The Medium Run.

Olivier Blanchard*

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Abstract

This paper focuses on medium-run evolutions of OECD countries over the last 30 years. Motivated by the very different evolutions of unemployment and capital shares in Continental Europe versus Anglo-Saxon countries, it offers the following broad interpretation of events. Continental Europe was affected by strong adverse labor supply shifts in the 1970s, and by strong adverse labor demand shifts in the 1980s. As documented by others, the earlier supply shifts largely reflected the failure of wages to reflect the slowdown in productivity and the increase in oil prices. The main contribution of this paper is to shift the focus to the more recent labor demand shifts. Plausible sources for those shifts are a combination of change in the distribution of rents from workers to firms, and of technological progress biased against labor. Together with the implied dynamics of employment and capital accumulation, these labor supply and demand shifts can explain both the increase and persistence in unemployment, as well as the increase in capital shares that have characterized most Continental European countries. These shifts have been largely absent in Anglo-Saxon countries; as a result, unemployment has been lower, and capital shares have not increased.
Macroeconomics is largely divided in two subfields. One focuses on the short run, on the study of business cycles. The other focuses on the long run, on growth and its determinants. The assumption implicit in that division of research is that the medium run is mostly a period of transition from business-cycle fluctuations to growth. The simplification is clearly convenient. But it is misleading. Modern economies are characterized by medium-run evolutions that are quite distinct either from business-cycle fluctuations or from steady-state growth.

Two facts will make the point. The first is well known. Unemployment rates have steadily increased in Continental Europe over the last 25 years, while remaining largely stable in the United States and most other Anglo-Saxon countries. The other is less well known but equally important. Capital shares have steadily increased in Continental Europe over the last 15 years, and stand, in many countries, at post-war highs; in contrast, capital shares have remained largely stable in the United States and in most other Anglo-Saxon countries. Because this fact plays a central role in the story that follows, let me document it in Figure 1. For visual convenience, I have chosen to plot the evolutions of only the main Continental European and Anglo-Saxon countries. The top half of the figure shows the behavior of capital shares in the business sector in Germany, France, Italy and Spain. Note how, after reaching a low in the late 1970s, shares in all four countries stand at high levels today. The average share stands at 41% in 1995, up from a low of 31% in 1981, and a value of 34% in 1970. The bottom half of the figure shows the behavior of shares in the U.S., Canada and the U.K. Note how, in contrast to Continental Europe, capital shares in those countries have remained stable. Note in particular how, in the United States, the old stylized fact of a constant capital share still largely holds true.

[Figure 1. The Evolution of Capital Shares. Continental Europe versus Anglo-Saxon countries.]

The paper offers an integrated explanation for these two sets of facts. The expla-
Figure 1.

Profit shares in France, Germany, Italy and Spain

Profit shares in the U.S., Canada and the U.K.
nation goes roughly as follows.

Starting in the 1970s, Continental European countries were affected by large adverse "labor supply" shifts. More specifically, there was an increase in the wage required by workers at a given rate of unemployment and a given level of total factor productivity. While this paper does not look into the causes of these shifts, they have been the subject of much research by others, and there is a wide consensus that they came from the failure of wages to adjust to the productivity slowdown and the adverse supply shocks of the 1970s. In any case, the initial effect of these shifts was to decrease profit rates and capital shares. Over time, the reaction of firms was to move away from labor, leading to a steady increase in unemployment, a recovery and even an increase in capital shares.

More has been at work however. In most Continental European countries, labor supply shifts have substantially decreased, if not vanished. But, since the early 1980s, labor markets have been characterized by adverse "labor demand" shifts. More specifically, the real wage offered by firms at a given labor-capital stock and a given level of total factor productivity has decreased. What may explain this

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1. Let me take up two semantic issues here. First, as my definition of a labor supply shift indicates, I do not take "labor supply" to necessarily mean competitive labor supply, but rather, and more generally, the relation between the wage and unemployment implied by wage setting in the labor market. Some researchers have called this relation "the wage curve", or the "wage-setting relation", or the "pseudo-labor-supply curve"; I shall stick to "labor supply", but with the appropriate warning. Second, in order not to have labor supply and labor demand shift along a steady state growth path, I look at the wage adjusted for total factor productivity. Thus, a slowdown in productivity growth not fully reflected in a parallel slowdown of real wages, shows up as a "labor supply" shift.

2. The same semantic warnings apply as for labor supply earlier. By "labor demand", I do not necessarily mean competitive labor demand, but rather the relation between the real wage and employment that emerges from the employment and pricing decisions of firms. This relation is sometimes called the "price-setting relation" or the "pseudo-labor-demand curve." Again, for simplicity, I shall
decrease in the real wage at a given labor-capital ratio? There are two potential explanations. The first is a shift in the division of rents from workers to firms. The second is technological bias: at given factor prices, firms have been adopting technologies which use less labor and more capital, thus decreasing the marginal product of labor at a given labor-capital ratio. It turns out to be difficult to distinguish empirically between these two explanations, at least on the basis of aggregate evidence; this evidence, to the extent that it speaks, weakly favors the second. Whatever the reason, the effect of this adverse shift in labor demand has been to further increase unemployment, while at the same time increasing capital shares.

This is the story for Continental Europe. In contrast, Anglo-Saxon countries appear to have been largely shielded from both the adverse labor supply shifts of the 1970s, and the labor demand shifts of the 1980s and 1990s. This accounts for their different evolutions, both in terms of unemployment and in terms of capital shares.

While it is true that macroeconomics has not typically focused on such medium-run evolutions, the paper is surely not the first to explore the issues above. A number of references must be made at the start. The purpose of Bruno and Sachs [1985] was to tell the first half of the story, how the failure of wages to adjust to lower productivity growth and other adverse shocks could explain the rise in unemployment in the 1970s. This paper can be seen as an update of their story, emphasizing the role of labor demand shifts since the mid-1980s. One of the purposes of the project led by Jacques Dreze (Bean and Dreze [1990]) in the 1980s was to identify the role of capital accumulation in the rise of unemployment in Europe, a theme closely related to this paper. More recently, Phelps [1994] has argued that the rise in unemployment in Europe is best understood as a "structural slump", distinct from business cycle fluctuations. Finally, this paper is closely related to

stick to "labor demand".
the recent work by Caballero and Hammour. Their analysis of the effects of specificity and labor market institutions on capital accumulation and unemployment, and in particular their explanation of "jobless growth" in France (Caballero and Hammour [1997]) can be seen as providing some of the microfoundations for the shifts which I take as primitives in this paper.

The paper is organized as follows.

With an eye on the evolution of capital shares, the first section documents the evolution of capital, employment, wage and profit rates in 14 OECD countries since 1970. It starts from the basic proposition that, under Harrod neutral progress, there should be a close relation between the ratio of the profit rate to the wage rate (measured in efficiency units) and the ratio of labor (again measured in efficiency units) to capital. It then documents that, while movements in relative factor prices have typically been closely associated with movements in relative factor quantities, much of the increase in the ratio of the profit rate to the wage—and, by implication much of the increase in capital shares— in Continental Europe over the last 15 years does not reflect corresponding movements in relative factor quantities. It then suggests three potential lines of explanation for this divergence. The first is that there are long lags in the adjustment in factor proportions to factor prices, and we are still seeing the dynamic effects of the earlier adverse labor supply shifts. The second and the third explanations start from the premise that the relation between factor prices and factor quantities has genuinely shifted. The second attributes the shift to changes in the division of rents from workers to firms. The third attributes it to technological change biased against labor.

To explore the logic and the role of these potential explanations, Section 2 develops a simple model of employment and capital accumulation. Firms are assumed to be monopolistically competitive. There are costs to adjusting capital, as well as to adjusting the labor-capital ratio. Labor supply is upward sloping: the wage is a decreasing function of the unemployment rate. The interest rate is given, and in-
dependent of capital demand. That model makes clear how an adverse labor supply shift leads first to a decrease, and then to an increase — above its initial level if the elasticity of substitution between labor and capital is greater than one — in the capital share, and to a steady increase in the unemployment rate. It also shows how adverse shifts in labor demand, coming either from a shift in the division of rents, or from technological bias against labor, lead to both an increase in unemployment and an increase in the capital share.

Section 3 takes the model to task and explores how well it can explain the evolution of a particular country. Relying on comparative advantage, I focus on the evolution of France, since 1970. I construct series for shifts in labor supply, labor demand, and the user cost. Taking those shifts as primitives, I simulate the model. The simulations show how the shifts can explain the evolution of the labor-capital ratio, the capital share and unemployment. It would be overambitious at this stage of the research to try to explain the evolution of each individual country. But the same exercise can be performed mechanically for each country. I do it and give a short assessment of results, successes and failures.

Having shown the logic of the argument, I return to econometrics. In Section 4, I look for evidence of lags in the response of labor-capital ratios to real wages. I find evidence of long lags. But I find that, even allowing for such lags, there is still substantial evidence of adverse shifts in labor demand in Continental Europe since the early 1980s.

In Section 5, I try to identify whether the shifts in labor demand reflect biased technological progress or changes in the division of rents. The empirical strategy is a simple one. Shifts in the division of rents should not affect the production function. Bias in technological change should be reflected in the production function. But estimating production functions is tricky, and the empirical evidence speaks only weakly. Point estimates suggest technological bias, but the estimates are not tight.
Section 6 concludes and discusses open issues, from the sources of the labor supply and demand shifts, to the source of differences between Continental and Anglo-Saxon countries, to the relation, if any, with shifts in relative labor demand between skilled and unskilled workers.
1 Factor prices and factor quantities

Movements in the capital share, such as those documented in Figure 1, are not a puzzle in and of themselves. Changes in factor proportions lead to changes in factor prices—and vice-versa—and, unless the elasticity of substitution between capital and labor is equal to one, they lead to changes in shares. Thus, a natural first step is to see whether we can account for the evolution of factor prices—and by implication, of factor shares—by the evolution of factor quantities, or whether something unusual has been at work.

The following benchmark is useful. Suppose that output is a constant-returns-to-scale function of capital and labor. Suppose that technological progress is Harrod neutral—a natural benchmark as this is the assumption necessary for balanced growth. We can then write output, \( y \) as:

\[
y = y(zn, k)
\]

where \( n \) is labor, \( k \) is capital, and \( z \) is the level of productivity. Redefining labor in efficiency units, that is adjusted for the level of productivity, we can rewrite the production function as:

\[
y = y(\tilde{n}, k)
\]

where \( \tilde{n} \equiv zn \).

Under the further assumption that the marginal product of labor is equal to the wage, the following relation then holds:

\[
\pi / \tilde{w} = g(\tilde{n}/k)
\] (1.1)

where \( \pi \) is the profit rate, that is profit divided by the capital stock in volume, and \( \tilde{w} \equiv w/z \) is the wage rate per efficiency unit. \( g' > 0 \): an increase in the ratio of labor to capital both increases the profit rate and decreases the wage, and, by implication, increases the ratio of the profit rate to the wage. If, for example, the
production function is CES, the relation (1.1) is log linear, with coefficient equal to \( 1/\sigma \), where \( \sigma \) is the elasticity of substitution between capital and labor.

This suggests a simple empirical exercise, the examination of the relation between the left-hand side and the right-hand side of equation (1.1). We can then ask: What is the implied elasticity of substitution between capital and labor? Can an elasticity different from one explain the evolution of capital shares in Continental Europe in the 1980s? Or has there been a shift in the relation between the factor-price and the factor-quantity ratios during that period?

I carry this exercise for 14 OECD countries, typically for the period from the late 1960s (the starting date depending on data availability for each country) to 1995. For most of the analysis below, I put the countries in two groups. The first includes Australia, Austria, Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, Spain and Sweden. The second includes Canada, the U.K and the U.S. The groupings are based on the different evolutions of capital shares. With some geographical license, I shall refer to the first as the "Continental" group, to the second as the "Anglo-Saxon" group.

Throughout, the main data source will be the OECD data set for the business sec-

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3. OECD data for Germany refer to West Germany up to 1990, and to Germany as a whole after 1990. Although this turns out not to make much difference, the econometric work below does not use post-1990 data for Germany.

4. I have left a number of OECD countries out. This is for various reasons. Some, such as Luxembourg or Norway early on, are small and idiosyncratic in their economic structure. Some, especially the more recent members, such as Greece, Turkey or Mexico are at a different level of development. Portugal shows a permanent decrease in the measured capital share of 15-20% of GDP around the time of its revolution; while the fact is fascinating, I do not know how to interpret it. A similar problem of interpretation arises with Japan, which shows a very large permanent decrease in the measured profit rate in the 1970s. I have left both of them out.
tor in each country (OECD [1997]). Value added is net of indirect taxes, and is allocated either as labor or as capital income. Labor income includes the imputed income of self-employed individuals, using the average wage in the business sector; capital income includes the residual income of these self-employed individuals. Employment is measured as the number of workers, with no adjustment for hours worked (so that given the decline in hours per worker, employment growth is typically overstated, and productivity growth understated). I have made one adjustment to the data. When the OECD adjustment for the number of unpaid family workers (that must be deducted from total private employment as their output is not measured) does not start at the beginning of the sample, I extend the adjustment to earlier years, assuming a ratio of unpaid family workers to total employment equal to the ratio in the first year for which it is available.

Under the assumption that labor is paid its marginal product, we can construct the series for Harrod-neutral technological progress, $z$, by first constructing the Solow residual for each year, dividing it by the contemporaneous share of labor and inte-

5. Thus, to state the obvious, capital income here is different from corporate profits; it includes in particular interest payments by firms, as well as profit taxes. The decrease in nominal interest rates has increased measured corporate profits since the early 1980s in many countries (see Poterba [1997] for a discussion of the evolution of corporate profits in the United States). This decrease clearly has had no impact on the measure I use here.

6. In parallel work with Dale Jorgenson and Eric Yip, we use the data constructed by Chrys Dougherty and Dale Jorgenson for the G7 countries, for the period 1960-1989. While the methodology used to construct measures of capital and labor are quite different from those underlying the OECD data, the main conclusions reached below also hold for that data set. For France (on which I focus later on in the paper), a study of the statistical issues associated with the measurement of shares by Cetee and Mahfouz [1996] yields an evolution of the capital shares in the business sector, in the corporate sector, and in the non-financial corporate sector, very similar to that for the business sector share using the OECD data.
grating it over time. Once this is done, we can construct labor in efficiency units by multiplying employment by the constructed z, and the wage in efficiency units by dividing the real product wage (the wage divided by the deflator for business sector GDP) by z. Figure 2 plots the evolution of average factor-price ratios and average-factor quantity ratios for Continental and Anglo-Saxon countries; the averages are constructed using 1980 relative GDPs, using PPP exchange rates, and all four ratios are normalized to equal 1.0 in each country in 1970.

*Figure 2. Factor price versus factor quantity ratios. Continental and Anglo-Saxon countries.*

Figure 2 makes two points. In Continental countries, the period until the early 1980s was characterized both by a decrease in the profit rate relative to the wage rate (in efficiency units), and by a decrease in labor (again in efficiency units) relative to capital. Since then however, the profit rate has improved relative to the wage, while the labor-capital ratio has continued to decrease—albeit more slowly. This is what lies behind the increase in the capital share. In contrast, in Anglo-Saxon countries, the evolutions of both the factor-price and the factor-quantity ratio show little or no trend, and the movements appear to reflect business cycle fluctuations rather than medium-run evolutions.

The next step is to take a more formal econometric approach, although still in the spirit of data description. Let $pratio_{it} \equiv \log(\pi_{it}/\bar{w}_{it})$ be the log of the factor price ratio, $qratio_{it} \equiv \log(\bar{n}_{it}/k_{it})$ be the log of the factor quantity ratio, where $i$ is the country and $t$ is time. We can then run the following panel regression:

$$ pratio_{it} = aqratio_{it} + x_i + x_t + \epsilon_{it} \tag{1.2} $$

where $x_i$ and $x_t$ are country and time dummies respectively.

The results of running this regression, both for Continental countries and for
Anglo-Saxon countries are reported in Table 1 and in Figure 3. Table 1 gives the estimated coefficient \( \alpha \), and the significance level associated with the test that all the coefficients on the time dummies are equal to zero. Figure 3 plots the time series of estimated coefficients on the time dummies, together with two-standard-deviation bands (normalizing so that the value in 1970 is equal to zero).

**Table 1. Factor prices on factor quantities. Regression results.**

<table>
<thead>
<tr>
<th></th>
<th>( \hat{\alpha} )</th>
<th>Probability that time dummies all equal 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continental countries</td>
<td>0.96 (0.08)</td>
<td>P = 0.00</td>
</tr>
<tr>
<td>Anglo-Saxon countries</td>
<td>1.12 (0.07)</td>
<td>P = 0.03</td>
</tr>
</tbody>
</table>

**Continental countries:** 11 countries listed in the text. **Anglo-Saxon countries:** 3 countries listed in the text. Unbalanced panel, starting between 1961 and 1972 depending on the country, and ending in 1995, except for Germany, where it ends in 1990. Newey-West corrected standard deviations. \( P \) is the probability that all time dummies are equal to zero.

*(Figure 3. Estimated time dummies, for Continental and Anglo-Saxon countries)*

Together Table 1 and Figure 3 confirm the visual impressions given by Figure 2. For both groups of countries, the estimated coefficient is close to one (and by implication, so is its inverse, the elasticity of substitution in the CES case), implying little scope for movements in the share in the absence of shifts in the relation. The time series of estimated time dummies for Continental Europe shows a decrease in the late 1970s, and then a steady increase from the early 1980s on: the ratio
of the profit rate to the wage rate is indeed higher than what would be predicted by the evolution in the labor-capital ratio. The time dummies for Anglo-Saxon countries show no trend, and are not significantly different from zero.

These conclusions appear robust to a number of variations:

Allowing the parameter $a$ to vary across countries yields a range of coefficients $a_i$ between 2.10 (for Italy) and 0.29 (for the Netherlands) but does not substantially affect the shape of the series of time dummies.

Running the regression in reverse, that is regressing the ratio of factor quantities to factor prices yields an implied elasticity of substitution of 0.75 (and thus an implied value of 1.34 for $a$), but does not affect the shape of the series of time dummies substantially (obviously, up to a sign change).

No single country appears responsible for the results. Dropping one country at a time does not change the estimated parameter much.

There are various reasons to expect the parameter $a$ to be biased towards one. Business cycle fluctuations are associated with largely spurious fluctuations in measured total factor productivity, and thus spurious fluctuations in both wages and labor when measured in efficiency units. In a boom, measured productivity increases, decreasing the wage in efficiency units, and increasing labor in efficiency units; these similar proportional increases on both sides of equation (1.2) are likely to bias the estimated parameter towards one. As a rough solution to this problem, I have estimated the relation (1.2) using values of $q_{ratio}$ lagged $m$ to $m + 9$ times as instruments, for $m = 3, 4, 5$. The instrumental variable results are largely similar to the OLS results: $a$ is equal to 1.03 for $m = 3$, 1.12 for $m = 4$, and 1.26 for $m = 5$.

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7. Another source of bias is measurement error in capital, which affects capital and the profit rate—computed as profit divided by capital—in opposite directions. To the extent that, as is likely, this measurement error is highly serially correlated, that problem will not be solved by the use of those
I see basically four ways to interpret these results and the apparent shift in the relation between factor prices and factor quantities in Continental Europe.

(1) *Mispecified dynamics. Putty-clay.*

The first interpretation is that, while there has been a stable relation between factor prices and factor quantities, it is not the static relation estimated in (1.2) but rather a dynamic relation in which firms respond to changes in factor prices only over time. In other words, the relation (1.2) is misspecified and what appears to be shifts are artefacts of this misspecification.

The specific argument is the following. Factor proportions are largely embodied in existing capital: technology is putty-clay. Thus, in response to the adverse labor supply shifts in the 1970s, firms have taken a long time to shift to technologies that use relatively less labor and relatively more capital, to decrease their labor-capital ratio. As they have done so, profit rates have steadily recovered. Thus, what we see in the data for Continental Europe, namely a continuing decrease in the labor-capital ratio in the face of an improving ratio of profit to wages is simply the result of this long-drawn dynamic adjustment.

The next two interpretations start from the presumption that the shifts in Figure 3 are indeed genuine. As a matter of logic, such shifts can stem for two sources, changes in the division of rents, or biased technological change. Let me discuss each one in turn.

(2) *Genuine shifts. Shifts in the division of rents*

The shifts in the relation between factor prices and factor quantities may reflect changes in the division of rents away from labor towards capital. Generically, we can think of them as reflecting a decrease in the real wage relative to the mar-
ginal product of labor. It will be convenient to define the “markup” as the ratio of the marginal product to the real wage, and to think in terms of changes in this markup.\(^8\)

Suppose that, at a given factor-quantity ratio and thus a given marginal product of labor, the real wage decreases—equivalently, the markup increases. It is clear that this will lead to an increase in the factor-price ratio (the wage goes down, the profit rate goes up). Thus an increase in the markup can account for the shifts in Figure 3. But where may such an increase in the markup have come from?

As a matter of logic, it may have come from changes in price setting in the goods market, or from changes in wage setting in the labor market. Let me examine each one in turn.

Take the goods market first. If firms take the wage as given, the markup as I have defined it coincides with the markup of price over marginal cost.\(^9\) Thus, one interpretation of the shifts in Figure 3 is that firms have steadily increased their markups in goods markets since the early 1980s. I find this explanation implausible. The period since the early 1980s surely has been characterized by increased, not decreased competition, especially so in Continental Europe with the reduction of barriers to trade within the European Union. Phelps [1994] has argued that high real interest rates since the early 1980s may have led firms to care less about their customer base, and thus to go for higher markups and higher profit

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8. When there are costs of adjusting labor or of adjusting factor proportions, as in the first interpretation above, the ratio has to be redefined so as to include marginal costs of adjustment in addition to the wage. Specifics are better left to the formal model below.

9. Some simple algebra may be useful here. Let \(\mu\) be the ratio of the price, \(P\), to marginal cost, \(MC: P = \mu \cdot MC\). If firms take the wage as given, marginal cost in turn is given by the wage divided by the marginal product of labor, \(MP: MC = W/MP\). Putting the two relations together leads to \(P = \mu W/MP\), or defining the real wage as \(w = W/P, \mu = (MP)/w\), my definition of the markup.
margins in the short run. I find it difficult to believe that this effect, to the extent that it has indeed been present, could have offset the effects of steadily stronger competition in goods markets over the last 15 years.

I find it more plausible that the source of the increase in the markup is to be found in the labor market. Which model of wage determination best describes the labor market is still very much an open question. But in a number of plausible descriptions of wage setting, the wage need not be equal to the marginal product of labor.\textsuperscript{10}

In models of "efficient bargaining" for example, the marginal product of labor is set equal to the reservation wage. But the wage itself is then set between the average and the marginal product of labor, with the weights depending on the relative bargaining power of the union and of the firm. Under that interpretation, the increased markup reflects the fact that unions have become less powerful in Continental Europe, and that the wage has come closer to the marginal product of labor. To the extent that unions were weaker in Anglo-Saxon countries to start with, this may explain the difference in the evolution of the two groups.

Another interpretation, which I find quite plausible, is based on a reduction of labor hoarding, or "featherbedding" practices, in Continental Europe. Under that interpretation, Continental firms were characterized in the early 1980s by chronic excess employment, by "featherbedding"; equivalently, workers were employed to the point where the product of the last worker was below his wage.\textsuperscript{11} Under that interpretation, as unions have become weaker, firms have been able to reduce this excess employment, leading to an increase in the marginal product relative to the wage. The markup has increased from a value below one (a marginal product lower than the wage) to a value closer to one.

\textsuperscript{10} Dickens [1995] provides a nice review.

\textsuperscript{11} For a discussion of why bargaining may produce featherbedding, see for example Johnson [1990].
(3) Genuine shifts. Technological bias

The shifts in the relation between factor prices and factor quantities may reflect instead biased technological change, or, perhaps more accurately — given that technology as knowledge is probably largely common to OECD countries —, biased technological adoption. If, since the early 1980s, firms in Continental Europe have introduced technologies which steadily use less labor and more capital, this implies that the same labor-capital ratio corresponds to a lower marginal product of labor, thus a lower wage, and in turn a lower factor-price ratio. Such technological bias can therefore account for the shift in relation (1.2).

Under that interpretation, the question then becomes why Anglo-Saxon and Continental countries have adopted different technologies over time. A tentative answer must rely on induced bias in technological adoption, and parallels the argument developed in the first interpretation given earlier. In the same way as labor supply shifts led firms to move over time to technologies using less labor and more capital, it may have led them to develop or adopt new technologies that were also biased against labor. Indeed the distinction between movements along an isoquant — choices among existing technologies — and shifts in the isoquant — the development and adoption of new technologies — is probably much sharper in our models than in reality.

(4) Trade and composition effects

The fourth interpretation dismisses the shifts as simply reflecting composition effects. A particularly strong statement along these lines is the factor-price equalization theorem. Simply put, to the extent that trade leads to factor-price equalization, one should not expect any relation between the ratio of aggregate factor quantities in a country and the ratio of factor prices. Thus, what I have called shifts in that relation may simply capture the effects of the world factor-quantity ratio on domestic factor-price ratios — although why factor-price evolutions have been so different in Continental European and in Anglo-Saxon countries is diffi-
cult to reconcile with the very hypothesis of factor-price equalization.

One way to explore the relative importance of composition effects is to look at more disaggregated evidence within each country. Under the factor-price equalization theorem, the relation between factor prices and factor quantities should still hold for each firm, but disappear at the aggregate level because of the composition effects induced by trade. I have started looking at sectoral evidence in France, roughly at the 2-digit level of disaggregation (I return to this evidence in the conclusion). I find the increase in the share to hold in nearly all tradable sectors; unless composition effects are only at work at a lower level of disaggregation, this suggests that the factor-price equalization theorem is not the main source of the evolutions characterized above. I shall not consider composition effects further in this paper.

2 Shifting, Capital Shares and Unemployment

The purpose of this section is to build a simple model that both formalizes the previous arguments and prepares the way for a quantitative interpretation of medium-run evolutions in the next section.12

2.1 The model

The basic structure of the model is a set of two demand and two supply equations for labor and capital. The two demand relations are derived from costs of

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12. Caballero and Hammour [1997] build a richer model, with explicit putty-clay technology and explicit bargaining in the labor market. This allows them to relate macroeconomic outcomes to institutional changes in the structure of bargaining, unemployment benefit rules and so on. My strategy is instead to take a number of short-cuts that keep the model simpler but admittedly poorer.
changing capital as well as costs of changing factor proportions. Capital accumulation depends on current and expected future marginal profits; adjustment in factor proportions on the relation between current and expected marginal revenue products and wages. On the supply side, the wage is an increasing function of employment, while the interest rate is assumed independent of capital accumulation. The specific assumptions are as follows:

The economy is composed of monopolistically competitive firms; the reason for introducing monopolistic competition is to be able to trace the effects of markup changes, taking such changes as a stand-in for shifts in the division of rents in the economy.

Each firm uses one unit of capital, which it combines with variable amounts of labor to produce output. The production function of a firm is given by:  \( y = f(n, 1) \) \( (2.1) \)

The capital stock is thus equal to the number of firms in the economy, and changes in the capital stock correspond to entry and exit decisions of firms. A continuing firm makes only one decision at any point in time, that of how much labor to employ. Note that \( n \) is both employment in a given firm, and the labor-capital ratio for the economy as a whole. This separation between capital accumulation decisions and factor proportion decisions is inessential; but sharply separating the two decisions helps thinking about adjustment of capital and labor below.

Each firm is monopolistically competitive in the goods market. The demand for

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13. Harrod neutral technological progress can be introduced straightforwardly; all which is then needed is to measure labor and wages in efficiency units. For notational simplicity, I leave it out in this section, but reintroduce in the next when looking at actual economies.
its good is given, in inverse form, by:

\[ p = (y/\bar{y})^{-\gamma} \quad ; 0 \leq \gamma < 1 \]

where \( p \) is the price charged by the firm relative to the price level, \( \bar{y} \) is average output, and \( \gamma \) is the inverse of the elasticity of demand. It follows from this constant elasticity specification that the markup of price over marginal cost charged by a firm will be equal to \( \mu = 1/(1 - \gamma) \).

Each firm faces costs of adjusting its labor-capital ratio—equivalently its employment level. Rather than explicitly allowing for a putty-clay structure of technology, I assume that each firm faces costs of adjusting factor proportions. More specifically, I assume the cost of adjusting \( n \) to be given by \( (c/2)(dn/dt)^2 \), where \( c \) is a parameter.

Each firm faces a constant probability of death, \( \delta \), faces real interest rate \( r \), and real wage (in terms of the price level) \( w \). Under these assumptions, at any point in time, say time 0, the firm chooses employment so as to maximize its value, given by:

\[ v = \int_0^\infty e^{-\int_0^t (r + \delta) ds} (\pi_t - (c/2)(dn_t/dt)^2) \, dt \]

where

\[ \pi = p \, y - w \, n \]

The first order conditions, and the symmetry condition that all firms must charge the same price, so that \( p = 1 \), are then given by:

\[ \frac{dn}{dt} = \frac{1}{c}q \]
\[ \frac{dq}{dt} = (r + \delta)q - \pi_n \]
\[ \pi_n = \frac{1}{\mu} \, f_n(n, 1) - w \]

Firms adjust the labor-capital ratio in response to the present value of marginal
profit, denoted $q$. Marginal profit is equal to the marginal revenue product of labor—itself equal to the marginal product multiplied by the inverse of the markup—minus the wage.

In the long run, the marginal product of labor must be equal to the real wage times the markup (equivalently, the marginal revenue product of labor must be equal to the real wage). Denoting steady state values by a star:

$$f_n(n^*, 1) = \mu w^*$$ (2.2)

Note that, from the point of view of employment determination, a higher markup acts as a tax on the marginal product of labor (a tax collected by the firm however so that the effect on profit is quite different): a higher markup leads firms to choose a lower employment level, and thus leads to a lower labor-capital ratio.

The evolution of the stock of capital comes from entry and exit of firms. To capture the slow adjustment of capital, I assume costs of adjustment for capital: The relative price of capital is an increasing function of the net rate of entry (equivalently, the net change in the capital stock). More specifically:

$$p_k = 1 + h \frac{dK}{dt}$$ (2.3)

where $h$ is a parameter. Free entry implies that the following condition must hold:

$$v = p_k$$

If firms could freely choose their initial factor proportions, the model would yield a distribution of factor proportions across firms, with proportions depending on time of entry. To avoid such heterogeneity, I assume that new firms enter with the same labor-capital ratio as existing firms. This keeps the model tractable; but it also eliminates entry and exit of firms as one of the channels through which
aggregate factor proportions could change over time.\textsuperscript{14}

The value of a new firm must be equal to the price of the machine needed to run it. From the definition of \( v \) earlier:

\[
dv/dt = (r + \delta)v - (\pi - (c/2)(dn/dt)^2)
\]

Entry takes place—equivalently the capital stock increases—when the value of an existing firm is greater than one. In steady state, \( dv/dt = dn/dt = dK/dt = 0 \) so that the previous equations imply:

\[
\pi^* = p_e^*(r + \delta) = (r + \delta)
\]

(2.4)

Profit per unit of capital is equal to the user cost.

This ends the description of the dynamic demands for capital and labor. The aggregate demand for labor is given by \( N = nK \), the labor-capital ratio in each firm times the number of firms. I specify the supply of factors as follows:

I assume the real wage to be a constant elasticity function of the ratio of employment to the labor force, \((N/N)\):

\[
w = \theta (N/N)^\beta
\]

(2.5)

where \( \beta \) is the elasticity of labor supply, and \( \theta \) is a multiplicative constant.

I assume \( r \) to be exogenous. This is a strong assumption: in combination with equation (2.4), this implies that the long-run supply curve of capital is infinitely elastic, and that the profit rate always returns to the same value, \((r + \delta)\).

\textsuperscript{14} One of the contributions of Caballero and Hammour [1997] is to keep track of the distribution of firms and its implications, for example for wage bargaining.
2.2 Functional forms and parameters

I choose functional forms and parameters as follows. I think of the unit time period as a year. I take the production function to be CES, of the form (recall that each firm uses one unit of capital so that capital is there but equal to one in the production function):

\[ y = A((1 - a)n^{\frac{\sigma - 1}{\sigma}} + a)^{\frac{\sigma}{\sigma - 1}} \]  
(2.6)

I take the coefficient multiplying capital, \( a \), to be 0.3, the multiplicative constant \( A = 0.5 \). What happens to the capital share in the long run in response to an increase in wages depends on the elasticity \( \sigma \). The evidence below points to a value of \( \sigma \) close to 1.0; I shall use 1.0 as the benchmark value. But to show how increases in wages can potentially lead to an increase in the capital share, I shall also examine the case where \( \sigma \) is equal to 2.0.

I choose the probability of death for firms—equivalently the depreciation rate—\( \delta \), equal to 0.1, the real interest rate equal to 0.05. I take the initial value of \( \gamma \) equal to 0, corresponding to the case of perfect competition; this implies a value for the markup, \( \mu \), of 1.0.

I choose a value for \( c \) equal to 4.0. In a world in which production was strictly putty-clay, only the newly installed capital stock, thus roughly 10% of the total capital stock each year, would embody the new desired factor proportions. This would imply a mean lag of adjustment of 4.5 years. Together with the other parameters, a value of \( c \) of 4.0 implies that firms close roughly 17% of the gap between desired and actual factor proportions. This in turn implies a mean lag of 4.8 years.

I choose a value for \( h \) equal to 10.0. This implies an elasticity of investment with respect to the relative price of capital, \( p_k \), of 1.0. Empirical evidence on the relation of investment to "Tobin's Q" yields lower elasticities, and thus higher implied values for \( h \). But, as discussed in that literature, these estimates are likely to be upward biased. The instrumental variable approach used by Cummins et al. [1994]
\textbf{Table 2. Parameters and steady state values.}

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Steady state values</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \sigma ) (elasticity of substitution)</td>
<td>1.0, 2.0</td>
</tr>
<tr>
<td>( a ) (coef on capital in production f.)</td>
<td>0.3</td>
</tr>
<tr>
<td>( A ) (multiplicative ct in production f.)</td>
<td>0.5</td>
</tr>
<tr>
<td>( \delta ) (depreciation rate)</td>
<td>0.1</td>
</tr>
<tr>
<td>( \mu ) (gross markup)</td>
<td>1.0</td>
</tr>
<tr>
<td>( r ) (interest rate)</td>
<td>0.05</td>
</tr>
<tr>
<td>( c ) (cost of adjusting ( n ))</td>
<td>4.0</td>
</tr>
<tr>
<td>( h ) (cost of adjusting ( K' ))</td>
<td>10.0</td>
</tr>
<tr>
<td>( \beta ) (elasticity of wage to ( N ))</td>
<td>1.0</td>
</tr>
<tr>
<td>( \theta ) (wage at zero unemployment)</td>
<td>0.35</td>
</tr>
<tr>
<td>Output</td>
<td>0.50</td>
</tr>
<tr>
<td>Employment</td>
<td>1.00</td>
</tr>
<tr>
<td>Capital</td>
<td>1.00</td>
</tr>
<tr>
<td>Wage rate</td>
<td>0.35</td>
</tr>
<tr>
<td>Profit rate</td>
<td>0.15</td>
</tr>
<tr>
<td>Capital share</td>
<td>0.30</td>
</tr>
<tr>
<td>Unemployment</td>
<td>0.00</td>
</tr>
</tbody>
</table>
yields an elasticity of about 0.7.

I normalize the labor force to be equal to one. I choose \( \theta \) to be equal to 0.35; this value implies zero unemployment in the initial steady state. I choose an elasticity of the wage with respect to employment equal to 1.0. For an average 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] for a number of countries. The evidence in Blanchard and Katz [1997] suggests that the elasticity is in fact lower in the short run, higher in the long run; I shall ignore those dynamics here.

The parameters and their implications for steady state values of output and other variables are given in Table 2.

(Table 2. Parameters and steady state values).

2.3 Shifts in labor supply, changes in the division of rents, and technological bias

With the discussion of the previous section in mind, I consider the effects of three types of shifts.

(1) Figure 4 shows the effects of an unexpected, permanent, adverse shift in labor supply, an increase in \( \theta \) in equation (2.5) of 10\%—put less formally, the effects of an adverse wage push. The model, here and below, is solved under the assumption of rational expectations. The figure plots the evolution of the profit rate, the wage rate, the profit-wage ratio, the labor-capital ratio, the capital share and the unemployment rate, for two values of \( \sigma \), 1.0 (continuous line) and 2.0 (dotted line).

(Figure 4. The dynamic effects of an adverse shift in labor supply)
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At the initial labor-capital ratio, the increase in wages leads to a corresponding decrease in the profit rate and the capital share. This triggers two dynamic responses:

Over time, firms shift away from labor, leading to a decrease in the labor-capital ratio. This in turn leads to a partial recovery of the profit rate, and if the elasticity of substitution is greater than one, to a more than full recovery of the capital share.

Over time, lower profit leads to net exit of firms, and a decrease in the capital stock.

Lower capital and a lower labor-capital ratio both lead to lower employment, higher unemployment and a decrease in the wage: the effect of the initial wage push on the wage is steadily offset by the effect of higher unemployment.

In the long run, the profit rate must return to its initial value. This implies that the wage must return to its initial value as well. Given the unit elasticity of the wage with respect to employment, this implies that employment and capital both decrease by 10%. The capital share returns to its initial value, and the unemployment rate increases to 10%.

In summary, adverse labor supply shifts can indeed generate both an increase in unemployment over time and the kind of movement in the capital share that has been observed in Continental Europe, namely an initial decrease in the share followed, in the medium run, by a more than full recovery. But, to the extent that unemployment puts pressure on the wage to return to its initial value, the medium-run increase in the capital share is quite small. In the simulation corresponding to $\sigma = 2$, the capital share never rises much above its initial level.

(2) Figure 5 shows the effects of an unexpected, permanent, increase in the
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markup, an increase in $\mu$ by 10 percentage points.\(^{15}\)

Recall that—ignoring dynamics—the markup acts like a tax on labor. Thus, in response to an increase in the markup, firms decrease employment over time. This leads to an increase in unemployment, and in turn a decrease in the wage. Both because of the decrease in employment and the decrease in the wage, the capital share increases. Thus, in the medium run, the markup shift leads to both an increase in the capital share and an increase in unemployment.

The decrease in the wage leads in turn to an increase in the profit rate, which triggers a second mechanism, namely the entry of firms in response to the higher profit rate. After its initial increase, unemployment starts decreasing; the increase in the number of firms dominates the decrease in the labor-capital ratio in each firm.

What happens in the long run? Free entry and a given interest rate implies that the profit rate must return to its original value. This implies that, to a first approximation, the wage must return also to its original value, and so, in turn, must unemployment: the effect on employment of a lower labor-capital ratio in each firm is offset by a larger number of firms, a larger capital stock.\(^{16}\) The capital share however remains permanently higher, as as the labor-capital ratio is lower at any given wage rate.

While the markup in the model comes from monopoly power in the goods market,

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15. In a series of papers, Julio Rotemberg and Michael Woodford ([1991], [1997]) have drawn attention to the role of changes in markups in business-cycle fluctuations. This paper can be seen as also drawing attention to their potential medium-run implications.

16. The “first approximation” statement means that the result holds for $\epsilon$ changes in the markup, starting from an initial value of 1.0 (so that there are no distortions to start). For larger changes, or if starting from a value of $\mu$ larger than one, the wage rate ends up a bit lower; the unemployment rate a bit higher.
any change in the division of rents that leads to an increase in $\mu$ will have similar effects. Consider for example an increase in $\mu$ coming from a decrease in featherbedding practices. The dynamics will be identically the same as in Figure 5.\textsuperscript{17} At a given wage, firms want to reduce employment and do so over time. This leads to an increase in unemployment, but also a higher profit rate and a higher capital share. The economy exhibits both higher unemployment and a higher capital share. Over time, the increase in the profit rate leads to entry of firms and capital accumulation, leading unemployment to decrease until it has returned roughly to its initial level. By then, the profit rate is lower, but the capital share remains permanently higher.

\textit{[Figure 5. The dynamic effects of an increase in the markup]}

In summary, shifts in the markup lead in the short and the medium run to an increase in unemployment and an increase in the capital share. While unemployment eventually returns to its initial value, this takes, as the simulation shows, a very long time. Thus, markup shifts, or more generally shifts in the division of rents from workers to firms, appear potentially able to explain the evolution of Continental Europe since the early 1980s.

\textit{(3) Figure 6 shows the effects of the effects of biased technological change. I formalize such a bias as an increase in the coefficient $a$, the coefficient on capital, in the production function given by (2.6). In the Cobb-Douglas case, this takes the simple form of an increase in the exponent for capital and a corresponding decrease in the exponent for labor. This formalization captures the idea that new

\textsuperscript{17} The welfare implications will be different however. An increase in the markup coming from increased monopoly power—an increase in $\mu$ above one—represents an increase in distortions. The elimination of featherbedding—an increase in $\mu$ from a value less than one towards one—represents a decrease in distortions.
technologies save on labor, and has the advantage that the bias is well defined even in the Cobb-Douglas case.\textsuperscript{18} Figure 6 shows the effects of a 10 percentage points increase in the coefficient $a$ (from 0.3 to 0.4).\textsuperscript{19}

\textbf{[Figure 6. The dynamic effects of technological bias.]}  

The striking characteristic of Figure 6 is that it looks so much like Figure 5: the effects of technological bias are nearly identical to those of an increase in the markup. At the initial labor-capital ratio, the change leads to an increase in the profit rate, and an adverse shift in labor demand. This in turn triggers the same dynamics as before, with an increase in the capital share as well as in unemployment.

There are thus two lessons to draw from this last simulation: that technological bias can also potentially explain the evolutions of Continental Europe since the early 1980s. And that it will be difficult to distinguish this explanation from the previous one, except by looking at the production function—which is affected by technological bias, not by changes in the division of rents.

\textsuperscript{18} A while back, Houthakker [1956] showed how one could think of the Cobb-Douglas production function as the result of aggregation of Leontief functions, with the coefficients of the underlying functions being jointly Pareto-distributed. The same justification can be given here. New technologies are introduced that lead to a larger proportion of relatively capital-intensive methods of production, and, thus, to an increase in the coefficient on capital in the aggregate production function.

\textsuperscript{19} In changing relative marginal products, one must be careful not to introduce productivity level effects. In general, if the ratio of labor to capital is different from 1.0, the change in coefficients will change productivity unless offset by a change in the multiplicative constant. This issue does not arise here, as in the initial steady state, the labor-capital ratio is equal to one.
3 Looking at actual evolutions

The natural next step is to see whether and how this model can explain actual country evolutions. This involves constructing empirical series for labor supply shifts, labor demand shifts, and shifts in user cost (which I have not focused on until now, but are present in the sample as well) and simulating the model. Analyzing each country would be overambitious and space consuming. Thus, I present the results of this exercise for one country, namely France, and then summarize the results for the others.

3.1 Constructing the shifts

(1) To construct labor supply shifts, I start from equation (2.5) above. Allowing for Harrod neutral technological progress, taking logarithms, and approximating the difference between the log of the labor force and the log of actual employment by minus the unemployment rate, the equation becomes:

\[ \log(\hat{w}) = \log \theta - \beta u \] (3.1)

I first construct the series for the wage in efficiency units.\(^{20}\) I then construct the series for (log) labor supply shifts as \( \log \theta \equiv \log(\hat{w}) + \beta u \). I finally normalize this series to equal zero in 1970.

(Figure 7. France. Labor supply shifts.)

By constructing labor supply shifts in this way, I do not mean to imply that the

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20. Robert Hall (for example Hall [1990]) has shown how, if the markup is positive, the computation of total factor productivity growth must be modified to take account the effect of the markup on the shares. The results reported here are derived under the assumption that the average markup during the period was equal to one. I have also carried out the same exercise under the assumption that the average markup was equal to 1.2 and the results are very similar.
Figure 1

France

Labor supply shifts (beta=1.0, 0.5, 1.5)
"true" labor supply relation has the form given by (3.1). As discussed briefly earlier, the "true" labor supply or wage relation has richer dynamics—from overlapping wage setting to hysteresis—and surely includes many other variables. Thus, what I call labor supply shifts are combinations of these dynamic effects and movements in these variables. The best way to think about (3.1) and the construction of the labor supply shifts in this way is that they give the distance of the wage from the wage which would allow, in the absence of other shifts, the French economy to return to its 1970 unemployment rate.

The graphs in Figure 7 show labor supply shifts for three values of $\beta$, $\beta = 1.0$—the value I used earlier and shall use in simulations below—, $\beta = 0.5$ and $\beta = 1.5$. All three series show a large increase in the early 1970s, with the wage increasing much faster than measured total factor productivity, a peak around 15% in the early 1980s, and a decline since then. Depending on the value of $\beta$, the value of labor supply shifts stands in 1996 between 1% and 10%. Put another way, wages in efficiency units are actually lower today in France than they were in 1970; but they would be too high if unemployment decreased, putting upward pressure on them. How high is "too high" depends on the assumed value of $\beta$, the effect of unemployment on the wage.

What lies behind these labor supply shifts? Relating them to specific changes in the economic environment and in labor market institutions will have to be deferred to another paper. But, based on the large amount of research on European unemployment, I do not think that there is any great mystery.21 The slowdown in productivity growth from the mid-70s on, together with the increase in oil prices, were not instantaneously reflected in lower real wage growth, leading to an increase in the wage relative to total factor productivity during the 1970s. In response to higher unemployment, labor market institutions were changed so as to protect employed workers against the risk of unemployment, and improve the

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welfare of the unemployed. The effect of those changes was to decrease the effect of unemployment on wages. Since then, oil prices have returned to their 1970s levels, expectations of workers have presumably adjusted to the lower rate of productivity growth, and this is indeed reflected in the decline in labor supply shifts since the early 1980s. Why haven't the shifts been fully undone? Hysteresis is probably relevant here. Labor market institutions are not the same as they were in 1970. The treatment of unemployment for example is considerably more generous in France than it was then. Long-term unemployment has left many workers marginalized, reducing the weight of long-term unemployed in wage determination, and so on. A quantitative account remains to be done; but it does not seem to confront any great puzzle.

(2) In constructing labor demand shifts, I take them to be shifts in the markup; as will be clear below, if I were to interpret them as coming from technological bias, the constructed series would be identical, and we know from the previous section, the simulation results would be largely similar.

As we saw earlier, for monopolistic firms, ignoring costs of adjusting the labor-capital ratio, the marginal product of labor is equal to the real wage times the markup. Assuming that the production function is CES with elasticity of substitution \( \sigma \), this relation takes the form:

\[
\log \hat{w} + \log \mu = \text{constant} + \log(1 - a) - \left( \frac{1}{\sigma} \right) \log(\hat{n}/y)
\]

(3.2)

The right-hand side gives the logarithm of the marginal product of labor. The left-hand side gives the logarithm of the real wage times the markup.

Given a value for \( \sigma \), and under the maintained assumption that the parameter \( a \) is constant, one can construct a series for the log markup (up to a constant term) using (3.2).²²

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²² Note that under the additional assumption that \( \sigma = 1.0 \), the change in the log markup is equal
This equation is correct however only in the absence of costs of adjusting factor proportions. If it is costly for firms to adjust those proportions, an increase in the wage will be associated with little contemporaneous change in $\bar{\eta}/k$, and thus little change in $\bar{\eta}/y$; this in turn will lead to a decrease in the measured markup. As I show in Figure 8a below, this is indeed what happens when the series for the markup constructed using equation (3.2): markup shifts turn out to be highly negatively correlated with the labor supply shifts constructed earlier.

To take account the dependence of factor proportions on the history of wages rather than just the current wage, I replace the current wage by a weighted average of current and lagged wages. A more ambitious approach would have been to try to account for both past and expected future values of the wage, as implied by the model of the previous section. I have decided to take this simpler and more transparent approach here.23 More specifically, I construct the log markup (up to a constant) as:

$$\log \mu = -\log \bar{\tilde{w}} - (1/\sigma) \log(\bar{n}/y)$$

(3.3)

where

$$\log \bar{\tilde{w}} = \lambda \log \bar{\tilde{w}}_{t-1} + (1 - \lambda) \log \bar{\tilde{w}}_t$$

In line with the parameters chosen for the model earlier and the empirical evidence in the next section, I choose a value of $\sigma$ equal to 1.0 and a value of $\lambda$ equal to 0.8, implying a mean lag in the adjustment of factor proportions to the wage of 4 years.

Figures 8a and 8b plot labor demand shift series for the chosen values of $\sigma$ and $\lambda$.

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23. For a detailed discussion of this and other issues of construction of the markup, see Rotemberg and Woodford [1998].
Figure 8

France

Labor demand shifts, for \( \lambda = 0.8, 0.0 \) and 0.9

(a)

Labor demand shifts, for \( \sigma_m = 1.0, 2.0 \)

(b)
together with series corresponding to alternative values of the two parameters.

The three series in Figure 8a correspond to three different values for \( \lambda \): 0.0 (corresponding to no costs of adjustment), 0.8 (the benchmark value) and 0.9; in all three cases, \( \sigma \) is set equal to one. Under the assumption of zero costs of adjustment, the markup series show large negative values from the mid-1970s on, turning positive in the late 1980s. But, the other two graphs show, the initial decrease is largely spurious, coming from the slow adjustment of firms away from labor in the face of the wage push. For \( \lambda = 0.8 \), the markup shows a small decline from the late 1970s on, and a large increase from the late 1980s. For \( \lambda = 0.9 \), the increase takes place only from 1990 on. Note that in all three cases, the value of the markup shift is large and positive at the end; only the timing of the increase is affected by the value of \( \lambda \).

The graphs in Figure 8b correspond to two different values of \( \sigma \): 1.0 (the benchmark value) and 2.0; in both cases, \( \lambda \) is set equal to 0.8. The higher value of \( \sigma \) yields a more pronounced decline in the 1980s, and a smaller value of the shift at the end of the period.

(Figure 8a,b. France. Labor demand shifts.)

Note that the series for the markup shifts has been derived under the assumption that the production function was time invariant (up to Harrod neutral technological progress), so that, in particular \( \log(1 - a) \) was constant in equation (3.2). But the "markup shifts" could equally have been called "technological bias shifts", changes in the coefficient \( a \), with \( \mu \) remaining constant. Equation (3.2) makes clear that, just looking at labor demand, changes in \( \log \mu \) and changes in \(- \log(1 - a)\) are observationally equivalent. Thus, we could equally describe the series in Figure 8 as showing technological bias in favor of capital — an increase in \( a \) — since the early 1980s. I shall return in Section 5 below to whether and how one can use other evidence to distinguish between the two. At this point, I shall
remain agnostic.

(3) While I have not focused on them so far, one must also allow for shifts in the cost of capital. To construct the time series for \( r + \delta \), I use the depreciation ("scraping") rate from OECD data for \( \delta \). I construct \( r \) in three different ways.

In the series I use for simulations below, I construct \( r \) as equal to the long nominal interest rate minus the average rate of inflation over the previous five years. The resulting user cost series is denoted by "ucb5" in Figure 9. The second series uses the nominal interest rate minus the inflation rate over the previous year, and is denoted by "ucb1". The third series constructs the required rate of return as a weighted average of the real interest rate on bonds, constructed as the nominal interest rate minus a five-year average of inflation, and the required rate of return on equity, constructed as the sum of the dividend-price ratio plus a five-year average of past output growth (taken as an admittedly rough proxy for the expected rate of growth of dividends). The weights are 0.7 on bond finance, and 0.3 on equity finance. This third series is denoted by "ucbe" in Figure 9.

All three series in Figure 9 show a low user cost in the 1970s, a peak associated with disinflation in the early 1980s and another peak associated with German reunification and the "Franco fort" policy in the early 1990s. The user cost using lagged inflation rather than a five-year average is higher during most of the 1980s, and a little higher at the end. The user cost assuming bond and equity finance shows little trend and ends up lower than the other two: This is because the steady decrease in the dividend-price ratio and in the growth rate over the last 15 years implies a steady decrease in the estimated required rate of return on equity over the last 15 years.24

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24. I have so far ignored the trend decline in the relative price of capital, which is absent from the model above but is surely relevant empirically for a number of OECD countries. In France, this factor is not very important. The relative price of investment goods has decreased by only 6% since
Figure: User cost, assuming bond or bond and equity finance

France; User cost, assuming bond or bond and equity finance
3.2 Simulating the model

Figure 10 shows the facts to be explained. It plots the evolution of the profit rate, the wage rate per efficiency unit, the ratio of the profit rate to the wage rate (per efficiency unit), the ratio of labor (again in efficiency units) to capital, the capital share and the unemployment rate, for France, from 1970 to 1996. For ease of comparison, I normalize all the variables to have 1970 values equal to that of the steady state of the model; thus, in 1970, the profit rate is normalized to 0.15, the wage rate to 0.35, the ratio of the profit rate to the wage rate to 0.428, the labor-capital ratio is equal to 1.0, the capital share to 0.30, and the unemployment rate to 0.0. The basic evolutions are by now familiar, in particular the increase in the capital share, and the increase in unemployment.

[Figure 10. The facts to be explained. France] Warning: The series are normalized to facilitate comparison with the simulations. See text.

All the simulations below assume zero values for the shifts pre-1970, and actual values thereafter. They are run under rational expectations, with expectations of future shifts equal to current values of these shifts. Each figure shows simulation results under two alternative assumptions about \( \sigma \), \( \sigma = 1 \) (the hard line), and \( \sigma = 2 \), the dotted line.

Figure 11 shows the results of a first simulation allowing for shifts in labor supply and the cost of capital, but ignoring shifts in labor demand (markup or technological bias shifts). It shows how the adverse labor supply shocks can explain the increase in unemployment, and the increase in the capital share up to the mid 1970.
1980s. But it shows how they are unable to explain the further rise in unemployment as well as the further increase in the capital share since the mid 1980s: as labor supply shifts decrease in magnitude, and lags of adjustment in adjusting factor proportions work themselves out, the labor-capital ratio turns around, leading to a reduction in unemployment and in the capital share.

[Figure 11. The effects of labor supply and user cost shifts. France]

Figure 12 shows the effects of all three shifts combined. It shows how the adverse labor demand shifts since the early 1980s help account for the evolution of both unemployment and capital shares since then. Compared to the previous simulation, the labor-capital ratio keeps declining (as it does in the data) despite the fact that, with the decrease in labor supply shifts and the downward pressure from unemployment, the wage is now below its initial value. Unemployment remains high, and so does the capital share.²⁵

[Figure 12. The effects of labor supply, labor demand and user cost shifts. France]

3.3 A glance at other countries

I have carried out the same exercise for the other 13 countries. I have done so mechanically, without any attempt to fine tune even when the simulations results

²⁵ The fit between actual evolutions in Figure 10 and simulated evolutions in Figure 12 is obviously very good. This is however largely by construction. Recall that the series for the labor supply and demand shifts have been constructed so as to make the labor supply and the labor demand relations fit exactly. If the model had no internal dynamics, the fit would be perfect. To the extent that the model determines endogenously the dynamics of capital accumulation and factor proportions, the fit can still turn out to be poor. The next table, where the model is simulated for each of the other 13 countries, show that predicted unemployment can differ substantially from actual unemployment.

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<td>$\Delta n^d$</td>
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</tr>
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<td>U.K.*</td>
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<td>7</td>
<td>-10</td>
<td>-6</td>
<td>-4</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Shifts: see text. Change in the unemployment rate: OECD. *: simulation assuming constant real interest and depreciation rates. Germany up to 1990.
were poor—as indeed they are for a few countries. Fine tuning would have taken me too far and is left to later work.

Table 3 summarizes the results.\textsuperscript{26} It gives the change in constructed labor supply and labor demand shifts for the subperiods 1970-1981 and 1981-1995, for each country. And for each subperiod, it also gives the change in unemployment implied by the simulation as well as the actual change. To interpret the numbers for labor supply and demand shifts, it is useful to recall from earlier that, over a period of 5 to 10 years, the effect of 1\% adverse shift in labor supply is roughly to increase the unemployment rate by 0.8 percentage points, the effect of a 1\% adverse shift in labor demand to increase the unemployment rate by 0.4 percentage points. The table suggests a number of conclusions:

The model does a decent job of explaining unemployment evolutions across countries and across subperiods. The cross-country correlation between predicted and actual changes in unemployment is 0.6 for the first subperiod, 0.36 (0.65, leaving out Canada) for the second subperiod.

For a large number of countries, however, the model overpredicts the increase in the unemployment rate from 1970 to 1981. The worst case of overprediction is Austria, with a predicted increase of 12 percentage points versus an actual increase of only 1 percentage point. Spain is another: the predicted increase is substantially larger than the already large actual increase. The origin of these overpredictions is the following—and points to an important shortcoming of the model: The model assumes that each economy was on its steady state growth path in 1970. Starting from such a balanced path, any increase in the wage above what is implied by total factor productivity growth must lead to higher unemployment. But a country that is below its steady state growth path experiences an increase

\textsuperscript{26} I was unable to solve the model for two countries, Spain and the U.K., apparently because of large negative real interest rates in the mid 1970s. The simulations reported for both countries assume a constant user cost.
in its capital-labor ratio which allows wages to grow faster than total factor productivity without adverse effects on unemployment. This appears to have been the case for Austria, where the profit rate was unusually high in the early 1970s and has steadily declined as the capital-output ratio increased. This is also true of Spain—although, there, the increase in wages has been much larger than warranted either by convergence to the steady state path or by factor productivity growth.

There is a number of other large discrepancies which point to potential data issues as much as to a deficiency of the model. The very large predicted increase in unemployment in Canada since 1981 has as its proximate cause the large constructed adverse shift in labor supply since 1981. This shift in turn comes from wage growth in excess of low measured total factor productivity. This low factor productivity growth can be traced in turn from very high measured capital growth in the 1980s, which leads to a small Solow residual. Low measured capital growth in turn comes from a very large decrease in the measured price of investment goods, leading to high measured capital accumulation in volume given observed capital accumulation in dollars: According to the data, the relative price of capital goods in Canada has decreased more than twice as fast as in the United States. This seems implausible. 27

27. The OECD is not to blame as the data on the price of investment goods it publishes are consistent with those published by Canada. According to Statistics Canada, the price of producer’s durable equipment relative to the GDP deflator has decreased from 100 in 1970 to 33.8 in 1995 (compared to 64.8 in the U.S.). Part of the problem appears to be due to the use for Canada of an implicit price deflator, compared to a chain index for the United States. Canada has now introduced a new chain index and its evolution is much closer to that of the U.S. chain index price. I could not use this new index in my simulations as it only goes back to 1981. To see the potential effects of shifting to a better index, I have redone the simulations for Canada, but using the U.S. instead of the Canadian relative price of investment to compute the evolution of the capital stock in volume, total factor
Leaving aside the problems and puzzles, the typical explanation for the increase in unemployment in Continental countries suggested by the table is one of adverse labor supply shifts in the first subperiod, and of adverse labor demand shifts in the second. Thus the simulations explain the initial rise in unemployment through adverse supply shifts, and its further—albeit smaller—increase by labor demand shocks. Just as they do for France, these later adverse labor demand shocks also explain the increase in capital shares. Interestingly, the model suggests that labor demand shifts have played a more limited role in Germany than in France: the model accounts for most of the decrease and later recovery of capital shares in Germany simply from the dynamic response of factor proportions to factor prices.

4 Lags in labor demands or shifts?

In this section, I return to econometrics and look at dynamics in labor demand. These dynamics played an important role in the previous sections, and this raises two related questions. First, is there evidence for the lags assumed in the model and the construction of markup shifts earlier? Second, when such lags are allowed and estimated, how much evidence is left of shifts in labor demand since the mid-80s?

There is a large literature on dynamics of labor demand in general, and of labor demand in the context of European unemployment in particular.28 My goal here is again simply to provide a description of the data, and attempt to separate dynamics and time effects.

———

productivity and so on. The labor supply shift for 1970 to 1981 decreases from 4 in the table to -6, the labor supply for 1981 to 1995 decreases from 20 in Table 3 to 10; the increase in the unemployment rate over 1981-1995 is equal to 12%, thus still too high, but roughly half the number in the table.

28 For the first, see for example Hammett (1993). For the second see for example Layard et al. [1991].
For each of the two panels of countries described earlier (Continental European, and Anglo-Saxon), I run the following panel regression:

\[
\log (\tilde{n}/k)_{it} = \phi(L) \log (\tilde{w})_{it} + x_i + x_t + \epsilon_{it}
\]  

(4.1)

where \(i\) denotes a country, \(t\) denotes time, \(\tilde{n}\) is labor in efficiency units, \(k\) is capital, \(\tilde{w}\) is the wage per efficiency unit of labor, \(x_i\) and \(x_t\) are country and time dummies respectively, and \(\phi(L)\) is a lag polynomial.

As is well known, this log-log specification does not hold exactly except in the Cobb-Douglas case (this is the reason why the estimation earlier relied instead on the log-log relation between factor-price and factor-quantity ratios, which holds for the CES case), and must be thought of as log-approximation. Under that interpretation, the sum of estimated coefficients on current and lagged wages, \(\phi(1)\) is approximately equal to the ratio of the elasticity of substitution to the share of capital, \((\sigma/\alpha)\). This will be useful in interpreting the results below.

The results of estimation are reported in Table 4 and Figure 13. Table 4 reports four sets of results for each group. The first two are obtained by OLS, with and without time dummies. The next two are obtained using instrumental variables, again with and without time dummies. The labor supply shifts constructed earlier are natural instruments in this context.\(^29\)

---

\(^29\) Another issue arises from the fact that business cycles generate, either because of deviations of the marginal product from the wage, or from mismeasurement of total factor productivity, a correlation between the ratio of labor (in efficiency units) to capital and the wage (in efficiency units). A demand-driven boom is typically associated with high measured total factor productivity growth. High measured productivity growth leads to a large increase in \(\tilde{n}\), labor measured in efficiency units, and a large decrease in \(\tilde{w}\), the wage per efficiency unit. To alleviate this problem, I tried using only lagged values of the labor supply shifts, lagged three or more years to alleviate some of the business cycle effects. The pattern of estimated coefficients was typically non-sensical. I have not explored
Table 4. Labor demand. Lags and time effects.

<table>
<thead>
<tr>
<th></th>
<th>Time</th>
<th>$\bar{w}$</th>
<th>$\bar{w}(-1)$</th>
<th>$\bar{w}(-2)$</th>
<th>$\bar{w}(-3 \text{ to } -9)$</th>
<th>Sum Lagged</th>
<th>Time</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>dummies</td>
<td></td>
<td></td>
<td></td>
<td>wages</td>
<td>dummies</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>-0.31</td>
<td>-1.31</td>
<td>-2.27</td>
<td>0.00</td>
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<tr>
<td>OLS</td>
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<td>-0.30</td>
<td>-1.09</td>
<td>-2.47</td>
<td>0.00</td>
</tr>
<tr>
<td>IV</td>
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<td>-0.44</td>
<td>-0.44</td>
<td>-1.40</td>
<td>-2.79</td>
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<td>-1.13</td>
<td>-2.69</td>
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<td></td>
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<td></td>
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<td>IV</td>
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<td>-0.33</td>
<td>-0.60</td>
<td>0.79</td>
<td>-1.51</td>
<td>0.05</td>
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</table>

Continental and Anglo-Saxon countries; starting and ending dates: see Table 1. The number in the next-to-last column gives the probability that lagged wages do not belong in the regression. The number in the last column gives the probability that the time dummies do not belong in the regression. Covariance matrix of estimates Newey-West corrected. IV: labor supply shifts, 0 to 9 lags, used as instruments.
[Table 4. Labor demand, Lags and time effects.]

The regression results yield two conclusions:

There is evidence of long lags in labor demand. While the best lag length varies across specifications, the evidence suggests that up to 9 lags are needed to capture the dynamics of adjustment. If we take the average capital share to be equal to 0.35, the sum of coefficients on current and lagged wages imply a value for the elasticity of substitution a bit lower than 1.0 and thus unable to yield a significant increase in the capital share in response to adverse labor supply shifts.

Even allowing for lags, time dummies remain highly significant in Continental Europe, only marginally so in Anglo-Saxon countries. More information is given in Figure 13 which plots, for each group, the estimated time series of time dummies (using the IV results in each case). For comparison, it also plots the time series of time dummies from a regression allowing only for current wages in the regression (these are the dotted lines). For Anglo-Saxon countries, the shifts are small, with or without allowing for lags in labor demand. For continental Europe, allowing for lags reduces the size of the shifts in the 1970s, but does not otherwise change the general shape of the shifts. There is still a large unexplained adverse shift in labor demand starting in the early 1980s, and increasing to today.

[Figure 13. Estimated time dummies without and without lags, for Continental and for Anglo-Saxon countries, using instrumental variables]

5 Labor demand shifts: technological bias or increase in markups?

The main unanswered question at this point is that of the source of the labor demand shifts: technological bias away from labor, or changes in the division of

that direction further.
rents?

A similar question has been discussed in another context, that of the shift in labor demand for skilled relative to unskilled workers. The prevalent view has been that this shift reflects technological bias away from the unskilled. But some have taken the view that it may reflect institutional change, for example a weakening of unions leading to an increase in wage differentials across workers (see for example Fortin and Lemieux [1997]). The approach there has been to look at cross-country or cross-sectoral evidence, trying to link the shifts to factors that are more likely associated with one or the other explanation. At least for the question at hand here, there would appear to be a more direct approach. Under the hypothesis of technological bias, we should see changes in the production function. Under the hypothesis of markup changes, we should not. This suggests a simple test, and is the approach I follow in this section.

Consider the following example. Suppose we know that the production function is Cobb-Douglas, with exponent \( a \) on capital, and that except for possible changes in \( a \) over time, technological progress is multiplicative:

\[
y = z (cn)^{(1-a)} k^a
\]  

(5.1)

where \( c \) is a constant that depends on the units in which labor is measured. We typically ignore units in writing production functions, as a change in units just leads to a different constant term in the production function. But here, where we want to allow for changes in \( a \), it makes a difference: we do not want a given change in \( a \) in (5.1) to have different effects on \( y \) depending on whether labor is measured in thousands or in millions of workers.

Suppose that the markup set by firms is equal to \( \mu \), and assume away costs of adjustment, so that the wage times the markup is equal to the marginal product of labor. It is straightforward to derive that the capital share will then be equal to \( \alpha \equiv 1 - (1/\mu)(1 - a) \). Assume that, initially, \( \mu = 1 \), so that \( \alpha = a \).
Suppose that we observe an increase in the share of capital, $\alpha$. It can be due to one of two factors (or a combination of the two):

H0: Technological bias, namely an increase in $a$, reflected one for one in an increase in $\alpha$.

H1: An increase in the markup, $\mu$, increasing $\alpha$ given an unchanged value of $a$, call it $\bar{a}$.

Under H0, the production function is given by:

$$y = z(c_n)^{(1-\alpha)} k^\alpha$$

Or taking logs, and rewriting:

$$\log(y/k) = (1 - \alpha) \log(n/k) + (1 - \alpha) \log c + \log z$$

Similarly, under H1, the production function is given by:

$$y = z(c_n)^{(1-\bar{a})} k^{\bar{a}}$$

Or taking logs and rewriting:

$$\log(y/k) = (1 - \bar{a}) \log(n/k) + (1 - \bar{a}) \log c + \log z$$

In essence, under H0, the change in the share should be reflected in a change in the effect of the labor-capital ratio on the output-capital ratio; under H1, it should not.

We can nest these two hypotheses by writing:

$$\log(y/k) = \lambda(1 - \alpha) \log(n/k) + (1 - \lambda)(1 - \bar{a}) \log(n/k)$$
$$+(\lambda(1 - \alpha) + (1 - \lambda)(1 - \bar{a})) \log c + \log z$$
Or, rearranging:

\[
(\log(y/k) - (1 - \bar{a})\log(n/k)) = \lambda((\bar{a} - \alpha)\log(n/k)) + (1 - \lambda\alpha - (1 - \lambda)\bar{a})\log c + \log z
\]  

(5.2)

A value of \( \lambda = 0 \) implies that the change in the share is due to markup changes. A value of \( \lambda = 1 \) implies that the change in the share is due to biased technological progress.

Estimating equation (5.2) requires a specification of \( z \), the technological level. I assume that \( \log z_{it} \) (for country \( i \) at time \( t \)) is equal to a country specific quadratic trend \( f_i(t) \) plus a stationary component, \( \epsilon_{it} \).

If we assume that \( \bar{a} \), the underlying constant value of \( a \) under \( H_1 \) is equal to the mean value of the share in the sample, we can construct the time series for the dependent variable, \( X1 \equiv (\log(y/k) - (1 - \bar{a})\log(n/k)) \), and for the first right-hand side variable, \( X2 \equiv ((\bar{a} - \alpha)\log(n/k)) \), and run the following panel regression:

\[
X1_{it} = \lambda X2_{it} + x_i + \beta_i \alpha_{it} + f_i(t) + \epsilon_{it}
\]

Table 5 presents the results of estimation. All 14 countries are pooled together, as it is not clear why we should treat the two groups separately here.\(^{31}\)

The first line gives the estimated value of \( \lambda \), using OLS, as well as the test of the constraint that, when allowed to differ, the \( \lambda_i \)'s are the same across countries. The next two lines report the results of instrumental variable estimation. The

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30. Expressing everything in efficiency units to eliminate \( z \) from the regression as we have done before cannot be done here, because the weights we must use to construct \( z \) depend on whether \( H_0 \) or \( H_1 \) holds.

31. The results are very similar if only the Continental countries are used. Because their shares do not vary very much, the test has little power for Anglo-Saxon countries.
Table 5. Technological bias versus markup. Regression results.

<table>
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<td>1.47</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(0.35)</td>
<td></td>
</tr>
<tr>
<td>IV2</td>
<td>0.69</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td>(0.39)</td>
<td></td>
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</tbody>
</table>

All 14 countries. Each regression also allows for country effects, the country's time varying capital share, and a country specific quadratic trend. IV1: current and lagged values of labor supply shifts. IV2: current and lagged values of the user cost. The value in the second column is the probability that all country specific $\lambda_i$, when allowed to differ across countries, are equal.
first line uses current and lagged labor supply shifts. The second line uses current and lagged shifts in user cost: to the extent that this component is dominated by movements in the world interest rate, it is a good candidate instrument here.

[Table 5. Technological bias versus markup. Regression results.]

Point estimates of $\lambda$ are closer to one than to zero, and significantly so. This points to technological bias (which corresponds to a value of $\lambda$ of one) rather than to markups. Allowing for country specific values of $\lambda$ however yields a large range of estimated values, from -2.5 to 4.0. These have large standard deviations: equality of all $\lambda$'s is rejected only at the 3% level in the OLS case, and not rejected at all in the second IV case.

Because of the large variation of coefficients across countries—even if not always significant—I am uneasy about the results in Table 5. One reason for the variation may be that the assumptions underlying this approach (Cobb Douglas production function, no costs of adjustment, so that the share is the right measure of the effect of capital on output under H0) are overly strong. I suspect however that aggregate data may be unable to speak precisely. In effect we are asking whether, given total factor productivity, in those countries in which the capital share has increased, an increase in the labor-capital ratio has a larger effect on the output-capital ratio. But we know little about the exact process for factor productivity, nor are they large changes in the labor-capital ratio which would allow us to get sharp estimates. Thus, further progress will probably have to come from looking at the cross-sectoral evidence.

6 Conclusions

Let me briefly restate the main conclusions of the paper.

Starting in the 1970s, most Continental European countries were affected by large
adverse labor supply shifts. The initial effect of these shifts was to decrease profit rates and capital shares. Over time, the reaction of firms was to move away from labor, leading to a steady increase in unemployment and a recovery of capital shares.

In most Continental European countries, labor supply shifts have now abated and, in some countries, vanished altogether. But, since the early 1980s, they have been replaced by adverse labor demand shifts. These shifts explain why unemployment has remained high, and also explain the further rise in capital shares.

In contrast, Anglo-Saxon countries have been largely shielded from both the adverse labor supply shifts of the 1970s, and the later labor demand shifts. This accounts for their different evolutions, both in terms of unemployment and in terms of capital shares.

These findings yield a mixed message for the future course of unemployment in Continental European countries. On the one hand, they indicate that labor moderation—defined as the disappearance of the adverse labor supply shifts—may no longer be sufficient to insure a quick return to low unemployment. On the other hand, in the long run, there are reasons to expect the adverse effects of labor demand shifts on unemployment to disappear over time: the decrease in the labor-capital ratio should eventually be offset by entry of new firms and an increase in capital. Thus, assuming no further adverse labor demand shifts (something more likely to hold if these shifts come from changes in the division of rents than from technological bias), the results of this paper imply a slow decline in unemployment in the future.

Even if the story of this paper is broadly right, many questions need to be examined before forecasts or policy advice can be given with much confidence. Among them: 32

32. Readers of an early version of this paper (Blanchard [1996]) may note the absence of a theme
The relation of labor supply and labor demand shifts to underlying observable variables.

Identifying the source of the adverse labor supply shifts may be the easiest part as it builds on a very large body of research. There is a general consensus that the source of these shifts is to be found in both a combination of economic events — the increase in oil prices, the slowdown in total factor productivity growth —, and induced changes in labor market institutions — the more generous treatment of unemployment, the increase in employment protection, minimum wage legislation, and so on.

One of the puzzles faced by previous research has been how to reconcile the fact that unemployment has remained high while oil price hikes have been more than reversed, workers must by now have adapted to slower underlying productivity growth, unions appear to have become weaker not stronger, governments have started tightening social insurance programs, and so on. My findings that labor supply shifts have indeed largely decreased, and that the persistence of high unemployment comes from labor demand shifts since the mid 1980s offers a resolution to that puzzle.

Much of the econometric research on the increase in unemployment has taken the form of estimation across countries and time of a reduced-form equation for the

I had developed there, namely the relation between inflation and markups. Initial work showed a strong time-series relation between the increase of the measured markup and the decrease in inflation. Now that I have adjusted the construction of markups to take into account lags of adjustment of factor proportions, the relation is still there but is weaker. And, once time effects are allowed in panel regressions of factor prices on factor quantities, domestic inflation for each country is only marginally significant. Thus, given the difficulty of giving a satisfactory explanation for the relation in the first place, I have left it aside in this paper.
unemployment rate as a function of a number of observable variables. This paper suggests a potentially more productive approach, that of identifying separately supply and demand shifts, and then trying to explain each of them separately.

Identifying the source of the more recent labor demand shifts may be more difficult. I see the attempt to distinguish between shifts in the division of rents and biased technological adoption in the last section of this paper as inconclusive. The next step is, I believe, to look at cross-sectoral evidence. I have started doing so for France. While I have found the shifts to be present in most sectors, I have not yet made progress in relating relative shifts to potential underlying factors, such as the initial level of rents, the estimated initial degree of labor hoarding, the initial structure of bargaining and so on.

There may also be something to be learned from the cross-country evidence. The cross-country correlation in Table 3 between the labor supply shifts from 1970 to 1981 and the labor demand shifts since 1981 is 0.40: countries which had larger adverse labor supply shifts in the 1970s have typically also suffered larger adverse demand shifts since. It is tempting to see this relation as causal. Firms in countries where labor supply shifts were stronger may have decided to adopt technologies that used less labor and more capital. The lags in introducing such technologies may be even longer than those involved in changing factor proportions within the set of existing technologies.

This correlation between labor supply shifts and labor demand shifts also suggests a tentative explanation for the difference between Anglo-Saxon and Continental countries. The productivity growth slowdown was smaller in Anglo-Saxon countries, the induced adjustment of labor market institutions more limited. Building

33. See for example Jackman et al. [1996].
34. A number of recent papers tell stories of endogenous bias in technology adoption along broadly similar lines. See for example Zeira [1997], and Acemoglu [1997].
on the previous paragraph, smaller adverse labor supply shifts from 1970 to 1981 may then explain why adverse labor demand shifts have also been more limited since 1981.

(2) The relation of the shifts between labor and capital documented in this paper, and the shifts between skilled and unskilled labor documented in recent research in labor economics.

It is an intriguing fact that relative demand shifts between skilled and unskilled workers appear to have been particularly strong in Anglo-Saxon countries, and that relative demand shifts between labor and capital appear to have been particularly strong in Continental Europe. One wonders whether there may be an integrated explanation, whether what has happened in Anglo-Saxon countries has been a shift from unskilled to skilled labor, whereas Continental Europe has seen instead a shift from unskilled workers to capital.

Based on a preliminary look at numbers, it does not appear however that the increase in the capital share in Continental Europe since the early 1980s has come primarily at the expense of unskilled labor. The data constructed by Laffargue and Saint-Martin [1997] for France for example imply that the decrease in the labor share from 68% in 1982 to 58% 1990 has come from a reduction in the share of unskilled workers (defined as blue collar workers plus unskilled employees) from 10% to 7%, but also from a reduction of the share of skilled workers from 58% to 51%.\textsuperscript{35} In general, I see the data from France and other countries as suggesting two largely unrelated evolutions, a general and steady shift away from unskilled labor everywhere, and, in Continental Europe, a shift away from labor as a whole since the early 1980s. A next step will be to extend the exercise of this paper to three factors of production, skilled workers, unskilled workers, and capital.

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