afford to pay goes down: FF shifts down to FF' . The fact that firms have more to lose from ending the match increases the bargained wage for given labor market conditions—for a given exit rate: BB shifts up to BB' .

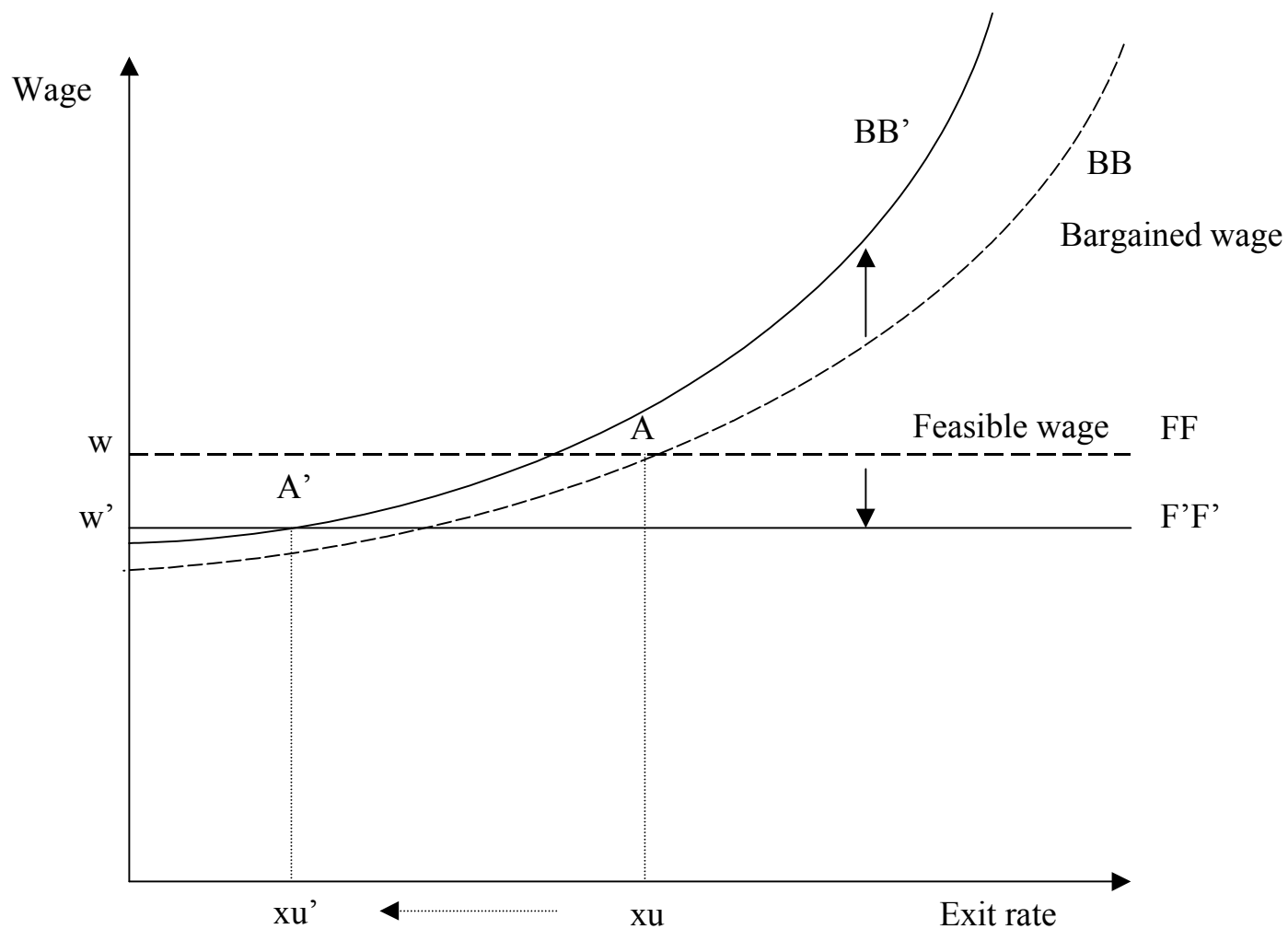
The new equilibrium is at A' , with wage w' and exit rate x' . There are two reasons why the equilibrium exit rate must decrease: For given labor market conditions, stronger bargaining power leads workers to hold for higher wages. At the same time, the feasible wage is lower. Worse labor market conditions are needed to reconcile the stronger wage demands with the lower feasible wage.

[Figure 2. The equilibrium exit rate, and employment protection]

Are there reasons to think that, say, the decrease in job flows will typically dominate the increase in unemployment duration, leading to an increase in unemployment? Or will the net effect go the other way, leading to a decrease in unemployment? In general, the answer is that we cannot tell: The net effect depends in particular on properties of the distribution of productivity shocks we know very little about. To see why, consider two extreme cases:

- Suppose that, when they occur, negative productivity shocks are so bad that firms want to terminate the job no matter what the firing cost. In this case, an increase in the firing cost will have no effect on the flows; but it will still decrease the feasible wage as firms have to pay a higher cost per layoff, as well as strengthen workers in bargaining. So equilibrium unemployment duration will increase, and given unchanged flows, so will the unemployment rate.
- Suppose instead that the distribution of shocks is such that even a small increase in the firing cost leads firms to drastically decrease

Figure 2. Employment protection and the equilibrium exit rate



layoffs.⁹ In this case, flows will collapse, dominating the effect of increased duration, and unemployment will most likely decrease.

So we have our basic results. Higher employment protection is likely to change the nature of the labor market. It is likely to decrease the flows of workers to and from employment, to and from unemployment. But it is also likely to decrease the exit rate from unemployment, to increase unemployment duration. The effect on the unemployment rate is ambiguous; the effects on the nature of unemployment is not.¹⁰

2 Looking at the evidence.

Given the predictions of the model, a natural first step is to look at the relation between flows, duration, and employment protection across countries. The evidence from the 17 OECD countries for which one can get the appropriate data is summarized in Figure 3. The source of the data is as follows:

⁹In more formal terms, suppose that the density function around the threshold level of productivity is very high.

¹⁰The framework can be easily used and expanded to think about composition effects of employment protection. To the extent that one group, say new entrants, is perceived by firms as more uncertain, it will suffer more from high firing costs. Other things equal, the lower feasible wage will lead to a higher equilibrium duration. In other words, new entrants may have to go through a longer period of unemployment as they enter the labor force. The presence of a minimum wage may make things much worse, making it nearly impossible for new entrants to get a first job. This has been well understood by governments, which have typically reduced employment protection for new entrants. The programs they have introduced may however have other perverse effects (see for example Blanchard and Landier [2000].) I shall focus on aggregate, not composition, effects here.

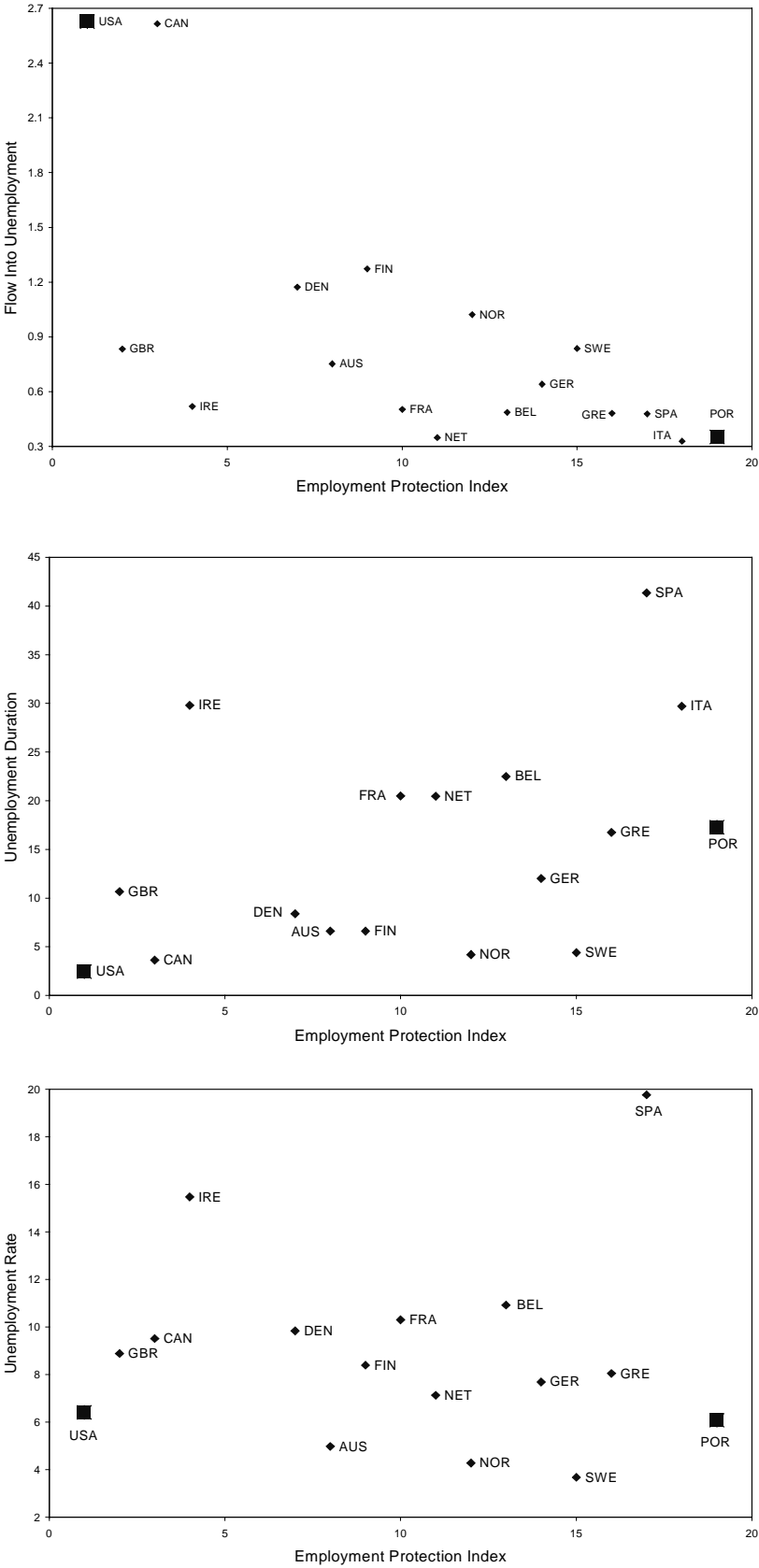
- Monthly flows into unemployment are constructed as the average number of workers unemployed for less than one month at a given time, for the period 1985-1994, divided by the average labor force during the same period, for each OECD country. The source for these data is the OECD duration data base.
- Unemployment duration is constructed as the ratio of the average unemployment rate for the period 1985-1994 to the average flow into unemployment constructed above. (So that, by construction, the average unemployment rate is equal to the product of the flows times duration).
- The employment protection index, denoted “EPL”, is the overall index constructed by the OECD for the late 1980s (EO 1999 OECD [1999], Table 2-5); this index is a rank index constructed for 19 countries, going from low to high protection (The index is based solely on institutional aspects of employment protection, not on labor market outcomes.) The value of the index goes from 1 for the United States to 19 for Portugal. (The two countries left out of the figure are Switzerland and Australia).

[Figure 3. Flows, duration, unemployment and employment protection across 17 OECD countries]

The top panel of the figure looks at the relation between the flow into unemployment (as a ratio to the labor force) and employment protection. The relation is clearly negative. The difference between the United States and Canada on one hand and other countries on the other is striking. But this is more than an America versus Europe difference. The relation remains significant even when leaving out the United States and Canada.

The middle panel looks at the relation between unemployment duration and employment protection. The relation is clearly positive, although

Figure 3. Flows, Duration, Unemployment, and Employment Protection



less strong statistically than for flows. It is robust to leaving out specific countries such as high-duration Spain, or the low-duration United States.

As one might expect from the top two panels, the bottom panel shows roughly no relation between the average unemployment rate and employment protection.

Regressions of the log flow, log duration, and the log unemployment rate on the employment protection index give:¹¹

$$\begin{array}{llll}
 \text{log flow} & = & 0.49 - 0.076 \text{ EPL} & \bar{R}^2 = 0.46 \\
 & & (t = -3.8) & \\
 \text{log duration} & = & 1.64 + 0.073 \text{ EPL} & \bar{R}^2 = 0.21 \\
 & & (t = 2.2) & \\
 \text{log u rate} & = & 2.14 - 0.003 \text{ EPL} & \bar{R}^2 = -0.06 \\
 & & (t = -0.2) &
 \end{array}$$

An increase in employment protection leads to a decrease in flows, and an increase in unemployment duration. The effect on the log unemployment rate is the sum of the two, and is roughly equal to zero. These three results appear robust to the use of alternative indices of employment protection, as well as to the inclusion of measures of other institutions, such as measures of level or length of unemployment benefits.

These regressions do not prove causality: Employment protection may be correlated with other unobservable characteristics of labor markets. But they are consistent with the implications of the model presented in the previous section: Higher employment protection is not associated with a systematic increase in unemployment, but it is clearly associated with changes

¹¹The reason for running regressions using logs is that the log of the unemployment rate is the sum of log flow and log duration, so the third regression is identical to the sum of the first two, making it easy to decompose the two effects of employment protection on the unemployment rate. The fits are the same using levels rather than logs.

in the nature of the labor market.

It is nice to find instances when institutions appear to matter in the ways predicted by the theory... Empirical research on job flows has pointed to a potentially worrying puzzle however. Let me now turn to it.

In the model of Section 1, there was no difference between the flow of job destruction and the flow of workers into unemployment. This was the result of two simplifying but counterfactual (implicit) assumptions. First, that the only source of separations for firms was job destruction. Second that all separations led to a movement from employment to unemployment. Both assumptions are false: Many separations are due to matching problems between a specific worker and a specific job, and the worker who leaves is often replaced by another worker in the same job. And many workers go directly from job to job, without going through unemployment.

To the extent that the two concepts are indeed different, the predictions of the theory are about job destruction, not the flows of workers into unemployment per se. And, here, the first pass at the data—which I believe was taken by Davis et al. [1996]—yielded a surprising conclusion: Based on existing data, rates of job destruction did not appear to be systematically lower in countries with higher employment protection. They did not for example appear systematically lower in Europe than in the United States.

A first reaction to this puzzle (the first reaction to any puzzle...) was to dismiss it, and to argue—reasonably in this case—that there were serious problems of data comparability across countries, more serious for measures of job destruction than for, say, measures for the flows of workers in and out of unemployment. The way to make progress here was to look at the data more carefully for a subset of countries, and this is what I did in Blanchard and Portugal [2001], comparing flows in Portugal and the United States. Let me describe what I think was learned from that study, and the remaining puzzles.

2.1 *Flows in the United States and Portugal*

The reason for choosing the United States and Portugal was twofold. Over the past 15 years, both countries have had the same average unemployment rate, roughly 6%; but, as is clear from Figure 3, they have done so with very different labor markets, much higher employment protection, longer duration, lower flows in Portugal than in the United States. Second, there are very good data on both job flows and worker flows for Portugal (indeed better data than for the United States), allowing for a close comparison with the United States.

The main conclusions from the study can be summarized in two tables, Table 1 and Table 2 below. Table 1 looks at job flows, Table 2 looks at worker flows.

Table 1. Job flows

	Creation		Destruction		Sum		Ratio
	U.S.	P	U.S	P	U.S.	P	P/U.S
Manufacturing:							
Annual	8.9	10.6	10.2	11.6	19.2	22.2	1.16
firm size adjusted	8.9	7.5	10.2	10.1	19.2	17.6	0.92
Quarterly	5.2	3.2	5.6	3.9	10.8	7.1	0.66
All sectors:							
Quarterly	6.8	4.0	7.3	3.9	14.0	7.9	0.56

Source. Blanchard and Portugal [2001], Tables 1 to 3.

The first line of Table 1 gives numbers for annual job creation and job destruction in manufacturing. Following the work of Davis et al. [1996], job creation (destruction) is constructed as the sum of positive (negative) employment changes from one year to the next across all firms, divided by

the average level of employment during the year. The reason for focusing on manufacturing is that this is the sector for which one can get the most reliable and comparable data across the two countries. The numbers confirm that there is indeed a genuine puzzle, not just a statistical artefact: Average job flows (creation plus destruction) are indeed *higher* in Portugal than in the United States. The last number summarizes the findings: The ratio of Portuguese to U.S. job flows is equal to 1.16

The two economies are different however in many ways, some of them relevant here. In particular, Portugal has smaller firms, and smaller firms have higher rates of job creation and destruction than larger ones. Thus, the second line shows the numbers for creation and destruction in both countries, adjusted for firm size. That is, the numbers for Portugal show what job creation and destruction would be in Portugal, if Portugal had the same firm size distribution as the United States. Not surprisingly, the adjusted numbers for Portugal are smaller than in line 1, and now smaller than the U.S. numbers. But the ratio remains close to 1, namely 0.92. The puzzle largely remains.

The third line looks not at average annual rates, but average quarterly rates, i.e. changes in employment from one quarter to the next, still for manufacturing. Now, the numbers give a very different picture. The ratio of Portuguese to U.S. flows is now only 0.66 (compared to 1.16 for annual rates). The interpretation of the difference between the second and the third lines is straightforward: Many quarterly changes in employment at the firm level in the United States are reversed in later quarters, while this is much less the case in Portugal. In other words, Portuguese firms appear to smooth high frequency movements in employment relative to their U.S. counterparts.

Finally, the last line gives quarterly rates of job creation and destruction for the private sector as a whole, rather than just manufacturing. This is clearly what we are ultimately interested in, but the quality of the data

(especially for the United States) is lower. The conclusion is the same as for quarterly manufacturing flows. The ratio of Portuguese job flows to U.S. flows is equal to 0.56.

This gives a first partial resolution to the puzzle. A look at annual flows does not show much difference, but a look at quarterly flows does. Quarterly job flows are indeed much lower in Portugal. But it raises a deeper issue. If the effect of employment protection is primarily to restrict high frequency movements in employment, how costly can this be to the economy in terms of efficiency? A full answer has to consider also what happens to worker flows. With this in mind, let me turn to Table 2.

Table 2. Worker flows

	Job destruction		Worker outflows		Ratio (2)/(1)	
	U.S	P	U.S	P	U.S	P
All sectors						
Quarterly	7.9	3.0	20.4*	4.3	2.6	1.4
	Worker outflows total		Worker outflows through u		Ratio (2)/(1)	
	U.S	P	U.S	P	U.S	P
Quarterly	12.6	4.0	3.9	1.0	0.31	0.40

Source: Blanchard and Portugal [2001], Tables 4 and 5. (: Mean of the range of estimates.*

The top part gives numbers for quarterly job destruction and for quarterly worker outflows from employment. If the only source of separations were net changes in employment at the firm level, worker outflows would be equal to job destruction.¹² The ratio of worker outflows to job destruction,

¹²This is not quite right. Within quarterly changes in employment will lead to worker

given in the last two columns, shows the extent of separations due to other causes, i.e. layoffs for non economic reasons and quits. The ratio of worker flows to job destruction is much larger in the United States than in Portugal. Put another way, more than half of the worker outflows in the United States are the result of either firms or workers trying to find a better match; the proportion is much lower in Portugal.

The bottom part of the table looks at the proportion of worker outflows from employment which go through unemployment. One reason why worker flows into unemployment might be low is that most workers go either directly from employment to employment, or less importantly, from employment to non-activity, rather than from employment to unemployment.¹³ The table gives total outflows from employment, outflows from employment to unemployment, and the implied proportion of outflows which go through unemployment. The proportions for Portugal and the United States are roughly similar, so this factor does not appear to be an important difference between the two countries.

I draw two main conclusions from these two tables. First, Portugal indeed has a more sclerotic labor market than the United States; a plausible culprit is high employment protection. Second sclerosis takes a form which is somewhat different from the predictions of the basic model: Low frequency movements in firm employment seem little affected. Layoffs for non economic reasons and quits are much lower, suggesting worse matches between workers and jobs on average. That quits would be strongly affected by employment protection would seem paradoxical, as firing costs apply only to layoffs, not quits. But the causality is likely to be indirect: Employment protection leads to long unemployment duration, which discourages quits, at least quits through unemployment.

flows but may lead to zero net quarterly change in employment.

¹³See the discussion in Boeri [1999].

3 Sclerotic labor markets, and the effects of shocks on unemployment

Let me now turn to the second—and harder—question raised in the introduction. Granted that high employment protection leads to more sclerotic markets, does this make a difference to the way shocks affect unemployment?

Various pieces of aggregate evidence suggest that the answer is yes, that in markets characterized by high employment protection, shocks have larger and/or longer-lasting effects on unemployment. In his study of the effect of institutions on unemployment, Nickell [1997] found that, controlling for other institutions, countries with higher employment protection suffered a larger increase in unemployment from the early 1980s to the 1990s. In our panel data regressions (Blanchard and Wolfers [2000]), Wolfers and I found that, controlling for other institutions, higher employment protection indeed appeared to increase the effects of shocks on unemployment. Our estimates imply that a shock with an effect of 1 on unemployment in the country with the lowest employment protection has an effect of 2.4 in the country with the highest degrees of employment protection.

Why might this be? There is a long running argument in the literature—developed initially, I believe, by Layard and Nickell—that sclerotic markets suffer from high long-term unemployment, and that the long term unemployed are largely irrelevant to the process of wage formation. In response to shocks, the argument goes, long term unemployment increases, but this has little effect on wages, so shocks have larger and/or longer lasting effects on unemployment. There is indeed some suggestive aggregate evidence that the composition of unemployment matters for wage determination. Layard et al. [1991] for example, have shown that, when one separates short-term from long-term unemployment in wage equations, the estimated effect of long-term unemployment is smaller than that of short-term unemployment.

While I have used the argument myself, I have also felt some uneasiness

in doing so, feeling that it remained loose, and in need of more work. My purpose in the rest of this section is to revisit its logic, and try to get a sense of its quantitative relevance.

3.1 Sclerotic markets and long term unemployment

To set the stage, go back to the model of Section 1. In that model, the higher the degree of employment protection, the lower the exit rate from unemployment—equivalently the longer the average individual duration of unemployment. And the longer the average duration of unemployment, the higher the proportion of long term unemployed. If we define the long-term unemployed as those who have been unemployed for a period of time at least equal to T , the proportion of long term unemployed is given by:

$$\text{LTU} = \exp(-x_u T)$$

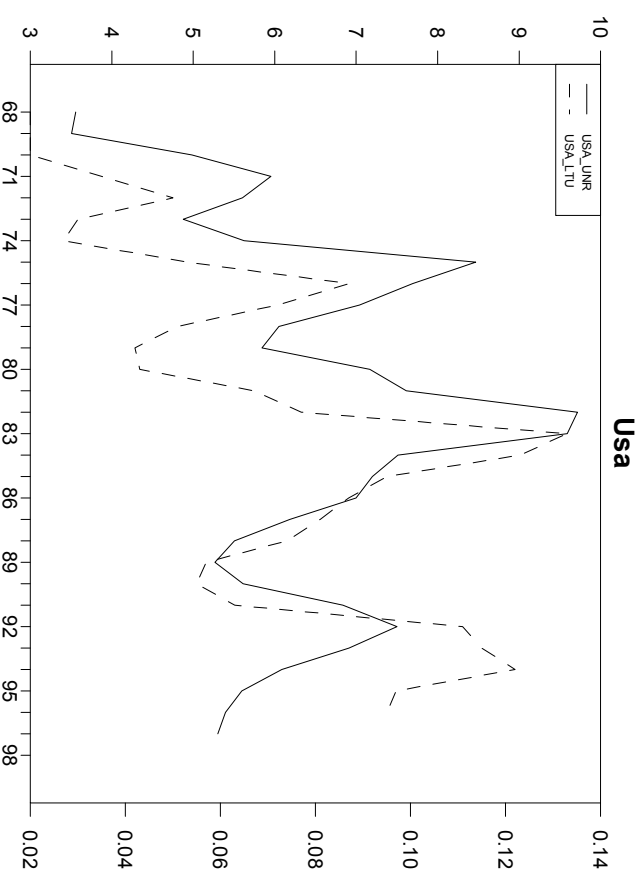
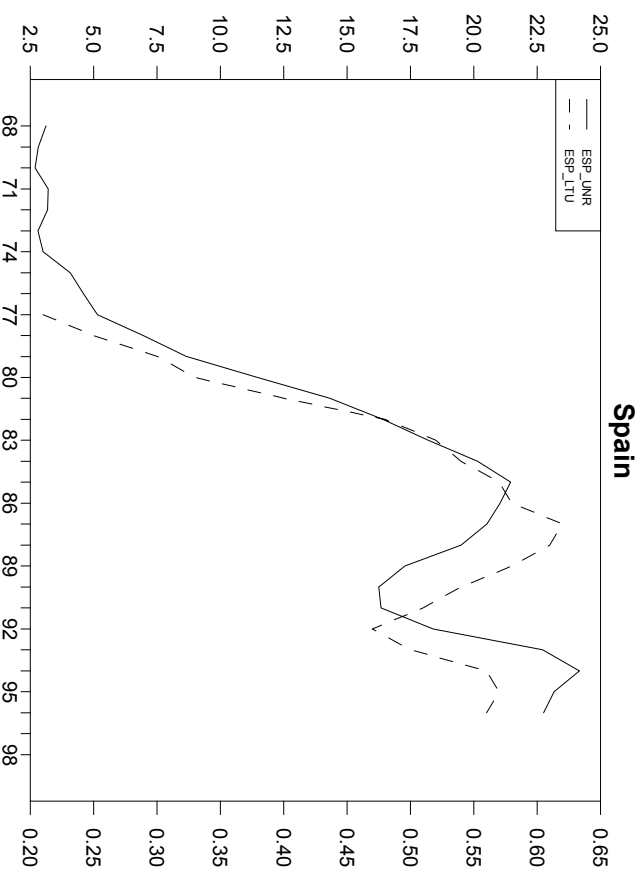
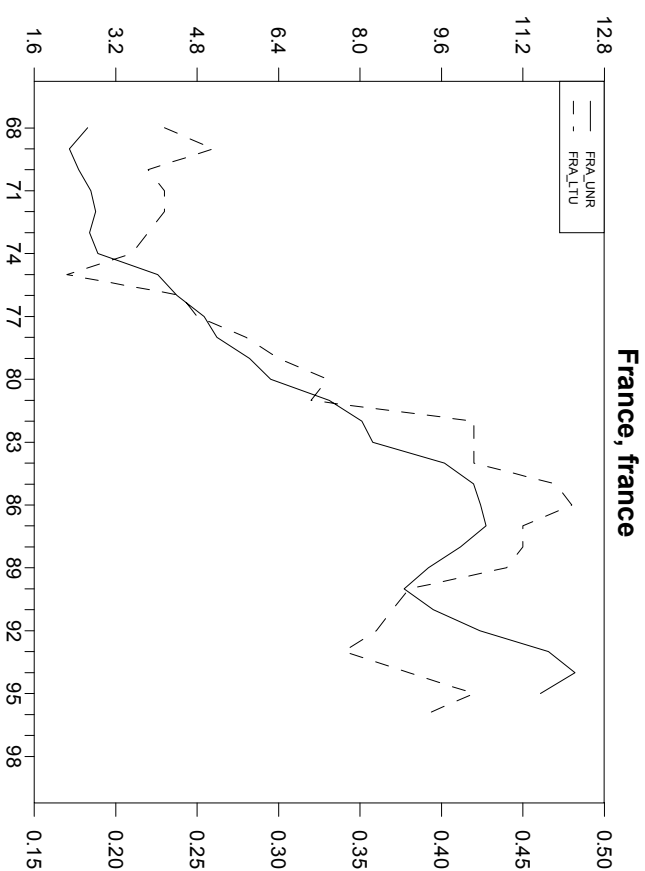
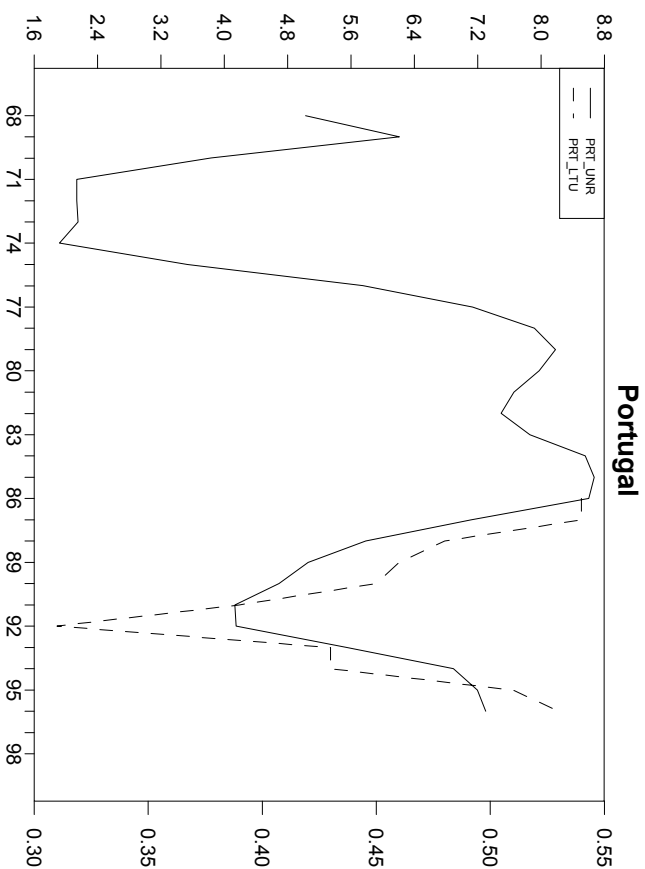
If we take T equal for example to 12 months, then for $x_u = 0.3$ (a probability of finding a job while unemployed equal to 30% per month, roughly the average U.S. value), then the proportion of long term unemployed is equal to 1%. For $x_u = 0.2$, the proportion increases to 9%. And for $x_u = .05$, a typical value for European labor markets, the proportion of long term unemployed reaches 54%.

In short, the model clearly implies that more sclerotic markets will have a much higher proportion of long term unemployed. As a direct corollary, it implies that shocks which decrease the equilibrium exit rate—equivalently, increase equilibrium duration—will also increase the proportion of long term unemployed.

[Figure 4. Unemployment rate and proportion of long term unemployed, 1968-1996, Portugal, Spain, France, and the United States]

These two implications are also clearly visible in the data. Figure 4 plots

Figure 4. Unemployment rate and LTU



the proportion of unemployed who have been unemployed for a year or more (LTU) together with the unemployment rate against time for four countries: Portugal (the country with the highest index of employment protection in the OECD rankings, 19), Spain (17), France (10), and the United States (1). The unemployment rate is measured on the left axis, the proportion of long term unemployed on the right axis. Note two features of the figure:

- In all four countries, the proportion of long-term unemployed and the unemployment rate move closely together. This reflects the fact that most movements in unemployment over time reflect changes in duration rather than changes in flows.
- At a given unemployment rate, the proportion of long-term unemployed is quite different across countries. It is for example much higher in Portugal than in the United States. This reflects the difference in durations across countries: As we saw earlier, at a given unemployment rate, average individual duration, and by implication LTU, is much higher in Portugal than in the United States.

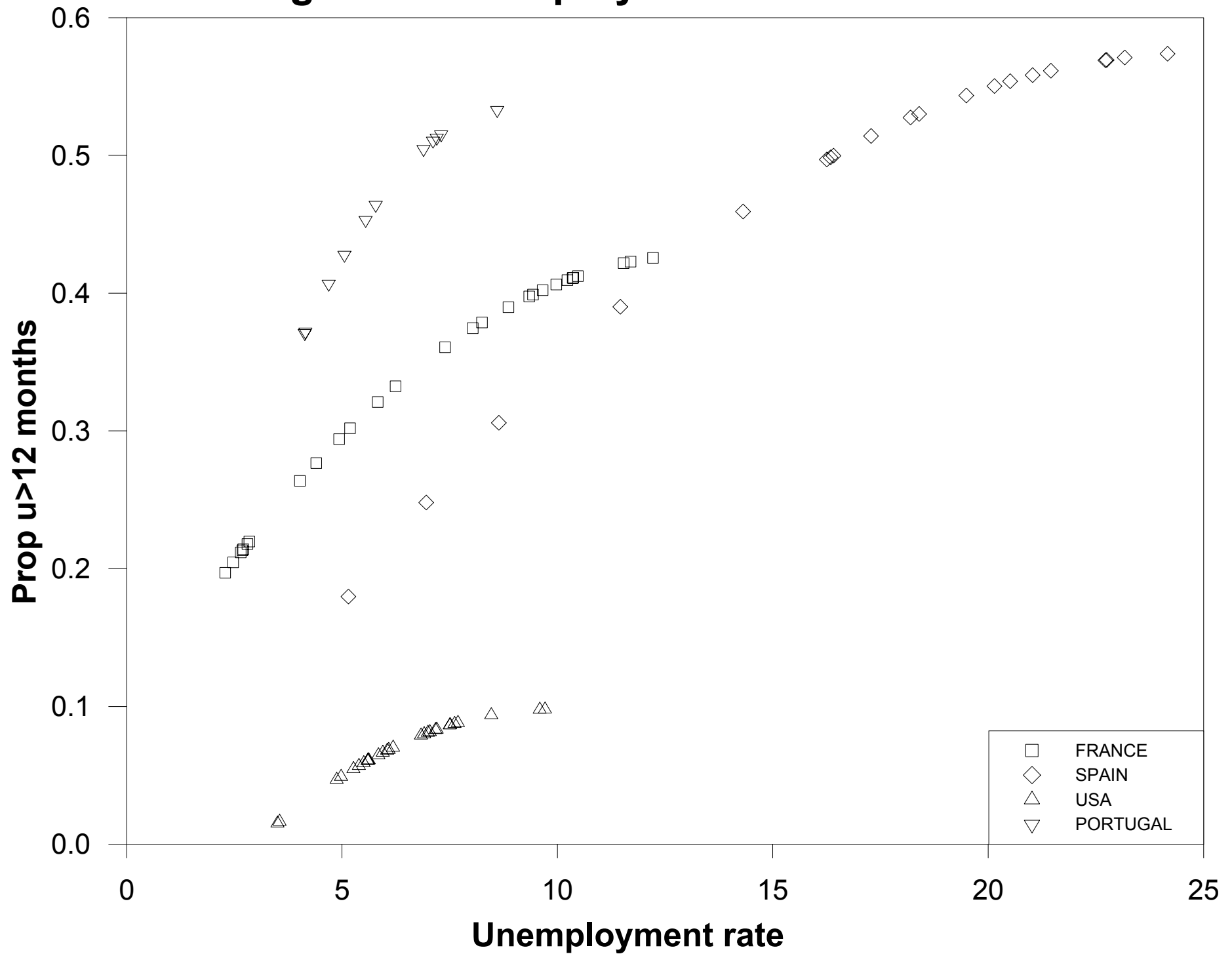
[Figure 5. Fitted value of LTU versus unemployment rate, Portugal, Spain, France, and the United States]

Another way of making this last point is to plot LTU against unemployment in a scatterplot. This is done in Figure 5. To construct it, I first run the following regression:

$$\text{LTU}_{it} = a_i + b_i u_{it} + c_i (u_{it})^2$$

where i stands for country, and t for time. The quadratic in unemployment seems sufficient to capture the non linearity in the relation between LTU and the unemployment rate. Figure 5 then plots the fitted value LTUF_{it} against u_{it} , for each of the four countries. The figure suggests two conclusions:

Figure 5. Unemployment rate and LTU



- First, at a given unemployment rate, LTU is indeed different across the four countries. At an unemployment rate of 5%, LTU is equal to 0.42 in Portugal, 0.30 in France, 0.18 in Spain, 0.05 in the United States.
- Second, the variation in LTU for a given variation in the unemployment rate also differs across countries. Note in particular how much steeper the relation between LTU and the unemployment rate is in Portugal, relative to the United States. I shall return to this point later.

Figures 4 and 5 make clear that long term unemployment is largely irrelevant in the United States, even when unemployment is high, but very relevant in Portugal, Spain, or France. But does it matter? Interestingly, within the logic of the model of Section 1 the answer is no: Whatever their current unemployment duration, all the unemployed have the same probability of being hired, thus the same prospects, thus the same level of utility. From either a positive or a normative point of view, the distinction between short and long term unemployed is irrelevant in that model...

This conclusion serves two purposes. First it serves as a warning: A high proportion of long term unemployed does not, by itself, have any obvious normative or positive implication. But it also tells us that there may well be something missing from the model of Section 1, namely that the prospects of the unemployed do in fact deteriorate with duration. In that case, the proportion of long term unemployed is likely to matter. So the next step is to extend our earlier model to allow for such duration dependence.¹⁴

¹⁴One may say at this point: Forget differences among the unemployed. Take two markets characterized by the model of Section 1, but different values of c so one is sclerotic and the other not. Extend the model to introduce shocks and look at both dynamic and

3.2 *Duration dependence and equilibrium unemployment*

There is substantial evidence that being unemployed for a long period of time decreases the probability of being reemployed. The channels are many: Decreasing returns to search and decreasing contacts with the work place lead to lower search intensity over time. Decreasing self-confidence and other psychological changes go in the same direction. Loss of skills, loss of work habits, health problems all decrease the probability of being hired anyway.¹⁵

How relevant is such duration dependence likely to be for macroeconomics? Intuition suggests that this will depend on the nature of the market. In labor markets with short average unemployment duration, long-term unemployment is likely to be limited, and duration dependence largely irrelevant. But in sclerotic markets, markets with long unemployment duration, long term unemployment is likely to be much larger, and thus duration dependence much more relevant.

To explore the argument further, let us extend the model of Section 1 (still limiting ourselves to an examination of steady state. I shall discuss dynamics later.) Assume that the longer an individual has been unemployed, the lower is his search intensity. In other words, search intensity is duration dependent. And let's examine how this changes the model and its implications.

steady state effects. Will the two economies respond in the same way? I do not know the full answer to this question. But, with respect to aggregate shocks (changes in the feasible wage), the answer is that there is no presumption that one economy will respond more or faster than the other. The answer depends on conditions on the parameters which can go one way or the other. Thus, I have not followed this route here.

¹⁵For a survey of the long term unemployed in France, see Aldgehi [1992]. A description of long-term unemployment in France is given in Fougere [2000].

The matching function revisited

Until now, we could use x_u to denote both the average exit rate from unemployment as well as the individual exit rate facing any unemployed: All the unemployed faced the same exit rate, regardless of duration. This is no longer the case. I shall continue to define x_u as the average exit rate, so $x_u \equiv h/u$. In the presence of duration dependence, it must now be that the short term unemployed face a rate higher than x_u , and the long term unemployed a rate lower than x_u .

Now return to the matching function we introduced in Section 1. Think of the parameter z in that function as reflecting the average search intensity of the unemployed. Under the assumption of duration dependence, z will now depend on x_u , the average exit rate from unemployment: The lower is x_u , the higher the average duration, the higher the proportion of long term unemployed, the lower the average search intensity. So we can write:

$$z = z(x_u) \quad z_{x_u} > 0$$

The matching function is now given by:

$$h = \sqrt{z(x_u) u v}$$

Or equivalently, squaring, using the definitions of the average exit rate from unemployment and the exit rate from vacancies, and reorganizing:

$$x_u x_v = z(x_u) \quad (3.1)$$

It follows from (3.1) that $dx_v/x_v = (-1 + x_u z'/z) dx_u/x_u$. The term coming from duration dependence is the second term in parentheses. Absent duration dependence, a decrease in the exit rate from unemployment is reflected in a proportional improvement in the exit rate from vacancies. In other words, a deterioration of the labor market from the point of workers is

associated with a proportional improvement from the point of view of firms. In the presence of duration dependence, there is another effect which goes the other way. As the labor market deteriorates for workers, the proportion of long term unemployed increases, and average search intensity decreases. If, as seems reasonable empirically, the duration dependence effect is not so strong as to imply $x_u z'/z > 1$, firms still find it easier to fill vacancies. But, because many of the unemployed are not very active in their search, the improvement is smaller than absent duration dependence.

The bargained wage revisited

The feasible wage and the layoff rate equations, which both reflect the decision problem of firms, are unaffected by the presence of duration dependence.¹⁶ This leaves the equation characterizing the bargained wage, equation (1.5) in the model of Section 1.

The reason why the average exit rate, x_u appeared in equation (1.5) was because it reflected the ease with which a worker could expect to find a job, were he to become unemployed. In the model of Section 1, all the unemployed had the same prospects, and so the relevant exit rate was also the average exit rate, x_u . This is no longer true when there is duration dependence: A worker who is currently employed knows that, were he to become unemployed, his exit rate will initially be higher than the average. Only if he is unlucky, and becomes long term unemployed, will his exit rate become lower than the average.

More formally, what matters to a currently employed worker, is the

¹⁶This conclusion depends on the specific form of duration dependence, a decrease in search intensity. If for example, duration dependence came from loss of skills, then the cost of retraining if partly borne by firms, or the lower productivity of workers if not retrained, would lead to a decrease in the feasible wage. I have not thought about the potential magnitude of this effect.

sequence of exit rates as a function of duration he can expect to face, were he to become unemployed—not the average exit rate, x_u . This suggests that the labor market prospects faced by a newly unemployed worker may be much better than reflected by the average exit rate: If most of the long term unemployed are not really searching, an apparently depressed market may still be consistent with a high exit rate for the newly unemployed; in effect, from the point of view of the newly unemployed worker, the long term unemployed are largely irrelevant. This argument can often be found in discussions of unemployment, and it was the motivation for Blanchard and Diamond [1994]. In that paper, we explored wage bargaining in an environment in which the exit rate decreased with individual unemployment duration. We reached a conclusion that, at first, surprised us:

In steady state, if the discount rate of the unemployed was reasonably small, the average exit rate still summarized the relevant labor market prospects facing a newly unemployed worker. Indeed if the discount rate was equal to zero, the average exit rate was still exactly the right summary statistic of labor market conditions in the wage equation. The reason is clear—at least a posteriori... In steady state, all the unemployed workers are the same ex-ante—i.e. before they become unemployed. The long-term unemployed are simply unlucky; but the same could happen and indeed will happen to some of the newly unemployed. When the newly unemployed take this into account, the exit rate relevant to them is simply the average exit rate. (Outside of steady state, the prospects for the newly unemployed may be sharply different from the current average exit rate; but I continue to leave dynamics aside for the moment, and just focus on steady state.)

The bottom line of Blanchard and Diamond [1994], and of this short discussion, was that the equation characterizing the dependence of the bargained wage on labor market conditions in steady state was largely unaffected by duration dependence. So, in what follows, I keep the same equation for the bargained wage, and the only change to the initial model is the form

of the matching function.

Equilibrium unemployment and duration dependence

How does the modification of the matching function affect the equilibrium? Flows are determined in the same way as before. Equilibrium duration is now characterized by:

$$\phi(c, \cdot) = b + f\left(\frac{x_u^2}{z(x_u)}, c; \cdot\right) \quad (3.2)$$

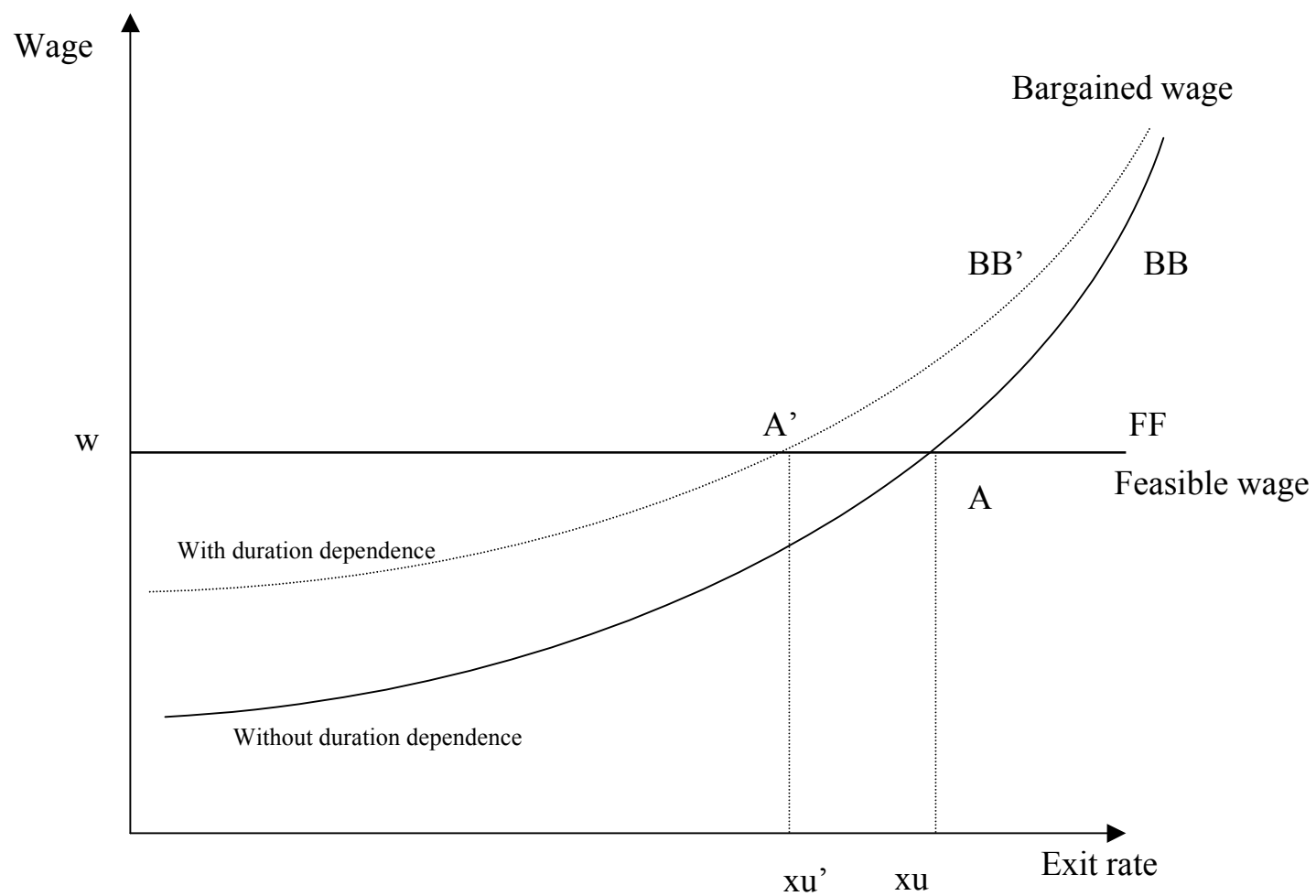
As x_u increases, there are three effects at work: direct, indirect through the effect of x_u on x_v given z , and indirect through the effect of x_u on z . The third effect comes from duration dependence: As the labor market improves for workers, the unemployed search more intensively, making it easier for firms to hire, and thus putting less upward pressure on wages. Symmetrically, as the labor market gets worse for workers, search intensity goes down, making it harder for firms to hire, and limiting the downward pressure on wages.

The equilibrium exit rate is characterized in Figure 6. Figure 6 starts by replicating Figure 1: FF gives the feasible wage, and BB gives the relation between the wage and the exit rate from the bargained wage relation, absent duration dependence. The equilibrium exit rate is given by A . In the presence of duration dependence, the relation between the bargained wage and the exit rate is flatter, given, say, by BB' . The equilibrium is given by A' .

[Figure 6. Equilibrium exit rate and unemployment duration]

The implications of duration dependence are then straightforward. For simplicity, think of two countries, one (“the USA”) in which equilibrium x_u is so high that long term unemployment is negligible, and z is constant; the other (“Portugal”) in which equilibrium x_u is low, long term unemployment relevant, and z decreasing in x_u .

Figure 6. Equilibrium exit rate and duration dependence



Now consider a shock which decreases the feasible wage, shifting the locus FF down.¹⁷ In the presence of duration dependence, this shock requires a larger decrease in the exit rate. As the labor market gets more depressed, search intensity falls, limiting the improvement in the labor market from the point of view of firms, and limiting the downward pressure on wages. As a result, to reconcile the bargained wage with the feasible wage, the equilibrium exit rate has to fall further. In short, the same shock has more of an effect on unemployment in Portugal than in the United States. And the difference comes from the combination of the increase in long term unemployment and duration dependence.

Duration dependence and persistence

We have just seen how duration dependence could lead to larger effects of permanent adverse shocks on unemployment. What about transitory shocks? Is it indeed the case, as is again often informally argued, that they will have longer lasting effects on unemployment?

The question falls far beyond what I can hope to do here. We have a long way to go in exploring dynamics even in models without duration dependence. Most of the models we have for example ignore adjustment costs in capital accumulation and the creation of new jobs, thus ignoring much of the dynamics we examined in the first lecture. Working out the implications of duration dependence adds an additional degree of complexity.¹⁸

¹⁷This may come for example from an increase in the interest rate. But anything which decreases the feasible wage relative to the bargained wage for a given exit rate; an increase in b , or an increase in b relative to mean productivity, will do.

¹⁸We examined the dynamic implications of duration dependence in Blanchard and Diamond [1994], and my intuition comes largely from the simulations of that model. But the model had exogenous movements in job creation and destruction. A full answer requires endogenizing those. Justin Wolfers and I are currently working on such an extension.

But intuition can go some way here:

Consider an adverse shock which initially decreases job creation, reducing the flow into employment, and increases job destruction, increasing the flow into unemployment. For both reasons, unemployment increases. Absent duration dependence, higher unemployment, which makes it harder for the unemployed to find a job and easier for the firms to find workers, puts downward pressure on the wage, until unemployment returns to its initial level.

Now introduce duration dependence. Initially, the downward pressure on wages will be stronger than in steady state. This is because the proportion of long-term unemployed is initially lower than in steady state. Most of the new unemployed are still short-term unemployed, still searching. Thus, the average search intensity is higher than in steady state, leading to better matching. And competition among the unemployed for jobs is stronger, leading to a lower relative exit rate for the newly unemployed than in steady state, and more downward wage pressure.

Over time however, an increasing proportion of the unemployed becomes long-term unemployed. And the effects we have talked about come into play. Those who become long-term unemployed search less, become increasingly less relevant to matching. And the prospects of newly unemployed workers are better than reflected by the average exit rate, leading to less wage pressure. Thus, as time passes, the pressure of unemployment on wages decreases, slowing down the return to steady state.

How much persistence can this generate? This is where a formal quantitative model is needed. But one can think of extreme cases. If the long term unemployed nearly give up searching altogether, and a series of adverse transitory shocks creates an unusually large proportion of long term unemployed, it will take a long time for the economy to absorb them. One of the crucial elements here is how strongly reemployment prospects decrease with duration. With this question in mind, let me have a look at the relevant

empirical evidence.

3.3 *An attempt at quantification*

To get a sense of the steady state implications of duration dependence, one needs two ingredients. First a characterization of the relation $z(x_u)$, the average search intensity of the unemployed as a function of the state of the labor market. Second, a characterization of how variations in z translate in variations in the equilibrium unemployment rate. Let me take both ingredients in turn.

Variations in search intensity

To be concrete—and fit our data on long term unemployment, which give the proportion of the unemployed who have been unemployed for a year or more—suppose that search intensity drops from 1 (an innocuous normalization) to $\theta < 1$ after a year, and remains equal to θ thereafter. Then, the average search intensity z is given by:

$$z = (1 - \text{LTU}) + (\text{LTU}) \theta$$

We can get estimates of the relation of LTU to the unemployment rate directly. This is what we did in Figure 5. What we need is an estimate of θ , the relative search intensity of the long term unemployed. To get such an estimate, one can pursue two approaches:

- A microeconomic approach, looking at reemployment probabilities as a function of duration.

The problems of going that route are well known, namely those of separating between heterogeneity and duration dependence: Are the long term unemployed less successful at finding jobs because those who had better chances got jobs earlier, or because long unemployment

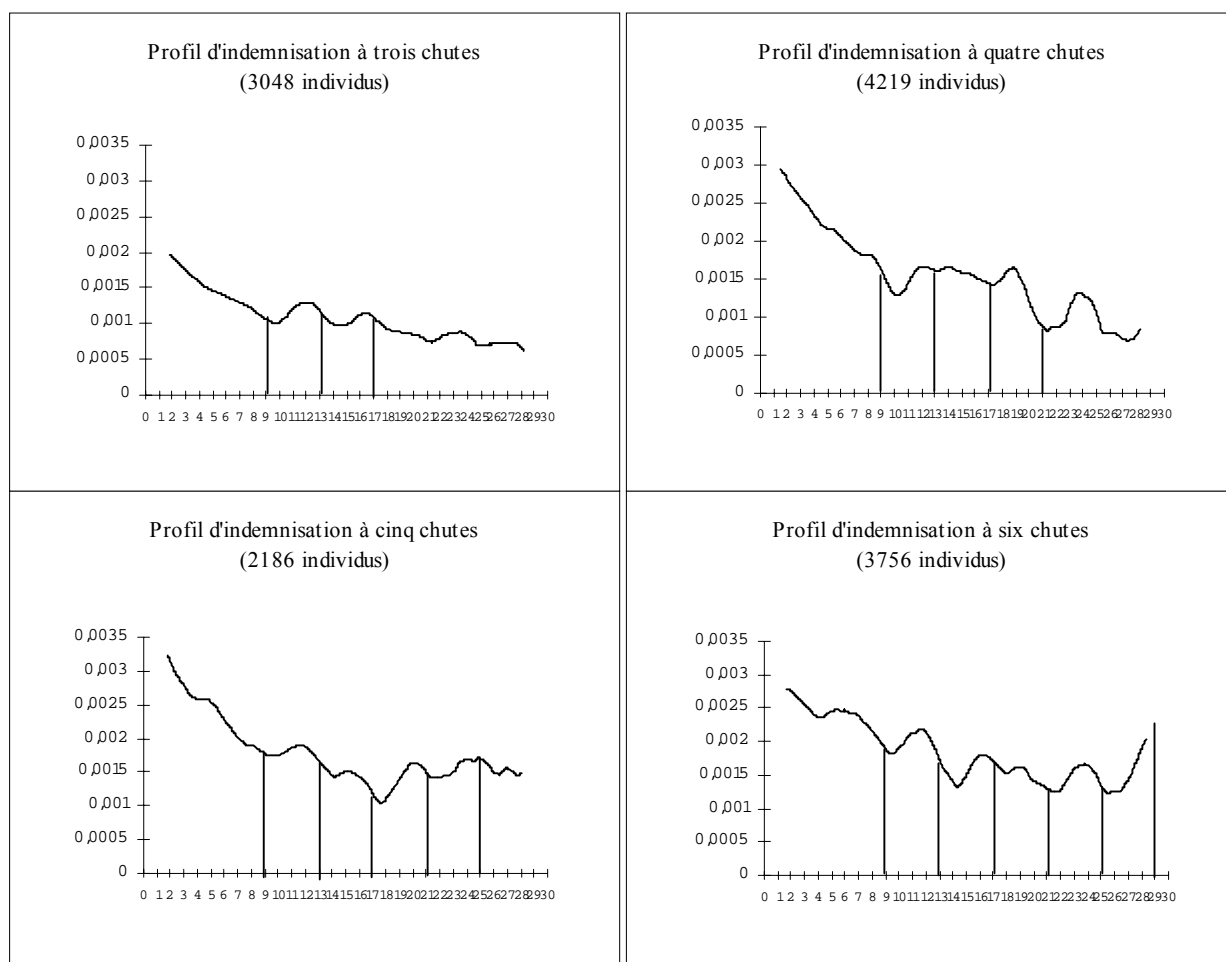
decreased their chances? I see the results from existing studies as suggesting that, controlling for observable characteristics, the exit rate is decreasing in duration. A good example of such results is given in Figure 7, taken from Prieto [2000]. In that study, Prieto estimates the exit rate for a sample of French unemployed workers, over the period 1986-1996, controlling for individual characteristics (sex, age, education, reason for previous job loss, length of previous tenure, previous wage). The daily exit rates, for a worker with average characteristics, are given in the four panels of Figure 7. Each panel corresponds to a different profile of unemployment benefits, and each vertical line in each panel corresponds to the time when unemployment benefits are reduced. The top left panel corresponds to the lowest paid workers, the bottom right to the highest paid workers.

For our purposes, the important fact is that, apart from the bumps induced by the anticipation of decreases in the level of benefits (an interesting question also, and the main focus of the article by Prieto), the exit rate decreases roughly by a factor of 2 to 3 over the first two and a half years of unemployment.

- A macroeconomic approach, based on estimation of the matching function, allowing for different effects of short- and long-term unemployment.

Even if we had accurate estimates of the dependence of individual exit rates on duration, we would still face a tough aggregation problem. Suppose, as we did in Blanchard and Diamond [1994] that the hiring decisions of firms were characterized by pure “ranking”, namely that, in the presence of multiple applications, firms were willing to hire any applicant, but hired the lowest-duration applicant first. This would clearly give rise to declining exit rates at the individual level. But it would not have any implications for aggregate matching, just for

Figure 7. Exit rate as a function of duration.



Source: Ana Prieto, "L'introduction d'une allocation chômage dégressive en France en 1992. Quel impact sur la reprise de l'emploi?", CREST-INSEE, mimeo, 2000.

who got hired. In this case, micro evidence would be simply irrelevant to the issue at hand. Pure ranking is too strong a hypothesis, but it serves as a warning of the problems of aggregation: The effects of long term unemployment on average search efficiency may be less than suggested by micro-estimates.

This suggests an alternative approach, that of estimating the matching function directly, allowing for average search intensity to depend on the composition of unemployment. We went down that road in Blanchard and Diamond [1989] when estimating the matching function for the United States; our results were not encouraging: The estimate implied a slightly higher exit rate for those unemployed more than 6 months. But the United States, with its low duration and low long-term unemployment, is hardly the right country in which to look at the issue. Studies for other countries (summarized for example in Petrolongo and Pissarides [2000]) have indeed found that matching is decreasing in the proportion of long term unemployment.¹⁹

My purpose in the computations which follow is to get an upper bound on the effect of duration dependence on equilibrium unemployment. So based on the above evidence, let me assume that θ goes from 1 in the first year to 0.3 thereafter (This is surely an upper bound on the decline in θ : The lack of control for unobserved characteristics suggests that the true decline is probably smaller than shown in Figure 7. Also, the exit rate clearly declines during the first year.) Now combine this with the information contained in Figure 5 about the relation between LTU and the unemployment rate, to get a sense of the change in z as unemployment increases:

- For the US, an increase in unemployment from 4 to 10% leads to an

¹⁹The specification in those studies is such that it is hard to infer the implied value for θ and compare it to the value of θ from micro estimates. I shall do it in the next draft.

increase in LTU from 2 to 9%, thus a decrease in z from 0.99 to 0.94, a 5% decline.

- For Portugal, the same increase in unemployment leads to an increase in LTU from 36 to 54%, thus a decrease in z from 0.75 to 0.62, a 20% decline.

Is the larger decline in average search intensity in Portugal sufficient to generate a much larger increase in unemployment? To answer this, we need to go back to the model we developed earlier, quantify and solve it. This would appear to be a major task, and indeed it is. But back of the envelope computations can go a long way. Let me turn to those.

From changes in z to changes in unemployment

Suppose that z decreases by 20%. By how much will the unemployment rate increase? To answer this question, go back first to the matching function, (1.1), $h = \sqrt{zuv}$. If we assume that the layoff rate is unaffected by the change in z , and so, to a first approximation, is the flow of layoffs, and by implication, in equilibrium, the flow of hires, then equation (1.1) implies:

$$d \log u + d \log v = -d \log z$$

Turn to the condition that the bargained wage equals the feasible wage, $\phi(c; \cdot) = b + f(x_u/x_v, c; \cdot)$. As z does not enter the equation, for this equation to hold as z changes, it must be that x_u/x_v remains constant. In words: The change in z does not affect the feasible wage. The bargained wage must therefore remain the same. This implies that the relative labor market conditions faced by workers and firms must remain the same.

Given the definitions of the two exit rates, this in turn implies that the ratio of unemployment to vacancies, u/v , must remain constant, so, that in

response to a change in z :

$$d \log u = d \log v$$

Combining the two equations gives:

$$d \log u = -\frac{1}{2} d \log z$$

So, if z decreases by 20%, the unemployment rate will increase by 10%. Starting from a 5% unemployment rate, duration dependence adds one percentage point to the unemployment rate. Starting from 10%, it adds two percentage points to the rate. Put another way, a shock which increases unemployment from 5 to 10% in the US increases unemployment from 5 to 12% in Portugal.

In short, the model does not deliver large effects of duration dependence, at least with respect to the steady state effects of permanent shocks. The argument is qualitatively right; but quantification suggests that it is unable to generate the size of interactions suggested by casual discussions or by the panel data evidence.

4 Conclusions

To summarize: This lecture explored the effects of one institution—employment protection—on the nature and the dynamics of the labor market. I see the first two sections as telling a success story. Theory and empirical evidence strongly suggest that employment protection changes the nature of the labor market, making it more sclerotic. The third section is closer to an admission of (temporary) failure. The good news is that the logic behind the argument that, in sclerotic markets, long term unemployment combined with duration dependence can lead to larger and longer lasting effects of shocks is indeed correct. The bad news is that the effects

predicted by the theory do not seem quantitatively very large.

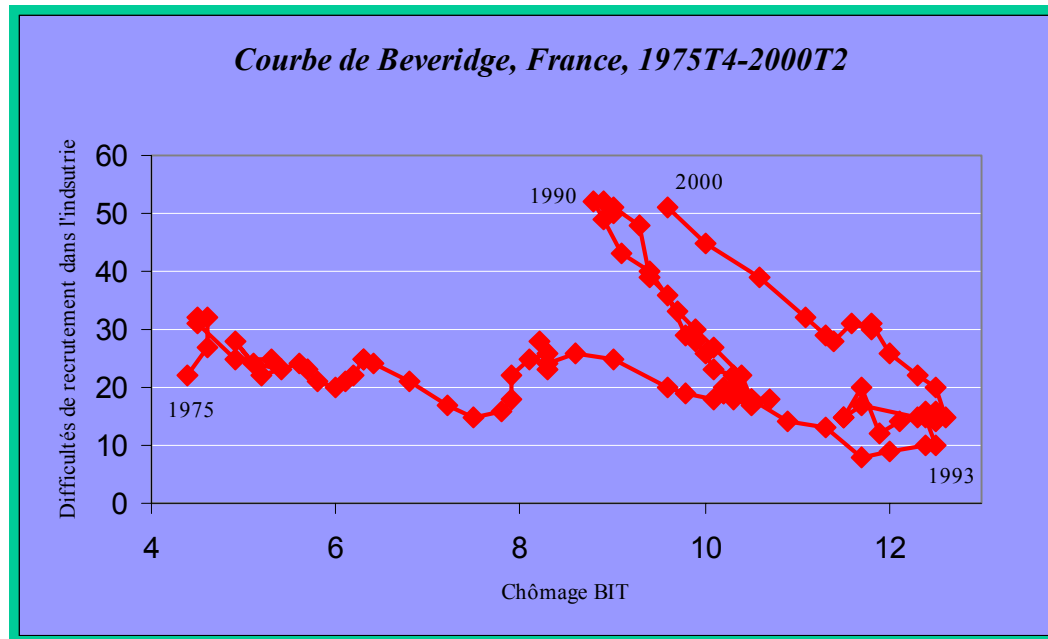
When faced with a negative conclusion, it is often better to accept it, and move on... In this case, I am not quite ready to do so. The reason is that, qualitatively, the hypothesis seem to fit so many facts. A recent example is the recent behavior of unemployment and vacancies—of the Beveridge curve—in economies where unemployment has started declining. Figure 8 is taken from a recent study of France by Pisani-Ferry [2000]. The variable on the vertical axis is a proxy for vacancies in industry.²⁰ There are two interesting aspects to the figure. First, the steady shift to the right from 1975 on. Second, the sharp movement up in both the 1990 expansion, and the more recent expansion since 1997. This is quite consistent with the notion of a steady decrease in search intensity, perhaps due to the increase in long term unemployment, from 1975 on, and the notion that, today, many of the unemployed are not actively searching, leading firms to have problems recruiting workers, even at 10% unemployment.

[Figure 8. The Beveridge curve in France, 1975-2000]

Are there ways to modify the model to get much larger effects? The negative conclusions can serve as a guide here. There are two ways in which long term unemployment can potentially affect the equilibrium: First, through decreased search intensity; there, the logic of the model and the quantification exercise suggest that the effect cannot be much bigger than I derived. Second, through wage bargaining. This effect is (nearly) absent in steady state in our model; the reason is that all unemployed face the same prospects ex-ante, and so workers realize that they might become long-term unemployed. One way to cut this link is to remove the assumption that all

²⁰The variable is constructed from a survey of firms asking them about “difficulties in recruiting” by firms. It is conceptually closer to the average duration of a vacancy, v/h than to vacancies themselves.

Figure 8. Beveridge curve, France, 1975-2000



Source: Jean Pisani-Ferry, ``Le Plein emploi'', CAE October 2000

unemployed are the same ex-ante. If, for example, increases in unemployment fall disproportionately on new entrants, then, even in steady state, long term unemployment, which falls on new entrants, is irrelevant to those currently employed, and will have little effect on wage bargaining. This is the direction I intend to explore next.

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Lecture 2. Rents, product and labor market regulation, and unemployment.

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October 2000

The first lecture focused on the role of shocks in the evolution of European unemployment. This second lecture focuses on the role of changes in institutions. More specifically, it focuses on the role of product and labor market regulation in determining the macro-economic equilibrium, and in particular the equilibrium rate of unemployment.

The motivation behind this choice of topic is primarily empirical. It comes from two apparently surprising macroeconomic evolutions in most European countries from the mid-1980s to the late 1990s, a large decrease in the labor share as a proportion of GDP, together with the persistence of high unemployment. I believe that this evolution is best explained in terms of labor market deregulation: Put simply, a decrease in the bargaining power of workers may lead initially to both lower wages and lower employment, therefore higher unemployment. Higher wages mean higher profits, and higher profits eventually lead to higher employment, but this may take some time. After 10 to 15 years of lower labor share and persistent unem-

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ployment, that time may be starting only just now.¹ If this explanation is right, it is an important example of one of the themes developed in the introduction, namely how changes in institutions can have an important effect on unemployment.

While my empirical interest is primarily in the recent evolution of European unemployment, I start with a more ancient example, namely the macroeconomic effects of the 1974 revolution in Portugal; its relevance will become clear as the lecture goes along. I then develop a simple macroeconomic model of product and labor market regulation, and show the effects of different forms of deregulation on the equilibrium, in particular on the labor share and on unemployment. Having done so, I return to the case of Portugal, and then, at more length, to the case of Europe since the mid-1980s.

1 The Portuguese revolution.

In 1968, Salazar, who had ruled Portugal for 40 years, retired from power. In 1974, his appointed successor, Marcello Caetano, was thrown out by a leftist military coup, leading, in 1976, to a democracy, and a series of leftist governments.² My focus here is on the macroeconomic effects of that revolution. And a good place to start is by plotting, in Figure 1, the evolution of the labor share.

The labor share in Figure 1 is for the business sector only, and is constructed by imputing a wage to the self-employed equal to the average wage in private dependent employment. There is a number of both empirical and

¹My first attempts to interpret these twin facts were given in Blanchard [1997] and Blanchard [1998]. This lecture offers the model I was groping for in those earlier attempts.

²For those who want a longer description of history, I have found the book Corkill [1999] to be very useful.

conceptual issues associated with the measurement of the share; these are discussed in the appendix. The conclusions below appear robust to alternative methods of construction.

[Figure 1. The labor share, Portugal, 1960-1998]

The figure yields two conclusions:

- The revolution was associated with a wage explosion, and, by implication, with a very large increase in the labor share, from roughly 60% of (business sector) GDP to nearly 100% for two years, 1974 and 1975. (Some of the alternative measures of the share are lower, but their increase is of similar magnitude.)
- This sharp increase was followed by a sharp but only partial decline later. For most of the period since, the labor share has remained higher than it was before 1974. Leaving out 1974 and 1975, the mean value of the share since 1976 has been 72%, compared to 58% from 1960 to 1973.³

One might have expected such a large and long lasting increase in the labor share to lead to a collapse in investment, and a large increase in unemployment over time. Figure 2 shows that this was not the case.

[Figure 2. Unemployment rate and gross investment rate, Portugal. 1960-1996]

³This fits well with an empirical proposition by Rodrik [1999] that, even after controlling for a number of other social and economic factors, the wage tends to be higher relative to labor productivity (equivalently the labor share tends to be higher) in democracies than in dictatorships.

Figure 1. Labor share, Portugal, 1960-1998

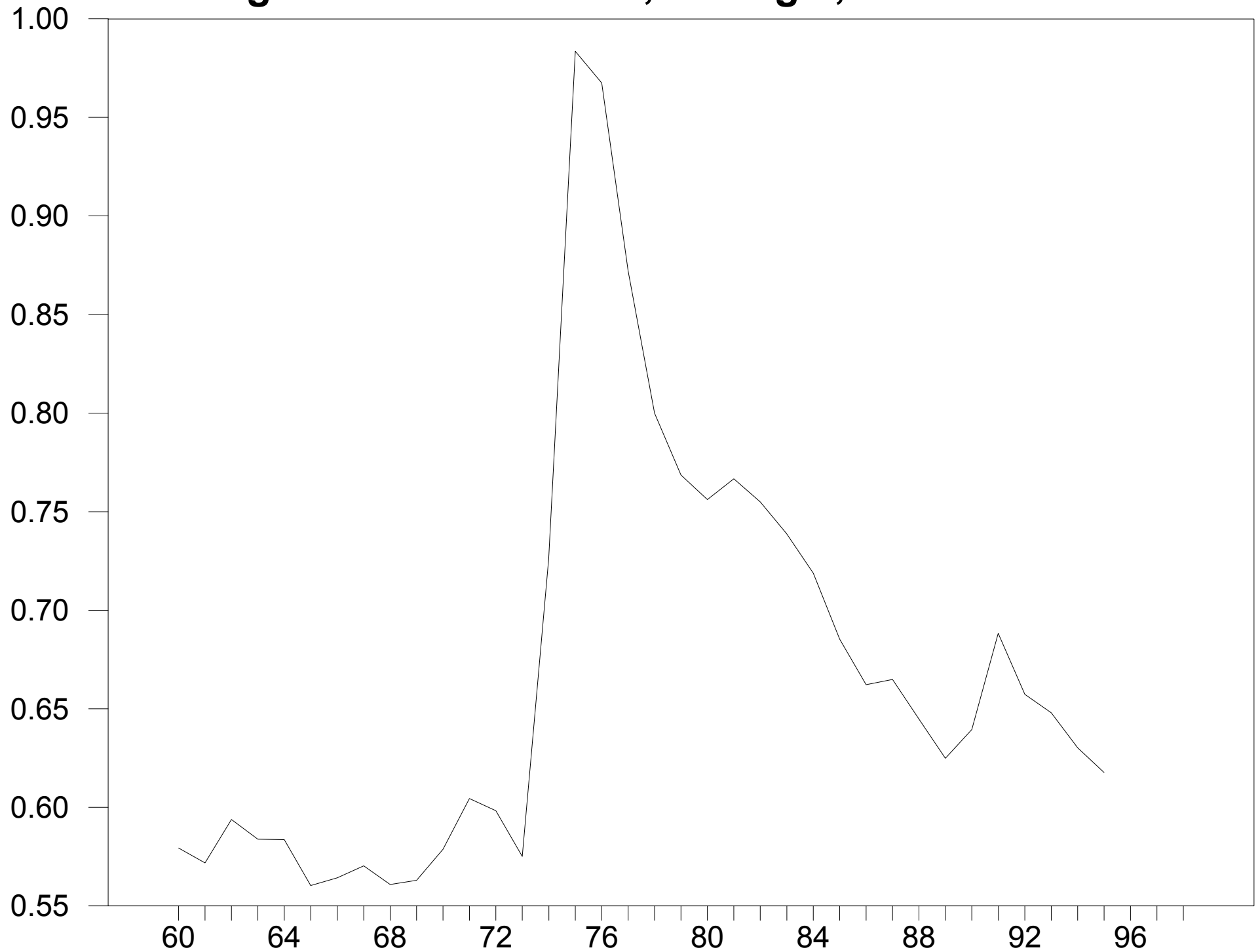


Figure 2(a) shows the behavior of unemployment from 1960 on. The unemployment rate went up during and just after the revolution, reaching close to 10% in 1980. Yet, given the size of the wage explosion, given also the large return migration both from the now independent colonies (800,000 people, or about 10% of the Portuguese population at the time) and from the rest of a Europe in recession, one might have expected the Portuguese unemployment rate to increase much more than the average European unemployment rate. It did not. And unemployment started coming down in the mid-1980s, and has remained low since then.

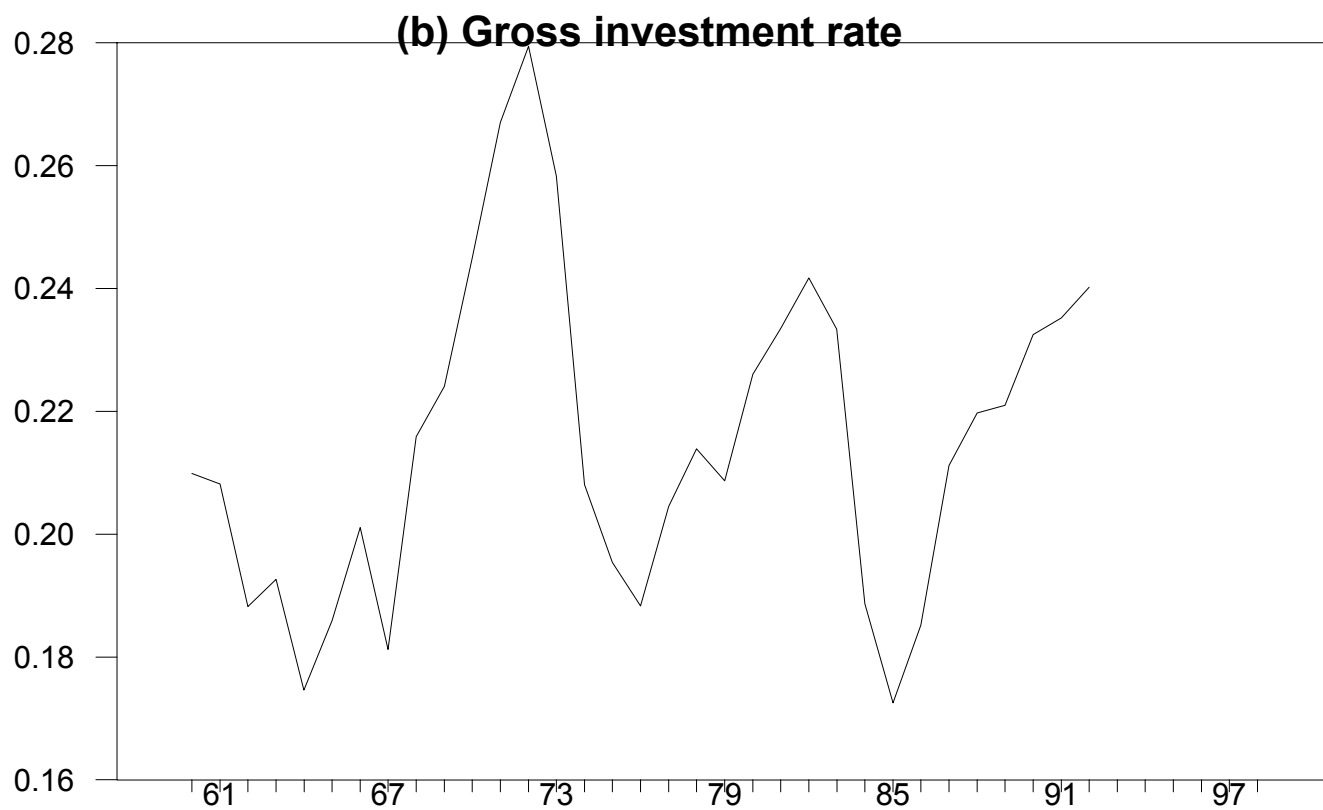
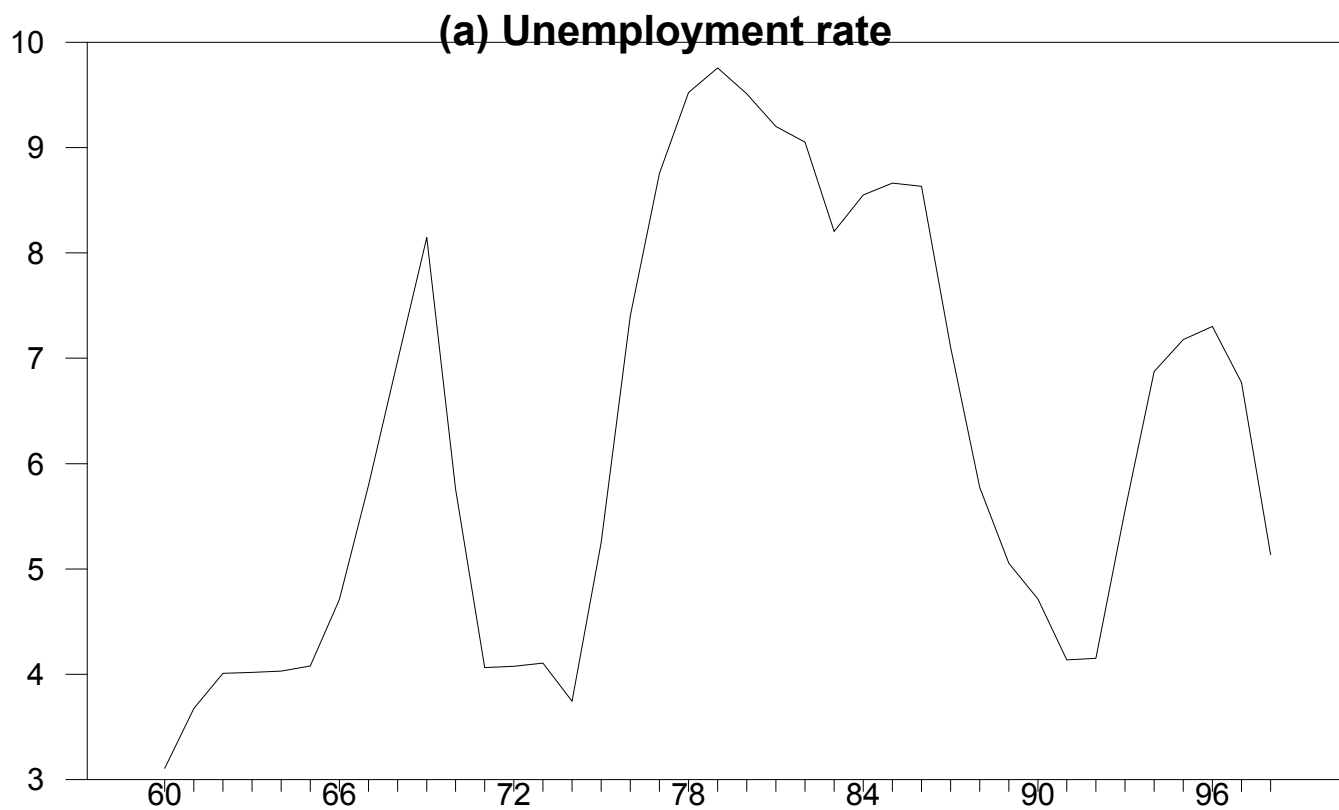
Figure 2(b) shows the behavior of the ratio of the gross investment rate to output in the business sector (the data end in 1995). Again, the revolution was associated with a decrease in the investment rate. The decrease actually had started a few years before the revolution (not, it appears, because of anticipations of an impending revolution, but as a result of the phasing off of a program of investment in heavy manufacturing), but continued until the late 1970s. Since then however, gross investment has remained roughly at the pre-revolution level.

How could Portugal sustain such a major shift in factor income distribution without larger macroeconomic consequences? A full answer will have to wait until I have developed a model in the next two sections. But here is a preview: Part of the increase in the labor share reflected an increase in the bargaining power of workers, indeed bad news for unemployment. But part of the increase in the labor share was due to the removal of barriers to entry in the goods market, good news for investment and for unemployment. Let me now turn to the model.

2 Laying out the model.

To think about the issues at hand, we need a model with at least two components. We need to have rents, so there is something to bargain about.

Figure 2. Portugal, 1960-1998



I do so by assuming monopolistic competition in the goods market. We need bargaining over these rents. I do so by assuming employment and wages to be set by bargaining in the labor market.

We can then think of product and labor market regulation as affecting the size of the rents and their allocation, and we can ask: How do product and labor market regulation/deregulation affect the macroeconomic outcome, in particular the labor share and unemployment?⁴ These are the questions I take up in this and the next section.⁵

2.1 Assumptions

Think of the economy as being composed of monopolistically competitive firms. At any point in time, the number of firms, n , is given. (Over time, the number of firms is endogenous and determined by the entry condition). Each firm i faces the following conditions:

- It faces a demand curve given by:

$$Y_i = \frac{Y}{n} D\left(\frac{P_i}{P}\right) \quad D(1) = 1$$

where Y is aggregate income, n is the number of firms, P_i and P are the price of good produced by firm i and the price level, respectively.

⁴What follows is based on joint work with Francesco Giavazzi. See Blanchard and Giavazzi [2000].

⁵Just like the model in the first lecture, the model here is composed of standard, off-the-shelf elements, from monopolistic competition with constant elasticity demand, to efficient bargaining between workers and firms under the assumption of linear utility. All these elements can be found for example in Layard et al. [1991]. The model lives or dies only by the relevance of its conclusions.

From the point of view of a given firm, Y is given. The condition that $D(1) = 1$ reflects the fact that if all firms charge the same price, they each get $1/n$ of total demand. Note that all income is spent on goods. There is no non-produced good, no money, no intertemporal choice: Say's law holds.

The elasticity of demand with respect to the relative price is σ . Assume it is an increasing function of the number of firms, n and goes to infinity as the number of firms goes to infinity: More firms imply more competition.

$$\sigma = \bar{\sigma} g(n), \quad g'(n) > 0 \quad g(\infty) = \infty$$

Think of $\bar{\sigma}$ as reflecting the first dimension of product market regulation.

- Its production function is given by:

$$Y_i = N_i$$

I do not introduce capital: Exit and entry of firms will capture the dynamic effects I want to get at here.⁶ (I shall return to the role of capital accumulation at the end of the lecture, when discussing alternative interpretations for the behavior of labor shares in Europe since the mid-1980s).

⁶The implications of introducing capital-labor substitution, together with the assumption of fixed capital in the short run, and the assumption that the supply of capital is upward sloping even in the long run, are explored in Spector [2000]. They lead to a more complex model, but give a richer picture of the effects of regulation and deregulation.

Given that labor productivity is identically equal to one, the labor share (which is equal to the real wage divided by labor productivity) is identically equal to the real wage. Thus, everything I derive below for the real wage extends directly to the labor share.

- Workers have a reservation wage in real terms given by:

$$(W/P)_r = bf(u) \quad f'(u) < 0$$

where b reflects factors such as sources of income while unemployed, and the utility of leisure if any, and u is the aggregate unemployment rate. The higher b , the higher the reservation wage. The higher the unemployment rate the lower the reservation wage.

Think of b , which I shall call unemployment benefits for short, as reflecting the first dimension of labor market regulation.

- Employment and the real wage are determined by Nash bargaining between the firm and the workers. The workers have linear utility and care about the surplus from employment:

$$N_i \left(\left(\frac{W_i}{P} \right) - bf(u) \right)$$

The firm cares about profit:

$$\left(\frac{P_i}{P} Y_i - \frac{W_i}{P} N_i \right)$$

The weight of workers in bargaining is β , the weight of the firm $1 - \beta$. Think of β as reflecting the second dimension of labor market regulation: Stronger regulation leads to a higher value of β .

This way of formalizing bargaining is known in the labor literature as (privately) “efficient bargaining”. As first pointed out by Leontief

[1946], and explored at more length later by McDonald and Solow [1983] among others, it leads to a combination of employment and the wage which typically does not lie on the labor demand curve: Employment is set to equalize the marginal disutility of labor with the marginal revenue product of labor. The wage is set so as to divide total rents according to bargaining power.

While the assumption that, at any point in time, the wage is distributive (with employment determined by the equality of the marginal disutility of work and the marginal revenue product of labor) is surely too strong as a description of reality, it captures something important and relevant, namely that the wage and the employment level may not always lie on the labor demand curve. This is the role this assumption plays here.

The dynamics of the model are sparse: The model has two runs, a short and a long run.

- In the short run, the number of firms, n , is given, and the equilibrium is derived from the above assumptions.
- In the long run, firms enter or exit until profits, net of entry costs, are equal to zero. This determines the equilibrium number of firms.

I take entry costs to be proportional to the size of the firm, i.e. equal to cN_i (equivalently, cY_i). I think of the parameter c as reflecting the second dimension of product market regulation, namely legal barriers to entry for new firms. For that reason, I think of c as a shadow cost rather than an actual cost.

Together, the twin assumptions that the only entry costs are legal restrictions, and that the elasticity of substitution between goods goes to infinity with the number of firms implies that, absent product market regulation, the goods market would be perfectly competitive. In

case it needs to be said, it is obvious that a large part of actual product market regulation is aimed not at creating rents but at alleviating market failures; this is not the part I focus on here, nor is it the part that economists have in mind when they advocate product market deregulation. Introducing either a fixed cost of entry per firm, or/and assuming that c reflects both product market regulation and other entry costs (and so, does not go to zero even with full deregulation) would change the nature of the equilibrium in the absence of product market regulation; but it would not change any of the main conclusions reached below.

Putting things together, note that product and labor market regulation are each characterized by two parameters:

- Product market regulation is characterized by $\bar{\sigma}$, which affects the elasticity of substitution between products for a given number of products, and c , the cost of entry.
- Labor market regulation is characterized by b , which affects the reservation wage of workers, and β , the weight of workers in bargaining.

The equilibrium can be characterized in three steps. By looking first at the problem facing an individual firm. Then, by looking at the short-run general equilibrium—the equilibrium for a given number of firms. Finally, by looking at the long-run general equilibrium—the equilibrium with an endogenous number of firms, and a zero net profit condition.

2.2 *Partial equilibrium*

The choice of price, wage, employment and output by a given firm i , given aggregate output Y , the unemployment rate u , and the number of firms n , is represented in Figure 3:

[Figure 3. Partial equilibrium.]

- The downward sloping demand and marginal revenue curves facing the firm are drawn as DD and MRP. The flat line at $bf(u)$ shows the reservation wage which makes workers indifferent between working and not working.
- Employment is such that marginal shadow cost (the reservation wage times the marginal product of labor, which is equal to one) is equal to marginal revenue, so employment is at N_i .

In other words, the contract curve is vertical at N_i . As is well known, the independence of employment from the value β is not a general feature of the solution, but the result of the assumption of linear utility. In general, as shown by McDonald and Solow [1983], the contract curve is likely to be upward sloping, with higher β associated with a higher real wage and a higher level of employment.

- Rents are maximized by setting the relative price equal to one plus a markup over the reservation wage:

$$\frac{P_i}{P} = (1 + \mu(n)) bf(u)$$

where $\mu(n)$, the markup, is given by

$$\mu(n) = \frac{1}{(\bar{\sigma}g(n) - 1)} \text{ so } \mu'(n) < 0$$

- Finally the wage is set so as to split the rents. The joint rents to workers and the firm are equal to $\mu(n)bf(u)N_i$. The wage divides these rents according to the relative bargaining power of the two sides:

$$\frac{W_i}{P} = [1 + \beta\mu(n)] bf(u) \tag{2.1}$$

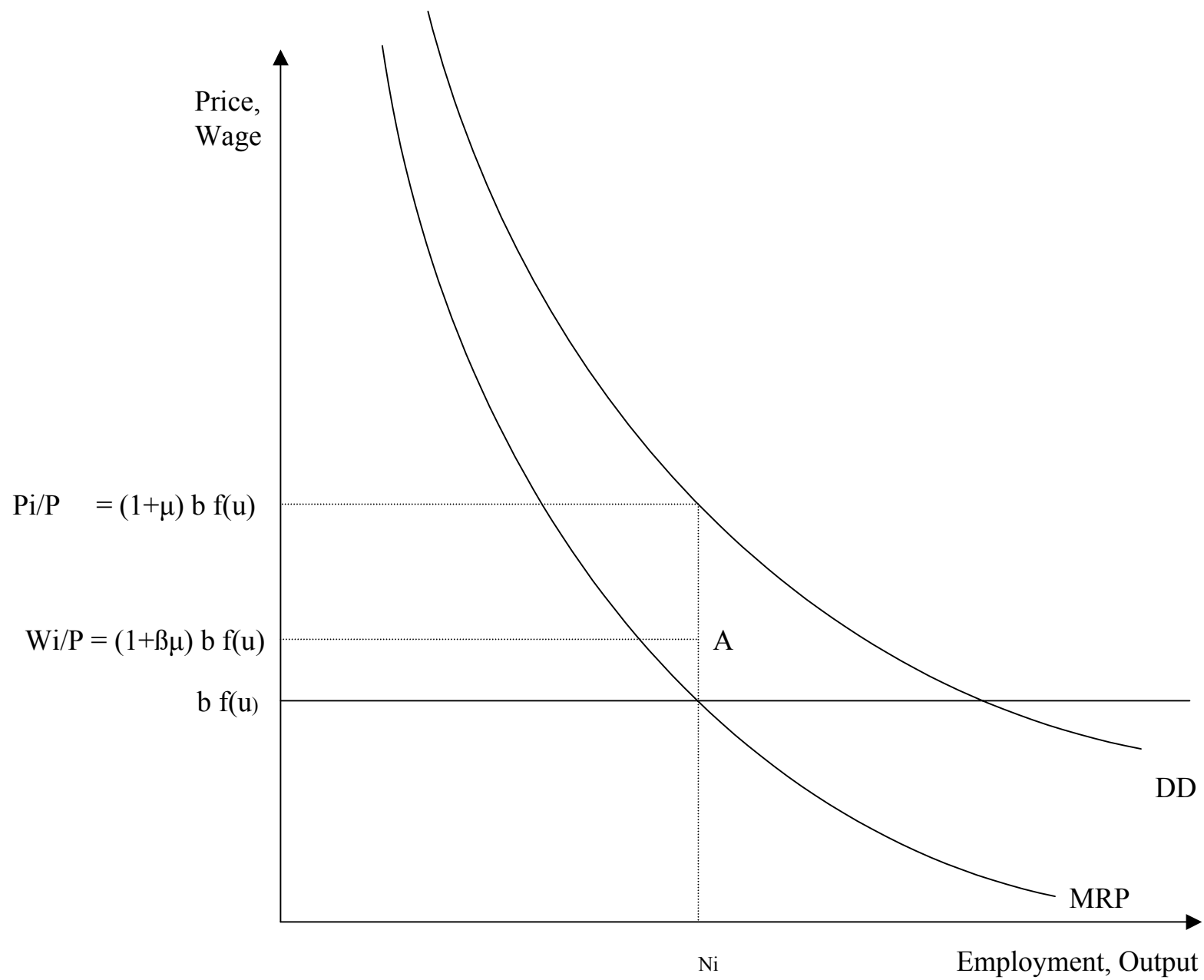


Figure 3. Partial equilibrium

The equilibrium is given by point A in the figure. Note, from a partial equilibrium viewpoint, both product and labor market regulations are good for workers. A higher markup, μ , implies higher rents, and so a higher wage. A higher value of b implies a higher reservation wage, and in turn a higher wage. And a higher value of β implies that workers receive a larger proportion of the rents, thus a higher wage.

2.3 General equilibrium, with a given number of firms

In the short run, n , the number of firms, is given. By implication, so is the elasticity of demand $\bar{\sigma}g(n)$ and so is the markup over the reservation wage chosen by firms, $\mu(n) = 1/(\bar{\sigma}g(n) - 1)$.

The general equilibrium is then characterized in Figure 4, which replicates Figure 3 with the general equilibrium constraints added in.

[Figure 4. Short-run general equilibrium]

- The equilibrium *unemployment rate* is determined by the symmetry condition that all firms charge the same price, i.e. that $P_i/P = 1$:

$$1 = (1 + \mu(n)) bf(u) \quad (2.2)$$

The higher the markup, $\mu(n)$, the higher the equilibrium unemployment rate. To see why, start from the equilibrium unemployment rate associated with a given markup. Now consider an increase in the markup. At the initial unemployment rate, the higher markup means that all firms want to have a relative price higher than one. As this is impossible, the reservation wage must decrease, until the relative price chosen by firms is again equal to one. This is achieved by an increase in the unemployment rate.

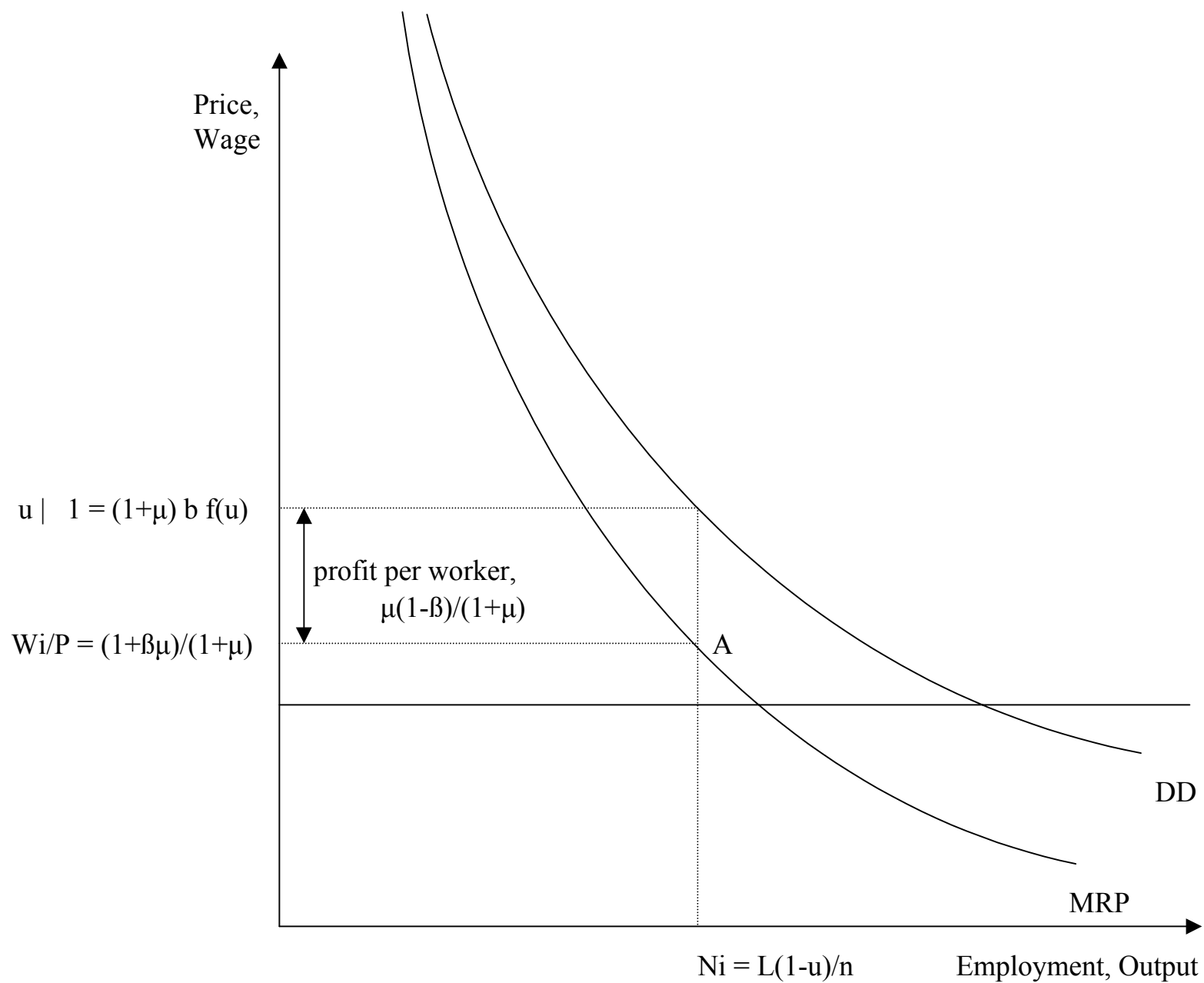


Figure 4. General equilibrium

- From above, and given $P_i/P = 1$, the *real wage* is equal to:

$$\frac{W_i}{P} = \frac{1 + \mu(n)\beta}{1 + \mu(n)} \quad (2.3)$$

As in partial equilibrium earlier, the real wage is an increasing function of β , the degree of bargaining power of workers: The stronger the workers in bargaining, the larger the proportion of rents going to workers, the higher the real wage.

With an eye to our discussion of regulation and deregulation later, consider the effects of β , b and μ on the short run equilibrium:

- As in partial equilibrium, a higher value of β translates into a higher real wage, with no effect on the equilibrium unemployment rate. Expanding on an earlier point: If we allowed workers to have concave rather than linear utility, a higher value of β would lead to both a higher real wage and a lower unemployment rate in the short run (see Blanchard and Giavazzi [2000].)
- In contrast to the partial equilibrium results, an increase in b does not benefit workers. It leads to higher unemployment and no change in the real wage: The effect of the higher unemployment benefits on the reservation wage, and in turn on the real wage, is now exactly offset by the effect of increased unemployment.
- Again in contrast to the partial equilibrium results, an increase in μ does not benefit workers. It leads to a lower real wage, and a higher unemployment rate. The reason why the real wage is lower is that the partial equilibrium effect we saw earlier—the effect of an increase in the firm’s own markup on its price and so on the wage it pays its workers, $(1 + \mu(n)\beta)$ —is more than offset by the effect of the increase

in the markup on other firms' prices, $1/(1 + \mu(n))$. Put another way, workers gain as workers, but lose more as consumers.

2.4 General equilibrium, with zero net profit

In the long run, firms enter or exit until profit per worker is equal to the shadow entry cost c . This determines the equilibrium number of firms:

- Profit per worker (or per unit of output, as the two are equal), is given by:

$$\left(\frac{P_i}{P} - \frac{W_i}{P}\right) = \left[\frac{\mu(n)(1 - \beta)}{1 + \mu(n)}\right]$$

Profit per worker is a decreasing function of the number of firms, through the markup $\mu(n)$, and of the bargaining power of workers, β : The higher the number of firms, the higher the degree of competition in the goods market, the lower the markup, the smaller the profit per worker. The larger the bargaining power of workers, the lower the rents left to firms, the smaller the profit per worker.

- The *number of firms* is determined by the condition that profit per worker is equal to c .

In terms of Figure 4, the distance between the relative price and the real wage indicated by the double pointed arrow must be equal to c . More formally, the following condition must hold:

$$\frac{\mu(n)(1 - \beta)}{1 + \mu(n)} = c \tag{2.4}$$

This implicitly defines the number of firms, n : The number of firms, and by implication the degree of competition in the goods market, must be such that profits per worker just cover the entry cost. The

number of firms is a decreasing function of both β and c . Both require a higher markup to sustain zero net profits, so a lower degree of competition, and thus a smaller number of firms.

If we replace the markup by its expression in terms of the elasticity of demand, (2.4) can be rewritten to give the equilibrium elasticity of demand:

$$\bar{\sigma}g(n) = \frac{1 - \beta}{c} \quad (2.5)$$

For profit maximization to yield an interior maximum, the elasticity of demand must be greater than one. This in turn puts a restriction on the range of allowable values for c and β , namely that $c < (1 - \beta)$. I assume this restriction to hold.

- The equilibrium markup determines the *unemployment rate*.

Starting from the earlier characterization of unemployment for a given number of firms, $1 = (1 + \mu(n))bf(u)$, and eliminating $\mu(n)$ using (2.4) gives:

$$bf(u) = 1 - \frac{c}{1 - \beta} \quad (2.6)$$

The unemployment rate is an increasing function of β , b and c . A higher value of b leads to a higher reservation wage, and so higher unemployment. Higher values of β and c lead to a smaller equilibrium number of firms, so a higher markup, and, in turn, a higher unemployment rate.

- The equilibrium markup determines the *real wage*.

Starting from the expression for the real wage for a given number of firms, $W_i/P = (1 + \mu(n)\beta)/(1 + \mu(n))$, and using (2.4) to eliminate $\mu(n)$ gives:

$$\frac{W_i}{P} = 1 - c \quad (2.7)$$

Under the zero net profit condition, the *real wage* depends only on the entry cost, c and is independent of all other parameters.

Again with an eye to the discussion of deregulation below, let me summarize the effects of the parameters β , b , and c on the long run equilibrium:

- A higher value of β leads to less competition, thus to a higher markup, a higher rate of unemployment, but an unchanged real wage: The effect of the higher value of β on the real wage is exactly offset by the higher markup μ .
- A higher value of b does not affect the number of firms or the real wage. But, through the increase in the reservation wage for a given level of unemployment, it increases equilibrium unemployment.
- Finally, a higher value of c leads to less competition, to a higher markup, a higher rate of unemployment, and a lower real wage.

We now have all we need to discuss the macroeconomic effects of product and labor market regulation and deregulation.

3 Macroeconomic effects of regulation and deregulation.

With the recent European experience in mind, let me focus on the effects of deregulation rather than regulation, so on increases in $\bar{\sigma}$ or decreases in c in the goods market, or decreases in b or in β in the labor market.

3.1 *Increased competition in the goods market*

Consider first an increase in $\bar{\sigma}$, an increase in the elasticity of demand, given the number of firms.

In the short run, the increase in the elasticity of demand leads to a lower markup, and thus to a higher real wage, and a lower unemployment rate. Workers benefit through both higher real wages and a lower unemployment rate.

Things are different in the long run however. Lower markups mean lower profits. So long as the entry cost, c , is unchanged, lower profits mean that the number of firms must decrease until the zero net profit condition is again satisfied. From equation (2.5), this happens when the elasticity of demand is back to its original value, i.e. when the increase in elasticity for a given number of firms is offset by the decrease in elasticity coming from a smaller number of firms. An unchanged elasticity implies in turn an unchanged markup, an unchanged real wage, and an unchanged unemployment rate.

In short, product market deregulation which increases competition among firms but does not change the entry cost, is eventually self defeating: In the short run, it leads to higher real wages and lower unemployment. But in the long run, it leads to a smaller number of firms, and has no effect on the unemployment rate, nor on the real wage, nor on output.

3.2 Lower entry costs

Consider now the second dimension of product market regulation, a decrease in the entry cost c .

By definition of the short run as the period of time over which the number of firms is given, a decrease in c does not have an effect on the equilibrium in the short run. Unemployment and the real wage remain the same. In the long run however, lower entry costs lead to an increase in the number of firms: From (2.4), the decrease in c requires a decrease in the markup, thus an increase in the elasticity of demand, thus an increase in the number of firms: Firms enter until the elasticity of demand has increased sufficiently to drive net profits back to zero.

Equations (2.6) and (2.7) imply in turn that unemployment decreases, and the real wage increases. This follows directly from the result that the elasticity of demand is higher, and therefore the markup is lower.

So, in the long run, a decrease in entry costs is good for the economy, but also good for workers. By increasing competition, it both increases the real wage and decreases unemployment.⁷

3.3 *Lower unemployment benefits*

Turn next to the first dimension of labor market deregulation, a decrease in b . In the short run, the decrease in b leads to a decrease in the unemployment rate, with no change in the real wage. And, because changes in b do not affect the profit rate, there is no change in the equilibrium number of firms, and the long run effects are the same as the short run effects.

The results are thus rather conventional here: This first dimension of labor market deregulation leads to a decrease in unemployment with no effect on the real wage, in either the short or the long run.⁸

3.4 *Lower bargaining power of workers*

Turn finally to the second dimension of labor market deregulation, a decrease in β , the bargaining power of workers.

⁷Given these results, one wonders why workers would ever be opposed to product market deregulation. Our partial equilibrium analysis gives us one hint. In our symmetric economy, workers–consumers lose as workers: Lower rents to firms means lower rents to workers. But they gain more as consumers, in the form of a lower price level. If, however, rents are concentrated in only a few sectors, then workers in those sectors may well be net losers and will oppose product market deregulation.

⁸This again raises the question of why workers oppose such deregulation. Heterogeneity must again be of the essence here.

In the short run, the decrease in the bargaining power of workers leads to a decrease in their real wage. Recall that the real wage is given by:

$$\frac{W_i}{P} = \frac{1 + \mu(n)\beta}{1 + \mu(n)}$$

So for a given n , and thus given $\mu(n)$, the decrease in β leads to a decrease in W_i/P , a decrease in the real wage.

From (2.2), the equilibrium unemployment rate remains unchanged. This result comes from two assumptions. The first is the assumption of efficient bargaining, which implies that, so long as the reservation wage and the marginal revenue product of labor are unaffected, employment in each firm, and by implication unemployment, does not change. The second is the assumption of linear utility, which implies that changes in the income of workers due to changes in β do not affect the reservation wage.

Thus, in the short run, this dimension of labor market deregulation makes workers worse off. Their real wage is lower, and there is no increase in employment to show for it.⁹ As discussed earlier, were we to assume that workers have concave rather than linear utility, the result would be even stronger. A decrease in β would lead to a movement down an upward-sloping rather than vertical contract curve, so to a decrease in the real wage and an increase in unemployment.

In the long run, things are more favorable for workers. The decrease in β leads to an increase in profits for existing firms. Given an unchanged

⁹If one thinks of labor hoarding as an excess of the wage over the marginal product, one way of describing what happens is as a reduction in labor hoarding—as “labor shedding.” This is the terminology I used in Blanchard [1998]. But, again, the semantics may be misleading. One typically thinks of labor shedding as reflecting an improvement in efficiency. This is not the case in this model (although it may be the case in reality): Under our assumptions, the employment-wage outcome is always privately efficient.

entry cost, the zero net profit condition, equation (2.4) implies that new firms enter, leading to an increase in the elasticity of demand facing each firm, to a decrease in the markup, $\mu(n)$.

From equation (2.6), the decrease in β leads to lower unemployment, with the effect working through the markup: The lower markup leads to a decrease in unemployment.

The effects on the real wage would seem a priori to be ambiguous: Firms receive a larger share of the rents. But, because of higher competition, the rents themselves are smaller. As equation (2.7) shows, the two effects exactly cancel out: In the long run, the real wage is independent of β .

In short: This second dimension of labor market deregulation leads, in the short run, to a lower real wage, and unchanged unemployment. In the long run, entry of firms leads to an unchanged real wage, and lower unemployment.

Table 1 below summarizes the main conclusions of this section. With an eye on the empirical evidence below, I state the conclusions in terms of their implications for unemployment and for the labor share.

The two dimensions of product market deregulation have different timing implications: Increasing competition initially leads to an increase in the labor share, and to a decrease in the unemployment rate. But, as firms exit, the effect disappears and the share and the rate are unchanged in the long run. In contrast, lowering entry costs has no effect in the short run, but leads to an increase in the labor share and a decrease in the unemployment rate in the long run.

The two dimensions of labor market deregulation also have quite different implications. A reduction in the reservation wage decreases unemployment, both in the short and the long run, but has no effect on the labor share. In contrast, a decrease in the bargaining power of workers leads, in the short run, to a decrease in the labor share and an unchanged unemployment rate

(or indeed, if workers have concave utility, an increase in the unemployment rate). In the long run, wages and the labor share return to their original value, unemployment is lower.

Table 1. The effects of deregulation on the unemployment rate and the labor share

	Short run		Long run	
	Unemployment	Labor share	Unemployment	Labor share
Increase in $\bar{\sigma}$	–	+	0	0
Decrease in c	0	0	–	+
Decrease in b	–	0	–	0
Decrease in β	0	–	–	0

Thus, the model gives a (rough) tool to look at the data. Leaving aside the movements in the labor share due to the dynamic effects of factor prices on factor proportions (a big “leaving aside,” to which I shall come back below), increases in the labor share point to product market deregulation, decreases in the labor share point to labor market deregulation. With this tool, let me now return to the empirical evidence, first to Portugal in the 1970s, then to Europe in the recent past.

4 Back to Portugal.

The model suggests the following hypothesis for what happened in Portugal during and after the revolution. The revolution was associated with major changes in the structure of both labor and goods markets. In the labor market, it was surely associated with both an increase in b and a large increase in β . But, in the goods market, it was associated with a large

decrease in legal restrictions to entry—a large decrease in c . The combined effect was a large increase in the labor share (recall that an increase in β and an increase in c both work to increase the labor share) but only a moderate effect on unemployment (an increase in β leads to an increase in unemployment, a decrease in c to a decrease in unemployment). Given the time series evidence, and going somewhat on a limb, one might argue that the first effect dominated the initial years, but the second was the more persistent, leading to a sustained increase in the labor share with only a limited increase in unemployment.

The same argument can be expressed in terms of rents. Pre-revolution Portugal was associated with large rents, which were kept by firms, i.e. not shared with workers. The revolution was associated with higher appropriation of these rents by workers (an increase in β), but also with a substantial decrease in these rents, leading to lower prices, higher real wages and a higher labor share.

Is the story plausible? Many elements seem to fit. The corporatist state put in place by Salazar from 1928 on was indeed based on a very tight structure of industrial regulation.¹⁰ Entry was restricted, with set market shares for existing firms; even existing firms had to ask for authorization to embark on new capital projects. While the corporatist structure had weakened over time, the economy was still characterized by an unusual degree of concentration when the revolution started. For example, preeminent among state-supported cartels was the Companhia Uniao Fabril (CUF), which included more than 100 companies, and accounted for more than 20% of Portugal's manufacturing output in 1970. In parallel, at least until the early 1970s, there were tight limits on unions, and workers were largely powerless in bargaining.

That the revolution strengthened the bargaining power of workers is ob-

¹⁰See for example Corkill [1993], Chapter 2.

vious. During the revolution, newly created “workers’ commissions” had a strong hand in the running of firms. At the same time, the government increased the minimum wage, introduced employment protection, and established and enforced price controls. Starting in 1976, these measures were progressively tempered but by no means eliminated.

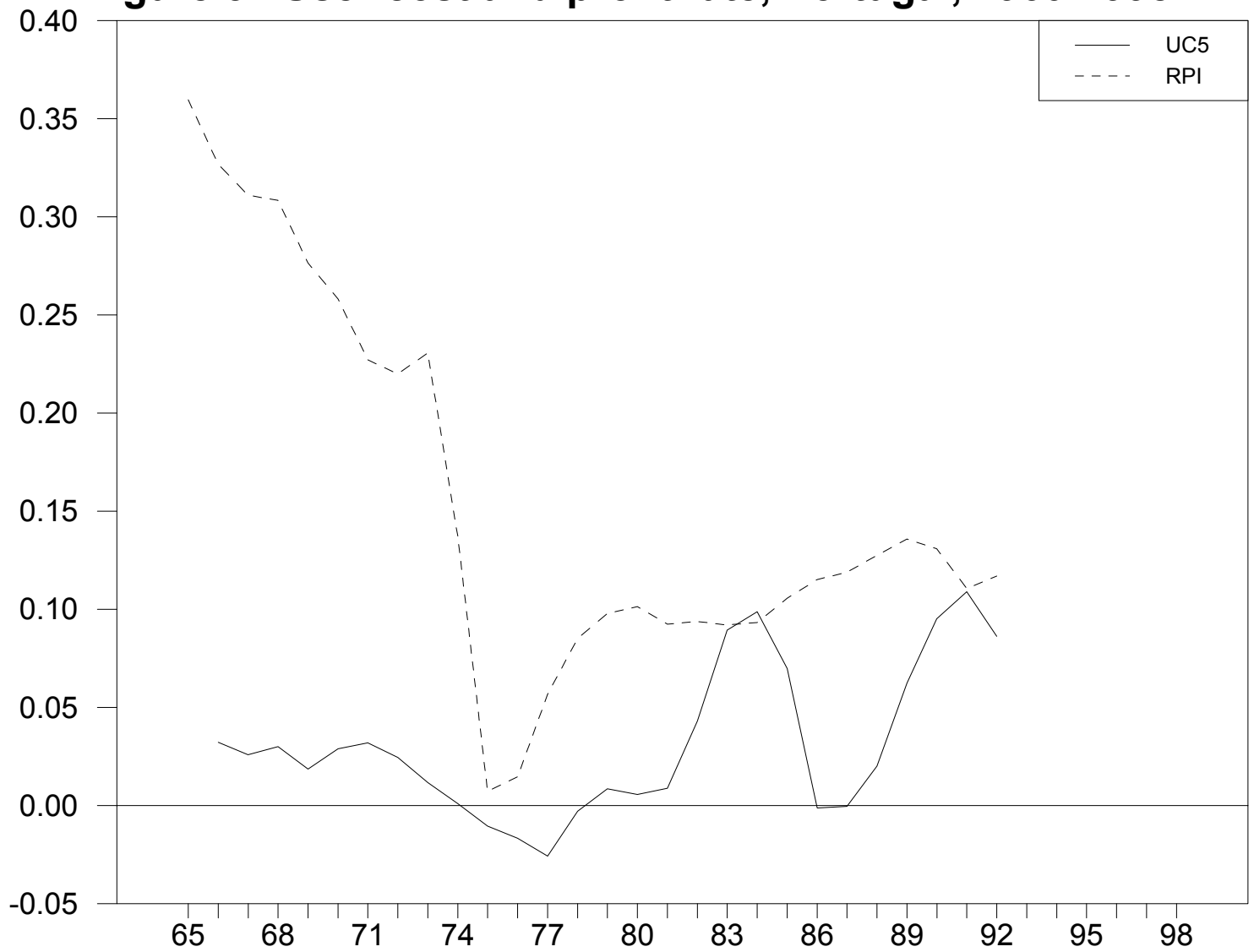
The argument that the revolution was associated with product market deregulation may sound paradoxical. Surely, this was not product market deregulation in the same sense as, say, the E.U. commission would use it today. The revolution was associated with substantial waves of nationalization (with the stated goal of eliminating monopolies, but also with the complex effects which typically follow nationalization in such a case). The state-owned sector increased from 9% of GDP in 1973 to 30% in 1976. But the end result was the dismantling of the old corporate structure, and the elimination of the high net profit rates which had characterized Portugal before the revolution.

[Figure 5. User cost and profit rate, Portugal, 1960 to 1992]

In support of the hypothesis, Figure 5 shows the evolution of the profit rate and the user cost in Portugal from 1965 to 1992. The profit rate is defined as profit in the business sector divided by the capital stock in the business sector. The user cost is constructed as the long nominal rate on bonds, minus an average of inflation in the current and the previous four years. The figure shows the drastic reduction in the excess of the profit rate over the user cost associated with the revolution. It shows both the initial presence of large rents, and their later disappearance—although, by itself, it does not settle whether the rents went away because of higher competition in the goods market (lower c) or of direct appropriation by workers (higher β).¹¹

¹¹The figure also raises a number of data issues, with which I have struggled, but without

Figure 5. User cost and profit rate, Portugal, 1960-1998



Let me now turn from Portugal to the recent European experience.

5 Europe in the 1980s and 1990s.

Figure 6 returns to the two macro-evolutions which motivated this lecture in the first place. The figure plots the unemployment rate and the labor share in the business sector, for the four major European countries, Germany, France, Italy, and Spain, since 1970. The two facts I want to focus on are:

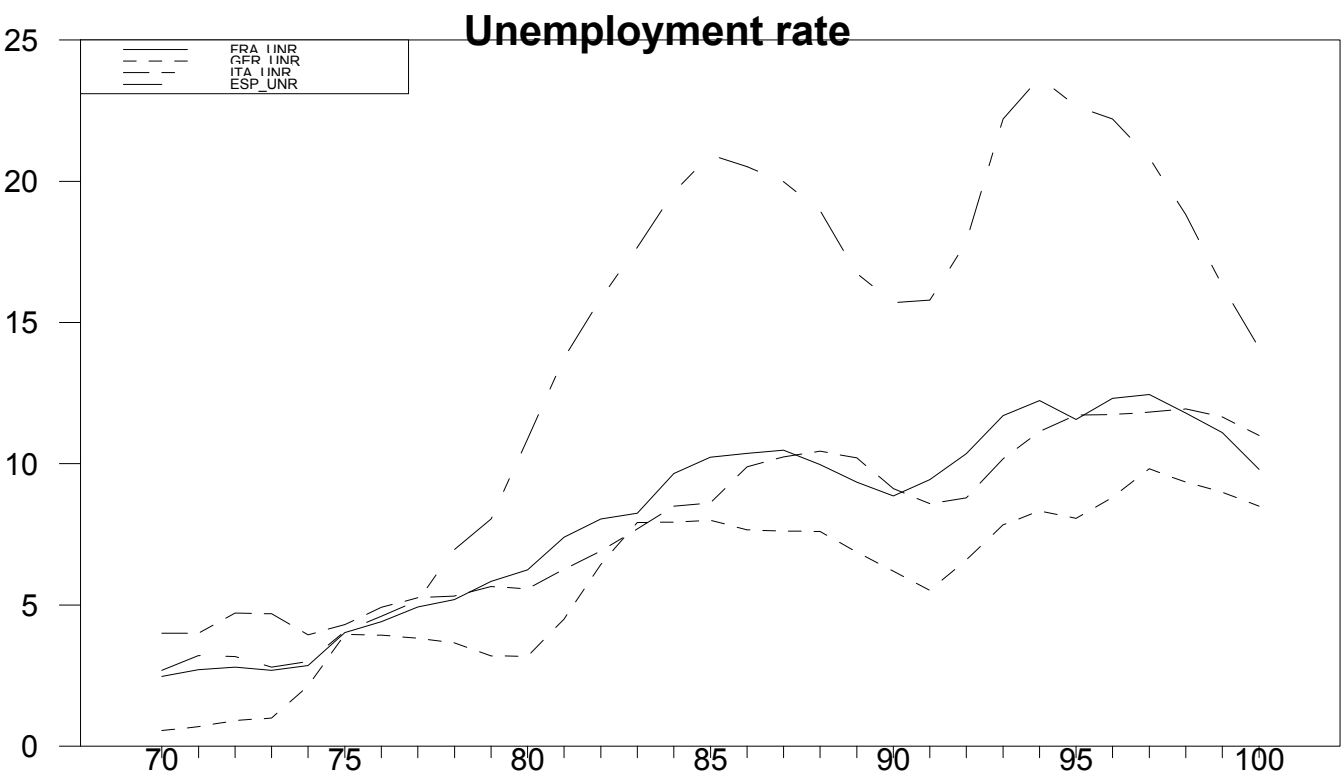
[Figure 6. Unemployment rates and labor shares, Germany, France, Italy, and Spain, 1970-2000.]

- The persistence of high unemployment for much of the 1990s in all four countries. Only in the last few years has unemployment started to decline, most dramatically in Spain, least so in Italy.
- The sharp decrease in labor shares, starting in the early to mid 1980s. For France, for example, (the continuous line in figure 6b), the labor

getting a full answer. Note that the profit rate starts declining before the revolution, going from 0.35 in 1965 to 0.22 in 1973. This surely reflects reality, at least in part: During that time, as part of a “new industrial policy”, business and government embarked on a program of heavy investment, much of it of doubtful profitability. It may also reflect however a problem of construction of the capital stock series. The OECD constructs the series by accumulation, using an initial guess for the capital stock in 1960, and investment and depreciation rates thereafter. Too low a guess will lead to too high a rate of capital accumulation and too fast a decline in the profit rate, especially at the beginning of the sample. I have compared the series constructed by the OECD with other series constructed in Portugal, and have found them to be roughly consistent as to their rate of change over time. This does not however exclude a common mistake, a common understatement of the initial capital stock.

Figure 6. Unemployment rates and labor shares

Germany, France, Italy, and Spain. 1970-2000



share, which had increased from 70% in the early 1970s to 74% in the early 1980s, has now decreased to 60%, an increase of 14% of GDP relative to the peak, 10% relative to the 1970 value. (The data end in 1998. Based on aggregate rather than business sector evidence, there is no evidence of an increase since then.)

The focus in Figure 6 on only four countries is for visual convenience only: The decrease in labor shares has been common to most continental European countries. The decrease has been smaller however in the U.K., and nearly non existent in the United States and Canada, suggesting a difference between continental and anglo-saxon countries, a difference to which I shall come back later.¹²

The model we developed earlier suggests a natural interpretation for this joint evolution, namely a decrease in the bargaining power of workers, starting some time in the mid-1980s. As we saw, such a shift can initially generate both a decrease in the real wage and in the labor share, and either no improvement (if the contract curve is vertical) or an increase (if the contract curve is upward sloping) in unemployment. Both implications seem to fit the facts. Under this interpretation, the rewards in terms of employment are still to come. Indeed, the current decline in unemployment, a decline which appears to be a decline both in actual and in equilibrium unemployment (as inflation shows no sign of increasing yet), may be a sign of things to come.

Before exploring this interpretation in more detail, we must make sure however that there truly is something in the joint evolution of the unemployment rate and the labor share that cannot be explained in terms of a

¹²In Blanchard [1997], I looked at these evolutions for 14 OECD countries, up to 1995 or 1996. The evidence available since then indicates the labor share has decreased further in most countries.

more neo-classical model, such as the model we used in Lecture 1. That model suggests at least two other hypotheses for the decrease in the labor share since the early 1980s:

- The first is that it reflects the long lasting effects of the decrease in the rate of technological progress, together with a *high* long-run elasticity of substitution between labor and capital in the long run.

Under this hypothesis, the decrease in the rate of technological progress led to an increase in wages in efficiency units, starting in the mid 1970s. This wage push in turn has led to a movement away from labor. The movement has been slow, because of the putty-clay nature of the technology, and thus the cost of adjusting the ratio of labor to capital. But, eventually, it has taken place and because the long-run elasticity of substitution exceeds one, it has led both to the decrease in the labor share we have observed since the early 1980s.

- The second is that it reflects instead the effects of the increase in interest rates since the early 1980s, combined with a *low* long-run elasticity of substitution between labor and capital.

The increase in the user cost and the decrease in wages in efficiency units since the early 1980s, this hypothesis goes, have led to a movement away from capital towards labor. But because the elasticity of substitution is low, this has led to the decrease in the labor share we have seen since the early 1980s.

Let me briefly discuss both hypotheses.

5.1 *Neo-classical alternatives*

The first hypothesis requires a high long-run elasticity of substitution between capital and labor. Most existing estimates of this elasticity suggest

instead values close to or slightly below one.¹³ But this evidence may not be dispositive. Caballero and Hammour [1999] argue that because of the difficulty of estimating this long run elasticity when the adjustment is very slow, existing estimates might be subject to a strong downward bias. In their own attempt at estimating the elasticity, they come up with much higher estimates, around 4 rather than 1.

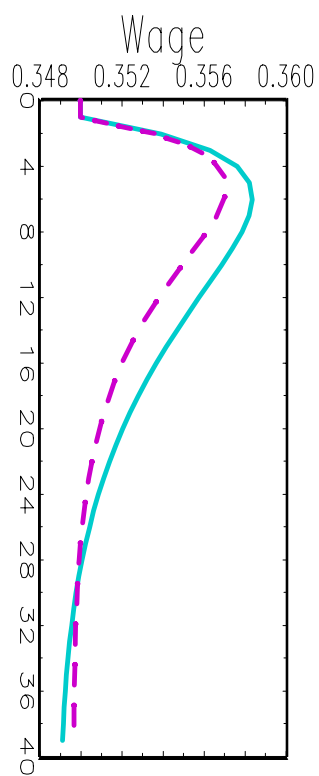
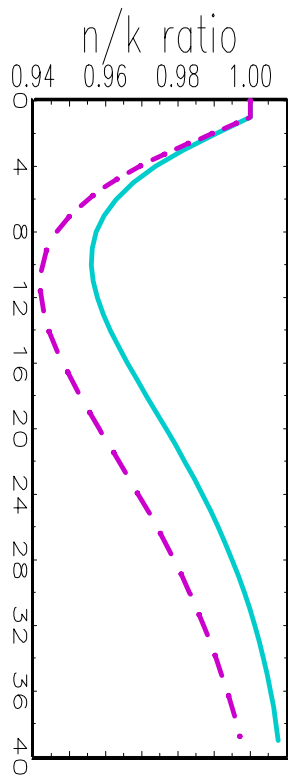
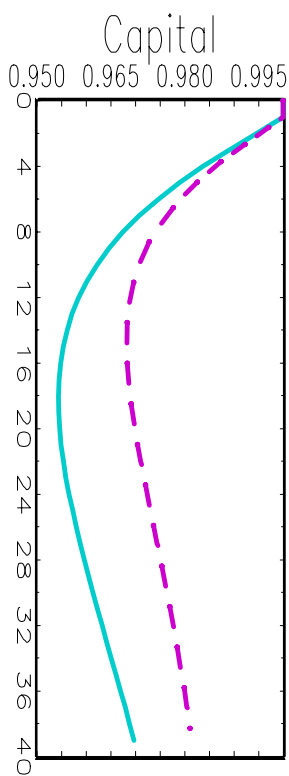
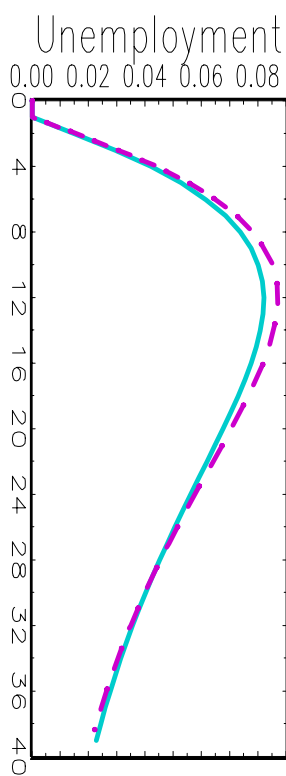
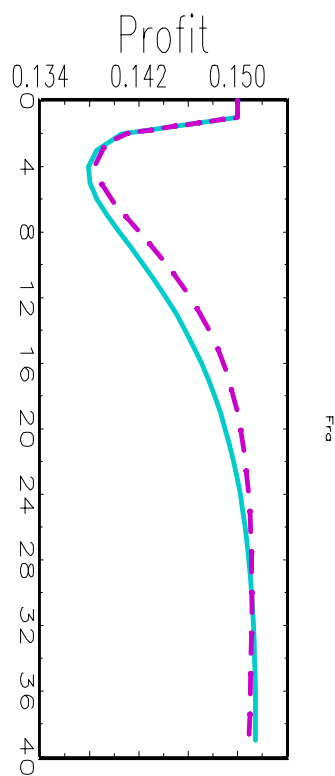
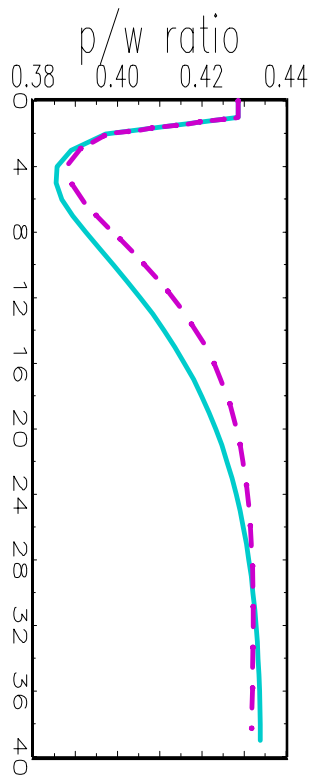
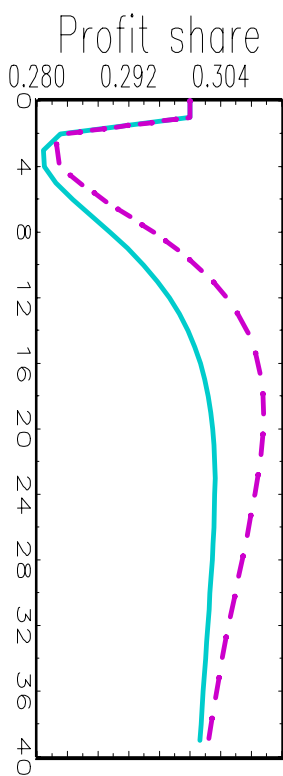
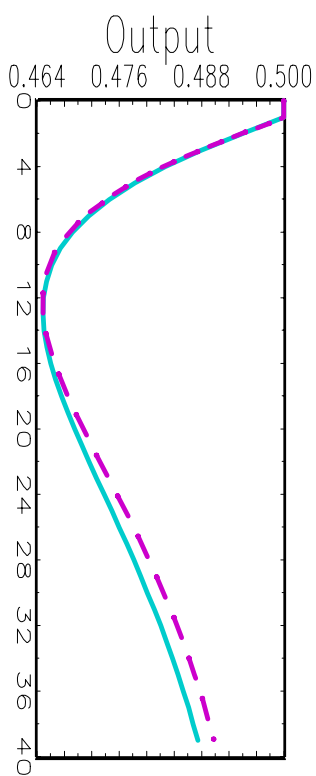
Suppose, for the sake of argument, that the elasticity is indeed that high. Could this explain the evolution of labor shares in continental Europe? A useful first step in trying to answer that question is to return to the simulations we saw in the first lecture, but with a much higher value for the elasticity of substitution. This is the motivation for Figure 7, which shows the effect of a slowdown in the rate of technological progress, under the same assumptions as in the first lecture, but for two values of the elasticity of substitution, a value of 1 as in Figure 4 in the first lecture (the dotted lines), and a value of 4 (the continuous lines)—as suggested by Caballero and Hammour.

[Figure 7. The effects of a decrease in the rate of technological progress, for $\sigma = 1, 4$]

I draw two main conclusions from the figure:

- First, the effect on unemployment is largely independent of the elasticity of substitution. In particular it is not the case that a higher elasticity implies a larger or longer lasting effect of the decrease in

¹³See the survey by Rowthorn [1998]. For the United States, the observation that the labor share has been very stable over time has led many (including Cobb and Douglas) to conclude that the Cobb–Douglas assumption (an elasticity of one) is a reasonable approximation in the long run. The evidence in Figure 6 shows however that the stylized fact of constancy of the labor share does not extend beyond the United States.



the rate of technological progress. A higher elasticity leads to a larger decline in the ratio of labor to capital over time. But, as firms are better able to substitute away from the expensive factor of production, i.e. labor, the profit rate decreases less, leading to less of a decline in capital accumulation. The two effects—larger adjustment of the ratio, smaller adjustment of the capital stock—largely cancel.

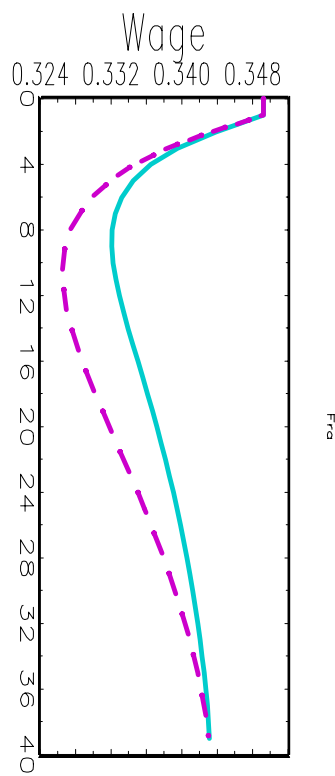
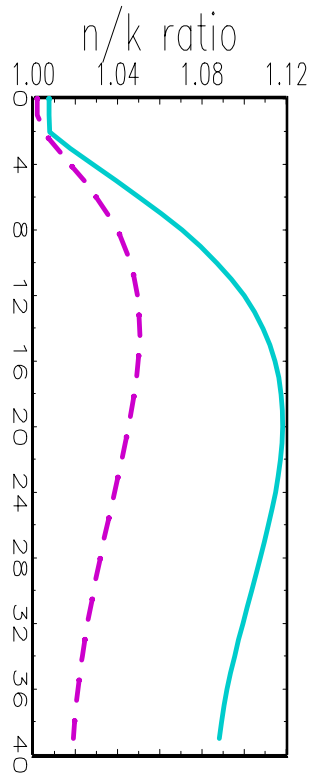
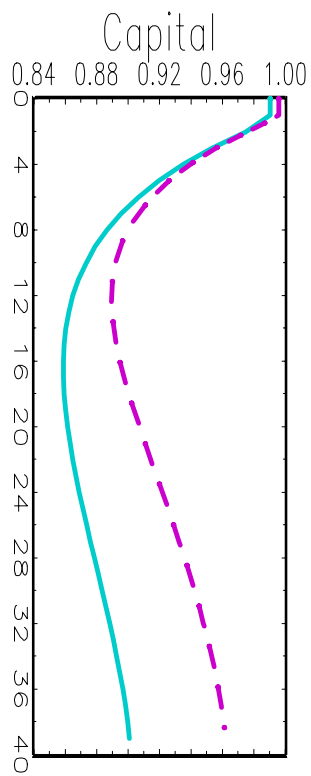
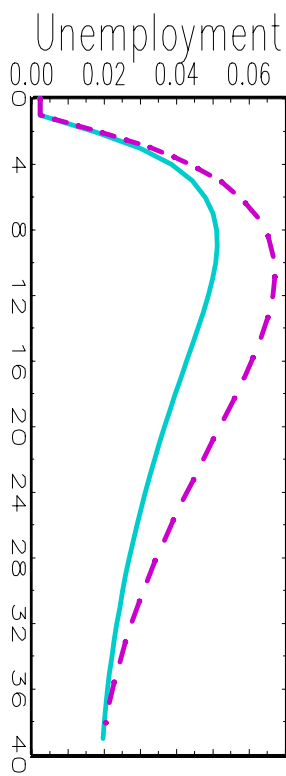
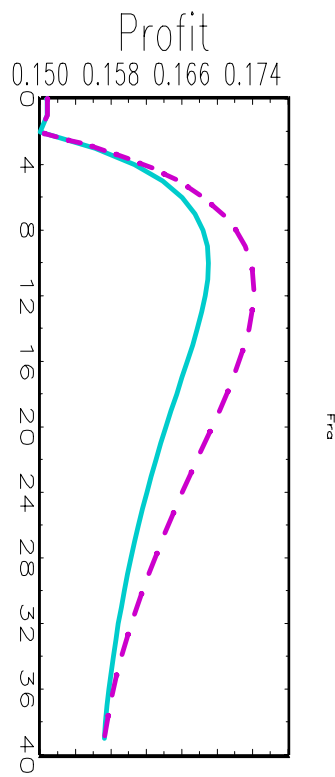
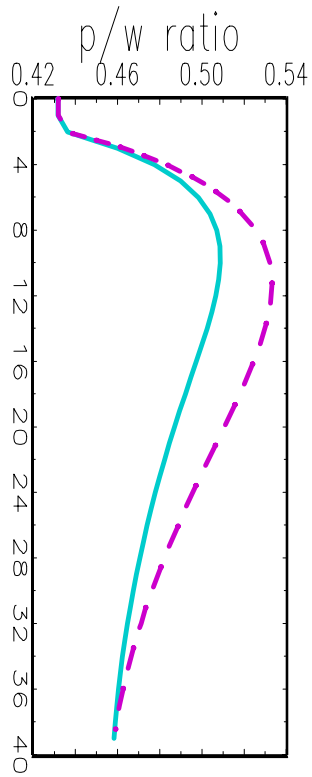
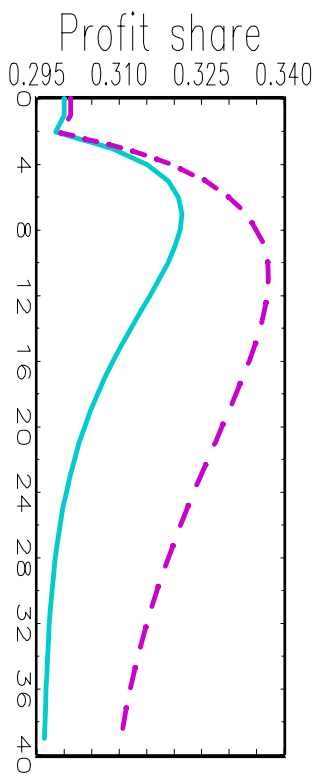
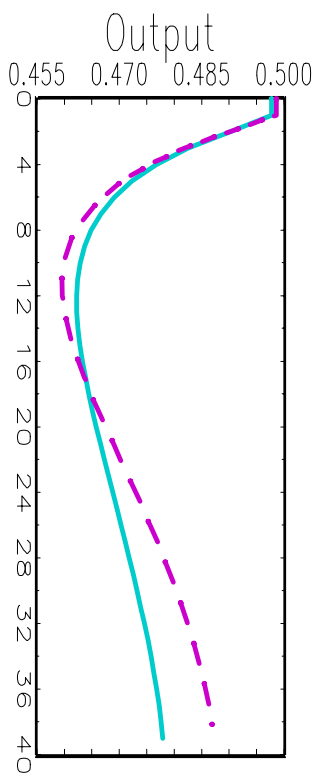
- Second, while the labor share undershoots its pre-shock value, the undershooting is small, less than 1% of GDP, compared to more than 10% in the data. The basic reason is that, if firms are forward looking (as they are in this simulation), the fact that wages are expected to return to normal limits the extent of substitution.

In short, the simulation suggests that it is hard to blame the decrease in the labor share since the early 1980s on the effects of the tfp slowdown of the 1970s.

A similar simulation exercise helps to think about the merits of the second hypothesis. A crucial ingredient here is a *low* elasticity of substitution, so lower wages are associated with a lower labor share. With this in mind, Figure 8 shows the effects of a temporary increase in the interest rate, under the same assumptions as in the first lecture, but for two elasticities of substitution, a value of 1 as in Figure 5 of Lecture 1, and a value of 0.25, a number substantially below most existing estimates.

[Figure 8. The effects of an increase in interest rates, for $\sigma = 1, 0.25$]

Here again, the effects of the elasticity on the unemployment rate are limited. The lower the elasticity, the smaller the increase in the ratio of labor to capital, but also the smaller the decrease in capital accumulation, with little net effect of the elasticity on the paths of employment and unemployment.



The lower the elasticity, the larger however the effects on the labor share. The effects are larger than in Figure 7. They remain too small however—a decrease of less than 4% of GDP—to explain the size and the persistence of the actual decrease in labor shares in Figure 6. In short, Figure 8 suggests that, while high interest rates and lower wages may have contributed some to the decrease in labor shares, it seems unlikely that they can account for all or even most of it.

5.2 Tighter evidence: an/k and w/a

Simulations are useful but only suggestive. A more convincing way to proceed is to look at the relation between the ratio of labor to capital and the wage. In the simple model developed in Lecture 1, short-run labor demand took the form of a relation between the ratio of labor in efficiency units to capital, an/k and the wage per efficiency unit, w/a . Absent costs of adjusting factor proportions, the relation was a simple static one. Present costs of adjusting proportions, the relation was a dynamic one, with factor proportions depending both on the past and on expectations of the future wage w/a .

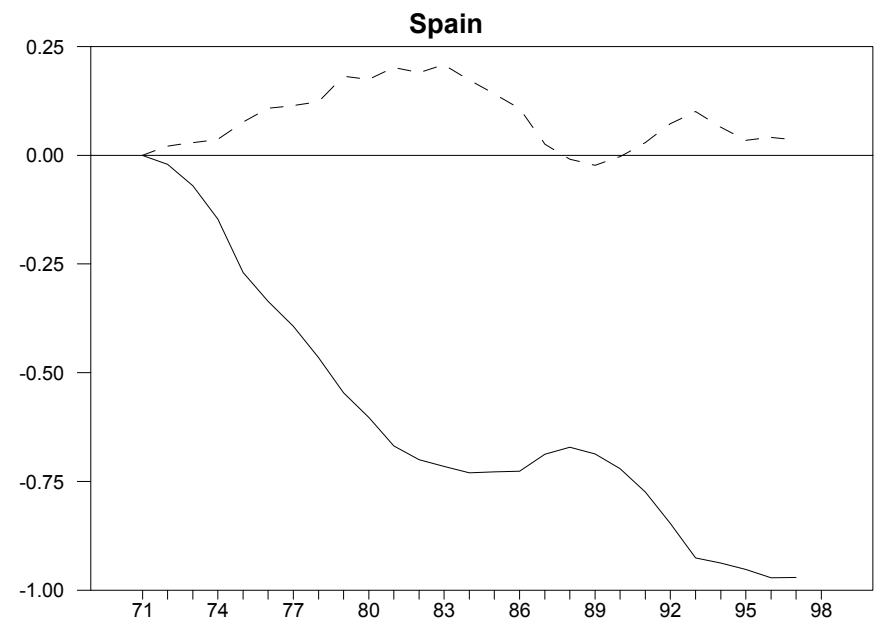
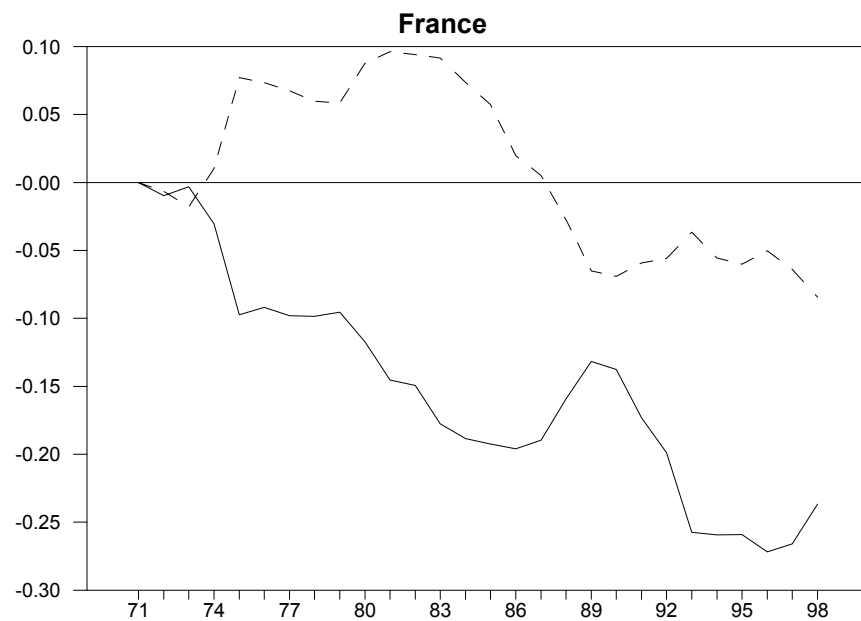
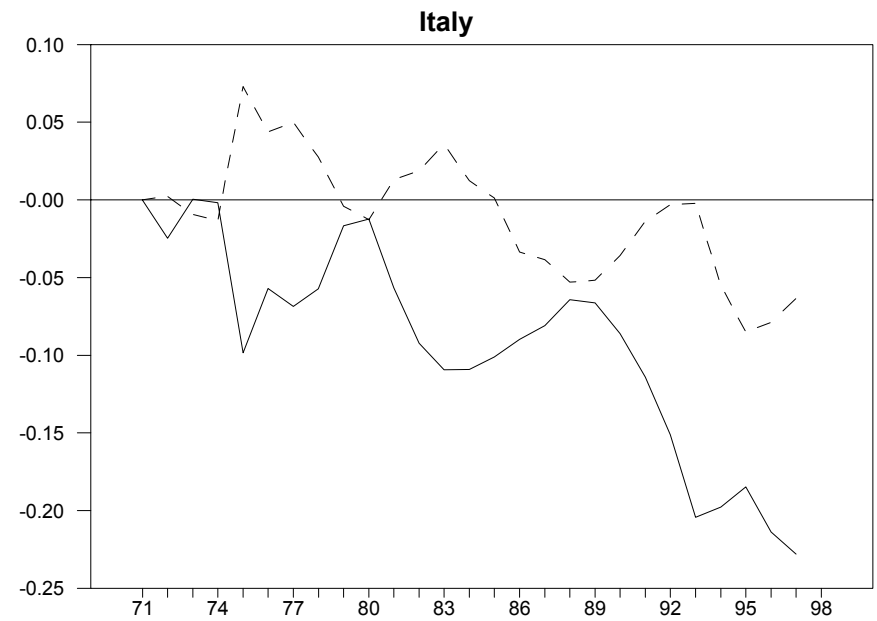
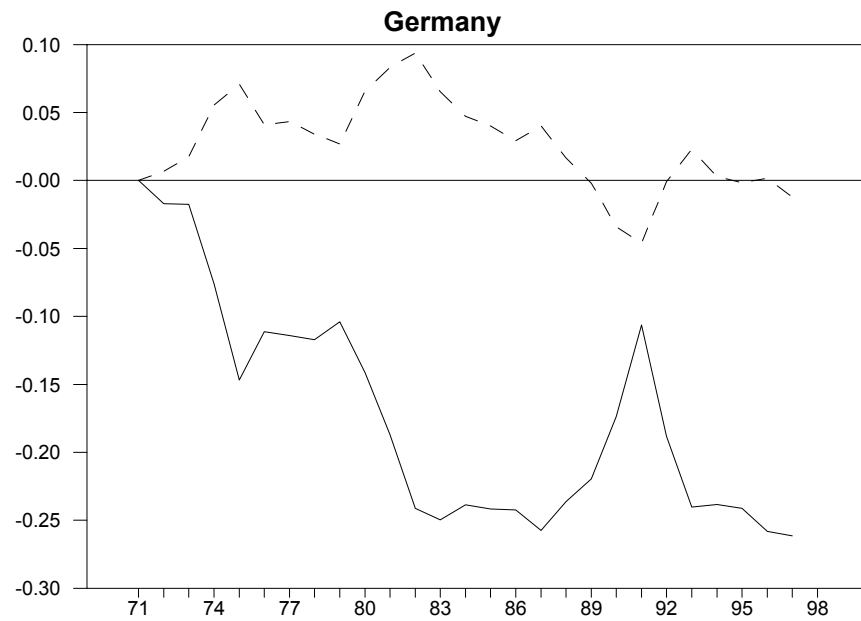
This suggests constructing and plotting an/k and w/a for each of the four countries shown in Figure 6. This is done in Figure 9. For each country, the figure plots the evolution of the logarithms of an/k (the continuous line) and of w/a (the dotted line), from 1971 on (not all the data are available for 1970). Both are normalized to zero in 1971. There are two important aspects to Figure 9:

[Figure 9. $\log(an/k)$ and $\log(w/a)$, Germany, France, Italy, and Spain, 1970-1998. 1970=0.0]

- The 1970s are associated with an increase in w/a . Associated with this increase is a sharp drop in the ratio of labor to capital, an/k . (Note how much larger both movements are in Spain than in the other

Figure 9. $\log(an/k)$ and $\log(w/a)$.

1970-1998. 1970=0



three countries). This was indeed one of the main themes of Lecture 1, and this is what we would expect from the model of Lecture 1.

- From the early 1980s on, w/a starts decreasing in all four countries. By the late 1980s, it is actually lower than its 1971 value. Yet, and here is the proximate cause of the decrease in the labor share, this return of w/a to its earlier level is not associated with a return of the ratio of employment to labor to its earlier level. The ratio appears to have stabilized, but at a level substantially lower than in the early 1970s. Thus, the decrease in the wage since the mid-1980s has not been associated with an increase in employment.

Could this evolution be explained by the long lags and the expectational effects coming from a putty-clay technology, or by costs of adjusting factor proportions more generally? This seems unlikely.¹⁴ Only expectations of large *increases* in w/a in the future could explain why the ratio of labor to capital has increased so little, if at all. This suggests that something else is at work.¹⁵ In that context, labor market deregulation looks like a promising candidate.¹⁶

¹⁴In Blanchard [1997], I used econometrics to reach that conclusion. I think the visual evidence is sufficiently convincing.

¹⁵Bentolila and Saint-Paul [1999] look at the same issue using a slightly different approach and a much larger data set, and reach similar conclusions. They start from the observation that, under the joint assumptions that technological progress is Harrod neutral, and that labor is paid its marginal product, there should be a stable relation between the labor share and the capital-output ratio, K/Y . They then look at this relation for 14 industries in 14 countries over the period 1973-1993. They conclude that, indeed, there appears to have been a substantial shift in the relation between the two. In other words, the movements in the share reflect more than the effects of movements in factor prices.

¹⁶This is not the only one. A shift from Harrod-neutral progress could also explain

5.3 *Back to deregulation*

Having tentatively rejected alternative, neo-classical, interpretations of the facts, let me get back to the interpretation of the data in terms of labor market deregulation.

Note that the deregulation argument has two components. The first is that, since the mid 1980s, Europe has gone through labor market deregulation, at least in the sense of a decrease in the bargaining power of workers. The second is that the effects of labor market deregulation have so far dominated the effects of product market deregulation; otherwise, our model predicts, and the intuition is straight enough to be robust to extensions, we would have seen an increasing, not decreasing, labor share, and a larger decline in unemployment.

How much direct evidence is there for each of these two propositions? The honest answer must be: Not much, either for, or for that matter, against. The main source of our ignorance comes from a number of conceptual and empirical issues, first in developing measures of the relevant institutions, second in constructing the evolution of these measures over time.

Most of what we know at this point comes from work by the OECD on changes in product market and labor market regulations in member countries. Initial results from the development and the construction of a number of measures are reported in Boeri et al. [2000]. Among the results in that study are two findings relevant to our purposes. First, the quantitative evidence points indeed to deregulation both in goods and labor markets in Europe since the mid 1980s. Second—and this goes against the hypothesis developed here—product market deregulation, which has taken place largely

the facts. While, in principle, the data should allow to test between the two, a test in Blanchard [1997] was inconclusive, and I have made no progress since.

as a result of E.U. initiatives, has been widespread if slow moving; by contrast, labor market reforms have been more marginal. This second piece of evidence may not be conclusive however. The indicators constructed by the OECD and examined by Boeri et al for the labor market focus on employment protection, unemployment benefits, and the generosity of pensions. Only the first is likely to be related to β in our model. And, going beyond these indicators, the larger picture appears to be one of a weakening of unions throughout Europe. The unionization rate has decreased, often substantially, in most European countries over the last 15 years (see for example Booth et al. [2000].) The general attitude of governments towards unions also appears to have changed, and so has the attitude of unions themselves (the Wassenaar agreement we discussed in Lecture 1 is an example of such a change in attitudes).

Indeed this weakening of unions points to potential interactions between product market and labor market deregulation. By reducing overall rents, product market deregulation reduces how much unions can expect to extract, making unionization less attractive, which in turn makes unions weaker in bargaining. In Blanchard and Giavazzi [2000], we develop an—admittedly highly speculative—argument which can potentially reconcile the various pieces of evidence: Product market deregulation is indeed happening, but most of its effects (say the effects of lower entry barriers on the degree of competition) are likely to take time. So the long run effects on the economy are not yet evident. At the same time, the anticipation of a more competitive environment and thus of lower rents in the future, may be one of the reasons why workers are finding it less attractive to join unions and why the bargaining power of unions has already declined. Such a story leads to a rosy forecast, in which the long run effects of product and labor market deregulation should now combine to reduce unemployment (and lead eventually to a return of a labor share to a higher level.)

Yet another way in which changes in the product market, either current

or prospective, may have affected labor market outcomes is by putting into question “efficient bargaining” in the labor market. As is well known, the outcome of efficient bargaining is not time consistent: Given that the wage typically exceeds the marginal product of labor, firms would like, ex-post, to reduce employment below the level agreed to in the bargain. (In figure 3, given W_i/P , the firm would increase profit in the short run by choosing a level of employment on the MRP curve, thus to the left of N_i). A number of authors (in particular Espinosa and Rhee [1989] have shown that, if firms have long enough horizons, then they may still decide to choose the efficient outcome; by foregoing profits in the short run, they are able to achieve a more efficient and more profitable outcome in the long run. Higher product market competition however may make it more tempting to achieve short-run profits. Under this interpretation, what we have seen is a change in the nature of bargaining, leading firms to reduce employment at a given real wage. The twist relative to a decrease in β in our model is that this shift leads to a less efficient outcome. We show in Blanchard and Giavazzi [2000] that it leads however to the same short-run effects, a decrease in the labor share and an increase in unemployment. In the long run however, unemployment remains permanently higher, leading to a less rosy forecast than for a decrease in β .

These are largey speculations at this stage. The next step is clearly to try to relate changes in the labor share to changes in labor market and product market regulation measures, both across countries and across sectors. I have not done it yet.

6 Why things are (always) more complicated.

Before concluding, I have to come back to the issue of alternative explanations for the twin share and unemployment facts. This is based on a puzzle and a challenge.

The puzzle is the fact, mentioned above, that the decrease in the labor share has been more muted in the U.K. than in continental Europe—going from 0.71 in 1970 to 0.68 today. Sylvain [1998] has shown that, once one leaves out the petroleum sector (where the labor share varies a lot with the world price of oil, and a sector which plays a much more important role in the U.K. than in the other major European countries), the evolution of the share looks more like the rest of Europe, going from 0.70 in 1970, to a high of 0.78 in 1981, to 0.70 today. This makes the U.K. look more like the rest of continental Europe, but still with a smaller decrease in the share. At the same time, one has the strong impression however that labor market deregulation and the weakening of unions has been, if anything, stronger in the U.K. than in continental Europe. So, unless product market deregulation has also been stronger (cancelling some of the effects of labor market deregulation on the labor share), this is indeed a puzzle.

The challenge is a recent paper by Caballero and Hammour (Caballero and Hammour [1999]) on France over the last 30 years. In that paper, which builds on their earlier work (in particular Caballero and Hammour [1998]), they argue that the decrease in the labor share since the mid 1980s is not the result of labor market deregulation since the mid 1980s as I do here, but rather the result of the earlier movement towards tighter labor market regulation in the 1970s and early 1980s.

Their argument is based on three central ideas. The first is that, because of putty-clay technology, the dynamics of adjustment are very long, so that what we see in the 1980s and 1990s can indeed be the result of institutional changes in the 1970s and early 1980s. The second is that the long run elasticity of substitution between capital and labor is very high, so the long-run substitution away from labor can be very substantial. The simulations I showed earlier in Figure 7, and which allowed for long lags and high elasticity, suggest however that these two elements by themselves are not enough. The third element they introduce is, however, the notion that the effects of tighter

labor market regulation can be quite different from the effects of the type of excess wage growth underlying the simulation in Figure 7: Attempts by workers to appropriate more of the rents lead firms to move away from labor; if the lags are long, and the long run elasticity of substitution, the result, they argue, is a decrease in the labor share just as we have seen in France, or more generally, in continental Europe. If their argument is correct, the implications are obvious and important: The decrease in the labor share is not the good news I have made it to be, but a reflection of past excesses, which will have to be undone if unemployment is to decrease.

The model I developed earlier does not have capital, and thus is too simple to do justice to their argument. The way to proceed would be to integrate the model of the first lecture with the model of this lecture, allowing for monopolistic competition in the goods market, and bargaining in the labor market. This is not hard to do, but would take us too far. Given the focus on bargaining in the labor market which is at the center of this argument, I shall extend the model of the first lecture in just one dimension, the introduction of bargaining in the labor market, and show the results of a simple simulation.

Return to the model of Lecture 1 but allow for efficient bargaining in the labor market. In other words, assume that employment is still determined by the same condition as before, that the reservation wage be equal to the marginal product of labor. But now assume that the wage is set as an average of the marginal product of labor and the average product of labor. In other words, w/a is now given by:

$$w/a = (1 - \beta)F'_n\left(\frac{an}{k}, 1\right) + \beta F\left(\frac{an}{k}, 1\right)/n$$

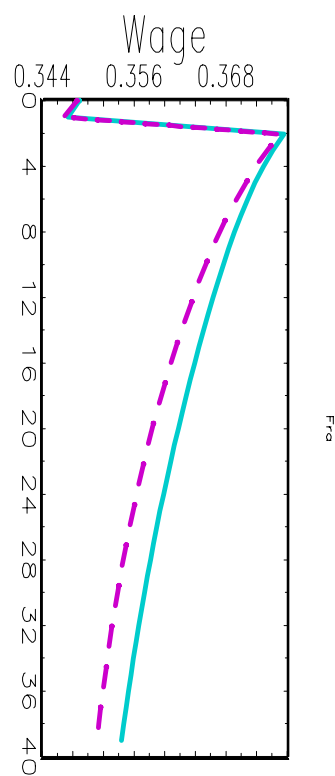
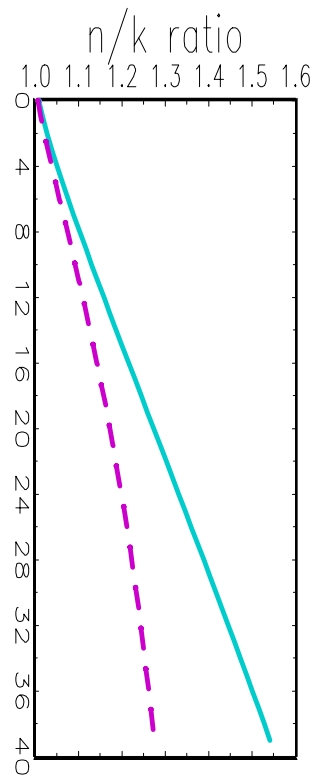
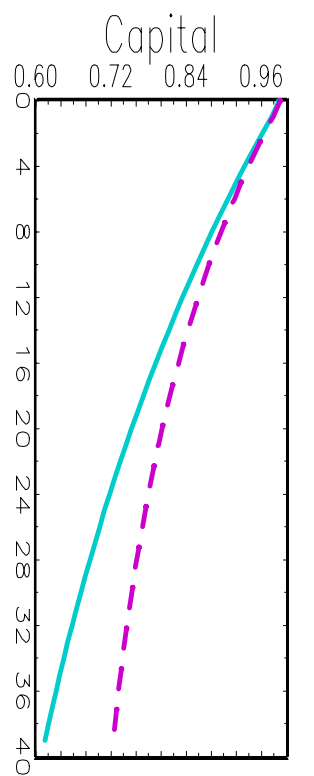
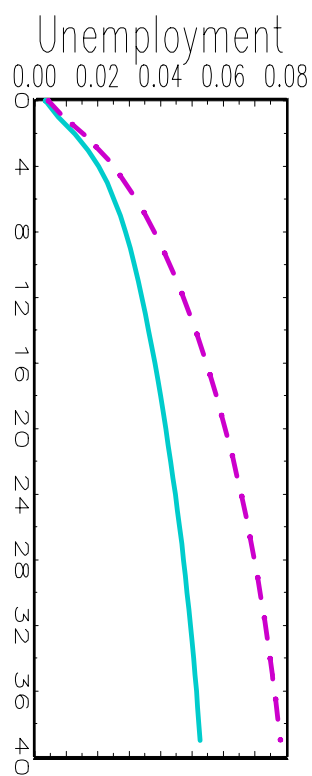
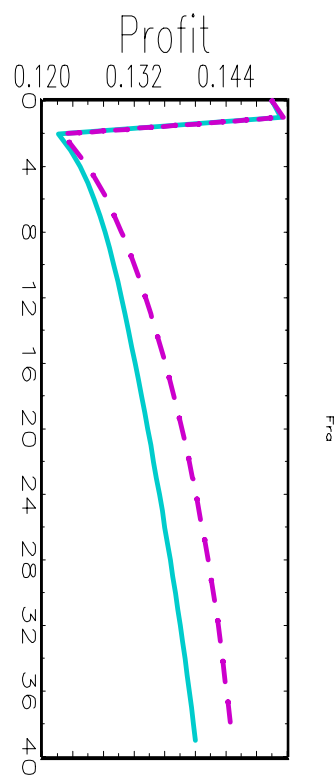
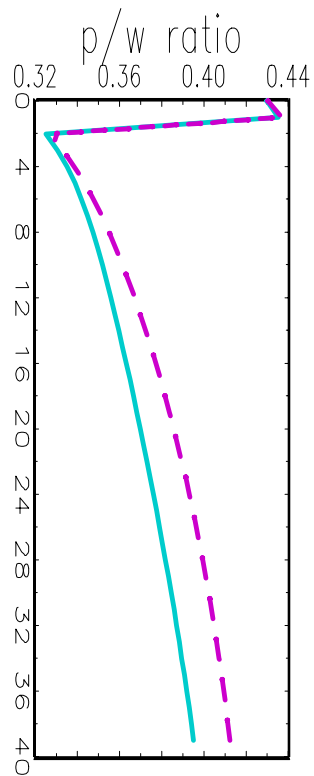
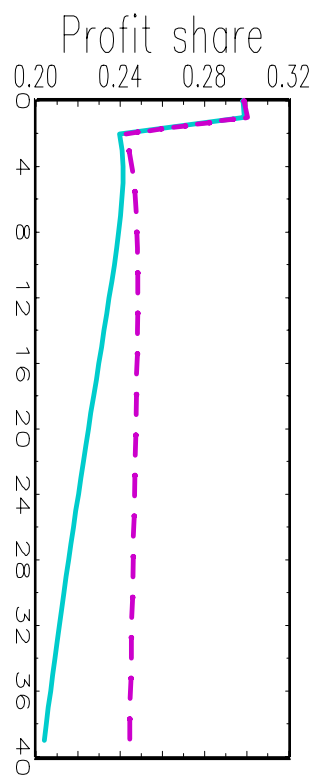
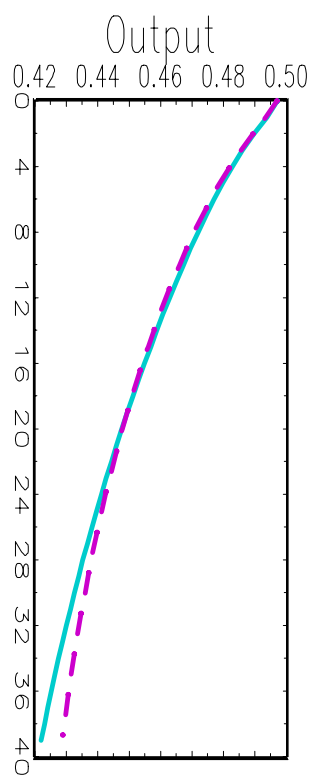
The model of Lecture 1 implicitly assumed $\beta = 0.0$. The extension is to allow β to be positive. Because employment is set efficiently, an increase in β has no effect on employment in the short run. But it affects the wage,

which in turn affects profit, which itself affects investment, and capital accumulation, and so on. In the long run, the profit rate must still be equal to the user cost.

Motivated by the Caballero–Hammour hypothesis, I then ask: What happens to unemployment, to the labor share, and so on, if β increases, if workers become stronger in bargaining? How is the result affected by the value of the elasticity of substitution between capital and labor? The answer is given in Figure 10, which shows the result of two simulations, both starting from a steady state where $\beta = 0$ (so the steady state is the same as in previous simulations), and increases to 0.2 in year 5. For the first simulation (the dotted line), $\sigma = 1$; for the second (the continuous line), $\sigma = 4$. I draw two main conclusions from the figure:

[Figure 10. The effects of an increase in bargaining power]

- The first serves as a warning: There are many ways in which a “wage push” can manifest itself. One is through excess wage growth for some time, with results similar to what we saw in Figure 7 earlier. One is through changes in institutions, such as an increase in bargaining power, as here. As a comparison of Figure 7 and Figure 10 shows, the effects of the two are very different. Note for example from Figure 7 that the effects of excess wage growth leads firms to move away from labor, to decrease the ratio of labor to capital. Note from Figure 10 that the effects of higher bargaining power, thus of stronger appropriation, is instead to increase the ratio of labor to capital. The intuition is straightforward. How much workers can extract depends positively on how much capital each worker works with. Thus, in response to higher appropriation, firms respond by decreasing capital per worker—equivalently, by increasing the ratio of labor to capital.
- The fact that firms decrease capital per worker is bad news for the



hypothesis that an increase in the bargaining power of workers leads to an eventual decrease in the labor share. Indeed, the higher the elasticity of substitution, the smaller the effect of the decrease in the ratio of capital to labor on wages and profits, and thus the larger the increase in the labor share. So the simulation generates a result opposite to that in Caballero and Hammour: The higher the elasticity, the larger the increase—not the decrease as in the data—in the labor share.

Why do Caballero and Hammour reach different conclusions? Because they formalize bargaining differently from the way I have done it here. One of the main institutional changes they consider is an increase in firing costs. Because firing costs are proportional to employment, it leads firms to economize on labor rather than on capital, and so to a decrease in the ratio of labor to capital. There is an important lesson here. The outcome of institutional changes, and by implication the status of the Caballero Hammour hypothesis, depends very much on the details of what institutions have changed, and how.¹⁷

This provides the right transition for the third lecture, the need for a more detailed look at specific labor market institutions, and their implications for unemployment.

¹⁷They make that point explicitly in their paper.

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Lecture 1. Shocks, factor prices, and unemployment.

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October 2000

A simple-minded approach to unemployment is to start with a labor demand curve and a wage setting curve (starting with a standard labor supply would be *too* simple-minded, at least if the goal is to explain the evolution of European unemployment), look at the equilibrium, and trace the effects of various shifts on equilibrium wages and unemployment.

This is simple-minded in at least three ways. First, it ignores the role of nominal rigidities and fluctuations in aggregate demand which are clearly central to short-run fluctuations in output and unemployment. Second, the wage setting curve depends very much on the nature of imperfections and institutions in the labor market. If one wants to understand how it looks and why it shifts, one must look more deeply into its origins. And, third, many of these imperfections and institutions imply that firms may not be operating on their labor demand curve. In many of the models of bargaining for example, the wage is typically not equal to the marginal product of labor.

Yet, and this is the theme of this lecture, this simple-minded approach is very useful. It makes straightforward and strong predictions: In the medium run, if factor prices are too high—be it the price of labor or the

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Comments welcome.

price of capital—unemployment will increase. And, if unemployment is too high, the only way to decrease it, again in the medium run, is to decrease one or both factor prices. These predictions are likely to remain true in more complex models (I shall return to this issue in the second lecture). And they provide a very useful guide to the evolution of European unemployment, both on the way up, and more recently, on the way down.

I start the lecture by sketching the model. I take it through its paces, by looking first at the effect of a decrease in the rate of technological progress, then at the effect of a sharp but temporary rise in interest rates as might arise from a monetary contraction. I then turn to the data, returning to the role of the productivity slowdown of the 1970s, to the role of monetary policy in shaping equilibrium unemployment in the 1970s and 1980s, and finally to the role and the effects of wage moderation in the decrease in unemployment in the Netherlands and in Ireland since the early 1980s.

1 Laying out the model.

Think of an economy which is growing along its balanced growth path. Firms use capital and labor under constant returns to scale. To allow for balanced growth, technological progress is assumed to be labor augmenting (equivalently: Harrod neutral), so the production function is given by:

$$y = F(an, k)$$

where y denotes aggregate output, n and k denote aggregate employment and capital, and a denotes the technological level. Put another way, output is produced using two inputs, “labor in efficiency units” an , and capital k . Assume that a grows at the constant rate g_a . I shall refer to g_a as the rate of labor-augmenting technological progress, or the rate of technological progress for short.

Labor demand

Assume that, in the short run, capital is fixed. The competitive, profit-maximizing, demand for labor given capital (short-run labor demand for short) can then be written as:

$$\frac{an}{k} = f\left(\frac{w}{a}\right) \quad f'(\cdot) < 0 \quad (1.1)$$

The ratio of labor in efficiency units to capital is a decreasing function of the wage in efficiency units. For our purposes, it will be more convenient to rewrite the relation as:

$$n = \frac{k}{a} f\left(\frac{w}{a}\right) \quad (1.2)$$

This relation between employment, n , and the wage in efficiency units, w/a , is drawn for a given value of k/a as the downward sloping curve DD in Figure 1. Its slope depends on the short-run elasticity of substitution between capital and labor: the lower the elasticity the steeper the short-run demand curve.

Turn to the long run. Assume the user cost of capital is given, and equal to c (think either of a small open economy which takes the interest rate, and thus the user cost of capital as given; or just think of what we do as a partial equilibrium analysis, taking the interest rate as given). In the long run, the wage in efficiency units must be such that the associated profit rate is equal to the user cost. Thus, long run labor demand is given by:

$$c = \pi = g\left(\frac{w}{a}\right) \quad g'(\cdot) < 0 \quad (1.3)$$

where π is the profit rate, and $g(\cdot)$ is the factor price frontier relation implied by the production function $F(\cdot, \cdot)$. In the long run, the wage in efficiency units must be such as to generate a profit equal to the user cost—equivalently, such as to generate zero net profit ($\pi - c = 0$). This relation is

drawn as the horizontal line LL in Figure 1.

Wage setting

Turn next to the wage setting relation. For notational simplicity, it is convenient to normalize the labor force to 1 so u denotes both the unemployment level and the unemployment rate. Given that, along the balanced growth path, both the wage in efficiency units and the unemployment rate are constant, it is natural to write the wage setting relation as:

$$\frac{w}{a} = z h(u) \quad h'(\cdot) \leq 0 \quad (1.4)$$

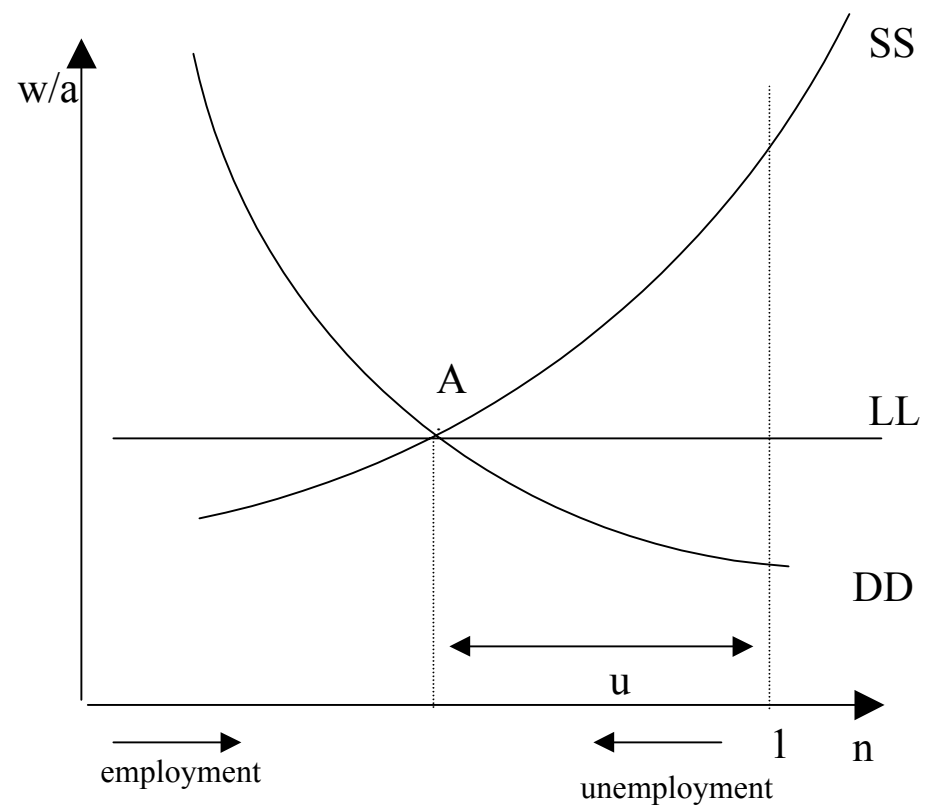
This states that the wage (in efficiency units) is a decreasing function of unemployment. The parameter z is a black box parameter, which captures all the factors which may affect the wage given the unemployment rate, from unemployment benefits, to the structure of bargaining, and so on. In this lecture, I shall not open the black box and look further into the determinants of z or the form of the function $h(\cdot)$. But we shall spend much of the next two lectures looking inside the black box.

Assume that, to start with, the economy is growing along its balanced path. The equilibrium is then given by point A in Figure 1. The short-run labor demand, long-run labor demand, and wage setting curves all go through point A . Equilibrium unemployment is equal to u (unemployment is measured from right to left, starting at 1, the labor force.) At the equilibrium unemployment rate u , the wage in efficiency units implied by wage setting is consistent with a profit rate equal to the user cost. Output, capital, and employment in efficiency units all grow at rate g_a .

[Figure 1. The balanced path.]

To see what this model implies, the next two sections take it through its paces, looking first at the effects of a decrease in the rate of technological

Figure 1. The balanced path



progress, and then at the effects of an increase in real interest rates.

2 The effects of a decrease in the rate of technological progress.

Looking at the five major European countries (Germany, France, the UK, Italy, and Spain) the rate of technological progress, which had been close to 5% in the 1950s and 1960s, decreased to 3% in the first half of the 1970s, and to 2% in the second half of the 1970s.¹ It has remained around 2% since.

It is natural to ask how much of the increase in unemployment might have come from such a decline and how long the effects may have lasted.²

The first answer given by the model above is that, if this decrease had been instantaneously perceived and understood by all, it would have had no impact on equilibrium unemployment. Output, capital, employment in efficiency units, and wages, would have grown at a lower pace, the unemployment rate would have remained the same.

But such an exceptional decrease is likely to take some time before it is fully understood by the economic players.³ Measures of productivity growth move a lot from year to year, and most of the movements are transitory.

¹These numbers refer to technological progress in the business sector. The rate of labor-augmenting technological progress is obtained by first constructing the Solow residual for each year, and dividing it by the share of labor in the business sector for that year. Put another way, the rate of labor augmenting technological progress is equal to the rate of total factor productivity growth divided by the labor share.

²I am obviously not the first one to ask... One of the first systematic attempts was made by Bruno and Sachs [1985], and there have been many since.

³Bob Solow, in commenting on this lecture, used the term “comprehension lag”, which sounds just right.

Workers, as well as others, are likely to take some time to realize that the change is actually permanent. Meanwhile, they are likely to extrapolate the old trend and thus overestimate the value of a .

A simple way to capture this idea is to extend the wage setting curve to read:

$$\frac{w}{a^*} = zh(u) \quad (2.1)$$

where a^* is the perceived rather than the actual level of technology.⁴ Rewriting gives:

$$\frac{w}{a} = z' h(u) \quad \text{where } z' \equiv z \frac{a^*}{a}$$

So, after a permanent decrease in g_a , a^* is likely to increase faster than a for some time, leading to an increase in z' , and a shift of the wage setting to the left over time, from SS to, say, SS' in Figure 2. As reality sets in, z' starts decreasing, and the wage setting curve starts shifting back to the right. As a^* eventually returns to a , z' goes back to z , and the wage setting relation returns to SS .

What happens to unemployment along the way? As SS initially shifts to the left, w/a increases. And this higher wage has two effects on firms. First, given their capital stock, they reduce their demand for labor. The economy moves along DD . But, also, the higher wage implies a profit rate below the user cost, and thus a decrease in capital accumulation relative to the balanced growth path; over time DD shifts to the left. Employment declines for two reasons: a lower employment given capital, as well as a lower capital

⁴Another interpretation which is often given, and which I find attractive but difficult to make operational, is to think of the underlying rate of technological progress as shaping “wage aspirations.” Workers get used to and expect a given rate of wage increase. In the face of a decrease in the underlying feasible rate, it then takes a long time for them to adjust their aspirations to the new reality.

accumulation. The specific dynamics depend on the details of the model, but the general adjustment path can be represented by the counterclockwise loop in Figure 2: a period of higher wages, and higher unemployment until aspirations adjust, wages decline, and the economy recovers.

[Figure 2. A decrease in the rate of technological progress]

That the decline in the rate of technological progress had something to do with the increase in unemployment in the 1970s will not be seen as very controversial.⁵ The more interesting but more difficult question is how much and for how long.

Because I could not find an answer in the literature, I decided to do a rough calibration. What follows is very much a back-of-the-envelope computation. The exercise requires two components: First, a way of thinking about the effects of the decline in g_a and the evolution of a^* relative to a . Second, the use of a quantitative model along the lines above, but with more explicit dynamics, to trace the effects of the evolution of (a^*/a) on unemployment.

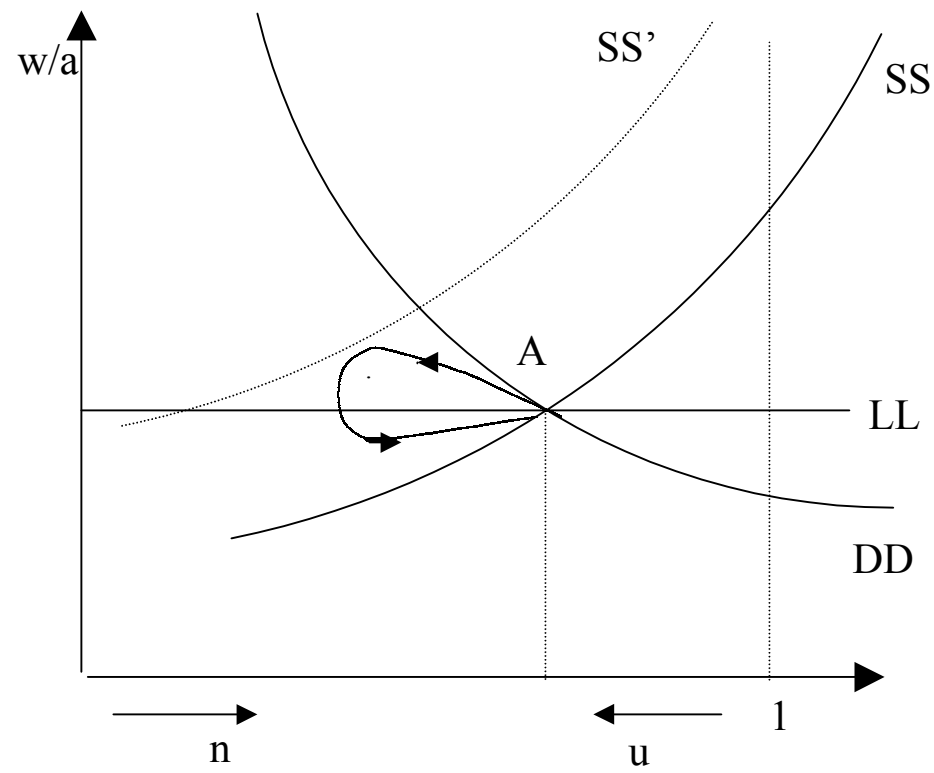
To think about the first component, assume that g_a is subject to both transitory and (infrequent) permanent movements. Suppose that workers suspect that, from some time, say $t = 0$, there may have been a permanent decrease in g_a . Then, from $t = 0$ on, they will adjust g_a^* according to:

$$g_{at}^* = \lambda g_{at-1}^* + (1 - \lambda)g_{at} \quad (2.2)$$

where λ will depend on the variances of the permanent and transitory

⁵We may be seeing the beginning of the reverse experiment in the United States today. The unexpected and persistent increase in the rate of total factor productivity growth since the mid to late 1990s may well be one of the main factors behind the decrease in the equilibrium rate of unemployment of the last few years.

Figure 2. A decrease in the rate of technological progress



shocks to g_a . And, given their perceived growth rate, they will then compute their perceived level of a according to:

$$\log a_t^* = \log a_0 + t g_a^*$$

As workers revise down their estimated underlying rate of technological progress, g_a^* will steadily converge to g_a . But as workers use too high a growth rate to compute a^* , a^* will diverge from a for a while, until eventually returning to a over time.

To get a sense of magnitudes, suppose that at time $t = 0$, g_a decreases from 5 to 2%. Figure 3 then shows the evolution of $\log a$ and $\log a^*$ over time if $\lambda = 0.9$. In this case, $\log a^* - \log a$ reaches a maximum of 10% roughly 10 years after the start of the slowdown, and then returns to zero over time. The point of this exercise is simple: The effect of the decrease in the rate of technological progress can be fairly large (equivalent to a 10% “wage push,” an increase of z of 10%), and the maximum effect may happen after some time, here after 10 years.

[Figure 3. Actual and perceived tfp levels.]

The second component we need is a quantitative model along the lines of the model sketched above. I developed such a model earlier (Blanchard [1997], and Blanchard [1998]), and I shall rely on it here. (The appendix gives the specific equations).

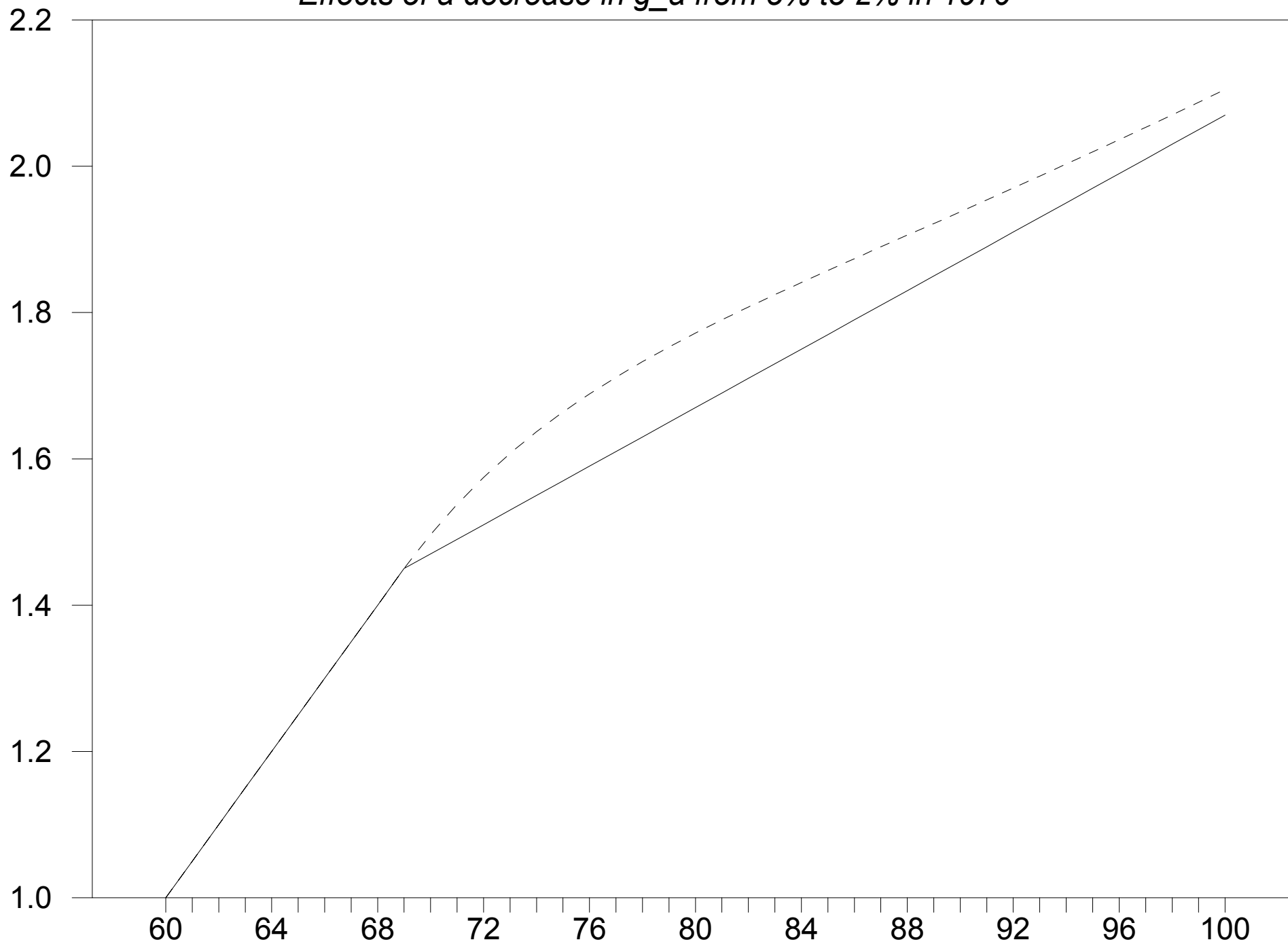
The model formalizes firms as competitive profit maximizers, with a CES production function, and labor-augmenting technological progress. The simulations below assume an elasticity of substitution of 1 (some simulations in Lecture 2 will relax this assumption.)

There are two sources of dynamics, coming from costs of adjustment for both capital and for factor proportions.

- The lower the costs of adjustment to capital, the faster the difference

Figure 3. Actual and perceived technology levels. 1960= 1.0

Effects of a decrease in g_a from 5% to 2% in 1970



between (current and prospective) profit and user cost translate in capital accumulation or decumulation.

The parameters characterizing the cost of adjustment in the model imply an elasticity of investment with respect to the shadow price of capital equal to 1.0. Empirical evidence on the relation of investment to Tobin's Q yields lower elasticities. But, as discussed in that literature, these estimates are likely to be downward biased. More reliable, instrumental variable, approaches yield higher estimates. The study by Cummins et al. [1994] for example yields an elasticity around 1.0.

- The lower the costs of adjustment for factor proportions, the faster firms adjust the ratio of labor to capital to the wage.

The parameters characterizing the cost of adjusting factor proportions imply a mean lag of adjustment of about 5 years. To get a sense of whether this is reasonable, think of the cost of adjustment as a short cut for a representation of the technology as putty-clay. In a world in which production were strictly putty-clay, only the newly installed capital stock, thus roughly 10% of the total capital stock each year (if we are thinking of equipment), would embody the new desired factor proportions. This would imply a mean lag of adjustment of 4.5 years.

Finally, the wage setting relation determines how unemployment in turn affects wages. The model assumes that an increase in the unemployment rate of one percentage point decreases the wage by 1%. For an unemployment rate of 10%, this corresponds to an elasticity of the wage with respect to unemployment equal to 0.1, roughly the number estimated by Blanchflower and Oswald [1994] in their estimation of a “wage curve” for a number of countries. My work with Katz [1997] has led me to conclude that the correct specification for the wage setting equation has richer dynamics than (1.4), and probably a higher long run elasticity than suggested by Blanchflower and Oswald. But I shall stick with the simple static specification here.

I solve the model under the assumption that nobody expected the slowdown in tfp growth before it happened, and that, when it happens, workers form their expectations as described above but firms have perfect foresight. In other words, firms understand that there has been a slowdown, understand that workers do not fully realize it but will eventually adjust their expectations over time. This is a strong assumption, but an assumption needs to be made. If firms are as confused as workers, then the effect on capital accumulation and on the labor–capital ratio will be smaller initially, but will last longer than those shown below.

The main results are shown in Figure 4 (When relevant, the variables are shown normalized by the level of technology, a .) The time unit is a year.

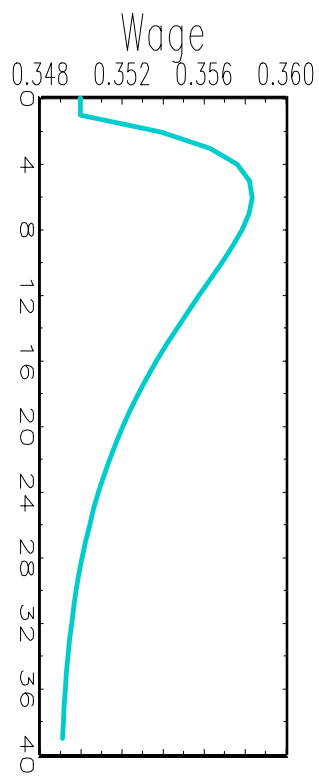
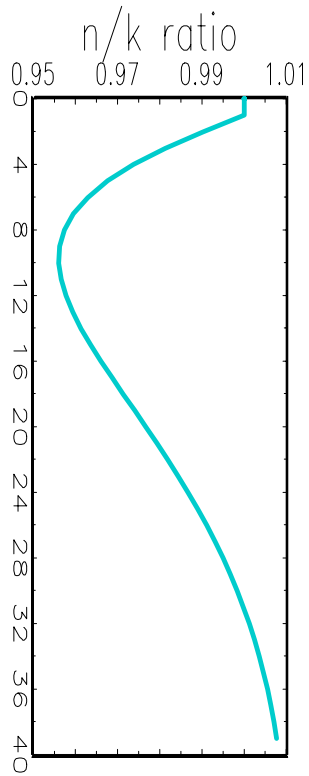
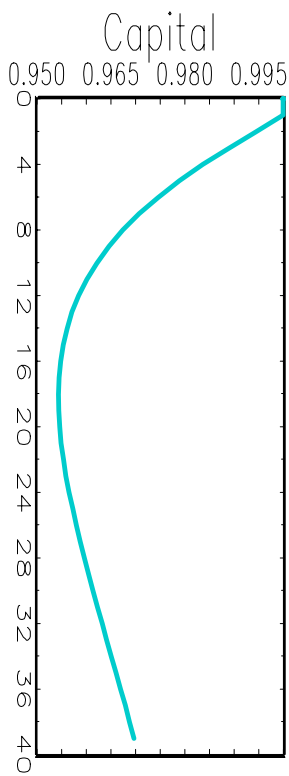
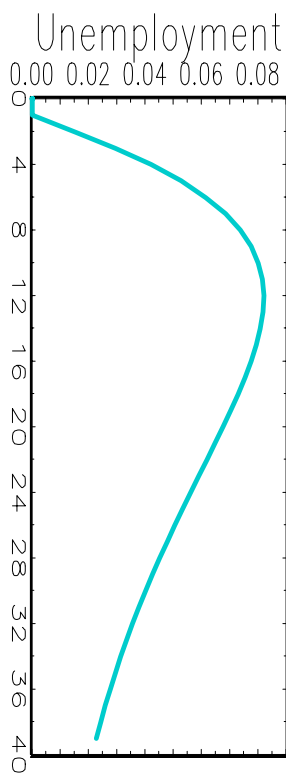
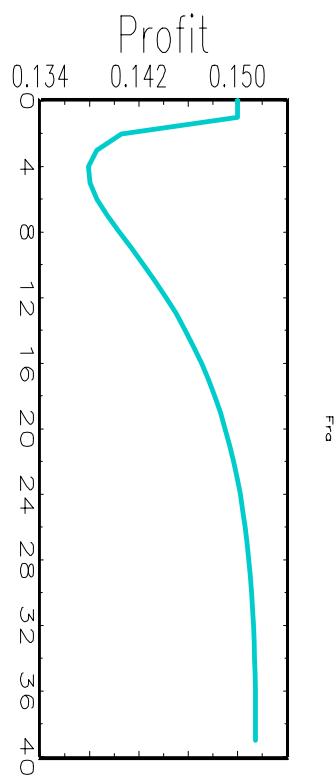
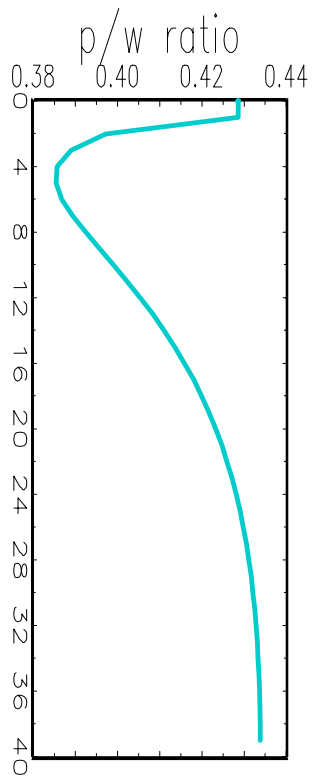
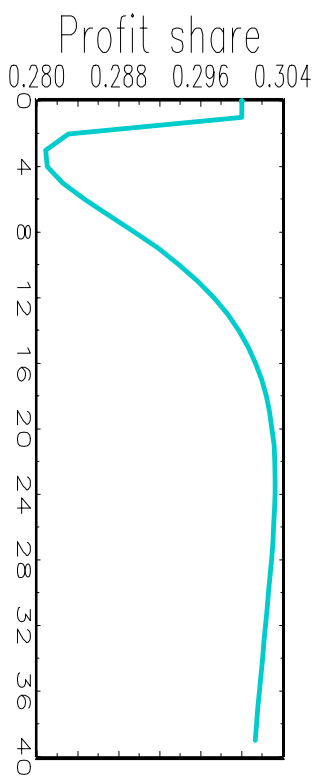
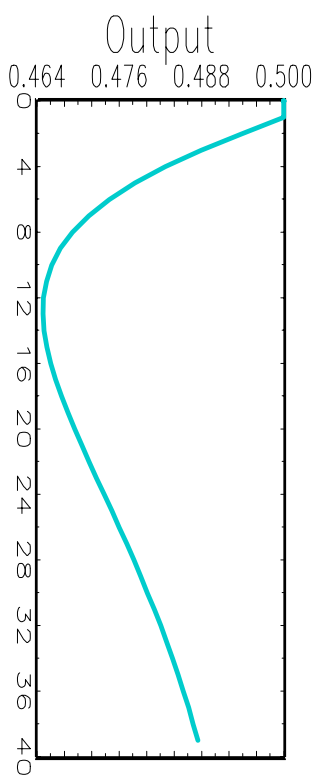
[Figure 4. The effects of a decrease in the rate of technological progress]

The wage increases for about 5 years, before eventually returning to its steady state value. The increase is small relative to the increase in (a^*/a) : much of the effect shows up as higher unemployment, rather than as higher real wages. The evolution of the profit rate is the mirror image of the wage.

The higher wage leads firms to decrease the ratio of labor to capital over time. The ratio reaches a minimum after 9 years. And the lower profit rate leads to lower capital accumulation, with the trough taking place 16 years after the initial shock.

Lower capital and a lower labor–capital ratio both lead to a decrease in employment, and a corresponding increase in unemployment. The increase in the unemployment rate is largest after 10 years, equal to about 8%. The associated loss in output (relative to its balanced growth path value) 10 years out is equal to nearly 10%.

Of marginal interest here but of central interest for the next lecture is the behavior of the profit share. Despite the Cobb Douglas assumption, the profit share initially goes down, reflecting the fact that costs of adjusting factor proportions prevent an instantaneous adjustment of the labor–capital



ratio. The share then recovers, overshooting slightly its steady state value before returning to it in the long run.

The limits of such a simulation are obvious, from the formalization of the adjustment of expectations, to the specification of the wage setting relation, to the choice of specific parameters. The purpose of the exercise was simply to see whether a decrease in the rate of technological progress could potentially generate a large and long increase in unemployment. I take the results to suggest that the answer is yes. According to this simulation, the slowdown in tfp growth in the mid-1970s can potentially explain much of the increase in European unemployment at least over the following 10 years, perhaps up to the mid or late 1980s. High unemployment has lasted much longer however. With this in mind, let me turn to a second exercise, the effects of higher interest rates on unemployment.

3 The effects of an increase in real interest rates.

The last 30 years have seen very large swings in real interest rates in Europe. For most European countries, the ex-ante real interest rate turned from positive in the 1950s and 1960s to sharply negative in the second half of the 1970s, and then to large and positive in the 1980s and much of the 1990s.⁶ For some countries, the ups and downs of real interest rates have been quite dramatic: The real interest rate in Spain which had averaged about 2% in the 1960s decreased to -5% in the mid 1970s, and then back to 5% in the 1980s and the early 1990s.

This raises two issues. The first one is where these large movements came from. My own reading of the evidence points to monetary policy,

⁶This statement is based on a construction of ex-ante real rates as equal to the yield on medium-term government bonds minus realized inflation in the previous year. See Blanchard and Wolfers [2000] for details.

accommodating at first, much tighter later. The second is what effect these movements may have had on (equilibrium) unemployment. I shall start by leaving the first issue aside, and focusing on the second. I shall then return to the connection with monetary policy.

Consider an increase in the interest rate, followed by a return to its original value over time. (Why assume a temporary rather than a permanent change? Because, if we think of monetary policy as being behind the change, we want to keep the assumption of long-run neutrality, so the real interest rate eventually returns to its original level.)

Figure 5 shows how the economy reacts. The increase in the real interest rate implies an increase in the user cost. The fact that the profit rate is now below the user cost implies a decrease in capital accumulation, and thus a shift in the short run labor demand curve to the left, say from DD to DD' over time. The economy goes from A to B and unemployment increases. Then, as the interest rate returns to its original value, capital accumulation recovers, and the economy returns to its original equilibrium, A , over time.

[Figure 5. A temporary increase in interest rates]

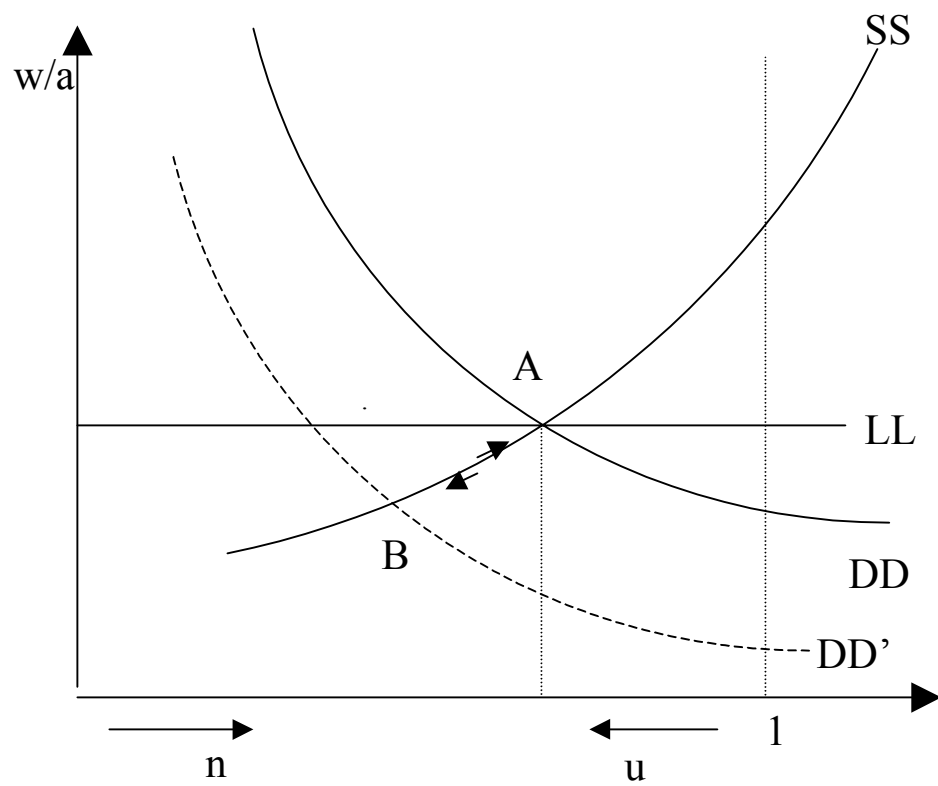
The fact that an increase in the interest rate leads to capital decumulation and increased unemployment for some time is again not very surprising. The more interesting and again more difficult question is how large these effects might potentially be. And so, with the same caveats as for the decrease in technological progress earlier, let me embark on a simple simulation.

Assume that, until time $t = 0$, the interest rate r is equal to 5%. At time $t = 0$, it increases to 15%, and then returns to 5% over time according to:

$$r_t - 5\% = 0.9 (r_{t-1} - 5\%)$$

Admittedly, a 10 percentage point change in the real interest rate is a

Figure 5. A temporary increase in interest rates



large one. But this is roughly what happened in Spain, first on the way down, from the 1960s to the 1970s, and, on the way up, from the 1970s to the 1980s.

The quantitative model is the same as before. The simulation assumes that the initial increase is unexpected, but, thereafter, both firms and workers anticipate the actual sequence of interest rates and thus the return to 5% over time. The results are shown in Figure 6.

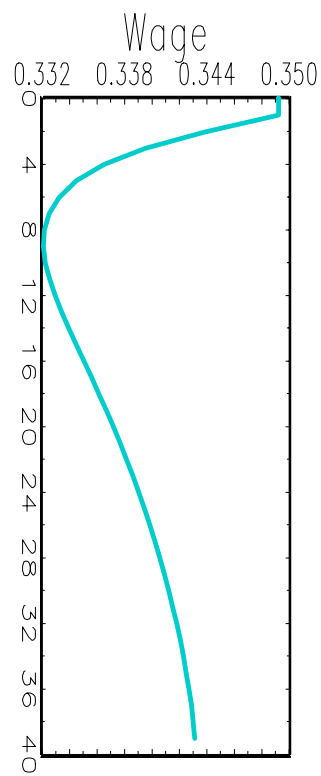
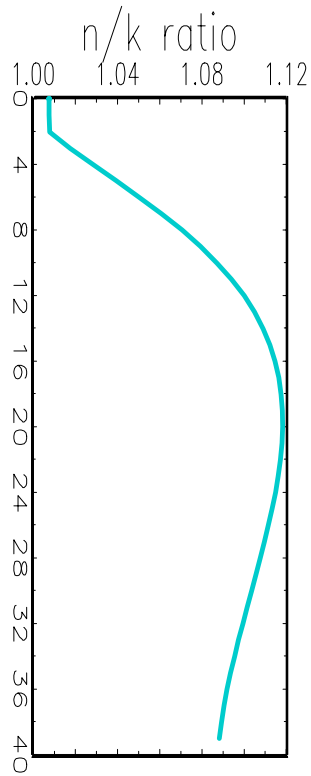
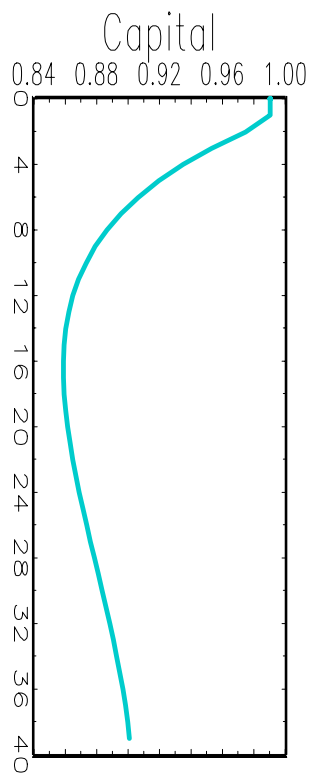
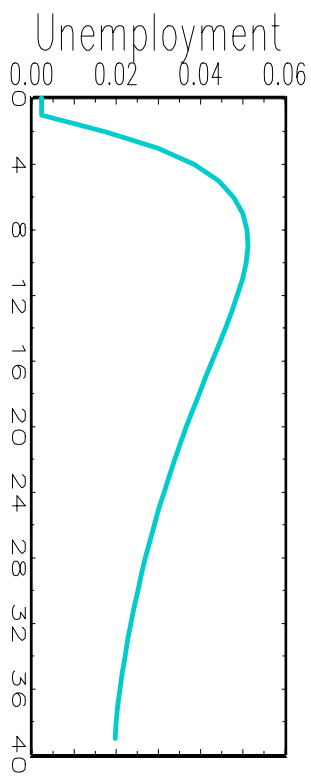
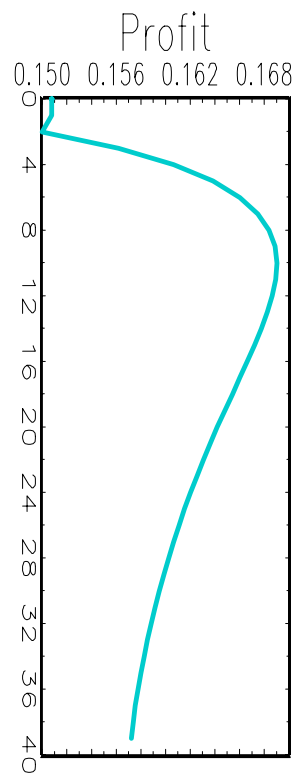
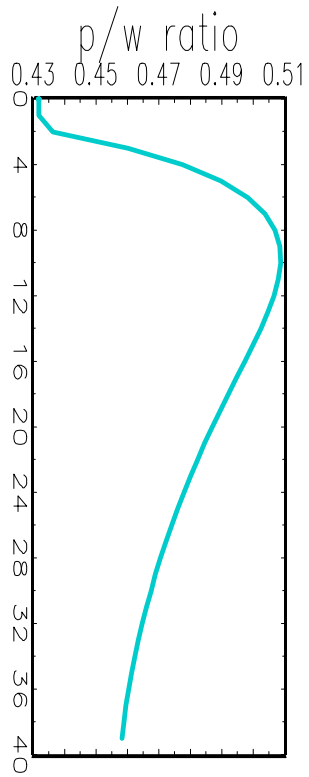
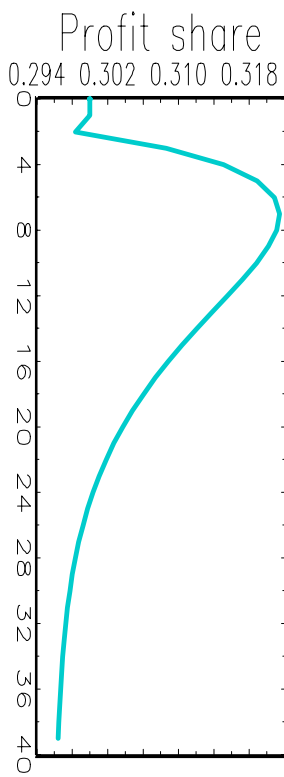
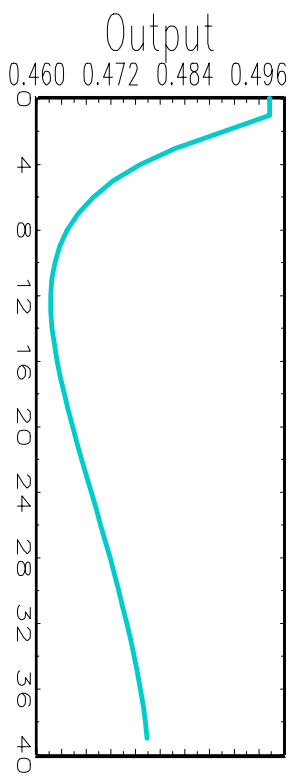
[Figure 6. The effects of a temporary increase in interest rates.]

The increase in the user cost leads to capital decumulation. The effect is quite large, with a decrease of the capital stock (relative to its balanced growth path value) of close to 15% after 14 years. At a given ratio of labor to capital, capital decumulation leads to a parallel decrease in employment, and a corresponding increase in unemployment.

This increase in unemployment in turn leads to a decrease in wages, which leads to an increase in the ratio of labor to capital. Thus, there are two mechanisms affecting unemployment. First, the decrease in the capital stock, and, second, the increase in the ratio of labor to capital. The first must dominate the second, and the net result is an increase in unemployment.⁷ Unemployment is higher by 5 percentage points after 8 years, before eventually returning to normal.

Again, marginal to our current interests but important for the next lecture is the behavior of the profit share. Because of costs of adjusting factor proportion, the ratio of labor to capital adjusts in response to the decrease

⁷The intuition, and the proof, is by contradiction: If the second effect dominated the first, unemployment would go down, leading to an increase in the wage. But if the wage increased, then the labor to capital ratio would decrease, not increase, a contradiction with the premise of the argument.



in the wage only over time, leading for some time to an increase in the profit share, followed by a return to its original value over time.

Going back to European unemployment: The argument developed in this section suggests that, some of the increase in unemployment which would have taken place in the 1970s was instead shifted to later, to the 1980s and maybe even to the early 1990s. Put another way, the evolution of interest rates helps explain why high equilibrium unemployment persisted into the 1980s, although it still leaves us short of a convincing explanation for why it persisted well into the 1990s in most countries.

Let me now go back to the other half of the question raised at the start of this section. Why did interest rates move the way they did? Many factors can lead to changes in real interest rates, from demographic changes, to changes in profitability, to changes in monetary policy.⁸ My reading of the evidence points to a major role for monetary policy. When inflation increased in the 1970s, monetary policy was lax, letting nominal rates lag behind inflation. Then, starting with the Thatcher disinflation of 1979 and moving to the European continent in the 1980s, monetary policy was steadily tightened, nominal rates increased, leading eventually to the low inflation rates we observe today.

If this conclusion is right, this points to a serious shortcoming of the model I have used until now: The model is purely “real”, with no nominal rigidities, and so no role for monetary policy in affecting real interest rates. The usual excuse for ignoring nominal rigidities is that the effects of money are sufficiently short-lived that, if the focus is, as it is here, on medium-term movements in unemployment, it may make sense to ignore them. If however movements in money can have sufficiently long-lasting effects on

⁸For two studies of the evolution of real interest rates up to the mid 1980s, see Blanchard and Summers [1984], and Barro and Sala-i-Martin [1990]. These would be fun to update.

real interest rates to affect capital accumulation and unemployment, then the usual excuse just does not hold. And if monetary policy affects not only actual but also equilibrium unemployment, we may need to revisit its role. If workers and firms were really confused about the slowdown in productivity in the 1970s, but the central banks were not (I am quite sure they were, so the argument will remain hypothetical), wasn't there an argument for lowering interest rates until aspirations adjusted and, in this way, lead to a more stable natural rate along the way? Or, to take another example, recent research has shown that inflation targeting makes good sense if the equilibrium rate of unemployment is given, unaffected by monetary policy. How is that analysis affected if the equilibrium rate itself responds to monetary policy?

4 A brief look at the panel data evidence.

How far does one actually get in trying to explain the evolutions of unemployment, both over time and across countries, based on the evolution of technological progress and real interest rates? This was one of the questions we took up in Blanchard and Wolfers [2000]. Let me summarize and slightly extend our findings here.

We started by constructing, for each of 20 OECD countries, annual measures of labor augmenting technological progress and of real interest rates.⁹ (We actually included a third variable, which we referred to as a shift in labor demand, or a shift in labor hoarding. I now prefer to think of this change as having its source in a change in institutions, and so I shall leave it out

⁹A semantic mea culpa: In that paper, we referred to the rate of labor-augmenting technological progress as the rate of total factor productivity (tfp) growth. The first is in fact equal to the second divided by the labor share. In these lectures, I am more careful about distinguishing between the two.

at this stage. But it will be the main focus on the next lecture.) We then constructed five-year averages of unemployment and each of the two shocks, for eight periods, starting in 1960-1964, and ending with 1995-1998.

We first ran a regression allowing the unemployment rate to depend on current, or current and lagged once, values of each of the two shocks, as well as a country effect:

$$u_{it} = c_i + a_1(L)ga_{it} + a_2(L)r_{it} + \epsilon_{it}$$

where i denotes the country, and t denotes the 5-year time period. The results of such a regression, allowing for just current values and for current values and one lag on one or both variables are given in Table 1. (The results are slightly different from those in the published paper because I include only two of the three shocks we included there. But, because the third shock is largely orthogonal to the first two, the general conclusions below are the same as in that paper). Table 1 yields two conclusions:

- First, the coefficients on the rate of technological progress and on the real interest rate are significant, both economically and statistically. In the specification allowing for current and lagged values of g_a variable, a 1% decrease in g_a leads to an increase in the unemployment rate of 0.5% in the first five years, 1.3% in the following five years. (One might want to impose the restriction that the effect of the tfp growth variable is zero in the long run. But the time series dimension of the panel is too short to learn much about these low-frequency dynamics.) An increase of 1% of the real interest rate leads to an increase in the unemployment rate of about 0.6 to 0.7%, with the effect happening mostly within the first five-year period.
- Second, the regression does a very poor job of fitting the cross-country dimension of the panel. This is shown in Figure 7, which plots the actual and fitted changes in unemployment, from 1970-74 to 1990-94.

Most of the fitted values are positive, reflecting decreases in the rate of technological progress and increases in the real interest rate in most countries over the period. But there is little cross-country correlation between fitted and actual values. To take an example (which has been a personal obsession for a number of years), Spain and Portugal have roughly the same fitted value, but very different actual increases in unemployment.

[Figure 7. Actual and predicted changes in unemployment. 1970-74 to 1990-94.]

Table 1. Technological progress, interest rates, and unemployment.

Dependent variable: u_{it}					
on :	ga_{it}	ga_{it-1}	r_{it}	r_{it-1}	\bar{R}^2
	-0.49		0.71		0.56
	(-3.2)		(6.2)		
	-0.40	-0.71	0.50	0.09	0.61
	(-2.2)	(-4.7)	(4.5)	(0.8)	
	(with country specific coefficients d_i)				
	-0.57		0.76		0.56
	(-2.3)		(3.9)		

Period of estimation: 1960-64 to 1990-94. For the regression with country specific coefficients, the coefficient is the average of the country specific coefficients.

Our next step in Blanchard and Wolfers [2000] was to then explore a specification allowing the effects of the shocks to be a function of the labor

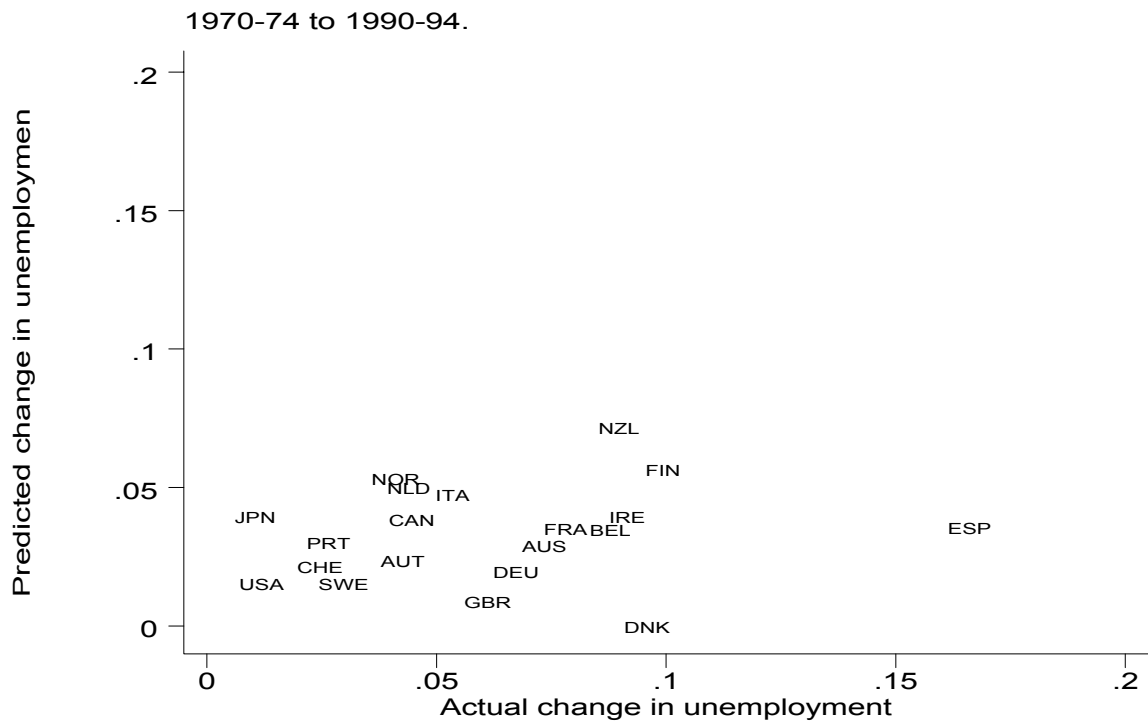


Figure 7. Actual and Predicted Change in unemployment

market institutions of each country. To avoid delving into institutions at this point, I shall present here the results from a slightly more agnostic approach, namely allowing the effects of the shocks to be country dependent.¹⁰ The last line of Table 1 presents the results of a regression of the form:

$$u_{it} = c_i + d_i(a_1ga_{it} + a_2r_{it}) + \epsilon_{it}$$

where the effect of a given combination of shocks is now allowed to differ across countries. A normalization is required for the d_i 's: The d_i 's are normalized so their average across countries is equal to 1.

This regression yields three conclusions:

- There is again a significant effect of both tfp growth and real interest rates on unemployment.
- The d_i coefficients vary significantly across countries, from 2.3 for Spain to 0.4 for the U.S. This implies that a shock which leads to an increase in the unemployment rate of one percentage point in the average country leads to an increase of 2.3 percentage points in Spain, but only 0.4 percentage points in the U.S. Put another way, the equilibrium unemployment rate appears indeed much more stable in the U.S. than in Europe.
- The fit between predicted and actual values of the change in unemployment, shown in Figure 8, is much better than before. Most countries are close to the 45 degree line, although there are some clear exceptions, in particular Spain—where predicted unemployment increases by 10%, but actual unemployment increases by 15%. (The general

¹⁰A similar approach was taken by Phelps [1994], and more recently by Fitoussi et al. [2000].

fit becomes better, indeed becomes very good, when allowing for the third shock in the regression. See Blanchard and Wolfers [2000].)

[Figure 8. Actual and predicted changes in unemployment. 1970-74 to 1990-94. Country specific coefficients]

There are good reasons however to read these results with some skepticism. Allowing for the d_i to differ across countries is basically a way of allowing the regression to fit any increase in unemployment (if not the more subtle variations over time) for any given adverse shock. The reason I believe these results to contain some truth is the statistical relation of the estimated d_i 's to a number of measures of labor market institutions. As we showed in Blanchard and Wolfers [2000], either forcing these coefficients to be a linear function of measures of institutions, or estimating them freely as done here and then regressing them on institutions, yields surprisingly plausible results, i.e. results which accord well with our priors of how institutions may affect the response of the economy to shocks. Although I shall not report and describe them, the same results hold here.

The conclusion I draw from this exercise is that one can indeed go a long way in explaining the evolution of European unemployment, at least up to the early 1990s, by the decrease in the rate of technological progress and the downs and ups of real interest rates.

Let me now turn to the more recent past, and see what light the model can shed on the recent declines in unemployment in countries such as Ireland and the Netherlands.

5 Ireland and the Netherlands.

Figure 9 shows the evolution of the unemployment rate in the Netherlands and in Ireland since 1970. In the Netherlands, the unemployment rate, which had reached 11% in 1983, has steadily decreased since, and is forecast to fall

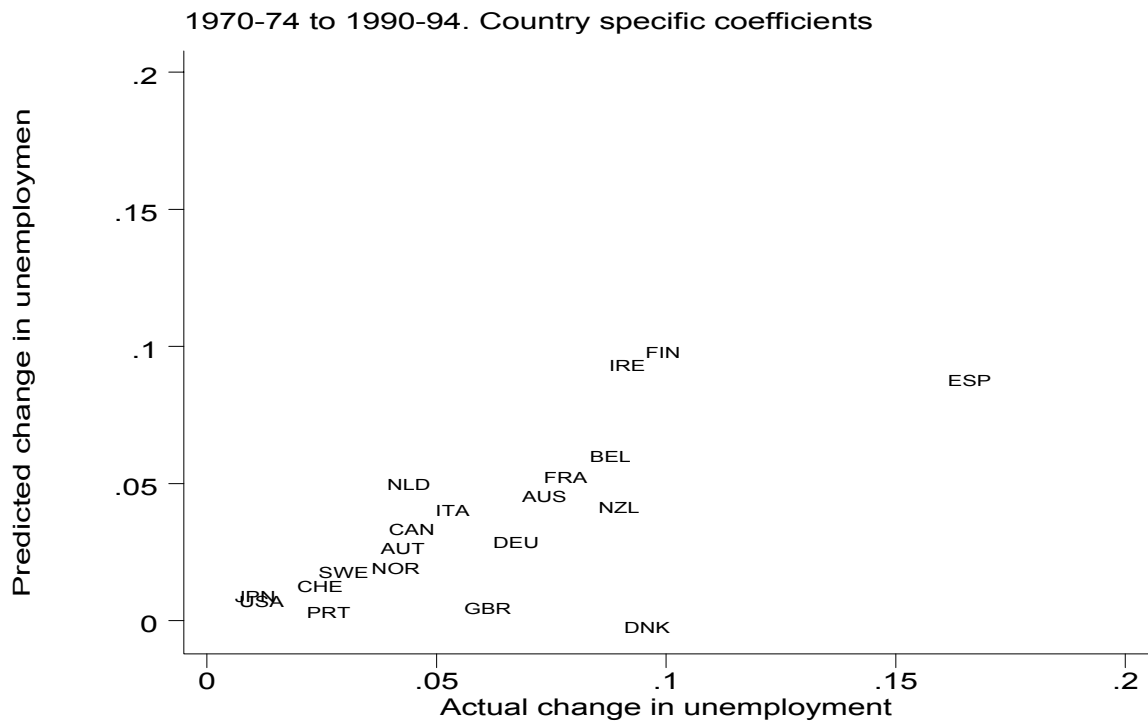


Figure 8. Actual and Predicted Change in unemployment

below 3% in 2000. In Ireland, the unemployment rate, which had reached 17% in 1986 and was still at 15% in 1993, has tumbled, down to 5% in 1999 and a forecast 3.6% in 2000.

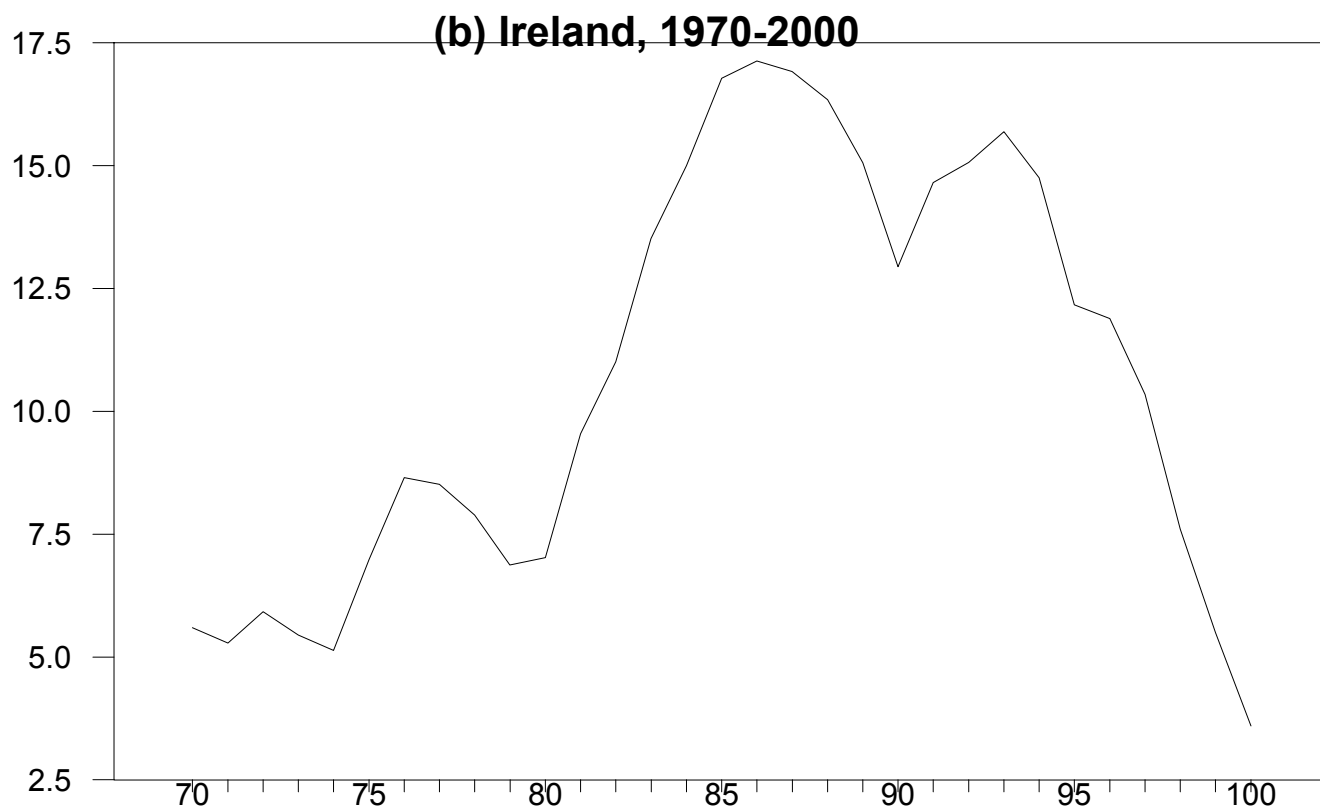
[Figure 9. (a) Unemployment rate, Netherlands. (b) Unemployment rate, Ireland]

Such apparent “miracles” —as these two declines are often called— naturally raise doubts about their reality. But in neither case does the decline since the mid 1980s have much to do with statistical artifacts. It is often stated that there has been a large increase in part-time employment in the Netherlands, suggesting a shift in the distribution of work rather than a true increase in employment. Part-time employment has indeed increased, but this has been more than matched by an increase in the participation rate of women. It is also often mentioned that the number of officially disabled workers is suspiciously high in the Netherlands, hiding what should in fact be called unemployment. This is indeed true, but the proportion has declined since 1983, and so this cannot be the source of the decline in unemployment. In the case of Ireland, the evolution of unemployment actually understates the employment miracle: Employment growth has been larger than the decrease in unemployment, reflecting net in-migration, a sharp change from the net out-migration of the past.

Why have these two countries succeeded where others have not, or at least not yet? Many articles, and a few books, have already been written.¹¹ My goal here will be more limited, namely to look at the two countries

¹¹Among them, for the Netherlands, the book by Visser and Hemerijck [1997], and the article by Nickell and van Ours [2000]. Broer et al. [2000] follows an econometric approach based on a model closely related to the model in this lecture. For Ireland, Fitz Gerald [2000] provides a very useful survey. Two good comparative studies (in French) are by Fitoussi and Passet [2000] and Freyssinet [2000].

Figure 9. Unemployment rate



through the lens of the model, and see what this suggests. Let me state already the main conclusion: Wage moderation—in terms of the model, a substantial decrease in w/a —appears to be at the center of both evolutions. Its effects can clearly be seen on the labor–capital ratio, on capital accumulation, and on unemployment. The more difficult question is where this wage moderation has come from.

The model I sketched earlier suggests starting with the construction and examination of (w/a) , the ratio of the real product wage to the level of technology—equivalently the wage in efficiency units. The model implies that, for the economy to remain on its balanced path with constant unemployment, the wage in efficiency units must remain constant, at a level consistent with the equality of the profit rate and the user cost. If (w/a) increases above this critical value, unemployment will steadily increase. If (w/a) decreases below this value, unemployment will steadily decrease.¹²

The first step is thus to construct a (Data sources and construction for both countries are given in the appendix.) This is done by integrating g_a over time, and taking the exponential of the resulting series.¹³ The (logs of the) real wage w and of the level of technology a are plotted in Figure 10(a) for the Netherlands. The two log levels are normalized to 0 in 1970, based on the idea that unemployment was roughly constant, and the Dutch economy was roughly on its balanced path, at the time. The data here and in the figures below refer to the business sector only.

¹²If the economy does not exhibit Harrod neutral technological progress, the proposition still holds, but in slightly modified fashion. The wage associated with a constant profit rate and constant employment is still given by a constant value of w/a , where a is constructed in the same way as below. But, as there is no balanced growth path in this economy, this wage will typically not be associated with balanced growth.

¹³Recall that g_a itself is constructed as the Solow residual for each year divided by the labor share in that year.

The Netherlands

[Figure 10. Netherlands. (a) w and a (b) (an/k) versus (w/a)]

Figure 10(a) shows the clear change in the evolution of w relative to a which took place in the early 1980s. The wage, which had grown faster than a from 1970 to the early 1980s, has grown much more slowly since then. Since 1983, the wage has increased by 15% less than a , an instance of clear wage moderation.¹⁴

The model predicts that such wage moderation should first have led firms to shift from capital to labor. Figure 10(b) plots the ratio of employment in efficiency units to capital, (an/k) , against the wage in efficiency units, (w/a) . From equation (1.1), there should be a tight relation between the two (a static relation in the simple analytical model, a dynamic relation in a world in which firms adjust factor proportions only over time). And indeed there is. After a decrease in the 1970s, the ratio of labor to capital turned around in the early 1980s and has increased by more than 20% since 1982.

The model also predicts that the decrease in (w/a) should also have led to an increase in the profit rate, and, other things equal, to an increase in capital accumulation. In light of this prediction, the increase in the investment rate has been surprisingly small. Figure 11 shows why: Other things have not been equal.

¹⁴Because of data limitations, I have used bodies rather than total hours worked as the measure of employment in the construction of the Solow residual and of the real wage (the wage bill divided by employment). Because of the increase in part-time as well as shorter workweeks for full-time workers, total hours have grown less than bodies. If we were to use hours rather than bodies, the figure would show both slightly faster tfp growth and slightly faster real wage growth per hour than plotted in Figure 10(a). But the difference would remain the same.

Figure 10. Netherlands

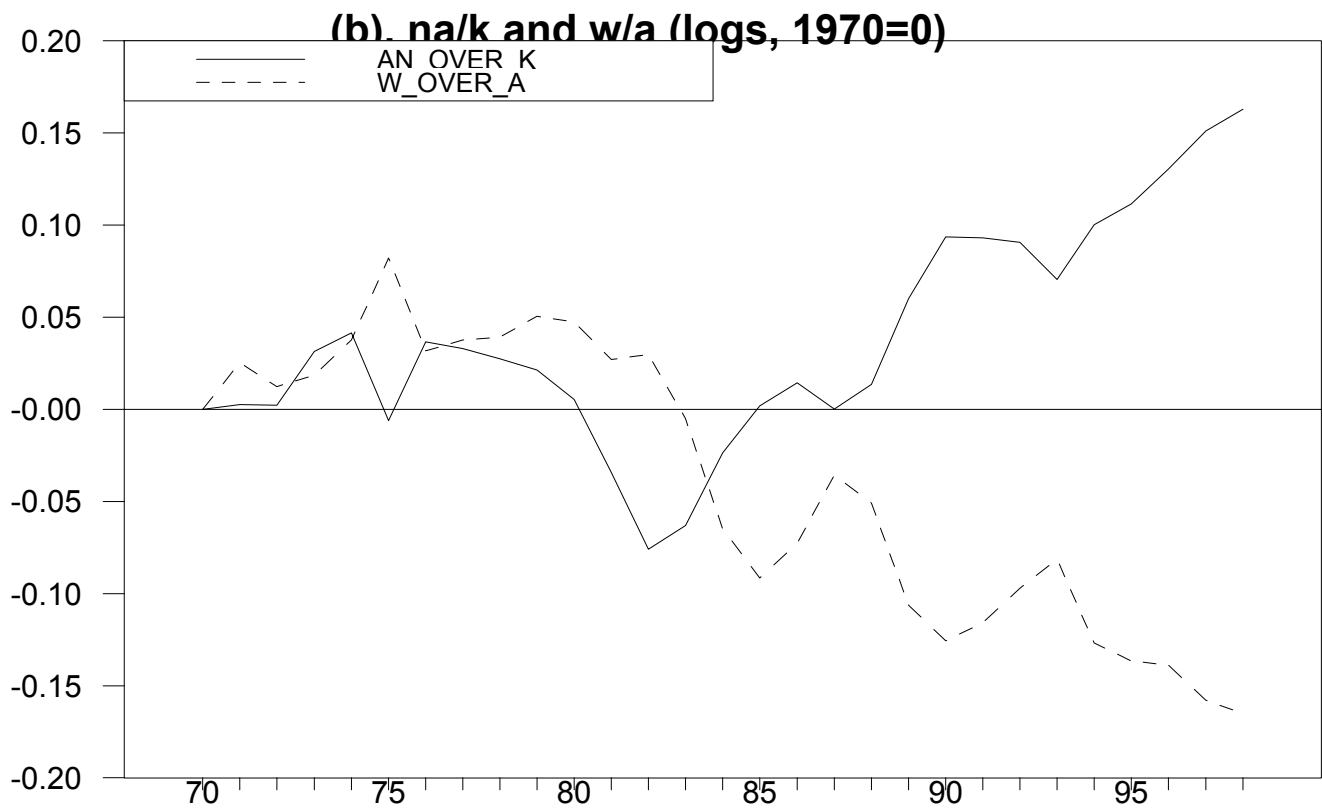
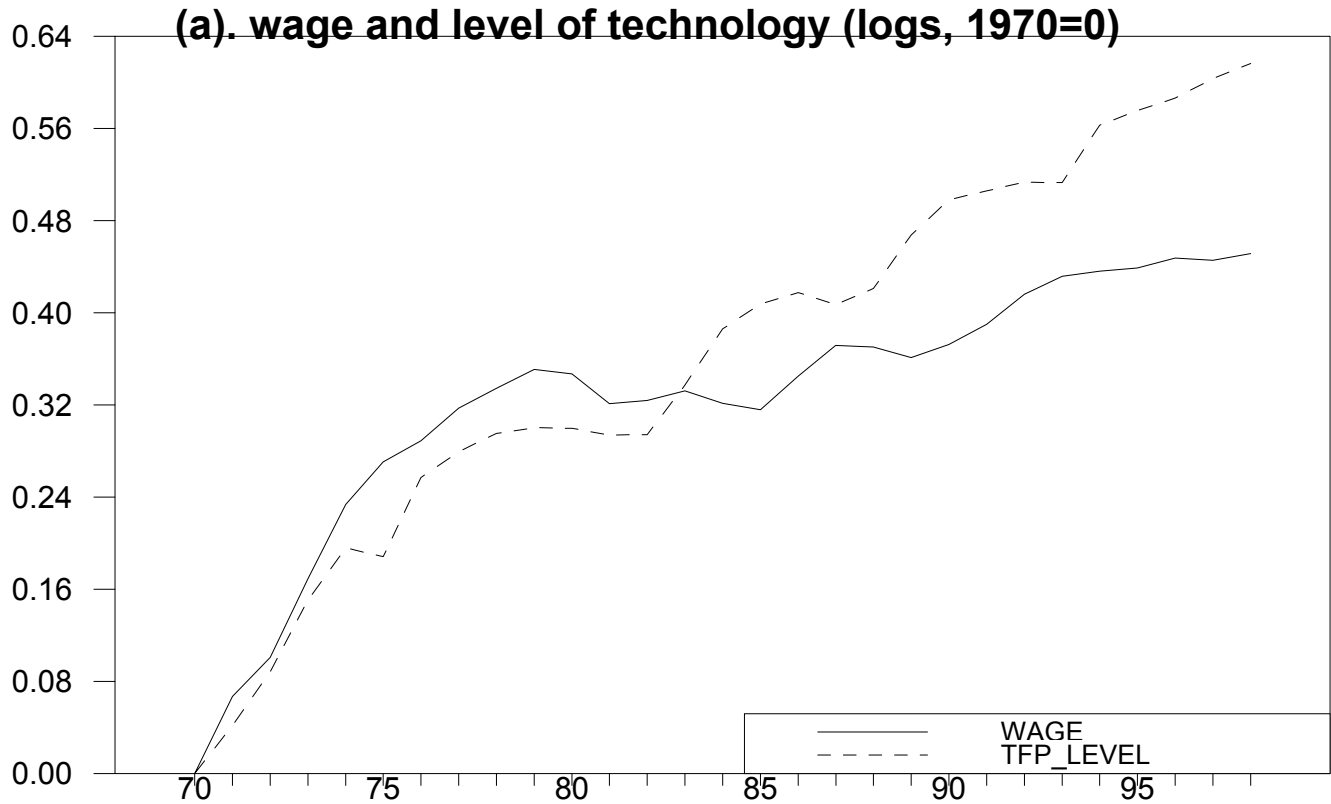


Figure 11(a) plots the profit rate (denoted r_{pi} in the figure), i.e. the ratio of total profit to the capital stock in the business sector, and two measures of the user cost of capital. The first (denoted uc) ignores taxes, and constructs the user cost as the sum of the depreciation rate plus the real interest rate, itself constructed as the long nominal interest rate minus the average rate of inflation over the current and previous four years. The second (denoted uct) takes into account taxation along the lines of Jorgenson–Hall (a precise definition of the user cost in this case is given in the appendix.)

The figure yields two conclusions: First, the profit rate has indeed increased since the early 1980s. Second, this increase has been all but dwarfed by the increase in the user cost from the late 1970s to the early 1990s, an increase of more than 12 percentage points over 15 years. In other words, wage moderation has increased profits, but, until the early 1990s, this was more than offset by the increase in the user cost, due itself to a steady increase in real interest rates over the period.

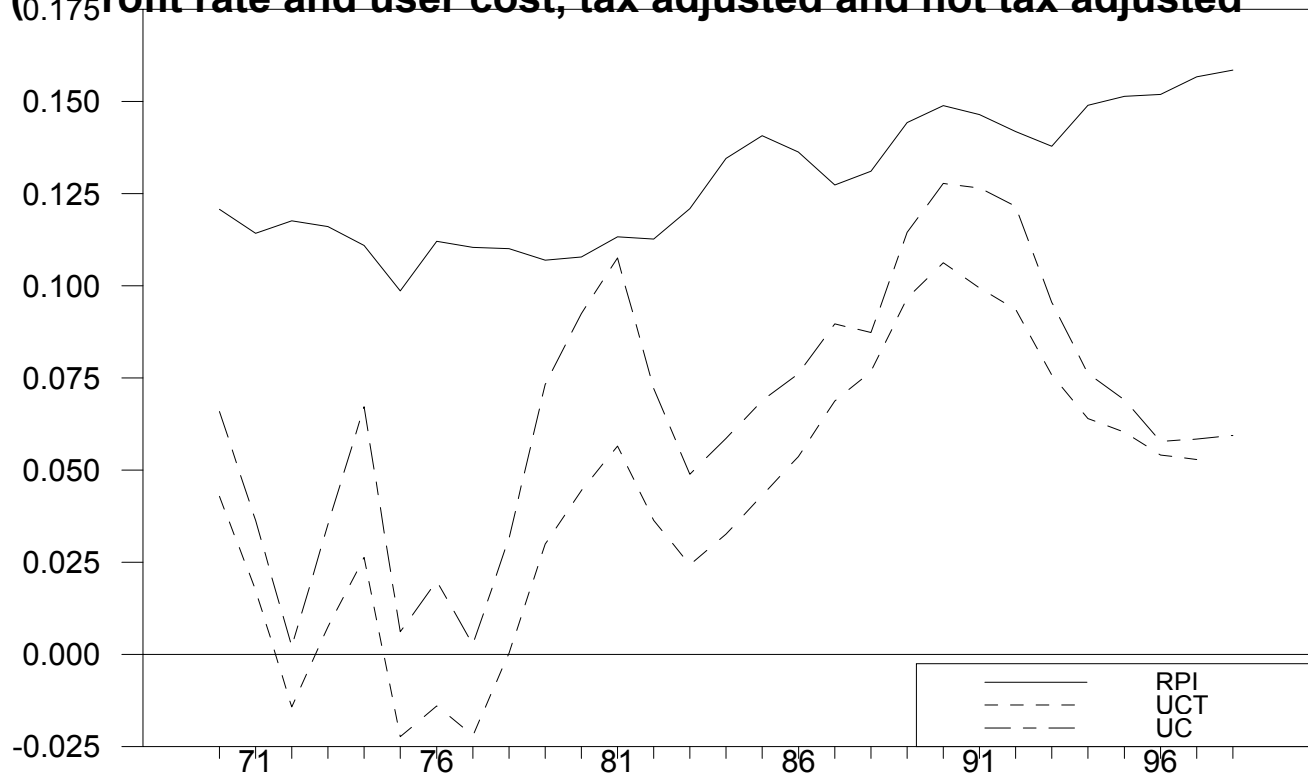
This is what explains the mediocre performance of investment, at least until the early 1990s, as shown in Figure 10(b) which plots gross investment as a ratio to GDP. The investment rate, which had fallen in the 1970s has recovered only partly. (Another way to look at the evidence is to look at (k/a) . (k/a) has remained roughly constant since the mid 1980s). The fact that the profit rate continues to increase, and the user cost to fall, in the second half of the 1990s suggests that an improvement might be coming. And, indeed, since 1997, gross investment for the economy as a whole (I do not have the investment data for the business sector yet) has grown at a rate 1.5% per year higher than GDP.

[Figure 11. Netherlands. (a) Profit rate and user costs. (b) Net investment rate]

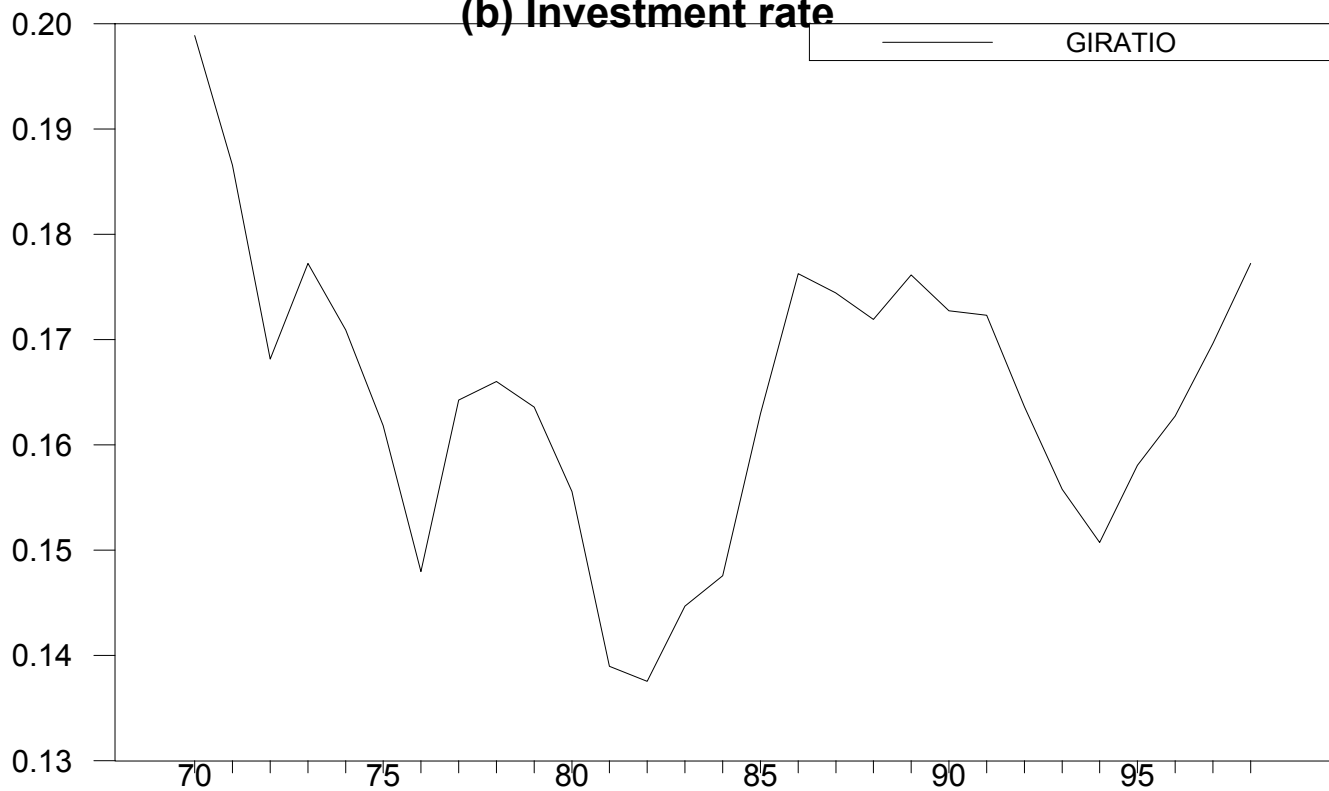
To summarize, the proximate cause of the decrease in unemployment in the Netherlands appears to have been wage moderation. This has led

Figure 11. Netherlands

(a) Profit rate and user cost, tax adjusted and not tax adjusted



(b) Investment rate



to an increase in the ratio of employment to capital. The effect on capital accumulation has been delayed by high interest rates; as interest rates have started to decline, the investment rate is now increasing. The increase in the ratio of employment to capital has led to an increase in employment, and a steady decrease in unemployment.

Ireland

Let me now carry out the same exercise for Ireland. Figure 12(a) shows the evolution of the real wage and the level of technology since 1970. The diverging evolution of the two since the early 1980s is again striking: Since 1983, w has increased by 40% less than a . (While the focus is on the decrease in unemployment, note another interesting aspect of the figure: There is no evidence of that excessive wage growth was at the root of the earlier increase in unemployment. The wage in efficiency units was roughly the same in the early 1980s as it was in 1970. This suggests either that the level of the wage was already too high in 1970, or/and that another factor was at work. As we shall see below, high real interest rates are indeed a plausible candidate.)

Figure 12(b) shows how, just as in the Netherlands but on a larger scale, this decrease in (w/a) has led to a turnaround of the ratio of labor to capital. Look at the scale on the left hand side: The ratio (an/k) has increased by more than 40% since 1983.¹⁵

[Figure 12. Ireland. (a) w and a (b) (an/k) versus (w/a)]

Turning to capital accumulation, Figure 13 shows that, even more than in the Netherlands, the performance of investment has been unimpressive. The explanation runs along the same lines as for the Netherlands. As shown in

¹⁵The disaggregated evidence suggests that this increase is more the result of a change in the mix of industries than a shift towards labor within industries (Bradley et al. [1993]); but the reasons and the results are basically the same.

Figure 12. Ireland

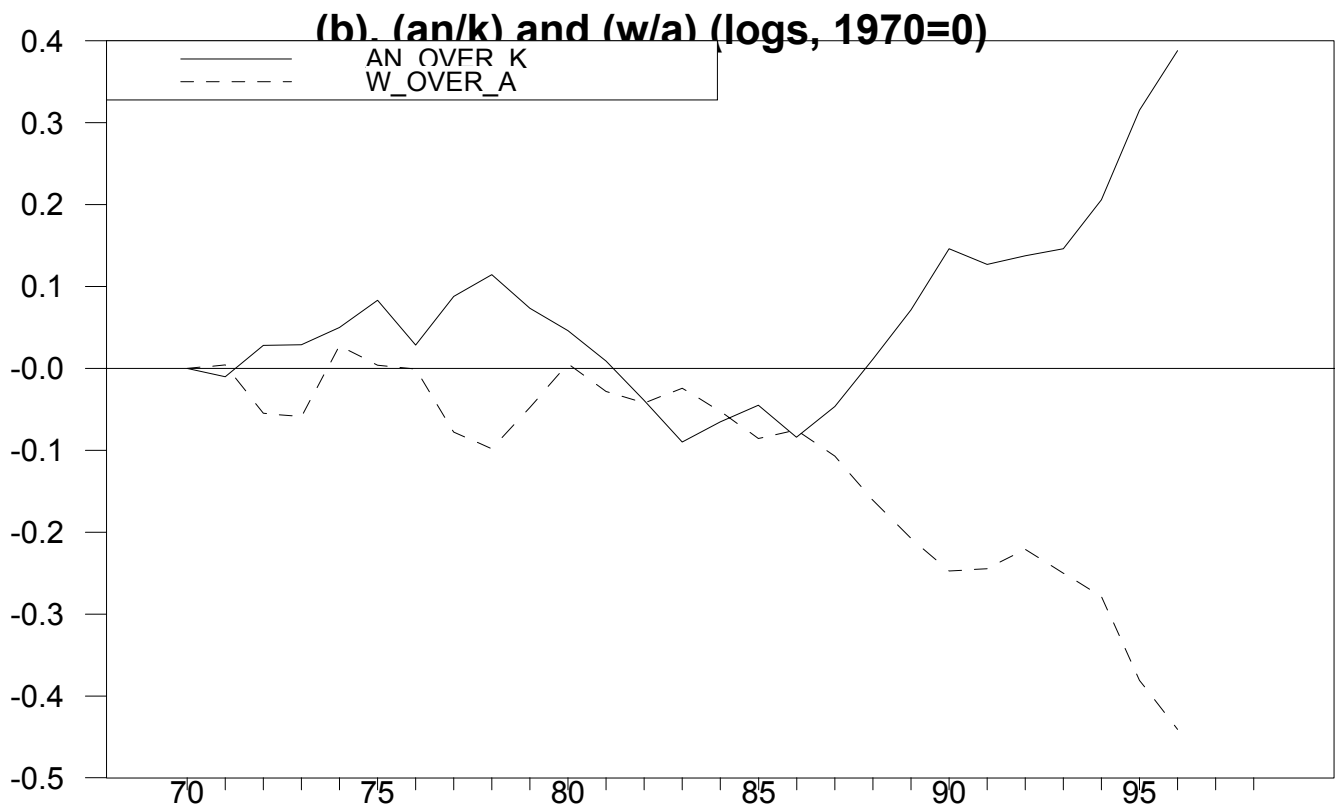
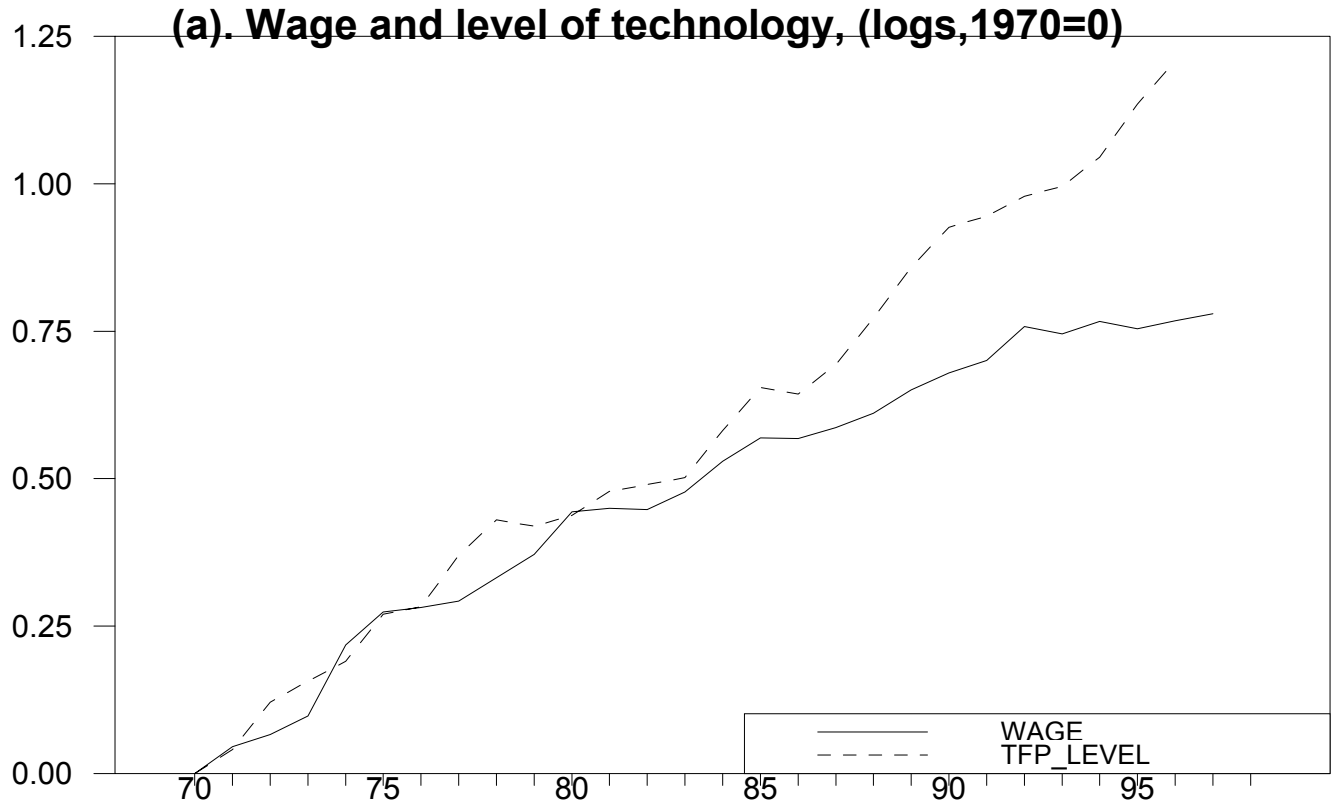


Figure 13(a), the profit rate has indeed increased steadily and considerably since 1983. But so has the user cost, from 1978 to at least the early 1990s. The reason behind the increase has been an increase in interest rates (rather than changes in taxation; despite the tax advantages given to foreign firms along the way, the evolution of tax-adjusted and non tax-adjusted series for the user cost are rather similar). And the increase in interest rates seems directly tracable to a change in monetary policy, i.e. to the entry of Ireland in the EMS in 1978.¹⁶

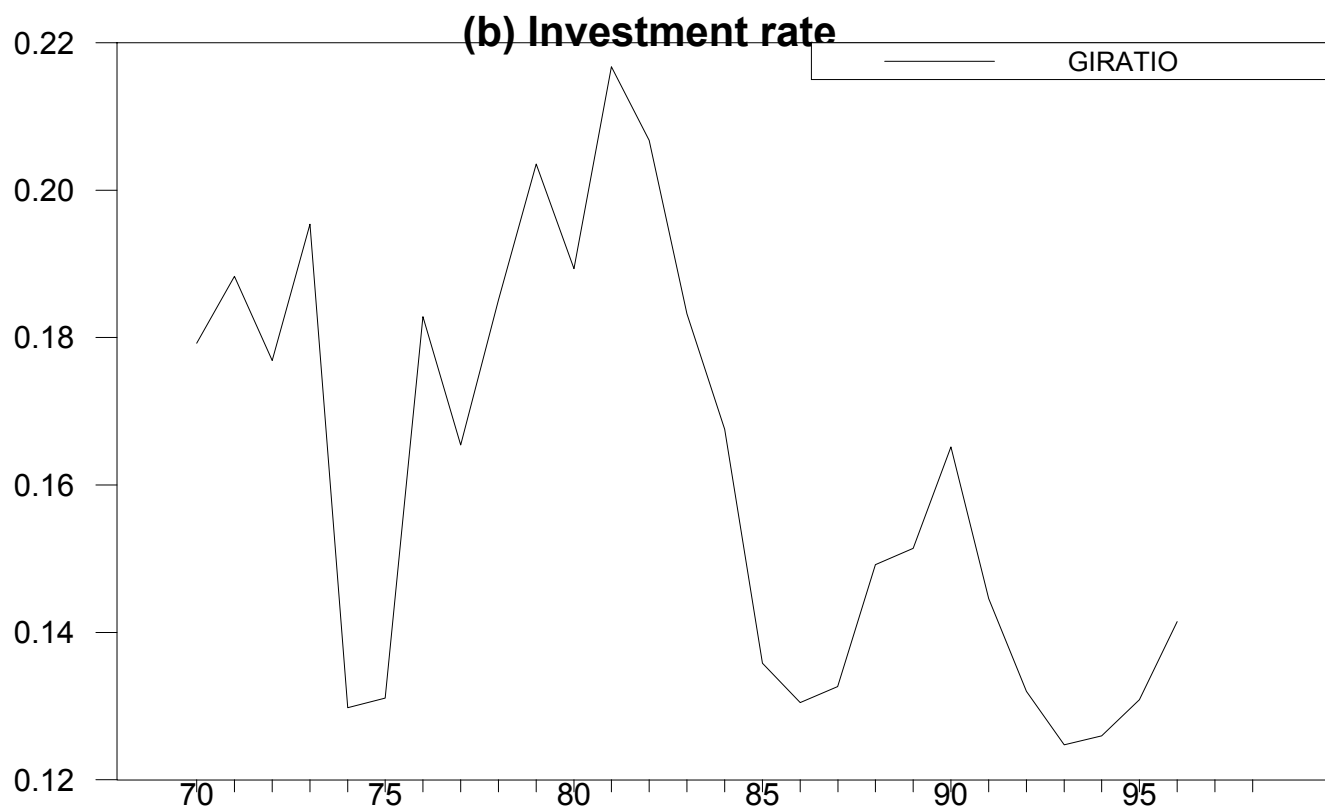
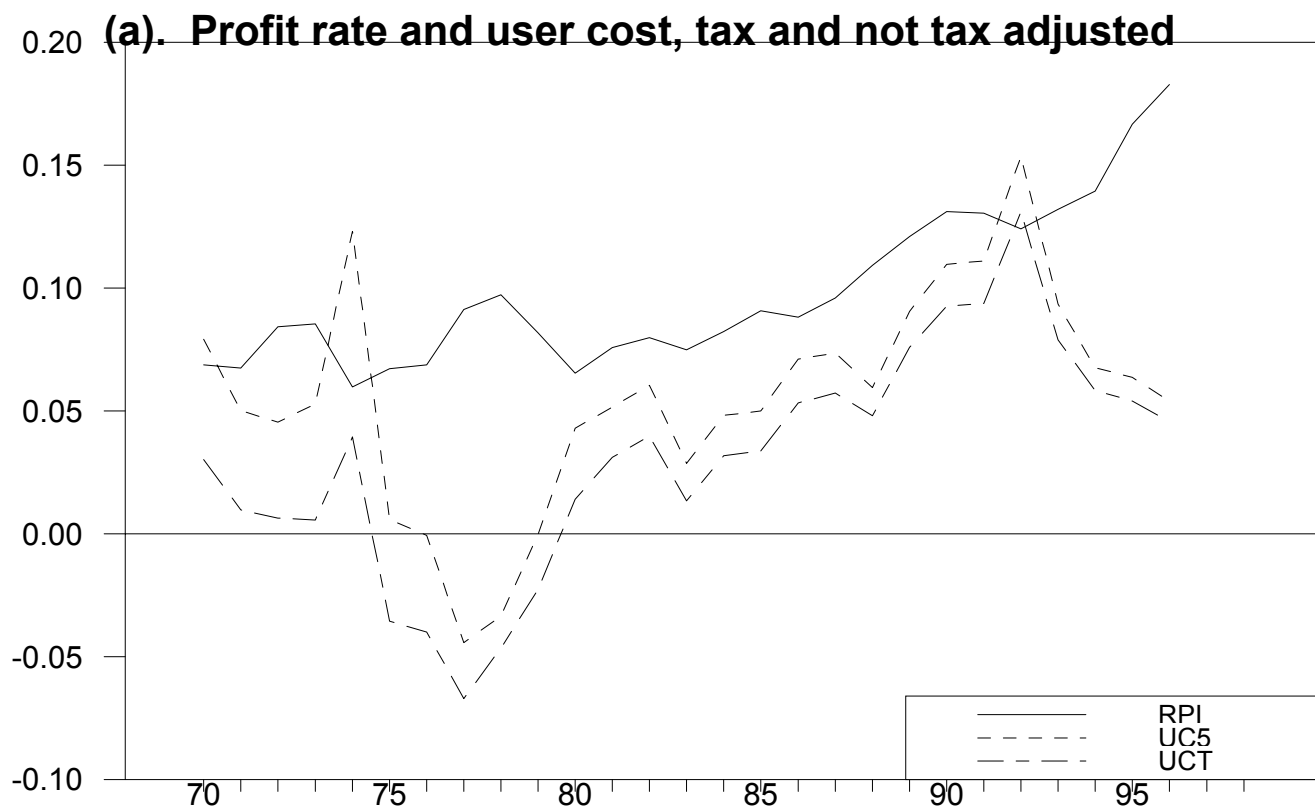
[Figure 13. Ireland. (a) Profit rate and user costs. (b) Net investment rate]

The recent further increases in the profit rate and decreases in the user cost suggest that Ireland should also see a large increase in investment. The data for business sector investment in Figure 13 end in 1996. But the evidence on the investment rate for the economy as a whole seems to bear this out. The gross investment rate has increased from 19% in 1996 to a forecast 23% in 2000.¹⁷

¹⁶This was indeed the perception at the time. See for example Dornbusch [1989].

¹⁷The very large increase in measured tfp growth (and by implication the rate of technological progress), the very large decrease in the wage in efficiency units, the very large increase in an/k , and the low measured rate of investment, all point to the possibility of measurement error in capital. If capital had in fact grown faster than reported, this would lead to a smaller increase in a , a smaller decrease in w/a , a smaller increase in an/k , and a more impressive investment performance. Looking into the issue, I found that the series for capital in the OECD business sector data base was indeed incorrect, based on an incorrect benchmark for capital at the start of the period, leading to very low growth of capital. I therefore use a corrected (lower) benchmark, based on Irish data, and the numbers presented here are based on this corrected benchmark (The details are available

Figure 13. Ireland



So the conclusions are roughly similar to those for the Netherlands. In both cases, wage moderation has led to an increase in employment relative to capital. The profit rate has increased, but until recently, so have user costs, leading to a limited increase in investment. The question this raises is an obvious one: What led to wage moderation? A full treatment would take me far beyond what I can do here. But I think the answer is somewhat different in each case.

Why the wage moderation?

The evolution of Ireland in the 1980s and 1990s seems to be the mirror image of our earlier analysis of the effects of the decrease in technological progress the 1970s. As can be seen from Figure 12(a), the rate of technological progress has increased in Ireland since the early 1980s. This is partly due to foreign investment, itself attracted by tax advantages, low labor costs, proximity to the markets of the European Union, and a skilled english-speaking labor force. But the effect has gone beyond foreign-owned firms, and tfp growth is high in most sectors of the economy.

The reason why this increase in technological progress has not led to a parallel increase in real wages is probably not misperceptions, but the high mobility between the U.K. and Irish labor markets. In-migration has limited the increase in wage growth in Ireland to a level close to that of the U.K., where the rate of technological progress has not increased, and therefore wage growth has been moderate. The recipe has worked well; but it can hardly be used by other countries, at least in this form.

The story is clearly different for the Netherlands, where, as can be seen from Figure 10(a), the rate of technological progress has not increased since

upon request). This implies higher capital growth than in the original OECD data. but even with the corrected benchmark however, capital growth is still surprisingly low.

the early 1980s.¹⁸ What has happened instead has been a decline in wage growth.

Can one link this wage moderation back to changes in labor market institutions? The answer is probably not, at least not fully. While reforms, in particular a reform of the unemployment insurance system, have taken place, they do not appear to be substantial enough to account for the change in wage behavior since the early 1980s.¹⁹ Most observers trace the start of wage moderation to the Wassenaar agreement, a tripartite agreement signed in 1982 between unions, business organizations, and the government. In that agreement, unions agreed to wage moderation (including the suspension of cost-of-living adjustments) in exchange for a number of measures ranging from a more generous financing of early retirements, and a movement towards a shorter workweek. Except for some wage pressure in the late 1980s, wage moderation has prevailed ever since.

This description leaves open however a number of deeper issues. Was the essential ingredient the presence of centralized bargaining?²⁰ The answer is not obvious. While centralized bargaining succeeded in 1982, it had been tried, without success, in previous years. At the same time, absent centralized bargaining and the complex package put in place by all sides

¹⁸If we were to measure employment by total hours rather than bodies, the measured rate of technological progress would be a bit higher, especially since 1983. From 1983 to 1997, annual hours per worker have declined from 1530 to 1365, a decline of 0.8% per year. I do not know the rate of decline from 1970 to 1983—which would be needed to know whether and how to modify the statement in the text.

¹⁹See the attempt at quantification by Nickell and van Ours [2000].

²⁰The degree of centralization of bargaining is one of the measures of labor market institutions which, confirming earlier results by Nickell, we found in Blanchard and Wolfers [2000], leads to smaller effects of shocks on unemployment.

in 1982, wage moderation might have been much more difficult to achieve. Why did bargaining succeed in 1982, and not before? The rise in unemployment surely had something to do with it; that changes had to take place had become obvious to all.²¹ And the increased intellectual and political acceptance of the notion that profitability was a key to a decrease in unemployment also played a role. Wage moderation went far beyond the usual effect of unemployment on wage demands. Whether one should categorize such a change in perceptions and the following wage moderation as a shock, in the same sense as the decrease in technological progress or an increase in interest rates, is unclear. But this is what has been at work.

6 Conclusions and extensions.

To summarize: The focus of this first lecture has been on shocks, and how they lead to changes in equilibrium unemployment. I have argued that the decrease in the rate of technological progress was at the root of the initial increase in European unemployment, that monetary policy shifted some of the increase from the 1970s to the 1980s, and that wage moderation is at the root of the recent unemployment miracles.

On this last point, an obvious question is how different evolutions have been in these “miracle” countries relative to the rest of Europe. The answer is that they have been indeed different. Wage moderation, as measured by the evolution of the wage in efficiency units, has much larger in Ireland and the Netherlands than in the rest of Europe. Still, there has been some wage moderation nearly everywhere, and this raises another issue: Why didn’t this wage moderation lead to more of a decrease in European unemployment

²¹In the words of the Dutch Central Bank, “The government and the social partners reached the conclusion that “a limit was reached”, and a change in policy and mentality was necessary”. (De Nederlandsche Bank [1997])

than we saw in the 1990s. This apparent puzzle will be the topic of the next lecture. Before we get there however, let me, in this final section, take up three issues related to the theme of this lecture.²²

Wages in efficiency units versus “real wage gaps”

In the early 1980s, a number of authors (among them Bruno and Sachs [1985]) suggested the use of “real wage gaps” as a diagnostic tool. Real wage gaps were defined as the deviation of the ratio of the wage to labor productivity $w/(y/n)$ —equivalently the labor share wn/y —from some reference value, presumably a value where the ratio seemed consistent with balanced growth.

The idea was a simple and appealing one. If wages increased faster than productivity, labor costs increased, leading to a reduction in employment. But there were also obvious shortcomings. If, for example, the production function was Cobb Douglas, and there were no costs of adjusting factor proportions, the labor share would be constant, and by implication the real wage gap would always be equal to zero. In the presence of costs of adjustment, excessive wage growth would initially show up in a higher labor share, a positive wage gap. But, as firms adjusted factor proportions, the

²²There is a fourth issue I would like to take up, an issue I have dubbed the “Modigliani puzzle”. Franco Modigliani has shown that there is a surprisingly strong time-series relation between the net investment rate and the unemployment rate over the last 30 years both for the European Union as a whole as well as for many of the individual European countries (Modigliani [2000]). Modigliani’s interpretation of this relation is in terms of aggregate demand, with investment demand determining demand, output, and by implication, unemployment. Given that the relation seems to hold at low frequency as well, I feel another explanation is needed. The question is whether it comes naturally out of the model sketched in this lecture. I do not have yet the data I need, and so this will wait until the next draft.

wage gap would disappear, while the problem was still there.

The measure of wages in efficiency units, w/a , avoids these shortcomings, and thus seems to be a more useful diagnostic device. It is not perfect, for at least three reasons.

- It is clear from the logic of the model presented at the start of the lecture that, in the long run, w/a is forced back to the value consistent with equality of the profit rate and the user cost. In the long run, what adjusts is unemployment. But, as the experience of the Netherlands and Ireland show, the dynamics here can be quite long, and the evolution of w/a can be quite visible for some time.

Put another way, what one would like to have is a sense of changes in z in the wage relation $w/a = z h(u)$. What one observes is w/a , and in the long run, shifts in z have to be offset by movements in unemployment so $z h(u)$ remains constant. This suggests constructing a slightly more complex measure. Suppose that we are willing to assume that the wage relation takes the form:

$$\log(w/a) = z - \beta u$$

Then, if we were willing to assume a specific value for β we could construct a measure of z as $z \equiv \log(w/a) + \beta u$. This was the measure I constructed in Blanchard [1997]. While this extended measure is, I believe, very useful, it is also much more dependent on a particular specification of the wage relation.

- The second reason is empirical, and has to do with the need to use a series for capital. The constructed rate of tfp growth, and by implication, the rate of technological progress, depends on the rate of growth of the capital stock. And whether we measure this rate of growth at

all adequately is, for many countries, in doubt (see for example the discussion for Ireland earlier).

- The third reason is also empirical. Business cycle fluctuations may induce spurious movements in w/a . In the presence of nominal rigidities, a decrease in demand leads to a decrease in output, and, for reasons explored in the recent literature on the Solow residual, a decrease in measured tfp growth. Thus, a demand driven recession will lead to an increase in the measured w/a , potentially leading to the incorrect conclusion of a causal link from the wage in efficiency units to a decrease in employment.²³ The evolutions we have looked at in this lecture appear to happen at too low a frequency to be explained by business cycle fluctuations.

Nevertheless, despite these flaws, w/a seems like a useful measure to construct, and track over time.

Technological progress or labor productivity?

In thinking about the balanced growth path, it was a logical first step to define a wage setting relation in terms of a relation between the wage in efficiency units and the unemployment rate: Both are constant along the path. But this implies that workers think in terms of the underlying level of technological progress (or in terms of tfp growth, as the two are closely related), and this seems unlikely.

The question arises of how the conclusions I reached earlier would change if instead workers cared about the underlying level of labor productivity along the balanced growth path, if the wage relation took the form:

²³Note the obvious parallel with the critique of RBCs as being based on a spurious relation between the Solow residual and output.

$$w = \left(\frac{y}{n}\right)^* h(u)$$

And workers revised their perceptions of underlying productivity in the same way as before, but now with respect to labor productivity (y/n) rather than with respect to the level of technology a .

With respect to an underlying decrease in the rate of technological progress, the effect on unemployment would likely be stronger. The reason is that, as firms decreased their ratio of labor to capital in response to higher wages in efficiency units, labor productivity would increase relative to total factor productivity, thus slowing down the adjustment of expectations and leading to a larger and longer effect of the slowdown on unemployment.

In the limit, if there were no costs of adjusting factor proportions and, for simplicity, the production function was Cobb Douglas, firms would decrease the ratio of labor to capital so as to maintain labor productivity in line with wage growth. So if workers only looked at the evolution of labor productivity, they would never learn that there had been a decrease in the rate of technological progress. Given the lower profit rate, capital would decrease and the economy would implode until employment was equal to zero... The case is extreme, but the notion that, if workers care about labor productivity, attempts by firms to reduce costs by reducing the labor-capital ratio are likely to be partly self defeating, is very relevant.²⁴

On the other hand, in response to a temporary increase in interest rates, the effect on unemployment would be weaker. The reason is that, as firms shifted away from labor, labor productivity would increase more slowly than

²⁴The notion that, if wages respond quickly to labor productivity, things can go very wrong, is indeed an old theme. I remember an article by Martin Hellwig on Germany which makes this point, and which I have to trace. There is also a thoughtful discussion of these issues in Rowthorn [1998], some of which I agree with, some of which I do not.

tfp, moderating wage demands along the way.

To make progress here requires looking into the wage setting relation, and understanding how productivity affect wages, looking at what determines the reservation wage, at whether and how firms are able to reduce the hold-up problems involved in increasing the capital-labor ratio, at how workers and firms form expectations of the underlying level of productivity. I feel we are still a long way from a good empirical understanding of this essential dimension of wage setting.

Actual and equilibrium rates of unemployment

Robert Solow once remarked in jest that the best estimate of the natural rate of unemployment seemed to be the average of the previous three years of the actual rate. One can think of two explanations for this. One is that the actual rate affects the equilibrium rate, along the lines explored for example by hysteresis theories. The other, suggested by this lecture, is that the two rates do not depend on each other, but may move in similar ways in response to shocks.

Exploring the relation between the two rates with respect to shocks would require extending the model to allow for a distinction between actual and equilibrium rates, and thus for a role of aggregate demand in determining output. But one can guess where it would take us:

With respect to changes in monetary policy, both rates are likely to move in the same direction. The effect is likely to show up first in the actual rate, because of the effect of interest rates on demand, including investment demand. It is likely to show up in the natural rate over time, in response to lower capital accumulation. This may give the impression of the actual rate pulling the natural rate, where in fact what we observe are different dynamic effects on the two rates.²⁵

The correlation is however likely to depend on the type of shock hitting

²⁵Another implication of the fact that both rates are moving in the same direction

the economy. A wage explosion may for example increase aggregate demand and decrease actual unemployment, but increase the natural rate. This suggests one way of differentiating between causal or common dependence, which may be worth exploring in further work.

implies that disinflation may be more costly (in terms of unemployment) than derived in models which assume a constant natural rate—the same implication as under hysteresis, but through a different channel.

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The object of these lectures is shown in Figure 1, which plots average unemployment rates over 5-year intervals, starting in 1960 and ending in 1999, both for the OECD–Europe as a whole (the line) and for 15 individual European countries.¹ The figure shows the increase in the overall unemployment rate, from 1.7% in the early 1960s to 11.0% in the mid 1990s, together with the large dispersion in unemployment rates across countries, from 4.0% in Switzerland to more than 20% in Spain in the mid 1990s.

[Figure 1. The evolution of unemployment, from 1960 to 1999, for 15 European countries]

Explaining this evolution, both over time and across countries, has proven to be a serious challenge. When unemployment started increasing in the mid–1970s, the focus was on the role of shocks, from the increase in oil prices to the slowdown in productivity growth. Later on, as unemployment remained high, the focus shifted to institutions, to the adverse effects of the “welfare state.” In the recent past, a broad consensus appears to have emerged, based on both shocks and institutions. It goes roughly like this:

Some time in the 1970s, the period of fast technological progress which had characterized the post-war period (what became known in France as “les 30 glorieuses”—the 30 glorious years), came to an end. It took a while for the economic actors to understand what had happened, all the more so because the slowdown was partly hidden by two sharp increases in oil prices, and two sharp recessions. Aspirations and wage demands continued at the old pace for some time, leading to a decrease in employment, profitability, and capital accumulation. Low, even negative, real interest rates initially softened the impact in the 1970s, only to increase and make things worse in

¹The 8 time periods are 1960–1964 to 1995–1999. The 15 countries included in OECD–Europe are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

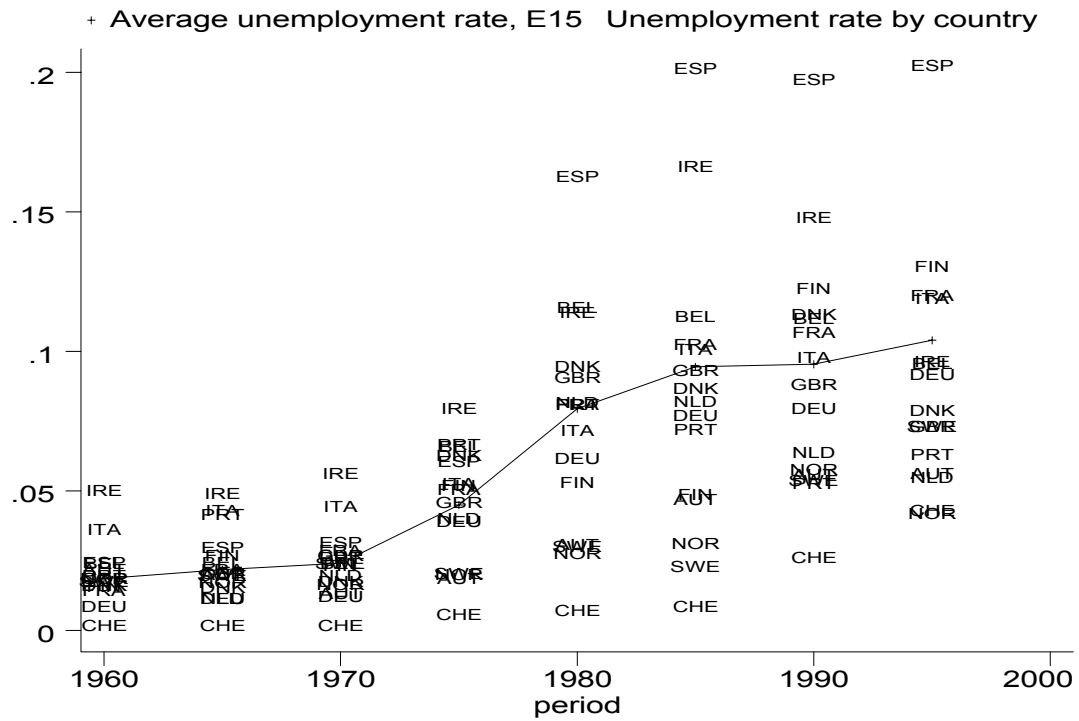


Figure 1. Unemployment Rate, E15

the 1980s. Since the mid 1980s, success stories, among them the Netherlands and Ireland, have typically been associated with the reverse process, with wage moderation leading to an increase in employment, profitability, and capital accumulation. Most other European countries now appear to be following suit.

One cannot however tell the full story without taking into account the role of institutions. Institutions have played two distinct roles:

Changes in the institutions have also shaped the evolution of unemployment. It is not true, as some claim, that current European labor market institutions emerged in the 1970s: Stories which blame the increase in unemployment on the rise of the welfare state simply rewrite history. But some programs indeed became more generous in the 1960s, when times were still good and countries thought they could afford a more generous social insurance system. Others were extended in the 1970s and the 1980s when times turned bad, and governments tried to temper the effects of adverse shocks on unemployment. In the last 15 years, as it has become clear that some of these earlier changes had been counterproductive, changes have gone mostly the other way. These evolutions also play a role in explaining both the rise, and the more recent fall in European unemployment.

And institutions have shaped the effects of the shocks on unemployment. True, the slowdown in productivity was smaller in the United States than in Europe, and this may explain in part why the increase in unemployment was more limited in the United States. But, leaving this aside, the United States appears to have institutions which lead to a much more stable natural rate than Europe. And, within Europe, largely similar shocks have had widely different effects on unemployment. Looking across countries, some labor market institutions, from high employment protection to long-lasting unemployment benefits, appear to affect both the strength and the persistence of the effects of shocks on unemployment.

The story is very plausible. A number of recent econometric studies suggest that it provides a good statistical description of the evolution of unemployment rates both across time and across countries. In a series of contributions, Steve Nickell (Nickell [1997], Nickell and Layard [1998]) showed that one could relate the increase in unemployment across countries to differences in labor market institutions. Following his lead, Justin Wolfers and I (Blanchard and Wolfers [2000]) looked at the panel data evidence; we constructed measures of shocks and institutions, and concluded that a specification based on observable shocks, and interactions of these shocks with measures of labor market institutions, gave a good statistical account of unemployment across time and countries over the last 30 years. We found in particular that differences in the response of unemployment to shocks across countries could be statistically related to differences in institutions. Some countries, such as the United States, indeed appear to have a set of institutions which dampens the effects of shocks on unemployment and thus leads to a stable natural rate. Some countries, such as Spain, have a set of institutions which seems instead to amplify the effects of shocks on unemployment.

Despite these successes, there are good reasons to remain skeptical however. After the long wars between proponents of alternative theories, the ecumenism of the consensus has the feeling of a compromise (To use another French expression, it feels like the “paix des braves”, a peace treaty accepted out of sheer exhaustion). It remains fuzzy. The exact nature of the shocks, the relative importance of shocks and changes in institutions, the exact mechanisms through which institutions and shocks interact, remain largely to be established. While I believe the general story, I feel I master few of the details. My goal in these lectures is to explore three aspects of the general story, trying in each case to assess what we (I) know and do not know.

Let me draw a rough map of where I intend to go.

- Lecture 1 focuses on the role of shocks. To do so, I construct what may be one of the simplest models to think about unemployment, a model in which profit maximizing firms use labor and capital, where the interest rate is given, and the wage required by workers is decreasing in the unemployment rate. I use the model to explain the evolution of European unemployment, from the effects of the productivity slowdown on the 1970s, to the gyrations of real interest rates in the 1970s and 1980s, to the role of wage moderation in the sharp declines in unemployment in the Netherlands and Ireland since the mid 1980s—the so-called Dutch and Irish miracles.
- Lecture 2 focuses on the role of changes in institutions, and in particular the effects of product and labor market regulation and deregulation. To do so, I introduce two elements missing from the model of the first lecture, monopolistic competition in the goods market, and bargaining between firms and workers in the labor market. I then use the model to provide an explanation to may be one of the most puzzling aspects of European unemployment, the persistence of unemployment for most of the 1990s, despite a very large increase in the profit share in most continental European countries from the mid-1980s on.
- Lecture 3 focuses on interactions between institutions and shocks. I construct a model of the labor market which takes into account the importance of flows and bargaining, and allows for a discussion of the effects of labor market institutions. Having done so, I focus on the effects of employment protection. I show that employment protection makes the labor market more sclerotic—characterized by lower flows of workers through the market, but also to higher unemployment duration. Sclerotic markets exhibit much higher long-term unemployment, and this leads me to explore an old theme in the literature, namely that long-term unemployment does not exert much effect on wages,

leading to larger and longer lasting effects of shocks on unemployment. I focus on the interaction between shocks, long-term unemployment, and duration dependence. I conclude that, while the argument makes sense, its quantitative relevance appears more limited than casual arguments have often suggested.

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