Employment Strategy Papers

Employment, productivity and output growth

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Preface

This paper was prepared as background research for the *World Employment Report 2004-05*, *Employment, Productivity and Poverty Reduction*. The topic of this year's *Report* was chosen based on the observation that it is not simply the lack of employment that leads to poverty, but rather the lack of *decent and productive* employment. In many parts of the developing world the poor are in fact employed, but employed in such poorly paid conditions that they and their families live on less than US$1 a day per person. Thus, unemployment is only the 'tip' of the iceberg of the decent work deficit. The *Report* concludes that not only do we need more jobs, but more *productive jobs* – jobs that allow workers to lifts themselves and their families out of the vicious cycle of poverty.

The background papers commissioned for this *Report* provide an overview of the important aspects involved in the links between employment, productivity and poverty reduction in both developing and developed economies. The papers were commissioned from experts in the field as well as various departments within the ILO and discuss different avenues through which poverty can be reduced, as well as the trade-offs that must be made in order to strike the right balance between productivity, employment and income growth. The research involves macroeconomic, sectoral and case study analysis that has helped form the basis of the chapters in the *Report*.

Based on the research from these background papers the *Report* concludes that increasing the opportunity for decent and productive work is an important channel towards achieving a fairer globalization, and is vital for poverty reduction.

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Contents

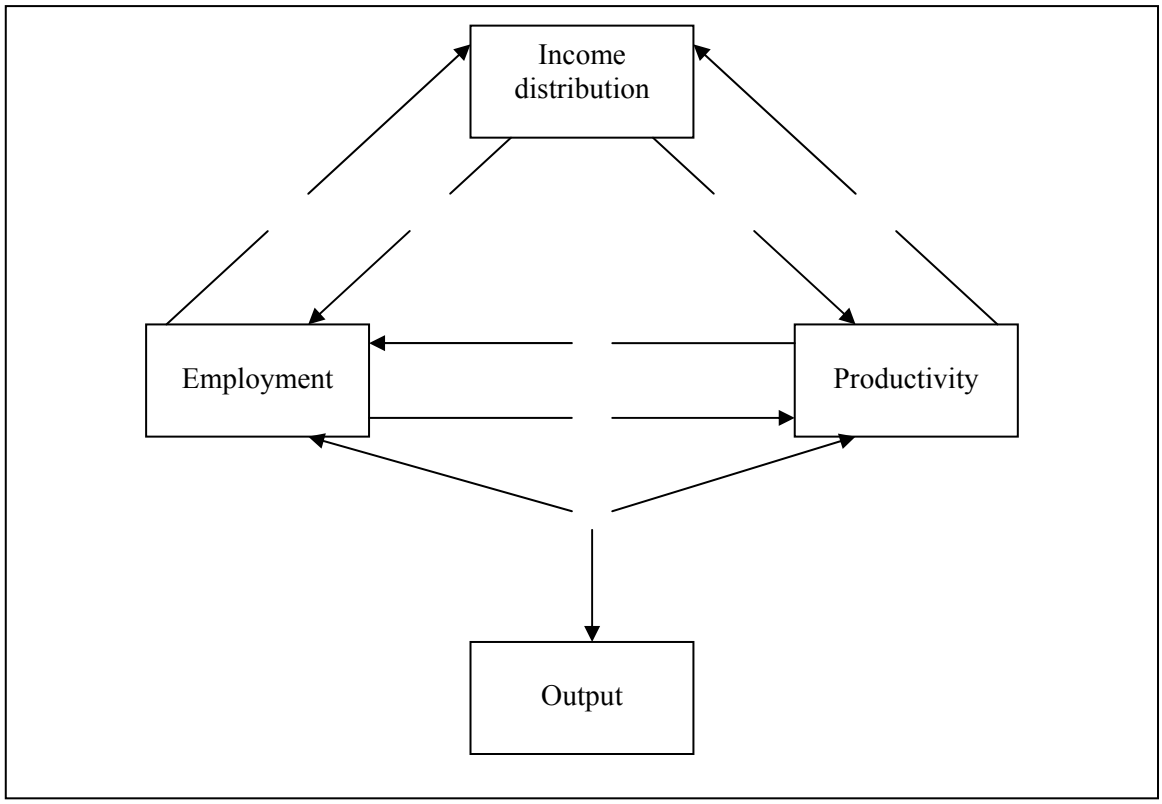
1. Introduction

This paper clarifies the links between employment, productivity and output growth and traces the changing nature of these links over different time frames. It raises issues central to the overarching theme of poverty reduction and productivity in the *World Employment Report 2004* published by the International Labour Organization.

According to Paul Krugman (1990) the three most significant elements for the economy overall are productivity, income distribution and unemployment. "If these things are satisfactory, not much else can go wrong; if they are not, nothing can go right"[1] – a statement which captures the principles of poverty reduction almost by definition. At first glance, the message for policy-makers seems straightforward. To overcome widespread poverty, you need to maintain full employment, foster productivity growth and eliminate the outer left-hand tail of income distribution. If it were only that simple!

This message can also read: in countries where poverty persists, policy-makers have failed to take effective measures against unemployment, low productivity and income inequality (or else are unsure of the right measures to take). This calls for macroeconomic theory and empirical evidence to identify the main determinants of employment, productivity and income distribution and their possible interconnection. Some of the links between these three concepts have attracted attention in the literature as well as in public policy debates. Figure 1.1 depicts the seven channels of mutual influence described below:

Figure 1.1
Income distribution, employment, productivity and output are closely linked: Seven channels of mutual influence



[1] Krugman (1990), p. 7.

Seven channels of mutual influence between income distribution, employment, productivity and output:

(1) The distributional importance of the employment situation stems from a simple fact: nothing breeds poverty as much as unemployment does. If at the same time unemployment is highly concentrated among the least skilled workers (as it is in most industrialized economies), the expansion of employment may necessitate creating a large number of low-wage jobs and thereby adding to the inequality of earnings.

(2) In turn, any attempt to override market forces on labour markets for the sake of correcting the primary income distribution can have far-reaching repercussions on the volume and structure of employment. This is illustrated most clearly in economies where labour market outcomes are strongly shaped by collective wage bargaining arrangements and where the institutional framework gives special interests ample leeway in the pursuit of their distributional concerns. Wage policies have traditionally been used to influence both the aggregate labour share and the structure of earnings across occupations and skill groups.

(3) A large literature has investigated the role of income distribution in facilitating or hindering sustained productivity growth. Among relevant considerations are the effect of income distribution on social stability and the ability of the legal framework to safeguard the property rights of individuals and companies who invest in physical and human capital as well as in new ideas.

(4) As a consequence, the growth path of aggregate productivity is likely to affect the distribution of income. A prominent example of how that relationship might look is the much discussed Kuznets' curve hypothesis.[2]

(5) How does productivity affect employment? This question has concerned academic economists and ordinary citizens for centuries. No one can deny that rapid and sustained productivity growth has lifted advanced industrialized nations to their present-day standards of living and, by any historical standards, has allowed them to eradicate mass poverty. The technological innovations and capital-intensive investments that were the mainsprings of this productivity growth are now feared as instigators of mass job destruction, for which they have often and rightly been held responsible. As this paper will show, it is not possible to detect an effect of productivity growth on aggregate employment in long-term time-series data. But economic growth continues to go hand in hand with structural change, which entails a fair amount of "creative destruction" in Schumpeter's celebrated phrase.[3] Old jobs are lost in declining industries and new jobs are created in the expanding sectors of the economy. The non-negligible costs of this structural adjustment strengthen the clout of the political forces resisting such change.

(6) Considerable ambiguity surrounds the implications of employment dynamics for productivity growth. Among the contentious issues is how to interpret the American-European employment and productivity differential over the past few decades. In the United States, the economy has successfully integrated large numbers of labour market entrants into the ranks of employed workers while at the same time turning in a dismal productivity performance. In stark contrast, the core of the European Union (the "Big Three" of France, Germany and Italy) has suffered from rising unemployment in the face of only moderate labour force growth but, at the same time,

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[2] Simon Kuznets, "Economic growth and income inequality", in *American Economic Review*, Vol. 45, 1955, pp.1-28.

[3] Joseph Schumpeter, 1883-1950.

has clearly outperformed the United States in terms of productivity growth. This has raised the question of a possible trade-off between unemployment and productivity growth (Gordon 1997). Is low productivity growth the price the United States had to pay for its "employment miracle"? In view of the interconnection between the productivity of labour and the level of real wages, such a trade-off would also imply a conflict between employment growth and real wage growth.

On the other hand, no such conflict is suggested by the strong positive correlation of employment and labour productivity over the business cycle. Two factors cast doubt on the premise of conflict between a high pace of job creation and rapid productivity growth – first, the observation that the rise of European unemployment coincided exactly with a sharp slowdown of productivity growth in the 1970s and, second, the more recent observation that a substantial acceleration of productivity growth in the United States (often associated with the "new economy") coincided with record low unemployment.

(7) No such ambiguity is involved in the simple logic that links employment and productivity with the aggregate output of an economy. It always remains true that aggregate employment is the ratio of aggregate output and the average productivity of labour – because that is how the average productivity of labour is defined. Other productivity concepts (such as the productivity of capital or total factor productivity) cannot be as easily related to employment but are also important for the theoretical or empirical analysis of economic growth. However, it is fair to say that labour productivity, defined as output per person or output per hour, is the concept politicians or the media usually have in mind when dealing broadly with this issue.

Because it always remains true, the "fundamental identity" which relates employment to output and labour productivity is the starting point for a spate of popular thinking on the determination of employment. Much of this thinking is grossly misleading since it tends to ignore that one can never extract a theory out of an identity without imposing some reasonable causal structure and some potentially falsifiable assumptions. Nevertheless, the "fundamental identity" can serve a useful purpose by organizing our examination of the various forces that govern observed patterns of employment, productivity and output growth.

This paper focuses on the nature of the mutual interdependence of employment, productivity and output as summarized in the links *(5)*, *(6)* and *(7)* above. However, these links cannot be fully understood if their interaction with income distribution is ignored (as becomes clear in the course of this paper). The relevant distributional issues that emerge will also be evaluated.

As point (*7)* mentions, the "fundamental identity" linking employment, output and labour productivity is a convenient point of departure for a systematic discussion of several popular constructs relating to the determination of employment and unemployment. For example, the concept of a "socially necessary" rate of growth derives directly from the "fundamental identity". So too does the widely held assumption that rapid productivity growth destroys jobs and thereby reduces the scope for employment growth. This paper critically reviews these and related hypotheses in the first part of Part 2 and concludes from this review that any reasonable statement about causation requires a sound analytical framework to explain productivity growth and unemployment. Part 2 outlines this framework. It also argues that it is useful to distinguish between an analysis of the forces shaping long-term equilibrium paths of output, employment and productivity on the one hand and the forces causing temporary deviations from these equilibrium paths on the other hand. However, as we will see, the need for this distinction is not universally accepted by macroeconomists. Even for those who accept its usefulness, it is sometimes difficult to

separate long-term equilibrium trends from short-term disequilibrium phenomena. For this reason, Part 3 considers three different time frames: the short, medium and long term.

In addition, Part 3 deliberates the cyclical behaviour of employment and productivity. As is well known, both of these macroeconomic variables are strongly and robustly pro-cyclical. Closely connected to this observation is Okun's law which relates output growth to changes in the unemployment rate. This paper cites some quantitative evidence on these regularities and observes considerable variations – both across time and across countries.[4] Robust as some of the facts may be, their theoretical interpretation remains highly controversial in business-cycle theory. Here again, the issue is causation. Proponents of the Real Business Cycle theory hold that fluctuations in both productivity and employment are driven mainly by technological shocks. The central pillar of Keynesian theory is that cyclical output movements are due to changes in aggregate demand, and that the pro-cyclical behaviour of employment and productivity is explained by a sluggish and incomplete adjustment of labour demand to such demand-side disturbances. Which of these interpretations is correct is important for determining the right policy responses to the business cycle. A case in point is the present macroeconomic malaise in Japan where output, employment and productivity are all dramatically depressed compared with the reigning trends of a decade ago (Prescott 2002; Hayashi and Prescott 2002).

Part 3 also appraises the behaviour of employment and productivity as they unfold beyond the business cycle. Here the crucial link is the interaction of productivity growth with the process of wage formation. Wages are an important determinant of employment in the short term as well but, at least according to Keynesian reasoning, it is the relation of nominal wages to nominal aggregate expenditure – rather than to productivity – that matters for real effective demand and hence for the short-term determination of employment (Landmann 2001). In contrast, medium-term labour market equilibrium strongly depends on the relation of real wage aspirations to aggregate labour productivity. Whenever real wage claims get out of line with the underlying productivity trend, or when productivity growth is subject to sustained changes that are not fully being taken into account by wage setters, this will be reflected in the level of equilibrium unemployment. The recent history of the major OECD economies contains a number of episodes that illustrate the usefulness of thinking along these lines. This paper makes repeated reference to the much-debated differences in the employment and productivity performances of the European Union and the United States.

Taking an even longer view, the final part of Part 3 explores the interaction of productivity growth and unemployment along an equilibrium growth path. The long-term concept of an equilibrium growth path takes into account the endogenous response of capital formation to the evolution of both employment and productivity. Moreover, modern developments in the theory of endogenous growth open a number of avenues along which links between productivity growth and unemployment can be investigated (Calmfors/Holmlund 2000). Some of the models contain explicit accounts of the process of creative destruction which can be easily combined with flow models of the labour market. Other theories focus on the skill bias of technological change which has repercussions on employment if wage differentials (skill premiums) are rigid. Yet another approach emphasizes the role of employment for human capital accumulation and hence productivity growth. Finally, labour and product market regulations that restrict the entry of new firms and the reallocation of jobs towards rapidly growing high-tech sectors may well act as a drag – not just on employment but also on productivity growth (Scarpetta et al. 2002).

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[4] For a more detailed discussion of Okun's law, the reader is referred to the companion paper by Pollak (2002).

Part 4 summarizes the findings and draws some relevant conclusions.

2. How productivity and employment are linked: Some facts and a theoretical framework

2.1 The "fundamental identity": Its uses and misuses

It is not feasible to think of employment, productivity and aggregate output as independently determined variables. If productivity is measured as output per person or output per hour worked, i.e. as the productivity of labour input, the three variables are linked, as a matter of pure arithmetic, by the so-called "fundamental identity":

output = employment × productivity,

which, for small rates of change, can approximately be translated into

output growth ≃ employment growth + productivity growth.

This means, for example, that any given rate of output growth can be achieved either with high productivity growth and low employment growth, in which case the employment intensity of economic growth is said to be low or, conversely, with low productivity growth and high employment growth (a high employment intensity).
There is always a temptation of jumping from such precepts to statements about cause and effect. The following explanation of Germany's unsatisfactory employment growth exemplifies this type of reasoning:

> Economic growth in Germany has a low employment intensity. Because average labour productivity has risen relatively fast, employment has not shown the desired increase, despite economic growth.[5]

This infers that employment would have shown the desired increase, if only labour productivity had risen relatively less rapidly, a conclusion that is only true if the rate of output growth can be taken either as somehow given or at least as sufficiently independent of productivity growth.

A similar tacit assumption underlies much hypothesizing about the alleged "end of work" – for example, Rifkin (1994), in which the rapid productivity advances achieved in the course of economic and high-tech development is leading to an inevitable decline in jobs. Another example is a work entitled *Die Globalisierungsfalle,* which projects the dire scenario of a "20:80 society":

> … 20 per cent of the working-age population would suffice in the upcoming century to keep the world economy going... One fifth of all job-seekers would

[5] CESifo Forum, Editorial, Summer 2000, p. 46 (CESifo is the international platform of Munich University's Center for Economic Studies and the Ifo Institute for Economic Research).

> suffice to produce all the goods and high-value services that the global society will be able to afford."[6]

Again, the loss of jobs is predicated on some exogenous limitation of the rate of output growth, in this case by what people "can afford". However, it is not clear that the assumption of a predetermined path of output growth can be reasonably justified. This vision of a "20:80 society" immediately provokes an intrinsic question: Shouldn't a society that becomes ever more productive also become wealthier – and thus able to afford what it produces? This question was first raised (and answered affirmatively) by the nineteenth-century French economist Jean-Baptiste Say, who thereby entered the world's textbooks of economic principles as the father of Say's law. Every version of the "end-of-work" story ignores Say's law by assuming (in one way or another) that there is a fixed amount of work to be done and that, therefore, increased productivity means less jobs. In the labour market literature this is referred to as the "lump of labour" fallacy.

A possible source of confusion may also be the so-called "fallacy of composition", an illicit generalization of partial-equilibrium insights which ignores the general-equilibrium properties of the system as a whole. Nothing is wrong with the prediction of falling employment in a particular sector if that sector experiences rapid productivity growth and faces stagnant demand at the same time. This is the real story behind the falling employment share of agriculture which has characterized the development of industrialized economies for over a century. While this loss of jobs in agriculture did not translate into unemployment, it paved the way for an offsetting expansion of employment in the rest of the economy. More generally, the enormous productivity advances of industrialized nations since the industrial revolution have differed among sectors and thus contributed to structural change, but they have certainly not produced anything faintly resembling a systematic destruction of employment opportunities.[7] On the contrary, the growth of jobs has kept in pace with an unprecedented expansion of the labour force. Individuals have made rational use of their increased productivity partly by increasing their consumption levels and partly by enjoying more leisure.[8]

Another application of the "fundamental identity" takes productivity as a given. This concept of a "socially necessary rate of growth" considers the growth rate of productivity as exogenous (perhaps as determined by technological progress). In this scenario, in order to generate the desired volume of employment, output must grow to the "socially necessary rate of growth". But how can the "necessary" growth rate be engineered – and would the rate of productivity growth remain unaffected by the policy moves entailed? That said, in some carefully defined settings this concept makes sense. Indeed, the "employment threshold" of economic growth is a closely related notion that is discussed in more detail below.

The main message so far is that the "fundamental identity" (much as it is often made to appear otherwise) does not convey any information about cause and effect among the three variables involved. Only when a reasonable hypothesis on the behaviour of at least one of these variables is introduced, can the "identity" be used to deduce non-empty implications of the hypothesis for the other two variables.

The "identity" is most useful for an analysis of the link between the productivity of labour and the material well-being of the population. Since labour productivity can be defined as output per person, the two concepts are often used almost synonymously. However, the most common indicator of material well-being, per capita income, is defined as the ratio of

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6 Martin/Schumann (1996), p. 12 (translation by the author of the present paper).

7 For a succinct discussion of this point, see Krugman (1999), pp. 18-23.

8 For an effective and readable refutation of the "end-of-work" view of the world, see Rojas (1999).

national income to the total population that must be supported by that income. Of course, output per head of the population depends not only on the productivity of labour, but also on the volume of labour devoted to the production process – or as van Ark and McGuckin (1999) aptly put it:

> Productivity is only one of the factors determining living standards. Living standards also depend on 'how many mouths need to be fed' from what is produced.[9]

The point can easily be seen and quantified if the "fundamental identity" above is augmented so as to express output in relation to the number of "mouths to be fed" and to make explicit the determinants of the volume of employment:

$$\underbrace{\frac{\textit{Gross Domestic Product}\,(GDP)}{\textit{Total population}}}_{(6)} = \underbrace{\frac{GDP}{\textit{Hours worked}}}_{(1)} \cdot \underbrace{\frac{\textit{Hours worked}}{\textit{Persons employed}}}_{(2)} \cdot \underbrace{\frac{\textit{Persons employed}}{\textit{Labour force}}}_{(3)} \cdot \underbrace{\frac{\textit{Labour force}}{\textit{Working-age population}}}_{(4)} \cdot \underbrace{\frac{\textit{Working-age population}}{\textit{Total population}}}_{(5)}$$

$$\textit{Per capita income} = \left(\textit{Labour productivity}\right) \cdot \left(\textit{Working hours}\right) \cdot \left(\textit{Employment rate}\right) \cdot \left(\textit{Participation rate}\right) \cdot \left(\textit{Age structure}\right)$$

In this relationship, labour productivity is defined as GDP per hour worked so that employment is measured by total hours worked expressed as the product of the four factors numbered (2) to (5). Of these factors, the (relative) size of the working-age population is determined by demographics. The other three, however, reflect the economic and sociological forces shaping participation decisions, working habits and employment status. As van Ark and McGuckin (1999) demonstrate in an illuminating empirical study, the utilization of the potential labour force varies substantially across countries and this variation makes a large difference for per capita incomes. Their results are summarized for 22 OECD member countries in Table 2.1. All figures refer to 1997 and are expressed as a percentage of the OECD average. Purchasing-power-adjusted exchange rates are used for the international comparison of productivity and income levels. Countries are ranked by the algebraic difference between their relative productivity position and their relative per capita income position.[10]

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[9] van Ark/McGuckin (1999), p. 39.

[10] While the data in Table 2.1 are from van Ark/McGuckin (1999), the table reproduced here is from a write-up on the van Ark/McGuckin study in the CESifo Forum, Summer 2000, p. 47.

Table 2.1

A quantification of the augmented "fundamental identity" for 22 OECD countries: Components of per capita income in an international comparison, 1997 (% of the OECD average)

Country	GDP per hour worked (1)	Effect of annual working hours (2)	Effect of employment rate (3)	Effect of participation rate (4)	Effect of age structure (5)	Per capita income[a] (6)
Belgium	128	-5	-3	-19	-1	101
France	123	-9	-6	-9	-2	97
Netherlands	121	-26	2	-4	2	96
Greece	75	-4	-2	-11	1	58
Italy	106	-11	-5	-1	2	91
Spain	84	13	-14	-13	2	71
Ireland	108	5	-4	-12	-3	95
Germany[b]	105	-5	-3	-4	2	96
United	100	-9	0	3	-2	92
Kingdom	36	2	0	-8	-1	29
Turkey						
Finland	93	0	-7	2	0	88
Sweden	93	-3	-3	6	-4	88
Norway	126	-17	4	12	-4	122
Austria	102	-4	3	-2	1	100
Australia	96	0	-1	2	0	97
Canada	97	2	-2	2	2	100
Portugal	56	2	0	1	1	60
United States	120	-1	3	9	-2	128
New Zealand	69	8	1	3	-1	79
Denmark	92	0	1	9	1	103
Switzerland	94	0	3	12	1	111
Japan	82	10	4	6	4	106
OECD[c]	100	0	0	0	0	100

Note: a) Total of columns (1) to (5). b) Including former East Germany. c) All listed countries.
Source: US Department of Labor, Monthly Labor Review, July 1999, p. 36

For example, Belgium (at the top end of Table 2.1) has the highest labour productivity of all countries considered but its per capita income is barely above the OECD average. Why? Because Belgians work less than average hours, suffer from more than average unemployment and, most importantly, have the lowest participation rate in the sample. This last-mentioned factor clearly reflects the widespread practice of early retirement. Whereas the participation rate of Belgian "prime-age" males (aged 25-54) is well above 85 per cent and thus in the same range as other countries, only 35 per cent of older male workers (55-64 years) belong to the labour force compared with an average of 48 per cent in the European Union, 66 per cent in the United States and around 79 per cent in Japan and Switzerland.[11] At

[11] The latter figures refer to the year 1999 and are taken from Jackman (2001), Tables 2 and 3. The

the bottom end of Table 2.1, Japan trails Belgium with respect to productivity by more than one-third but nevertheless has a higher per capita output – because the Japanese, by every measure of labour utilization, work much harder.

That said, the augmented identity linking columns (1)-(6) in Table 2.1 can no better serve as a basis for causal inferences than the simpler identity from which we started. (After all, it is still an identity.) And, while the latter is often misused to support cause-and-effect claims, the augmented identity evidently offers even more opportunities to do so. For those willing to accept that the total number of hours worked by a given working-age population is limited by the productivity with which workers produce a given GDP, it is a small step to the conclusion that the employment rate of an economy can be raised by either lowering working hours (which would spread the work among a larger number of workers), or by lowering the participation rate (which would reduce the number of workers competing for jobs). Both routes have been tried in practice. Working hours can be reduced either by shortening the workweek or by promoting part-time work. One way of reducing the participation rate is by offering generous early retirement schemes.

The "mathematics" of such policies appear unassailable: Any given number of hours worked per working-age population – i.e. any given product (2)·(3)·(4) in the augmented identity – requires the employment rate (3) to rise in proportion if either working hours (2) or the participation rate (4) are reduced. What is assailable, however, is the "lump of labour" assumption that the number of hours worked would remain unchanged in such a scenario. To the extent that this assumption is false, any policy aiming at a better balance of supply and demand by reducing the effective volume of labour supplied will fail.

The data in Table 2.1 do not permit a serious empirical judgment on any of the above propositions. They also do not warrant firm conclusions on the effectiveness of "employment policies" directed towards the total volume of labour supplied. However, they do permit a telling observation on the claim that rising productivity eats up jobs. If this were so, then countries with above-average unemployment would also show above-average productivity and *vice versa*. No such correlation is found in the data of Table 2.1 when a formal regression is run for these 22 countries.

Not surprisingly, however, a very robust correlation exists between the productivity variable in column (1) and per capita income in column (6). For every percentage point by which the labour productivity of a country rises in relation to the OECD average, the relative income per head of that country is augmented by .78 percentage points. Higher productivity thus translates into higher income and output, although not in a one-for-one relationship. Applying the "fundamental identity", we can likewise observe that every additional percentage point of relative labour productivity chips some .22 percentage points off relative total annual hours worked per head of the population. Since the employment rate does not vary systematically with the level of productivity, the inverse response of total labour input appears to reflect a labour supply response. This is exactly the pattern of behaviour one would expect from rational households: as the return to labour rises, households enjoy their growing prosperity partly in the form of higher income and partly in the form of more leisure (the well-known income effect of the theory of labour supply).

If it were correct that the employment situation can be enhanced by cutting working hours (job-sharing, shorter workweek) or by lowering participation (early retirement schemes), one could expect to find working hours and labour market participation inversely related to the employment rate. Again, no such relationship can be detected in the data of Table 2.1. On the contrary, the correlation between employment and participation rates is

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participation rate of Belgian women aged 55-64 are way below the OECD average as well.

strongly positive. All of the countries with less than average employment rates in the upper part of Table 2.1 also have less than average participation rates; all five countries in the lower part of the table have above-average employment and participation rates. The positive correlation is statistically robust. On the other hand, there is no significant correlation between working hours and the employment rate. High unemployment can accompany above-average working hours (Spain, for example) or below-average working hours (France and Germany).

It is worth emphasizing that no firm causal inferences can be drawn even where correlations between indicators do exist. The simple bivariate covariations considered here do not control for third factors that might be at work in addition to any direct channels of causation linking the variables. However, the observation that employment rates and participation rates typically deviate in the same direction from their respective means in this sample of 22 OECD countries clearly fails to support the proposition that a reduction of labour supply facilitates the realization of high employment rates. Rather, the positive correlation of employment and participation suggests a world in which unemployed workers, discouraged by their unsuccessful efforts to find a job, leave the labour force. [12] Or else a world in which societies are defensively responding to high unemployment by actively shrinking the labour force – for example, by offering generous terms for early retirement. Such measures do not solve the underemployment problem but they do help keep the unemployed out of the unemployment statistics. In all likelihood, such cosmetic approaches exacerbate the unemployment problem by weakening the corrective forces inherent in the economy and by softening the political pressure to act on underemployment.

2.2 Employment growth versus productivity growth: An "Atlantic divide"?

As argued above, the long-held assumption that excessive productivity growth limits the scope for job creation and employment growth cannot be based on the "fundamental identity". This does not mean that this assumption has been laid to rest or, for that matter, that it is wrong. Nothing has done more to keep the notion of a trade-off between employment and productivity alive than the comparative evolution of these two key variables in the European Union and the United States since 1970.[13] Table 2.2 decomposes the growth of aggregate output, in accordance with the "fundamental identity", into the contribution of employment growth and the contribution of labour productivity growth in these two economic regions.

From 1970 to 1990, the rate of annual output growth was similar in the European Union (2.8 per cent) and the United States (3.2 per cent). However, whereas Europeans relied almost exclusively on productivity growth to increase their output, American output growth in the same period was much more labour-intensive, with employment growth contributing two-thirds of output growth. Not surprisingly, Europe achieved much higher productivity growth than the United States in 1970-90 but trailed the United States badly in terms of job creation. Paradoxically, Europe was much less successful at providing a slowly growing labour force with jobs than the United States was at integrating a much more rapidly expanding labour force into the labour market. As the Introduction stated, this observation was widely regarded as corroboration that any given output growth can be generated either with a high or low

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12 The labour market literature refers to this phenomenon as the "discouraged worker effect".

13 The European-US employment and productivity differential has generated a large literature. A particularly perceptive analysis is given by Gordon (1997). Various issues of the *World Economic Outlook* by the International Monetary Fund (1995, 1999) have also addressed this topic.

employment intensity; that it is a matter of choice which of the two models is followed and that, by implication, Europe and the United States opted for different models.

Table 2.2
Employment and productivity in the United States and the European Union, 1970 - 2000

Economic region	1970 - 1990	1990 - 2000
United States		
Employment	2.1	1.3
Productivity	1.1	1.9
Output	3.2	3.2
Europe (EU 11)		
Employment	0.4	0.6 [1)]
Productivity	2.4	1.5 [1)]
Output	2.8	2.1 [1)]

Note: Annual growth rates (in %); [1)] 1991 – 2000.
Source: OECD, various years

In view of the importance of the unemployment rate in the preference system of economic policy, there can be little doubt about which model is preferable, given that the United States engineered an "employment miracle" while Europe, at the same time, was experiencing an ever-deeper unemployment crisis. Here, the wisdom of the US model may be questioned on the grounds that a much higher work effort was required for roughly the same output increase. As early as 1987, Richard Freeman remarked critically:

> Despite the fact that employment/population rates and annual hours per employee increased in the United States relative to OECD-Europe, *per capita GDP grew at the same 1.3 percent rate*. From this perspective, Americans worked harder for the same gain in living standards as Europeans... In sum, the United States paid more for its improved employment and unemployment position relative to OECD-Europe than is recognized by those who peddle flexible decentralized labor markets, US-style, as the 1980's Economic Cure-All.[14]

However, the crucial questions here are: Can the contrasting productivity-employment combinations of Europe and the United States be regarded merely as a matter of choosing

[14] Freeman (1988), p. 289-90 (emphasis as in original).

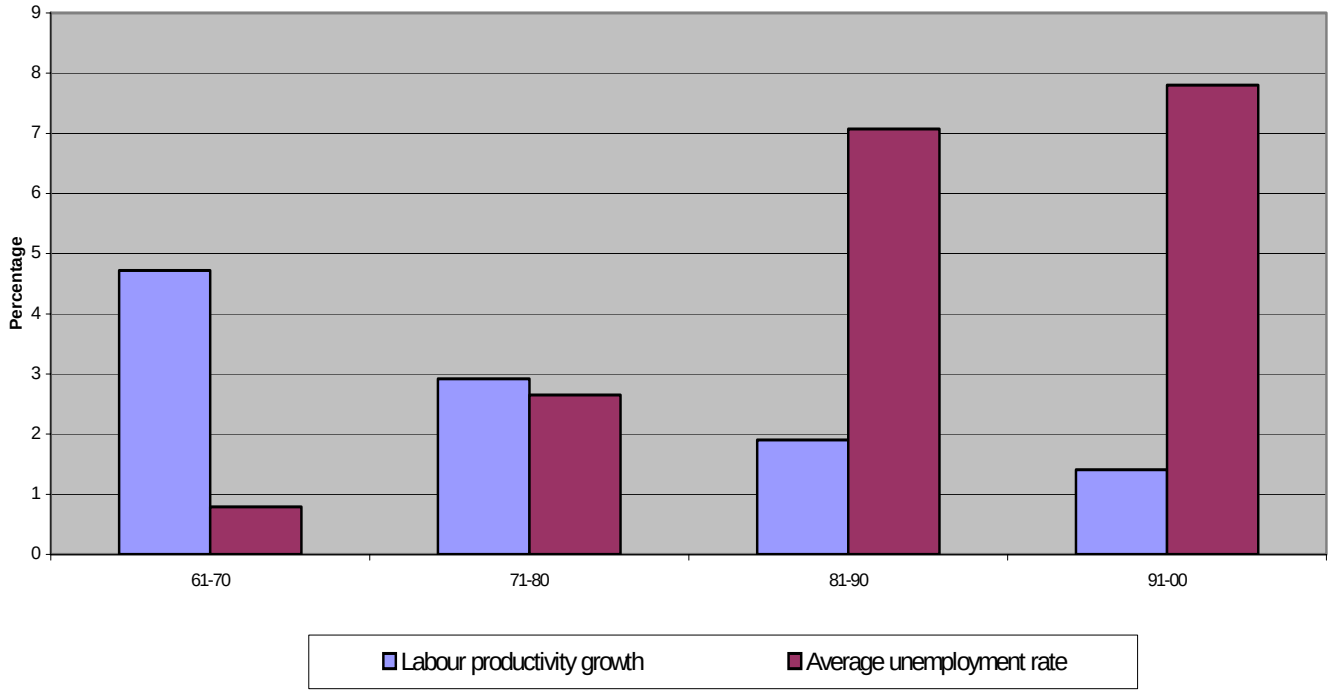
between different desired outcomes from more or less the same set of options? Is a lacklustre productivity performance the price to be paid for maintaining full employment and a rapidly expanding work force?

Doubts about the idea of an employment-productivity trade-off are triggered by the numbers for the 1990s in which the relative productivity performance of the European Union and the United States underwent a fundamental change. Particularly in the second half of that decade, the United States experienced a marked acceleration of productivity growth which is widely attributed to the growth of the "new economy" through information and communication technologies. For the first time in the post-war era, the United States outperformed Europe in terms of productivity growth. This "productivity miracle" in no way put an end to the "employment miracle" of the preceding decades. Employment growth slowed somewhat, but this was clearly due to slower labour force growth, as evidenced by the almost continuous fall of the unemployment rate throughout the decade: from 5.6 per cent in 1990 to little more than 4 per cent in 2000. In the same decade, European productivity growth decreased rather than increased, with no noticeable effect on employment growth. The productivity slowdown, which continued a trend that began in the 1970s, translated almost entirely into slower output growth. For the European Union, Table 2.2 gives the growth rates from 1991 to 2000 rather than from 1990 to 2000 in order to eliminate the only substantial (but artificial) one-time upward shift in the employment series: the inclusion of some 10 million East Germans in the employment statistics.

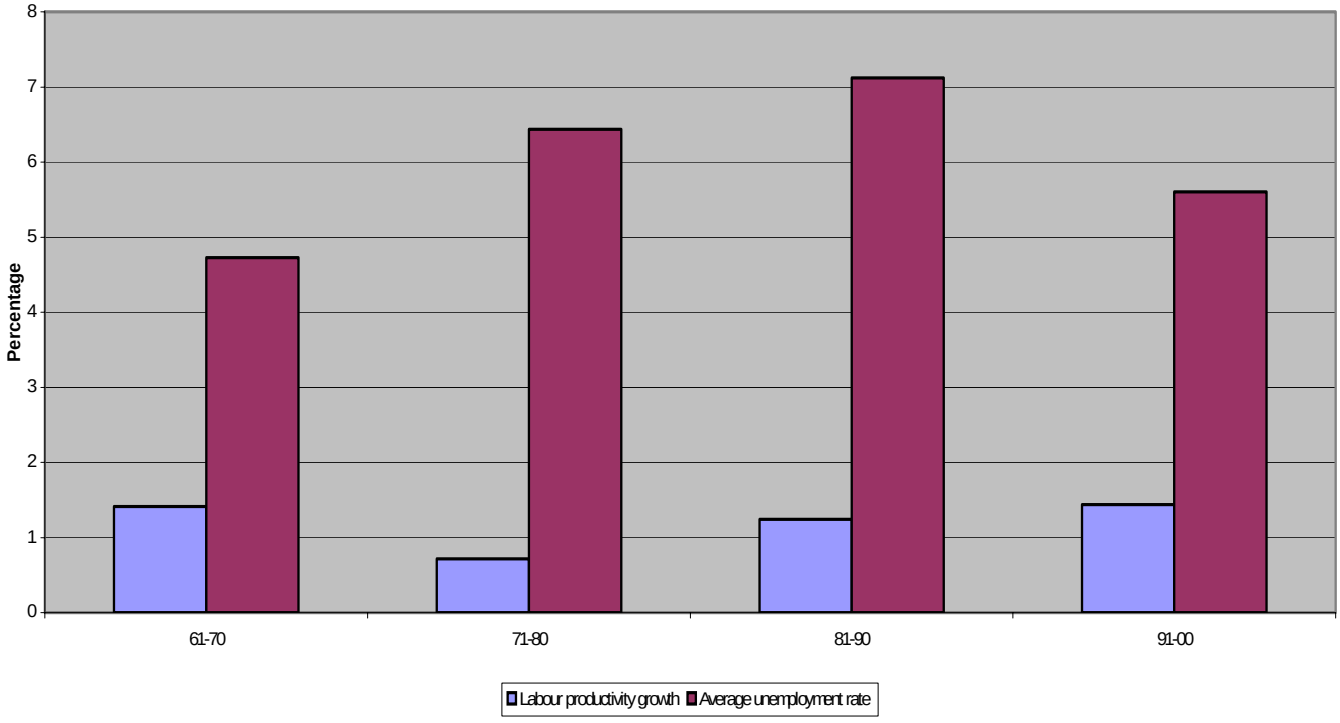
Much as the "Atlantic divide" of the 1970s and 1980s may have fostered the notion of an employment-productivity trade-off, no such trade-off is suggested by the time-series behaviour of employment and productivity relative to each other on each side of the divide. Figure 2.1 shows the evolution of the unemployment rate and the growth rate of labour productivity in Germany and the United States for the four decades since 1961. In Germany (which in this respect can be considered as fairly representative of the "big" European economies), both the unemployment rate and productivity growth exhibit clear trends: whereas productivity growth slowed down from one decade to the next, the unemployment rate moved in the opposite direction. Anyone looking for a connection between the changes of the two variables, or for a theory that could rationalize such a connection, would hardly start with the notion of an employment-productivity trade-off. Rather, the upper panel of Figure 2.1 appears to reflect a world in which "good things go together", as Krugman (1994) once put it, which could mean that high productivity growth is good for employment, that low unemployment is good for productivity growth, or that both are reflections of some underlying quality which determines the overall performance of the economy – "competitiveness" perhaps?

Figure 2.1
Productivity growth and unemployment in Germany and the United States, 1961-2000

Unemployment and labour productivity growth in Germany



United States



A less unambiguous picture emerges from the experience of the United States in the lower panel of Figure 2.1. Neither the unemployment rate nor productivity growth appears to be subject to uniform trends, although it can be said that the much-discussed productivity slowdown of the 1970s coincided with a substantial increase in unemployment. By 2000, the productivity slowdown had been reversed and so had the increase in unemployment. There is anything but a close inverse relationship between unemployment and productivity growth, however. During the 1980s, for example, both variables were higher on average than in the preceding decade.

What does all this evidence signify? Depending on how it is interpreted, conclusions differ. Some observers imply a trade-off between employment and productivity growth, some suggest just the opposite and still others see no strong relationship between productivity growth and unemployment trends.[15] To explore further, a conceptual structure that extends beyond the "fundamental identity" perspective is clearly necessary. The basic elements of such a conceptual structure are provided below.

2.3. On the determination of employment and productivity

Ongoing productivity growth is the defining feature of what economic historians refer to as the era of "modern economic growth" or the 200 years since the onset of the industrial revolution. This ongoing productivity growth has brought an unprecedented increase in the standard of living to those countries which industrialized their economies early and successfully.[16] Today there is almost unanimous agreement on the essential sources of such ongoing productivity growth: technological progress and the accumulation of capital. Modern research has also made clear that capital must be interpreted very broadly in this context to include not just the sum of all tangible physical assets required for the production of goods and services, but also the non-tangible investments that generate productive payoffs to the economy, in particular human capital (education) and know-how (research and development).

Of course, technological advances and capital accumulation began long before the advent of the industrial revolution but as Thomas Malthus and other nineteenth-century thinkers argued, such growth impulses had never before sparked ongoing per-capita growth because of limits imposed by natural-resource scarcity or by diminishing returns to capital. Most importantly, growth impulses led to increases in the sustainable level of populations that pushed down productivity and living standards to their subsistence level and brought population growth to a halt. Two features distinguished the growth process generated by the industrial revolution from the many earlier growth episodes and were responsible for the sustained per-capita growth that ensued. The first feature was an acceleration of technological progress to a pace sufficiently high to overcome the growth-restraining elements of the Malthusian trap. The preceding increase in world population and the development of property rights which strengthened the incentives for finding and introducing new and better methods of production are commonly given credit for this acceleration of technological progress.[17] The second feature was demographic transition, that is, a high stabilization of populations in spite of (or, as modern population theory would argue, because of) real per-capita income levels far above subsistence level.

These two features of the era of modern economic growth – ongoing technological progress at a non-decreasing pace and a population growth rate which does not endogenously

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15 This position is argued by Krugman (1994), among others.

16 For a neat textbook exposition of the history of economic growth, see DeLong (2002), Chapter 5.

17 See North (1981) and Jones (2000).

and automatically accelerate in response to rising per-capita incomes – are the crux of Robert Solow's celebrated neoclassical model of economic growth, by now almost half a century old.[18] Whereas Solow made the anti-Malthusian assumption of exogenous population growth, he took explicit account of the endogenous response of the capital stock and the capital-labour ratio to technological change and population growth. His highly consequential insight was that the fraction of output devoted to investment affects the levels of the time paths along which aggregate output and labour productivity evolve, but not their long-term growth rates. This is not to deny, of course, that additions to the capital stock contribute to output growth. But the endogenous nature of capital stock growth implies that the equilibrium growth rate of labour productivity is uniquely determined by the rate of technological change. More specifically, Solow expressed output Y as a function of capital input K, labour input L, and the state of technology A in the following way:[19]

3.1 $$Y = F(K, A \cdot L)$$

If, as Solow assumed, capital and labour exhibit constant returns to scale and factors of production are paid their marginal products, the production function (3.1) implies that the growth rate of output, $\hat{Y}$, is determined by the growth rates of capital and labour input, $\hat{K}$ and $\hat{L}$, respectively, plus the rate of (labour-augmenting) technological progress, $\hat{A}$, according to

3.2 $$\underbrace{\hat{Y}}_{\left(\begin{array}{c}\text{Rate of}\\ \text{change of}\\ \text{output}\end{array}\right)} = \underbrace{\alpha}_{\left(\begin{array}{c}\text{Capital}\\ \text{share in}\\ \text{national}\\ \text{income}\end{array}\right)} \cdot \underbrace{\hat{K}}_{\left(\begin{array}{c}\text{Rate of}\\ \text{change}\\ \text{of capital}\\ \text{input}\end{array}\right)} + \underbrace{(1-\alpha)}_{\left(\begin{array}{c}\text{Labour share}\\ \text{in national}\\ \text{income}\end{array}\right)} \cdot \left(\underbrace{\hat{A}}_{\left(\begin{array}{c}\text{Rate of}\\ \text{technical}\\ \text{change}\end{array}\right)} + \underbrace{\hat{L}}_{\left(\begin{array}{c}\text{Rate of}\\ \text{change in}\\ \text{labour}\\ \text{input}\end{array}\right)} \right)$$

which can equivalently be expressed as:

3.3 $$\underbrace{\hat{Y} - \hat{L}}_{\left(\begin{array}{c}\text{Rate of}\\ \text{change of}\\ \text{labour}\\ \text{productivity}\end{array}\right)} = \underbrace{\alpha}_{\left(\begin{array}{c}\text{Capital}\\ \text{share in}\\ \text{national}\\ \text{income}\end{array}\right)} \cdot \underbrace{(\hat{K} - \hat{L})}_{\left(\begin{array}{c}\text{Rate of}\\ \text{change}\\ \text{of capital} -\\ \text{labour ratio}\end{array}\right)} + \underbrace{(1-\alpha)}_{\left(\begin{array}{c}\text{Labour}\\ \text{share in}\\ \text{national}\\ \text{income}\end{array}\right)} \cdot \underbrace{\hat{A}}_{\left(\begin{array}{c}\text{Rate of}\\ \text{technical}\\ \text{change}\end{array}\right)}$$

In contrast to the simple and augmented "fundamental identities" discussed above, equations (3.2) and (3.3) are not true by definition. They are valid descriptions of reality only

[18] For an exposition, with enlightening observations on more recent developments, see Solow (2000).

[19] The reasons for including the state of technology as a multiplying factor of labor input are of a technological nature and beyond the scope of this paper.

to the extent that Solow's assumptions on the form of technological progress and on the operation of markets are correct. It is easy to show that the rate of growth of capital input must converge to the rate of output growth under Solow's assumptions – which broadly corresponds to what can be observed over the history of capitalist development. If capital stock grows at the same rate as output in long-run equilibrium ($\hat{K} = \hat{Y}$), equation (3.3) simplifies to

$$3.4 \qquad \underbrace{\hat{Y} - \hat{L}}_{\left(\begin{array}{c}\textit{Rate of}\\ \textit{change of}\\ \textit{labour}\\ \textit{productivity}\end{array}\right)} = \underbrace{\hat{A}}_{\left(\begin{array}{c}\textit{Rate of}\\ \textit{technical}\\ \textit{change}\end{array}\right)}.$$

This is the result mentioned above: the equilibrium growth rate of labour productivity is uniquely determined by the rate of technological change. Moreover, the continued improvement of (average and marginal) labour productivity growth translates into steadily increasing labour demand, which in turn leads to real wage growth at the same rate of technological change, $\hat{A}$, given Solow's assumption of an exogenously determined labour supply (population) and a constant employment rate (full employment).

While all of this is very much in line with the stylized facts of economic growth, it is well recognized that Solow's theory leaves open a crucial question: "What drives productivity growth?"[20] Economic theory answers clearly on a purely formal level (productivity growth is driven by technological change) but the real question is: What are the forces driving technological change? Recent research emphasizes a number of factors, including investment in broadly defined capital, spillovers from research and development, international integration and the conditions for structural change, to name but a few. The employment rate as such is in general not regarded as directly important for the process of technological change in this literature. But it is easy to imagine indirect channels of influence running from the labour market to the determination of productivity growth – most significantly, perhaps, the role of labour market flexibility as a precondition for productivity-enhancing factor reallocation and the effect of labour market conditions on human capital formation. These links will be further explored in Part 3 of the present report.

The neoclassical theory of output and productivity growth assumes permanent market-clearing on the labour market and hence full employment of the labour force. When first developed, this assumption could reasonably be justified as a property of long-run equilibrium. Unemployment was regarded as a temporary problem of deficient aggregate demand – to be analysed within the framework of short-term Keynesian theory and cured by means of standard counter-cyclical monetary and fiscal policies. It was not until the 1970s and 1980s that high unemployment, particularly in Europe, came to be understood as a long-run equilibrium phenomenon, persisting beyond the ups and downs of the business cycle and immune to monetary or fiscal "quick fixes". Also, it was quickly realized that this change of paradigm in employment theory did not require any fundamental overhaul of the reigning

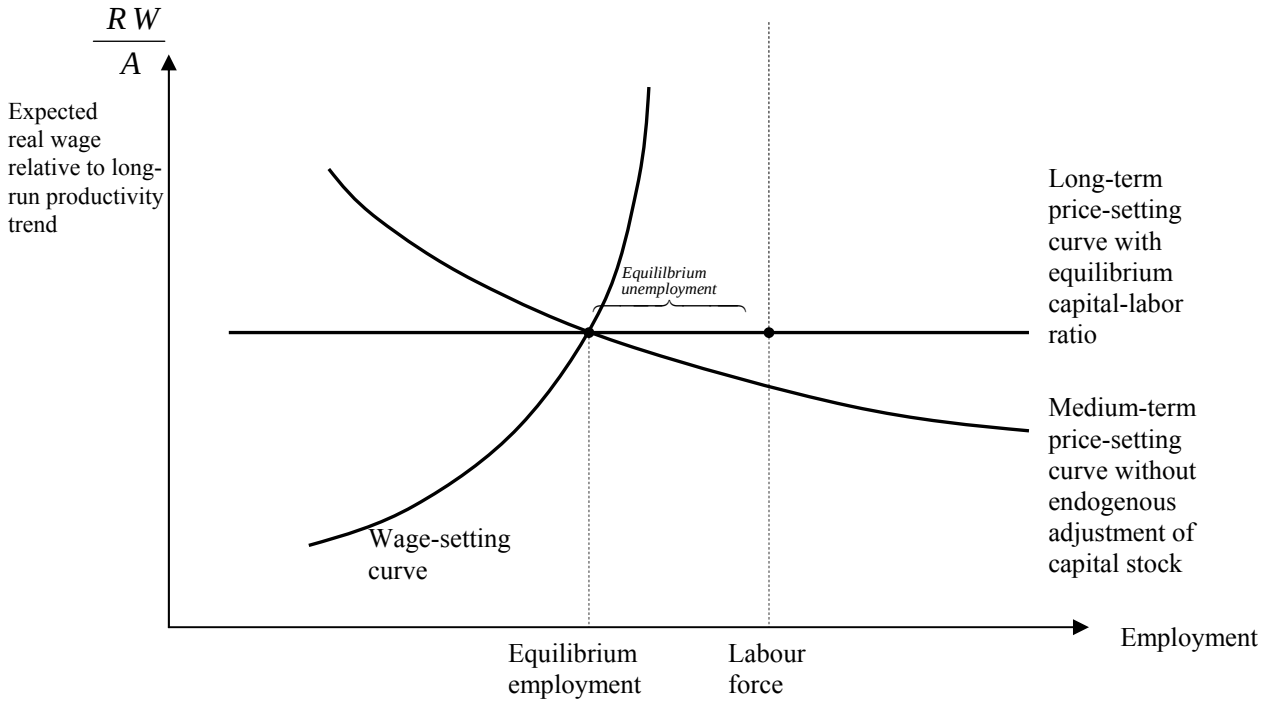
[20] This question and recent efforts to answer it are the subject of a very useful survey by Stiroh (2001).

paradigm of growth economics. Even though Solow had assumed full employment, what his model really required was the anti-Malthusian exogeneity of labour input, which could easily be reconciled with a model of non-zero equilibrium unemployment.

However, it can be argued that the standard theory of equilibrium unemployment fits perfectly into neoclassical growth theory, because it revolves around the interaction of wages and prices. The level and rate of change of labour productivity play an essential part in this interaction. The basic tent to explain how the labour market finds equilibrium at less than full employment is that, under conditions of imperfect competition on goods and labour markets, both prices and wages are shaped by the market power of firms, workers, and the organizations representing them. The rents that each side can expect to extract from its markets depend on the state of the economy and, in particular, on the state of the labour market.

Figure 2.2 illustrates this argument. Here, the underlying assumption is that the labour force is a given quantity which does not vary with the real wage level. The horizontal axis depicts employment, the vertical axis depicts the ratio of the real wage level (*RW*) to the long-run equilibrium productivity trend *A* – where *A* is the technology variable defined in equation (3.1) above. Thus, equilibrium productivity is assumed to be determined by the state of technology of the aggregate economy along the lines of neoclassical growth theory as explained by equations (3.2) to (3.4). This specification emphasizes that persistent unemployment can be regarded as an integral equilibrium feature of a growing economy.

Figure 2.2
The standard model of equilibrium unemployment



expected real wages. This hypothesis has solid empirical support and can be rationalized in a number of ways. Where collective wage-setting prevails, higher employment strengthens the bargaining position of unions. Where wages are set by firms competing for workers,

efficiency wage theory predicts that employers offer wages above market-clearing levels in order to obtain better performance from every hour of work they pay for. Whenever the employment situation and thus outside opportunities improve for workers, employers need to raise this wage premium in order to maintain the proper incentives.

The price-setting curve indicates the real wage level, again in relation to the underlying *trend* path of labour productivity, implied by the pricing behaviour of firms as they set their prices on the basis of marginal cost (mainly marginal labour cost). This implied real wage is closely related to the *actual* productivity of labour. How it varies with changes in the employment rate depends on the time frame of the analysis. In the long-term growth equilibrium of an economy, the capital stock adapts to any level of employment so as to establish the steady-state capital-labour ratio. Since the productivity of labour reflects the state of technology and the capital-labour ratio, and since the long-term capital-labour ratio is independent of employment, the long-term price-setting curve reflects a unique level of labour productivity and an implied real wage level determined by the state of technology regardless of the employment rate. Therefore, the long-term price-setting curve is drawn as a horizontal line in Figure 2.2. As long as the capital-labour ratio has not yet converged to its equilibrium level – a period which can be referred to as the medium term – then any expansion of aggregate employment runs into diminishing returns, so that the actual real wage implied by the pricing behaviour of firms falls with increasing employment. For this reason, the medium-term price-setting curve slopes downward in Figure 2.2.

Equilibrium in this framework means that the competing income claims of wage and price setters are consistent with aggregate disposable income.[21] Employment thereby assumes the role of an equilibrating variable which endogenously adjusts to the level where the real wage desired by wage setters and the real wage implied by price-setting behaviour coincide. In this equilibrium, the real wage level follows a growth path determined by the growth of the productivity of labour, along the lines spelt out by growth theory. With the ratio of the real wage level to the long-term productivity trend depicted on the vertical axis in Figure 2.2, the long-term equilibrium of the system can be represented as a stationary equilibrium point. This means that, in equilibrium, price setters allow prices to fall short of wage growth by the rate of long-term productivity growth while wage setters factor into their wage demands this same long-term productivity growth.

The economic forces that drive employment and unemployment to their equilibrium levels involve the interaction of the wage-price process with the aggregate demand management of fiscal and monetary policy-makers. At employment rates above the equilibrium level, wage setters aim at real wages in excess of what the productivity of labour and the market power of producers permit. As price setters respond with marked-up prices, a wage-price spiral is set in motion which results in accelerating wage and price inflation. If fiscal and monetary policies refuse to accommodate the acceleration of inflation – which sooner or later they must if they are committed to the preservation of a working system of monetary exchange – the inflationary pressure and the non-accommodating stance of demand policy combine to depress effective demand in real terms. The ensuing fall of output and employment reduces the inflationary pressure to the point where the inflation rate is stabilized and equilibrium is re-established.

Armed with this framework for the simultaneous determination of productivity growth and employment, we are now in a position to address the questions of how productivity and employment respond to exogenous shocks and structural breaks and how their interaction

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[21] The classic reference for models of equilibrium unemployment based on this idea is the monograph by Layard, Nickell and Jackman (1991).

evolves over time. The analytical framework outlined here distinguishes three different time frames:

(i) In the short term, the economy is out of equilibrium. Output, employment and productivity deviate from their trend paths. The short-term changes of these variables reflect the forces of the business cycle. Standard macroeconomic theory traces these cyclical fluctuations to nominal rigidities or to deviations of realized prices and wages from expected values in the face of aggregate demand disturbances. An alternative interpretation is that of a competitive market economy which remains in permanent equilibrium, but is constantly exposed to real disturbances, particularly to productivity shocks. Empirically, the short-term fluctuations of productivity and employment are strongly and positively correlated.

(ii) In the medium term, nominal wages and prices can be regarded as flexible, expected errors are eliminated, but the capital stock has not yet adjusted to its steady-state path. In this time frame, there is scope both for a positive and a negative association between employment and productivity, depending on the exogenous forces that cause the two variables to change.

(iii) In the long term, nominal wages and prices are flexible, expected errors are absent, and the capital stock has fully adjusted to its steady-state path. Whereas there is some theoretical speculation about channels of interaction that could connect the long-run trends of productivity growth and employment, the empirical picture does not suggest an important role for such an interaction.

Needless to say, this categorization of time frames radically cuts through the complex lag structures present in a dynamic economy. Ultimately, the legitimacy of this systematization hinges on its ability to help explain the changing nature of the employment-productivity relationship over time and space. Much as that relationship may change with the time horizon adopted, there is one common overarching thread. In each case, how employment and productivity move in relation to each other cannot properly be understood without reference to a coherent theoretical framework that treats the realizations of both variables as joint endogenous outcomes of a general equilibrium (or disequilibrium) system responding to exogenous disturbances. In general, the pattern of relative employment and productivity changes depends crucially on the type of disturbance causing it.

3. Employment and productivity: In the short, medium and long term

3.1 The short term: Cyclical fluctuations of employment and productivity

The cyclical behaviour of employment and productivity is one of the most thoroughly studied phenomena of applied business-cycle research. The evidence is clear that both variables are strongly and robustly pro-cyclical. According to Romer (2001), the US economy went through nine recessions during the post-war period of 1947-1999. In all of these recessions, employment fell. In eight of nine cases, output per hour in non-agricultural business also fell. In an average recession, for example, output falls by 4.7 per cent relative to its long-term growth rate; employment falls by 3.6 per cent and non-agricultural output per hour falls by 1.9 per cent (again, relative to their respective long-term growth rates).[22] Thus,

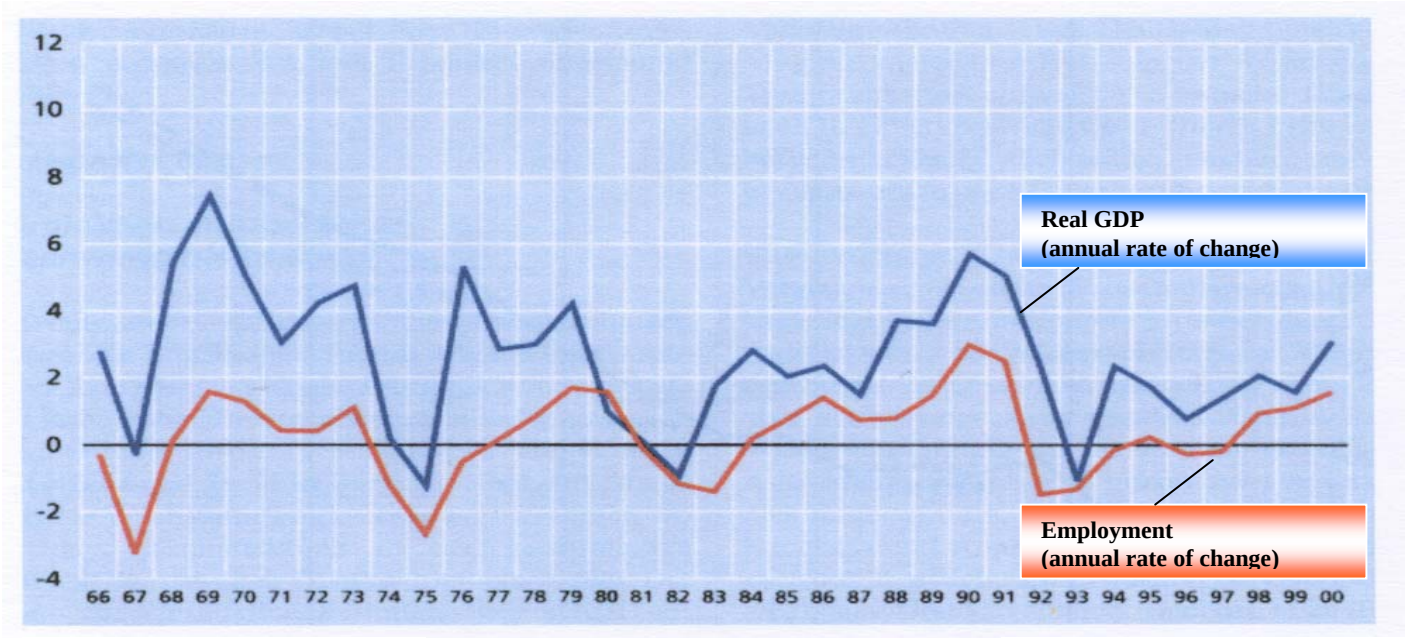
[22] Romer (2001), Table 4.3, p. 172. Note that the changes in employment and output per hour do not add up to the change in output because output and employment refer to the aggregate economy

employment and productivity fluctuate substantially over the business cycle, although not quite as strongly as output, and they generally move in the same direction.

Figure 3.1 illustrates the cyclical behaviour of output and employment for Germany from 1966 to 2000. Clearly, the two variables fluctuate in a highly synchronized way. Output growth exceeds employment growth by the rate of productivity growth (again, the "fundamental identity" at work). With the exception of one year (1980), the rate of change of labour productivity is positive. Moreover, output growth fluctuates more widely than employment growth. As a result, the difference between the two growth rates is always larger in booms than in recessions – which means labour productivity is solidly pro-cyclical.

Since the labour force does not fluctuate anywhere near as much as employment over the cycle, the cyclical behaviour of employment translates quite directly into a cyclical pattern of the unemployment rate. The relationship between output growth and changes in the unemployment rate is so close and robust that it has attained the rare status of an economic law. Okun's law, named after Arthur Okun's (1962) path-breaking empirical study, found that a fall in output of 3 per cent relative to the normal trend growth rate was associated with a 1 percentage point increase in the unemployment rate. Okun's law has been retested and re-measured time and again for innumerable countries and time intervals.

Figure 3.1 Output growth and employment growth in Germany, 1966-2000



Note: Until 1991: West Germany, from 1992: Germany.
Source: Bundesministerium der Finanzen, various years.

Some recent estimates for 15 OECD countries as well as a selective survey of the relevant literature can be found in a companion piece to this background paper (Pollak 2002). The major findings of this and related research can be summarized as follows:

- On the whole, Okun's law holds up well for most countries. However, Okun's coefficient, which links the change in the unemployment rate to output growth, exhibits substantial variation across time and space.

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whereas output per hour refers to non-agricultural business.

- In some cases, such as Japan and Switzerland, the relationship between unemployment and growth was extremely loose in early periods because the unemployment rate remained low and almost constant over the business cycle. As unemployment began to increase in these countries and as it responded more strongly to cyclical output variations, Okun's coefficient could be estimated more reliably.
- In most countries, Okun's coefficient has fallen considerably over the past 30 years. This means that the response of unemployment to cyclical output variations has become stronger. Today, a fall in the unemployment rate by 1 percentage point is generally associated with an extra 1.5 to 2.5 percentage points of GDP growth rather than the 3 percentage points of Okun's original study.
- Regressions of the change in unemployment on output growth also yield estimates of the so-called "employment threshold" – the rate of output growth that must be exceeded for the unemployment rate to start falling. From the "fundamental identity", it is evident that this "employment threshold" must be closely related to the rate of productivity growth and to the rate of change of the labour force. In many countries, the threshold rate has decreased over time – a development widely hailed as "favourable" for the labour market and for employment policy. In view of the fact that lower "employment thresholds" were in most cases due to a marked productivity slowdown, their desirability is far from obvious.
- Whereas variations in the intercept of Okun's equation lend themselves to a relatively straightforward interpretation in terms of productivity and labour force growth, the factors behind the cross-country variation and the secular decline of Okun's regression coefficient are not quite as clear. Most explanations focus on institutional properties of the labour market. In lightly regulated economies such as the United States, firms can easily lay off and hire workers when economic conditions change. Therefore, the response of unemployment to changes in output growth is stronger and quicker, and Okun's coefficient is smaller than in more heavily regulated economies. In the same vein, the fall of Okun's coefficient which can be observed in many countries may be related to the labour market reforms that have more recently been attempted in some countries.
- An alternative but by no means mutually exclusive explanation for the tendency of Okun's coefficient to fall over time might start from the observation that the higher coefficients of times past were associated in general with much lower unemployment rates. One can think of cyclical output fluctuations as movements up and down the Beveridge curve of an economy.[23] Whenever the unemployment-vacancy ratio changes (as it typically does over the business cycle), a larger fraction of that change is reflected in movements of the unemployment rate rather than the vacancy rate – if, to begin with, the unemployment rate is high and the vacancy rate is accordingly low. Conversely, when the unemployment rate was low in most (European) economies in the 1960s and 1970s, there was relatively less scope for unemployment to fluctuate over the business cycle so that any given change of the unemployment rate was associated with a larger movement of output.
- Interestingly though, the severity of economic crises experienced by different countries does not seem to be an important factor in accounting for changes in Okun's coefficient over time. Many countries that have experienced long recessions

[23] The Beveridge curve is an inverse statistical relationship between the unemployment rate and the vacancy rate. It indicates that the vacancy rate typically rises as unemployment falls during a boom, and *vice versa* in a recession. For more on the Beveridge curve, see Blanchard/Diamond (1989).

accompanied by drastic increases in unemployment show remarkably stable coefficients.[24]

Okun's coefficient is rarely found to fall short of unity. Unless there is substantial cyclical variation in the labour force, a coefficient above unity means that the response of employment to changes in output is less than proportional in the short run. As Figure 3.1 shows, this in turn entails a pro-cyclical behaviour of labour productivity. Incidentally, this "stylized fact" of the business cycle is not easily explained by standard Keynesian textbook accounts of cyclical output and employment variations. According to textbook theory, changes in effective demand are the dominant cause of short-term output changes which in turn lead to workforce adjustments as dictated by production needs. Almost all production functions commonly used in macroeconomic reasoning imply that, with other factor inputs held constant, labour is subject to diminishing returns. Since there is little short-term variation in the capital stock, these production functions would lead us to expect a more than proportional response of employment to cyclical, demand-induced output changes – which would amount to a counter-cyclical behaviour of labour productivity. But this is the just opposite of what the data show. The only way to reconcile the Keynesian view of the business cycle with the pro-cyclical behaviour of productivity is to take account of labour hoarding during recessions. Labour hoarding means that firms do not adjust their workforce down to the absolute minimum in recessions. Rather, experience shows that firms prefer to keep more workers on their payrolls than they actually need during a recession in order to avoid adjustment costs and be ready for the next recovery.

Figure 3.2 illustrates this point. The top panel depicts a production function which links output to employment and whose curvature expresses the hypothesis of diminishing returns to labour. According to Keynesian theory, the cyclical variation of output and employment is caused by fluctuations of aggregate demand. In Figure 3.2, aggregate demand is assumed to fluctuate between Y_B^d (in a boom) and Y_R^d (in a recession). If firms stayed strictly on their production function in accommodating the fluctuations of demand, they would move between points *B* and *R'*. Obviously, average labour productivity – which can be measured by the slope of a ray through the origin – is higher in point *R'* than in point *B*. If firms hoard labour during a recession, however, they move off the production function to point *R* where labour productivity is lower than in the boom point *B*.

The lower panel of Figure 3.2 depicts the effective labour demand as implied by the decision to let employment fluctuate between points *B* and *R* in the top panel – the "employment function" according to Keynes (1936). The movements of effective labour demand in relation to the labour force L^S generate the ups and downs of unemployment that we observe in the course of the business cycle. No particular cyclical behaviour of the real wage level can be derived from this analysis without further assumptions on the relative flexibility of nominal wages and prices. But with a suitable description of nominal adjustment processes, the Keynesian disequilibrium account of the business cycle is certainly capable of capturing the weakly pro-cyclical behaviour of real wages suggested by the data.[25]

Figure 3.2

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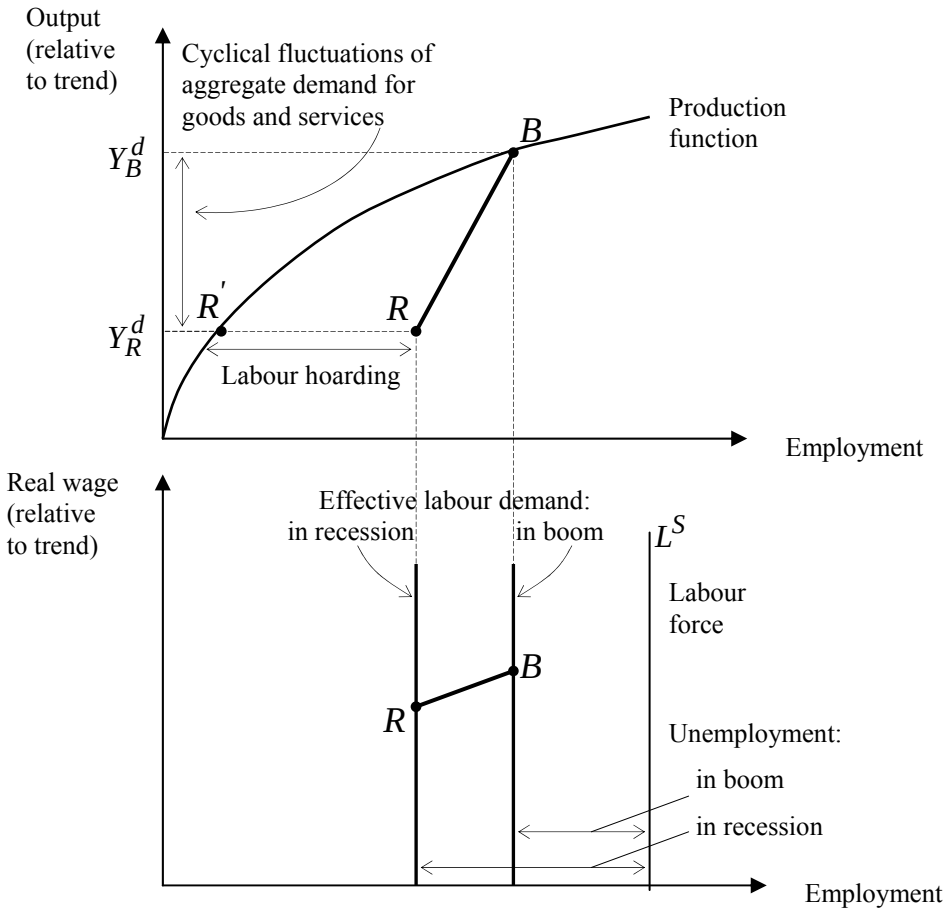
[24] For a more detailed account of the empirical findings and for further references to the literature, see Pollak (2002).

[25] This statement does not apply, however, to Keynes' original exposition of his theory or to most textbook expositions which follow him in assuming sticky wages and perfectly flexible prices, thereby implying counter-cyclical real wages along with counter-cyclical productivity.

Cyclical fluctuations in employment and productivity: The Keynesian interpretation



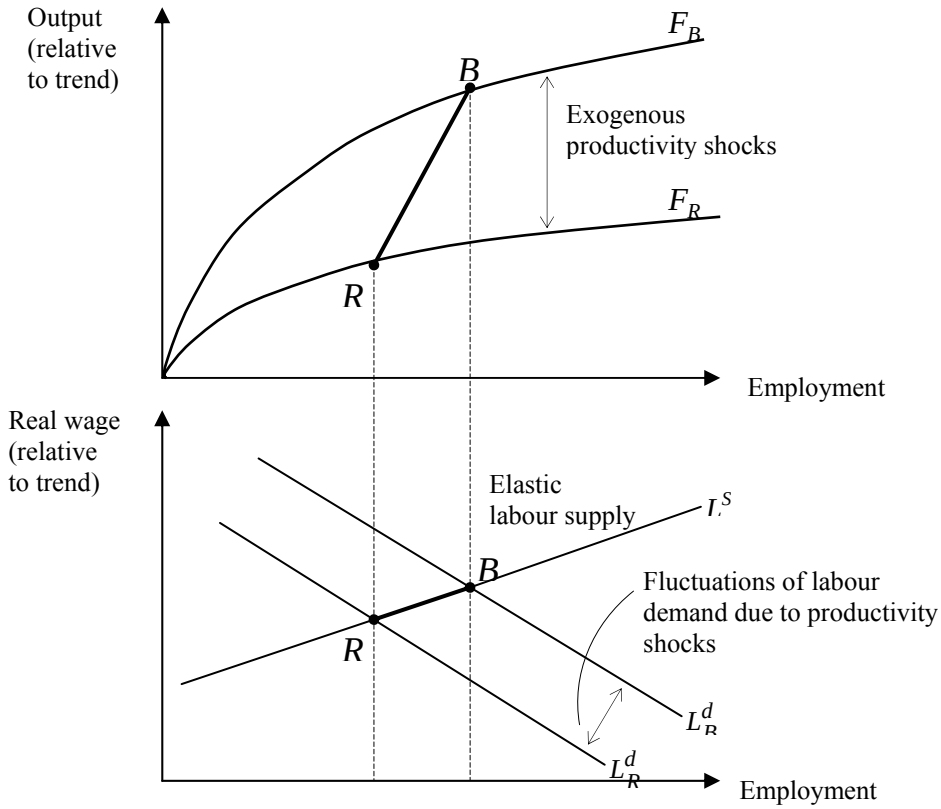
Keynes' theory has not gone uncontested and its main present-day challenge is the Real Business Cycle (RBC) theory, which grew out of the neoclassical revival that shook macroeconomics in the 1970s. The core message of the new classicists is that business cycles should and can be explained without abandoning the general equilibrium paradigm of the perfectly competitive market economy which has served microeconomic analysis so well. Early attempts at implementing this research programme resulted in a monetary theory of the business cycle based on rational expectations, market-clearing and the distinction between anticipated and unanticipated monetary shocks, as pioneered by Lucas (1981). Because of conceptual and empirical weaknesses, this neoclassical monetary interpretation was superseded by RBC theory, which operates with essentially the same competitive equilibrium model of the real economy – but ignores monetary shocks as a source of business fluctuations and instead places the emphasis on real shocks, in particular on technology shocks.[26]

The debate between the Keynesian tradition in the theory of business cycles and the RBC view is primarily a debate on the right vision of how a market economy is functioning and hence on the right approach to stabilization policy. Of interest in our context is how Keynesian theory and the RBC model differ in their account of the cyclical behaviour of employment and productivity. The main difference can be simply stated. Since the RBC

[26] An instructive and very accessible introduction to the debate on RBC theory is provided by the exchange between Plosser (1989) and Mankiw (1989).

school views technology shocks (i.e. shocks to the technology variable *A* in the neoclassical growth model above) as the driving force of the business cycle, thus fluctuations in aggregate labour productivity are at the very root of the business cycle rather than just a secondary consequence as in the Keynesian model.

Figure 3.3
Cyclical fluctuations in employment and productivity: The Real Business Cycle theory



Again, a diagram is helpful in setting out the argument. In Figure 3.3, the upper panel demonstrates how exogenous productivity shocks displace the aggregate production function, thus generating a business cycle. F_B is the production function during a boom; F_R is the production function during a recession. The productivity shocks affect not only the average productivity, but also marginal productivity of labour and hence the demand for labour, as shown in the lower panel. In contrast to the Keynesian model, labour demand here is not derived from the production level and labour-hoarding behaviour of demand-constrained firms, but represents the profit-maximizing response of competitive firms to whatever real wage they face on a cleared labour market. Together with the assumption of a highly elastic supply of labour, the RBC model thus implies a shifting labour market equilibrium and predicts a cyclical behaviour of real wages and employment which is fairly similar to the stylized facts established by empirical business cycle research: employment strongly pro-cyclical, real wages weakly pro-cyclical. The fluctuations of employment as derived from the model of the labour market (lower panel) combine with the shifts of the production function in the upper panel to account for the cyclical behaviour of aggregate output.

Figures 3.2 and 3.3 are drawn so that the points *B* and *R* represent exactly the same configurations of output, employment and real wages in both panels of both figures. It thus becomes clear that the two theories explain the same facts, but in completely different and contradictory ways. Apart from other differences, they are at odds on the nature of the causal relationship linking employment and productivity. According to RBC theorists, the cyclical behaviour of labour productivity largely stems from exogenous technology shocks to which producers and workers adjust their output and employment decisions. Keynesians, in contrast, attribute the cyclical variation of output mainly to exogenous changes in aggregate demand and explain the pro-cyclical behaviour of productivity in terms of the lagged adjustment of employment.

Which interpretation is correct matters a great deal for the formulation of the right policy response to employment fluctuations. Proponents of the RBC view do not consider that the business cycle inherently poses a policy problem. Rather, they view it as an expression of how a system of competitive markets efficiently handles a stochastic and unpredictable business environment in which it has no choice but to operate. According to this view, policy can ensure that markets are left free to react to exogenous shocks as efficiently as possible. Equally important is that policy itself avoids generating a source of unpredictable disturbances. Real shocks that emanate from government behaviour, in particular major changes in regulatory spending and tax policies, play a quantitatively important role in empirical applications of RBC theory. In contrast, the Keynesian view is that business downturns and concomitant unemployment are first-hand evidence of a deeply rooted failure of the market system to deal with the vagaries of private spending behaviour and calls for corrective action directed towards the stabilization of aggregate demand growth.

This is not the place to discuss in depth the merits and demerits of these two theories. Suffice is to say that Keynesian theory has long been criticized for its lack of convincing microeconomic foundation – for assuming rather than proving the market imperfections and coordination failures that it stipulates are at the root of the business cycle. Keynesians have swiftly refuted the initial claim of the new classicists that the lack of microeconomic foundation condemns the Keynesian paradigm to empirical failure. They have responded to this challenge by developing a large number of interesting ideas about the microeconomic sources of macroeconomic market failure.[27]

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[27] For a survey of these developments, see George Akerlof (2002), one of the pioneers of new Keynesian thinking.

A major objection to RBC theory is that it, too, prejudices its case by attributing to exogenous changes of technology all output movements which it cannot directly trace to changes in labour or capital input – making it all but a foregone conclusion that technology shocks largely explain the business cycle. But technology shocks do not easily lend themselves to independent verification. There is no scope for monetary disturbances to play a destabilizing role. The high elasticity of labour supply which is crucial for generating employment variations of a realistic dimension is not confirmed by micro-econometric studies of household behaviour. Perhaps most importantly, the market-clearing framework appears unsuitable to account for widespread involuntary unemployment. Of course, there are answers to most of these objections. The RBC paradigm can accommodate unemployment if it is augmented by a search-theoretic model of labour market flows. It can likewise account for real wage rigidity if combined with an efficiency wage theory or a wage bargaining model of the labour market. It can also account for monetary disturbances if a nominal rigidity sets in at the right place. Technology shocks may be interpreted broadly to encompass changes in the regulatory environment or in exogenous factor input prices.

Nevertheless, it must be said that adherence to the RBC view carries the risk of encouraging dangerous inaction in the face of a really deep crisis. What technological regression drove the world economy into the Great Depression of the 1930s? What helped the world economy emerge from the Great Depression if not a massive recovery of demand? Which technology shock has caused Japan's present paralysis? Remarkably, there are answers even to these questions. In recent research, Prescott (2002) and Hayashi/Prescott (2002) conclude that a standard neoclassical growth model plus the assumption of a sudden and exogenous fall in the growth rate of total factor productivity (TFP) growth is perfectly able to replicate the path of the Japanese economy in the 1990s. "The only puzzle is why the TFP growth was so low subsequent to 1990", they add.[28] However, their efforts to solve this puzzle do not go beyond the conjecture that subsidies to inefficient firms and declining industries might be the culprit. They recommend terminating such subsidies and perhaps correcting some other distortions.

Naturally it is hard to disagree with the diagnosis that the elimination of distorted incentives which prevent resources from being allocated to their best uses must ultimately be good for productivity. But it is difficult to believe that Japan did not have these problems before 1990. If conventional wisdom is right (that the deep crisis of the Japanese economy reflects a collapse of domestic demand in the wake of a burst asset-price bubble), then eliminating distortions will not cure such ills. What is needed is massive expansion.[29] Hayashi and Prescott are not willing to acknowledge a causal role for the burst asset-price bubble. In their view, the chain of causation runs from the productivity problem to the bubble rather than the other way round: high asset prices and buoyant investment spending reflected the expectation of continued high productivity growth – and collapsed when these overoptimistic expectations failed to materialize.[30]

The bottom line is: different accounts of the cyclical behaviour of output, employment and productivity may coexist and they may all satisfy the minimum requirement of consistency with the stylized facts. But they differ in their assessment of cause and effect and thus cannot agree on the proper policy response. The problem is that any action based on a false diagnosis can cause serious harm to the economy. If the RBC view is correct, Keynesian

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28 Hayashi/Prescott (2002).

29 Among the many blueprints for a revival of effective demand in Japan, Krugman's (1998) plan of a credible inflation target and Svensson's (2001) proposal of a price level target supported by exchange rate depreciation have perhaps received the most attention.

30 See Hayashi/Prescott (2002).

stabilization policies represent a misguided attempt to smooth a stochastic dynamic process that cannot be smoothed and is not in need of smoothing. If the Keynesian view is correct, however, the recommendation of microeconomic reforms as a cure for Japan-style economic stagnation is much like treating pneumonia with aspirin – on the grounds that the patient's behaviour does not contradict the hypothesis of an exogenous bout of fever.

3.2. The medium term: Shocks and institutions

The above discussion of the short term has made no reference to the model of unemployment determination described in Figure 2.2, because the theory of the cyclical fluctuations of employment and productivity essentially concerns the deviations from equilibrium unemployment. As we move beyond the time frame of the typical business cycle, however, and look at developments over five, ten or 15 years, the properties of the equilibrium itself move to centre stage. The current consensus in the theory of unemployment maintains that any analysis of changes in equilibrium unemployment must revolve around two key concepts: shocks and institutions.[31] The basic idea is that the labour market is subject to exogenous shocks such as changes in underlying productivity growth, energy prices, real interest rates or taxation. Whether or not such shocks affect equilibrium unemployment, and how they affect it, depends significantly on the institutional set-up of the labour market. Labour markets differ in the extent of social insurance and employment protection extended to workers; they differ in the legal framework governing wage negotiations and in many other rules of the game.

Since labour market institutions are widely blamed for causing high unemployment, particularly in Europe, they are frequently referred to as "labour market rigidities" (e.g. by Siebert 1997). A central tenet of the "shocks and institutions" view is that institutions alone explain relatively little as they have changed much less dramatically than unemployment has. But institutions mediate the impact of shocks and thus have the potential to explain why countries differ markedly in their response to similar shocks. The relation between institutions and labour market outcomes is clearly a two-way interaction. Institutions shape the employment effects of shocks, but the state of the labour market in turn feeds back into the evolution of the institutional framework. A case in point is the increase in the amount and duration of benefits with which legislators responded to rising unemployment in many countries.

What is the role of productivity in all this? Productivity is central to the determination of equilibrium unemployment because it affects both the wage- and price-setting functions that jointly determine the position of the equilibrium. Thus, structural breaks in the underlying productivity trend are a potentially important source of disturbances on labour markets. Moreover, there are repercussions to productivity whenever the system adjusts to other exogenous shocks, particularly those that affect capital formation.

Two examples of salient changes in productivity trends have received particular attention in the literature: the worldwide productivity slowdown of the 1970s and the remarkable acceleration of productivity growth in the United States since the mid-1990s. How such changes affect equilibrium unemployment is explained with the help of Figure 2.2. Since both the wage- and price-setting schedules are defined in terms of the real wage relative to trend productivity, it is clear that the equilibrium point can remain unaffected by productivity

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[31] This point of view has recently been emphasized by Blanchard (2000) and Blanchard/Wolfers (2000), in particular, but is also the organizing idea in the approach taken by Layard et al. (1991).

shocks only if such shocks are fully and immediately taken into account in wage- as well as price-setting decisions. But this does not appear to happen. While productivity changes find their way into the mark-up calculations of price setters with very little delay, wage setters take much longer to adjust their real wage targets to reality. In terms of the model in Figure 2.2, this means that whenever productivity grows faster than wage setters' wage aspirations, the wage-setting curve shifts downwards. As a consequence, real wages fall relative to the path of trend productivity and the equilibrium unemployment rate falls as well. The opposite happens in the event of an unanticipated productivity slowdown.

The history of post-war Europe provides a number of case studies which illustrate this mechanism. In the two decades after the end of World War II, spectacular growth rates were achieved, especially in Germany where the scope for reconstruction and catch-up was immense. Germany's famous *Wirtschaftswunder* was not only a growth miracle but also an employment miracle as a very high unemployment rate (above 10 per cent in 1950, for example) declined rapidly, notwithstanding the huge immigration flows from the East. Key ingredients of this employment miracle were decreasing labour costs and widening profit margins.[32] Interestingly, this pro-growth stance of wage policy was not the result of weak unions or conscious modesty on the part of workers. On the contrary, wages rose rather fast in those boom years but unit costs were kept in check by the unexpectedly high productivity growth that the economy managed to sustain year after year. Wage setters could not fail to take note of the exceptional productivity gains but did not believe they were sustainable.[33]

Eventually the high post-war productivity growth rates did prove unsustainable, although not until the early 1970s. Again, wage setters were ill-prepared for the change. As Bombach (1985, pp. 96-97) aptly put it: "Unions became growth-conscious just when growth slowed down." Adjustment was complicated by the coincidence of the productivity slowdown with other major macroeconomic turbulences, in particular the first oil-price shock, the end of fixed exchange rates and the first serious recession of the post-war era. Therefore, the secular break in the productivity trend could not easily be disentangled from the short-term effects of demand-side disturbances.

An explicit simulation of the dynamic adjustment process by which wage setters revised their estimate of underlying productivity growth downwards was conducted by Blanchard (2000). Using a simple adaptive mechanism to model the expectations of productivity growth, Blanchard constructed a plausible scenario in which the "comprehension lag" of wage setters (a term he attributes to Robert Solow) extends to a decade and beyond. In the interim, the misperception of the productivity trend causes excessive wage pressure, reduced profit margins and higher unemployment. Blanchard's conclusion is that:

> … the slowdown in [total factor productivity] growth in the mid-1970s can potentially explain much of the increase in European unemployment at least over the following 10 years, perhaps up to the mid or late 1980s.[34]

In view of the rational expectations paradigm that is now widely accepted by macroeconomists of all persuasions, the plausibility of a result based on such slow learning is certainly open to some doubt. It is indeed remarkable that wage setting, under a wide variety of labour market environments, seems to adapt to changes in the pace of inflation with much less delay than to changes in productivity growth. One possible explanation for this

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32 A detailed account of the rise and decline of the German business miracle, and of labor market developments in particular, can be found in Giersch/Paqué/Schmieding (1992).

33 See Giersch/Paqué/Schmieding (1992), p. 76-78.

34 Blanchard (2000), Lecture 1, p. 11.

asymmetry may lie in the fact that changes in underlying productivity trends are much more difficult to detect than price changes, not only because of the cyclical component in the productivity figures, but also because the observed behaviour of productivity is not independent of the type of wage policy pursued. As long as wage claims are based on an extrapolation of past productivity growth – when in fact technological change has slowed – wage pressure is being built up and employment falls. This causes the economy to go through a phase of above-normal capital intensity. Since the productivity of labour is positively related to the capital-labour ratio, the downward adjustment of actual productivity growth is delayed and hence less likely to be factored immediately into wage settlements. Although previous rates of real wage growth are no longer warranted in view of declining technological progress, they appear to "pay for themselves" in terms of measured productivity, at least for a while.

As time goes by, firms adjust their investment spending downwards in an effort to re-establish their optimal capital-labour ratios. Through this ongoing disinvestment, the medium-term price-setting curve of Figure 2.2 shifts downwards and moves the economy towards its long-term price-setting curve. In the process, the underlying productivity slowdown becomes increasingly visible in the data and the adverse repercussions on employment are reinforced and prolonged. The endogenous adjustment of capital formation thus turns out to be a substantial link in the chain of events leading up to the parallel deterioration of productivity growth and employment in Germany as shown in Figure 2.1.

Although this account helps partially to explain how the productivity slowdown of the mid-1970s could have had much deeper and longer-lasting labour market effects than at first appears, the exogenous productivity shock cannot be the whole story. Other mechanisms that must have contributed to the simultaneous weakening of productivity growth and labour demand in much of Europe over the past decades have also been identified. One factor that has received a great deal of attention in the literature is the increasing burden of taxation in general, and the taxation of labour in particular. With respect to the labour market, the effects of rising labour taxes and of an exogenous productivity slowdown are almost identical: both reduce the feasible growth rate of net real wages. Both would hardly affect gross wages and employment under conditions of perfect real wage flexibility. But with limited real wage flexibility, they both lead to higher unemployment and falling investment, along with lower output growth. A recent study by Daveri and Tabellini (2000) confirms and quantifies these effects of labour taxes, conditional on the type of labour market institution. Thus they find that "higher tax rates on labour are indeed shifted onto higher gross wages in continental Europe, but not in the other OECD countries" and, that, as a consequence "the high positive correlation between tax rates on labour income and unemployment is clearly a phenomenon of continental Europe...."[35]

In addition to the productivity slowdown and the increasing taxation of labour, which can both be regarded as exogenous forces directly operating on the equilibrium of the labour market, another development widely suspected to have contributed less directly to slower growth and higher unemployment is the high level of real interest rates prevailing in the 1980s and much of the 1990s.[36] The steep rise of interest rates from the low (in some cases even negative) levels of the 1970s clearly had an adverse impact on capital formation and reinforced the disinvestment incentives that were already in place in the wake of the productivity slowdown as discussed above. In terms of Figure 2.2, an increase in capital costs, by reducing the equilibrium capital-labour ratio, shifts the long-term price-setting schedule

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35 Daveri/Tabellini (2000), p. 54 and 52, respectively.

36 See Blanchard (2000), Lecture 1 (section 3) and Phelps (1994).

downwards and thus exacerbates the tension between the real wage aspirations of wage setters and the real wage level warranted by the productivity of labour and the market power of firms. Again, the assumption is that wage setters should be capable of adjusting to whatever the equilibrium level of the capital-labour ratio happens to be in the long term. But in the medium term, while the process of scaling down wage aspirations remains incomplete, the slowdown in the growth of the capital-labour ratio reduces both productivity growth and employment.[37]

The productivity slowdown, the rising rates of labour taxation and high real interest rates are best seen as complementary explanations for the severity and persistence of the poor employment, investment and productivity performance in much of continental Europe over the past three decades. The model sketched in Figure 2.2 demonstrates how all these explanations fit into a framework of medium-term analysis which can account for a negative correlation between productivity growth and unemployment well beyond the ups and downs of the business cycle.

Is this framework suitable to accommodate the diverse picture conveyed by cross-sectional (cross-country) data? As hypothesized by the shocks-cum-institutions approach, it should be possible to trace international differences in the evolution of unemployment either to the differential intensity of the shocks hitting different countries or to differences in the country-specific institutions that determine the shock-absorbing capabilities of an economy. More specifically, if the United States experienced a much smaller increase in equilibrium unemployment than continental Europe after the mid-1970s, this can be attributed both to smaller shocks – a less pronounced productivity slowdown and at most a moderate increase in labour taxes – and to a more flexible labour market which did not translate these shocks into higher unemployment to the same extent as Europe's less flexible labour markets did. Some of the increase in equilibrium unemployment of that time has been explained by an adverse shift in the composition of the American labour force which, more recently, has partly been reversed.[38]

How, then, does our analytical framework accommodate the "Atlantic divide" documented in Table 2.2, i.e. the coincidence of low unemployment, high employment growth and low productivity growth in the United States as compared to high unemployment, low employment growth and high productivity growth in Europe throughout the 1970s and 1980s? The answer is that the difference in average productivity growth as such has little to do with – but nevertheless reflects – the specific historical context of the growth process on each side of the Atlantic. Starting from much lower levels of productivity in the aftermath of World War II, Europe was on a path of convergence and catch-up associated with substantially higher productivity growth than that of the technological leader, the United States.

This convergence process by no means created the difference in labour market performance. However, the sharp productivity slowdown (inevitable in Europe, as the convergence process was nearing completion) did strain the limited adjustment capability of Europe's social fabric and contributed to the deterioration of the employment situation, as discussed above. In short, the trade-off between productivity growth and employment growth suggested by Table 2.2 is spurious.[39] Full employment does not come at the cost of poor

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[37] For a model of the interaction between capital costs and real-wage rigidity as well as some empirical evidence on the importance of capital costs for investment in the case of Germany, see Landmann/Jerger (1993).

[38] See Shimer (1998).

[39] This point was forcefully made by Gordon (1997).

productivity growth. High productivity growth does not limit the scope for expanding employment. If anything, the opposite is true.

One proviso to be attached to this clear-cut conclusion concerns a compositional bias that egalitarian wage policies and the design of social safety nets have inflicted on European employment. By squeezing the dispersion of earnings, these policies have virtually priced the low-wage segment of the economy out of the market. This may have caused an upward bias to measured average productivity as well as to the average real wage level. It has certainly caused unemployment to afflict unskilled labour disproportionately. As a consequence, any successful attempt to reintegrate unskilled unemployed might well have an adverse impact on aggregate productivity and real wage averages. From the political angle, though, it is important that any such productivity or wage effect is a statistical mirror image of the changing composition of the workforce and, therefore, does not imply any type of income loss for hitherto employed persons.[40]

Further proof of the spurious nature of the alleged productivity-employment trade-off is provided by the remarkable acceleration of productivity growth in the United States in the 1990s. For the first time since the end of World War II, the United States surpassed Europe in terms of productivity growth on a sustained basis. Thus, the American productivity miracle marks the end of the "Atlantic divide" as far as superior European productivity performance is concerned. However, the divide is still there in terms of labour market performance. In fact, it grew wider as the unemployment rate fell to levels not seen in the United States since the 1960s, while unemployment in the major economies of continental Europe remained stubbornly high. Moreover, the exceptionally low unemployment rate in the United States cannot entirely be dismissed as the by-product of an overheated economy, but clearly also reflected a fall in the equilibrium rate of unemployment. Otherwise, inflation would have shown signs of renewed acceleration, which it did not.

Among the many factors that have been considered as proximate causes of this favourable combination of low unemployment and low inflation, the unexpected acceleration of productivity growth is, not surprisingly, a prime suspect. In a recent study, Ball and Moffitt (2001) presented an estimate of equilibrium unemployment based on a Phillips curve model for the United States. The distinguishing feature of their model is that productivity growth feeds one-for-one and rapidly into the price-setting equation whereas wage increases are determined largely by unemployment and past wage increases. This means that changes in productivity growth are reflected in wage-setting behaviour only with a considerable lag. With this simple model, Ball and Moffitt explain a large part of the variation in equilibrium unemployment since the early 1960s and particularly its fall in the 1995-2000 period.[41] Thus, notwithstanding the many differences in historical and institutional circumstances, this explanation of the most recent American "employment miracle" tells much the same story as those earlier accounts of the productivity-employment link during Germany's post-war *Wirtschaftswunder*.

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[40] The relation between the inequality-unemployment trade-off and the aggregate productivity performance is discussed more thoroughly in Landmann (2000).

[41] A closely related analysis leads Lynch and Nickell (2001, p. 558) to the conclusion that the unexpected acceleration of total factor productivity growth by about 0.6 percentage points might have temporarily contributed some 0.36 to 0.6 percentage points to the fall of equilibrium unemployment in the United States since 1995.

3.3. The long term: An "iron law"

Whatever the employment effects that exogenous shocks might engender in the medium term by displacing either the wage- or the price-setting curve, they will all depend on the imperfect adaptation of wage-setting behaviour to changes in the evolution of feasible net real wages. The implied co-movements of employment and productivity depend on the nature of the shocks that are hitting an economy and on the adjustment dynamics both of wage-setting behaviour and of capital formation. Clearly, the reference point for any description of such adjustment dynamics is a long-term equilibrium defined by two key features: the absence of any misperception of feasible wages on the part of wage setters and the absence of any discrepancy between actual and desired capital stocks on the part of firms. As noted above, the transition paths leading up to a long-term equilibrium can be complicated and drawn out. Why then should we concern ourselves with the implications of an equilibrium which is so remote that new shocks are likely to hit and to set in motion new adjustment dynamics long before the economy gets even close to eliminating any previous disequilibrium? After all, John Maynard Keynes famously warned us about giving too much thought to a long term we might not live to see. Indeed, most relevant questions on the determination of employment focus on the short and the medium term – the two time frames concentrated on in the present paper. However, from Thomas Malthus and Karl Marx in the nineteenth century up to present-day "end-of-work" doomsters, some long-standing concerns exist on the capability of a market economy to maintain full employment in the face of ongoing technological progress and capital-labour substitution. These issues are reviewed below.

We have previously discussed in detail what economic theory can tell us about the determination of long-term productivity trends. What about the determination of employment and unemployment in the long term? According to one authoritative textbook on unemployment theory:

> Despite all [the variation of unemployment over time], unemployment does not follow any particular pattern or trend over the very long term. This is a key point. It suggests that ultimately there are very powerful mechanisms at work which have forced the number of jobs to respond to huge changes that have occurred in the numbers of people wanting to work. It also suggests that in the long term productivity and taxes have no impact on unemployment.[42]

Indeed, this is a key insight. Its empirical support in long-term unemployment data is so strong that it seems safe to say that this is about as close to an "iron law" as macroeconomics is likely to get. Its gist is that in spite of the numerous imperfections that prevent the labour market from operating as a regular competitive market, the forces of demand and supply have always been strong enough in the long term to bring the number of jobs roughly into line with the size of the labour force – regardless of how much the number of workers has increased or how much productivity growth has reduced the labour requirement per unit of output. As Lindbeck (1993) rightly emphasized, this does not mean that the equilibrium rate of unemployment is a type of natural constant with which the actual unemployment rate must sooner or later converge. Changes in the composition of the labour force, in the job-matching process, in the design of the social safety net, in labour market legislation and in related institutional rules of the game can hardly fail to be reflected in the

[42] Layard et al. (1991), p. 5.

very long-term average rate of unemployment.[43] Given these structural characteristics of the system, it is unlikely that even drastic changes in exogenous parameters (such as productivity, the labour force, aggregate demand or the level of taxation) would have a permanent effect on the unemployment rate once the short- and medium-term adjustments have run their course – *unless* such exogenous shocks feed back into the institutional framework of the labour market.

That said, it must be acknowledged that recent theoretical research has identified a number of channels through which the equilibrium rate of unemployment and the process of economic growth could potentially affect each other even in the very long term. Among the effects considered in this research are the following:[44]

- *The capitalization effect*. In a model of unemployment in which the hiring of workers is costly, more rapid growth raises the rate of return on hiring and may thereby lower equilibrium unemployment.
- *Creative destruction*. If economic growth brings about structural change, more rapid growth raises the rate of job destruction and may thereby raise frictional and structural unemployment.
- *Biased technological change.* If technological change affects the structure of labour demand, favouring skilled labour at the expense of the unskilled, if wage differentials are rigid, and if the structure of labour supply is slow in responding to changing skill requirements, then more rapid growth may raise equilibrium unemployment.
- *Joint determination of unemployment and growth*. The same political and institutional framework that shapes the operation of the labour market may also affect the dynamism of economic growth. For example, a society that values "social justice" highly relative to the efficient operation of markets is prone to implement policies of redistribution that interfere both with the allocated role of the labour market and with incentives to invest. Such a society is likely to experience both higher unemployment and lower growth in the long term than a society with broad support for a market-friendly economic environment. In a similar vein, a recent OECD study argues that labour and product market regulations which restrict the entry of new firms and the reallocation of jobs towards rapidly growing high-tech sectors may well act as a drag not just on employment, but also on productivity growth.[45]

Some of these constructs may sound more convincing than others. All share a lack of systematic empirical evidence to support or refute them. Without this evidence, the assumption that the determinants of long-term productivity growth and of long-term equilibrium unemployment are largely independent appears to be a reasonable working hypothesis.

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43 See Lindbeck (1993), p. 9.

44 The following paragraphs borrow from Calmfors/Holmlund (2000), section 4.

45 See Scarpetta et al. (2002).

4. Conclusion

The links between employment, productivity and output growth discussed in this paper are central to the overarching theme of poverty reduction and productivity in the ILO *World Employment Report 2004*. Where poverty persists, it invariably does so because societies fail to deal effectively with unemployment, low productivity and income inequality.

Employment, the productivity of labour and aggregate output are linked by the so-called "fundamental identity". While this identity can play a useful role in organizing our thinking about the links between the three variables, it cannot justify any inferences about cause and effect.

Perhaps the best-known misuse of the "fundamental identity" is the widely held assumption that too high a rate of productivity growth can crowd out employment growth and thereby become a source of unemployment. This assertion is based on the "lump of labour" fallacy and has no empirical support.

Equally popular, and equally based on the "lump of labour" fallacy is the proposition that unemployment can be alleviated by shrinking the effective supply of labour – be it by shortening working hours or by reducing labour market participation. Again, there is no empirical support for contending that either policy works. Across OECD countries, no significant correlation exists between working hours and the employment rate, whereas the correlation between the employment rate and the participation rate is strongly positive. This empirical picture is consistent with the view that societies suffering from high unemployment defensively respond by cosmetic approaches which do not address the root of the problem, but do keep the unemployed out of the unemployment statistics.

Nothing has done more to keep alive the notion of a trade-off between employment and productivity than the opposite labour market experiences of the United States and the European Union since 1970. Over the 1970s and 1980s, the United States and the European Union achieved similar rates of output growth with completely different employment intensities. The American "employment miracle" was widely attributed to the high employment intensity of output growth in the United States. The European unemployment crisis was blamed on excessive capital-labour substitution which entailed too low an employment intensity of growth. However, it is highly misleading to represent the different employment elasticities on each side of the "Atlantic divide" as a matter of choosing between different desired outcomes from the same set of options. Rather, the rapid pace of job creation in the United States was largely the mirror image of an equally rapid labour force growth, while Europe experienced unusually high productivity growth as a corollary of the post-war convergence process. In the course of the 1990s, the relative productivity performance of the United States and Europe was reversed, mainly due to the extraordinary pick-up of American productivity growth. At the same time, the relative rates of employment creation continued to diverge in favour of the United States, thus further discrediting the notion of a trade-off between employment and productivity.

Turning from the cross-country evidence to the time-series behaviour of employment and productivity growth within countries, the following empirical picture emerges. Employment and productivity are strongly and positively correlated over the business cycle as both variables fluctuate in a robustly pro-cyclical way. The positive correlation appears to survive beyond individual business cycles as the rate of productivity growth is subject to occasional changes, such as the productivity slowdown of the 1970s or the pick-up of productivity growth in the United States associated with the "new economy" in the 1990s. In an even longer term perspective over several decades, productivity and employment evolve along largely independent paths.

The theoretical framework commonly used to account for the evolution of productivity over time and the theory of equilibrium unemployment are related. Standard growth theory explains productivity growth in terms of technological progress and capital accumulation, with the latter endogenously adjusting to the former so that steady-state productivity growth is equal to the rate of technological progress. Equilibrium employment and unemployment, in turn, are analysed by modern employment theory in terms of the interaction of wage setting and price setting – both of which can be thought of as responses to productivity growth. Thus, output, productivity and employment are best understood as resulting from a process of joint determination. Their variation through time reflects the response of wages, prices and quantities (both stocks and flows) to a multitude of exogenous shocks hitting the economy.

The most widely accepted explanation for the pro-cyclical co-movements of productivity and employment rests on two pillars: the hypothesis that the slow adjustment of nominal wages and prices translates demand-side disturbances into cyclical output movements; and the hypothesis that adjustment costs prevent employment from adjusting to changes in output without delay. An alternative interpretation is proposed by Real Business Cycle (RBC) theory. This approach looks at business fluctuations as the optimal dynamic response of a competitive general-equilibrium system to real shocks, in particular exogenous productivity shocks. While both theories are consistent with some major stylized facts of the business cycle, they lead to radically different attitudes towards stabilization policy. If the RBC view is correct, Keynesian policies are ineffective and possibly even counter-productive. Instead, RBC theorists propose to handle a situation such as Japan's current economic malaise by applying microeconomic structural reforms. However, this is bound to prolong and exacerbate high unemployment and low productivity if the situation in reality calls for massive demand-side expansion, as the Keynesian view suggests.

To explain changes in unemployment that persist beyond individual business cycles, the modern theory of unemployment is focusing on the interaction of shocks and institutions. The shocks affect equilibrium unemployment mainly because wage setters are slow to take them into account. Labour market institutions determine the dimension of such effects as well as their persistence. Among the shocks that have caused major changes in equilibrium unemployment, structural breaks in the trend path of productivity have repeatedly played an important role. Even for the United States, whose flexible labour market might be expected to absorb such shocks relatively quickly, it can be demonstrated that unexpected changes in productivity growth affect equilibrium unemployment because the wage-setting process is slow to respond. The fall in equilibrium unemployment in the United States since 1990 is a case in point. In this way, productivity shocks easily explain the positive correlation of productivity and employment trends in the medium term – but so do other shocks once the endogenous response of capital formation is taken into account.

If shocks affect unemployment only because of various adjustment lags, as most theories maintain, it does not come as much of a surprise that changes in productivity, the labour force, aggregate demand or the level of taxation appear to lose any influence on unemployment once the time frame is extended to the very long term. Although the unemployment rate is trend-less in any truly long-term perspective, it is not a natural constant. Its long-term average level inevitably reflects the structural and institutional characteristics of the economy.

A low unemployment rate and rapid productivity growth are the hallmarks of a successful economy and thus top priorities of economic policy. Popular thinking about these two variables often tends to regard them as conflicting targets. But, as this paper has argued, they are interrelated in many complex ways and the nature of the mechanisms that link them changes with the time frame adopted. Overall, there is more harmony than conflict between

them and their mutual interdependence is weaker in the long term than in the short. No policy action that promises to raise long-term productivity growth should ever be rejected on the grounds that it might cost jobs in the short term. And no policy action that promises to lower equilibrium unemployment should ever be rejected on the grounds that it might create a low-productivity economy.

Bibliography

Akerlof, G.A. "Behavioural macroeconomics and macroeconomic behaviour", in *American Economic Review*, Vol. 92, 2002, pp. 411-433.

Ball, L.; Moffitt, R. "Productivity growth and the Phillips curve", in A.B. Krueger and R. M. Solow (eds.): *The Roaring Nineties: Can full employment be sustained?* (New York, Russell Sage: Century Foundation Press, 2001), pp. 61-90.

Blanchard, O.J. "The economics of unemployment – Shocks, institutions, and interactions", Lionel Robbins Lectures, London School of Economics, October, 2001.

Blanchard, O.J.; Diamond P. "The Beveridge curve", in *Brookings Papers on Economic Activity* (Washington), Vol.1, 1989, pp. 1-76.

Blanchard, O.J.; Wolfers, J. "The role of shocks and institutions in the rise of European unemployment: The aggregate evidence", in *Economic Journal*, Vol. 110, 2000, pp. C1-C33.

Bombach, G. "Post-war economic growth revisited", F. deVries Lectures in Economics (Amsterdam and New York, North-Holland, 1985).

Calmfors, L.; Holmlund, B. "Unemployment and economic growth: A partial survey", in *Swedish Economic Policy Review*, Vol. 7, 2000, pp.107-53.

Daveri, F.; Tabellini, G. "Unemployment, growth and taxation in industrial countries", *Economic Policy*, Vol. 30, 2000, pp. 49-88.

DeLong, B. *Macroeconomics* (Berkeley, University of California, 2002).

Freeman, R. "Evaluating the European view that the United States has no unemployment problem", in *American Economic Review*, 1988, Vol. 78, pp. 294-99.

Giersch, H.; Paqué. K.H.; Schmieding, H. *The fading miracle – Four decades of market economy in Germany* (Cambridge, Cambridge University Press, 1992).

Gordon, R.J. "Is there a trade-off between unemployment and productivity growth?", in D. Snower and G. de la Dehesa (eds.): *Unemployment policy: Government options for the labour market* (Cambridge, Cambridge University Press, 1997), pp. 433-463.

Hayashi, F.; Prescott, E.C. "The 1990s in Japan: A lost decade", mimeo, University of Tokyo and University of Minnesota, 2002.

International Monetary Fund. *World Economic Outlook*, May 1995.

—— . *World Economic Outlook*, May 1999.

Jackman, R. "The pros and cons of a common European employment policy", in *Swedish Economic Policy Review*, Vol. 8, 2001, pp. 201-34.

Jones, C.I. "Was an industrial revolution inevitable? Economic growth over the very long

run", Working Paper No. 7375 (Cambridge, Mass., National Bureau of Economic Research, 2000).

Keynes, J. M. *The general theory of employment, interest and money* (London, MacMillan, 1936).

Krugman, P. *The age of diminished expectations* (Cambridge, Cambridge University Press, 1990).

——. "Past and prospective causes of high unemployment", in *Reducing unemployment: Current issues and policy options*, a symposium sponsored by the Federal Reserve Bank of Kansas City, 1994, pp. 49-80.

——. "It's Baaack: Japan's slump and the return of the liquidity trap", in *Brookings Papers on Economic Activity*, Vol. 2, 1998, pp.137-87.

——. *The accidental theorist* (London, New York, W.W. Norton, 1999).

Landmann, O. "Wages, unemployment, and globalization: A tale of conventional wisdoms", in H. Wagner (ed.): *Globalization and unemployment*, Berlin-Heidelberg, Springer, 2001, pp. 165-91.

——. "Wage restraint, employment, and the legacy of the General Theory's Chapter 19", in S.K. Berninghaus and M. Braulke (eds.): *Beiträge zur Mikro- und Makroökonomik*, (Berlin-Heidelberg, Springer, 2000), pp. 291-305.

——; Jerger, J. "Unemployment and the real wage gap: A reappraisal of the German experience", in *Weltwirtschaftliches Archiv*, Vol. 129, 1993, pp. 689-717.

Layard, R.; Nickell, S.; Jackman, R. *Unemployment: Macroeconomic performance and the labour market* (Oxford, New York, Oxford University Press, 1991).

Lindbeck, A. *Unemployment and macroeconomics* (Cambridge, Mass., The MIT Press, 1993).

Lucas, R.E. *Studies in business-cycle theory* (Cambridge, Mass., The MIT Press, 1981).

Lynch, L.M.; Nickell, S.J. "Rising productivity and falling unemployment: Can the U.S. experience be sustained and replicated?", in A. B. Krueger and R.M. Solow (eds.): *The Roaring Nineties: Can full employment be sustained?* (New York, Russell Sage: Century Foundation Press 2001), pp. 538-77.

Mankiw, N.G. "Real Business Cycles: A New Keynesian Perspective", in *Journal of Economic Perspectives*, Vol. 3, No. 3, 1989, pp. 79-99.

Martin, H-P.; Schumann H. *Die Globalisierungsfalle (*Reinbek b. Hamburg, Rowohlt Taschenbuch Verlag, 1996. Also published in English (*The global trap*, 1997, London, Zed Books) and French (*Piège de la mondialisation,* 1997, Arles, Solin Actes Sud).

North, D.C. *Structure and change in economic history* (New York, Norton, 1981).

Okun, A. "Potential GNP: Its measurement and significance", in *Proceedings of the Business and Economics Statistics Section* (Washington, DC, American Statistical Association, 1962) pp. 98-103.

Phelps, E.S. *Structural slumps: The modern equilibrium theory of unemployment, interest, and assets* (Cambridge, Mass., Harvard University Press, 1994).

Plosser, C. "Understanding real business cycles", in *Journal of Economic Perspectives*, Vol. 3, No. 3, 1989, pp. 51-77.

Pollak, A. "Changes in the unemployment-growth relationship: The stability of Okun's coefficient in 15 OECD countries", mimeo (University of Freiburg im Breisgau, 2002).

Prescott, E.C. "Prosperity and depression", in *American Economic Review*, Vol. 92, No.2, 2002, pp.1-15.

Rifkin, J. *The end of work* (New York, Tarcher/Putman, 1995).

Rojas, M. *Millennium doom: Fallacies about the end of work* (London, Social Market Foundation, 1999).

Romer, D. *Advanced macroeconomics*, 2nd edition (New York, Boston, McGraw-Hill, 2001).

Scarpetta, S.; Hemmings, P.; Tressel, T.; Woo, J. "The role of policy and institutions for productivity and firm dynamics: Evidence from micro and industry data", Working Paper No. 329 (Organisation for Economic Co-operation and Development, 2002).

Shimer, R. "Why is the U.S. unemployment rate so much lower?", in B. Bernanke and J. Rotemberg (eds.): *NBER Macroeconomics Annual 1998*, Vol. 13, (Cambridge, Mass., London, MIT Press, 1999) pp. 11-61.

Siebert, H. "Labor market rigidities: At the root of unemployment in Europe?", in *Journal of Economic Perspectives*, Vol. 11, No. 3, 1997, pp. 37-54.

Solow, R.M. *Growth theory: An exposition*, 2nd edition (Oxford, New York, Oxford University Press, 2000).

Stiroh, K.J. "What drives productivity growth?", in *Economic Policy Review,* Federal Reserve Bank of New York, Mar. 2001, pp. 37-59.

Svensson, L.E. "The zero bound in an open economy: A foolproof way of escaping from a liquidity trap", in *Monetary and Economic Studies*, Special Edition, Feb., 2001, pp.277-321.

Van Ark, B.; McGuckin, R.H. "International comparisons of labor productivity and per capita income", in U.S. Dept. of Labor *Monthly Labor Review,* July, 1999, pp. 33-41.

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