

Unemployment and taxes

Do taxes affect the rate of unemployment?

SUMMARY

To the layman, the upward trend in European unemployment is related to the slowdown of economic growth. We argue that the layman's view is correct. The increase in European unemployment and the slowdown in economic growth are related, because they stem from a common cause: an excessively rapid growth in the cost of labour. In Europe, labour costs have gone up for many reasons, but one is particularly easy to identify: higher taxes on labour. If wages are set by strong and decentralized trade unions, an increase in labour taxes is shifted onto higher real wages. This has two effects. First, it reduces labour demand, and thus creates unemployment. Secondly, as firms substitute capital for labour, the marginal product of capital falls; over long periods of time, this in turn diminishes the incentive to invest and to grow. The data strongly support this view. According to our estimates, the observed rise of 14 percentage points in labour tax rates between 1965 and 1995 in the EU could account for a rise in EU unemployment of roughly 4 percentage points, a reduction of the investment share of output of about 3 percentage points, and a growth slowdown of about 0.4 percentage points a year.

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Unemployment, growth and taxation in industrial countries

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1. INTRODUCTION

1.1. The problem

The most pressing economic problem in Europe today is the apparently endless surge in unemployment. Other industrial countries have also seen an increase in unemployment over time, though to a smaller extent. To the layman, the upward trend in unemployment is related to the slowdown in economic growth, which is also apparent in most industrial countries and in particular in Europe. Both trends are illustrated in Table 1, which contrasts Europe and the US. Over the last 30 years, the unemployment rate has risen by more than 7 percentage points in the EU, and by just 1.3% in the US. Per-capita GDP growth fell markedly in both Europe and the US, but the growth slowdown in Europe was clearly more pronounced. Moreover, US growth has turned around dramatically since the mid-1990s. No such sharp acceleration is in sight in Europe.

Given the long time period, these two trends are not simply the result of business cycle fluctuations, but reflect long run tendencies. The observed negative relation between

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Table 1. Unemployment and growth in the long run: Europe and the US

	1960-70	1971-80	1981-90	1991-8
Unemployment				
EU	2.5	3.7	8.2	9.9
USA	4.8	6.4	7.1	5.8
Growth				
EU	4.4	2.7	2.3	1.7
USA	2.6	1.8	1.7	1.8

Notes: Unemployment is the OECD standardized unemployment rate; Growth is the growth rate of real per capita GDP; all in percentage points.

Source: OECD National Accounts and Economic Outlook.

long run growth and unemployment is at odds with the economist's shared opinion that the natural rate of unemployment is invariant to productivity growth. Despite a very large literature on growth and unemployment, few papers have jointly studied these two phenomena; none has made a systematic effort to come to grips with the evidence from industrial countries.¹

1.2. The main idea of this paper

This paper argues that the layman's view is correct and compatible with the economist's view. The observed increase in unemployment and the slowdown in economic growth in Europe are related, both stem from a common cause, an excessively rapid growth of the cost of labour. Over the last 30 years, gross real wages in the private sector have grown in excess of total factor productivity by a cumulated total of about 15 percentage points in Europe. Over the same period, labour costs slightly decreased in the US.

If labour markets are non-competitive, an *exogenous* and *lasting* increase in labour costs has two effects. On the one hand, it reduces labour demand, and thus creates unemployment. On the other hand, as firms substitute capital for labour, the marginal product of capital falls. Over long periods of time, this in turn diminishes the incentive to invest and thus to grow. Then high unemployment is associated with slow growth and lower investment. There is nothing very profound nor very surprising in these arguments. Yet, sometimes the simplest explanations are also the best explanations.

European labour costs have increased for many reasons, one of which is particularly easy to identify: higher taxes on labour. As shown in Table 2, labour taxes have gone up

¹The result that equilibrium unemployment is invariant to productivity growth was obtained by Phelps (1968) and more recently restated in Blanchard (1996: ch. 25). There are many excellent surveys on European unemployment, including Bean (1994), Alogoskoufis *et al.* (1995), Nickell and Layard (1999), Blanchard (1998), and OECD (1994; 1999). Little regard is generally given to the growth-unemployment link – an important exception is Bean and Pissarides (1993). Standard search theory (see Pissarides, 1990: ch. 2) has made a theoretical case that growth and unemployment are negatively related in the long run. As exogenous technical change drives productivity up, the rate of return on the creation of job vacancies rises, which accelerates the exit rate from unemployment. Aghion and Howitt (1994) allow for search unemployment in their model of growth through creative destruction. More rapid growth shortens the average length of a given job match, thus increasing job separation and reducing job finding rates. Depending on whether the 'capitalization effect' or the 'creative destruction effect' prevails, the growth-unemployment relation may be negative or positive. See also Mortensen and Pissarides (1997).

in almost every country and in almost every decade. But the consequences of labour taxes are not the same everywhere. They depend on the wage setting institutions. If labour markets are competitive, the elasticity of individual labour supply is low and the burden of a tax on labour income is borne almost entirely by the worker, with little effect on unemployment and the capital-labour ratio. But if workers are organized in monopolistic unions and their income, if unemployed, is taxed at a lower rate than wages, then they can succeed in shifting the burden of labour taxes onto firms. In this case, a permanent rise in labour taxes permanently increases unemployment. It also increases the capital-labour ratio, reduces the rate of return on capital and slows down economic growth.

Even though the unemployment effect of taxes is permanent, the effect on gross real wages could be temporary. The reason is that the dynamics of real wages reflect both an exogenous component (labour taxes) and an endogenous component (productivity, in turn driven by capital accumulation). As higher labour taxes slow down growth, this could eventually moderate real wages too. However, the slowdown in productivity growth does not affect the natural rate of unemployment as long as incomes at work and out of work are equally affected. Hence unemployment may remain permanently higher even when wages do not. This difference in the long-run behaviour of unemployment and real wages after a lasting tax increase is important. It implies that evidence of long-run wage moderation after a tax increase is consistent with the hypothesis that labour taxes have caused permanently higher unemployment.

The goal of this paper is to make this argument more precise, and to assess its quantitative relevance. Our theory, featuring a unionized labour market, is presented in Appendix A. (Furuya, 1995, studies the implications of efficiency wages and also finds a negative relation along the transition to the steady state.) Our results serve as a basis for

Table 2. Effective tax rates on labour incomes

Country/Year	1965-70	1971-5	1976-80	1981-5	1986-91	1991-5
Australia	11.7	14.1	16.5	17.9	18.6	20.1
Belgium	30.5	36.4	41.7	45.3	48.0	47.3
Canada	17.1	22.0	22.6	25.0	28.7	31.9
Finland	20.7	28.1	30.9	31.1	34.0	36.0
France	33.9	33.0	37.9	42.4	45.5	48.5
Germany	30.5	35.1	38.3	38.9	41.0	42.0
Italy	26.1	28.7	32.0	37.0	41.1	45.4
Japan	16.0	18.1	20.6	24.4	27.2	27.7
Netherlands	36.1	42.7	47.1	50.1	51.6	52.6
Norway	31.0	38.9	38.7	38.4	39.6	39.0
Spain	15.4	20.2	26.4	32.8	35.6	33.0
Sweden	34.3	38.9	47.2	48.1	51.5	50.1
UK	22.6	24.7	26.7	27.1	25.9	24.4
USA	20.1	23.0	26.1	28.3	28.8	27.4

Notes: Effective tax rates are constructed following the methodology suggested by Mendoza *et al.* (1994). See also Appendix B.

Source: OECD National Accounts and Revenue Statistics.

our empirical investigation based on a panel of 14 OECD countries over the period 1965–95, contrasting Europe and other industrial countries.

1.3. Key findings

An important step in our argument is that the unemployment effect of labour taxes depends crucially on the wage-setting institutions. Thus, the variety in labour market institutions across OECD countries is useful. We ask whether the negative effects of labour taxation on employment and growth are more pronounced in continental Europe, where labour markets are clearly dominated by powerful trade unions, and yet wage bargaining is not as centralized as in the Nordic countries. This is indeed what we find in the data depicted in Figures 1, 2 and 3 (the country groups are as described in Table 4). The difference between countries in continental Europe and the other industrial countries is striking: the high positive correlation between tax rates on labour income and unemployment is clearly a phenomenon of continental Europe, not present in the Anglo-Saxon or Nordic countries.

In continental Europe the effective tax rate on labour income (inclusive of social security contributions) rose from 28% in 1965–70 to 42% in 1991–5. During the same period, the average unemployment rate went up from 2.1% to 10.5%, the growth rate of per-capita GDP fell from 4.2% to 1% per year and the investment share over GDP fell from 27.5% to 24.5%. According to our estimates, a tax increase of this magnitude can account for a rise of 4 percentage points in unemployment (about half of the actual one), a growth slow down of about 0.4 percentage points a year (about one-seventh of the actual one) and a fall in the investment share of almost 3 percentage points (the entire fall in the investment share). No such effect is present in either Anglo-Saxon or Nordic countries.

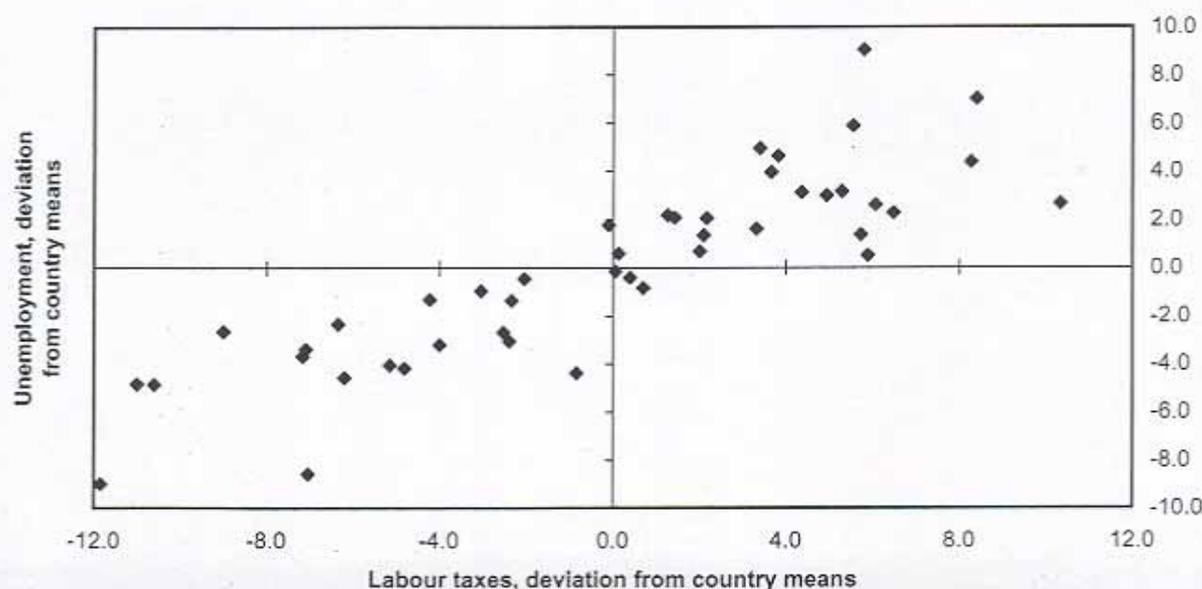


Figure 1. Unemployment and labour taxes in continental Europe

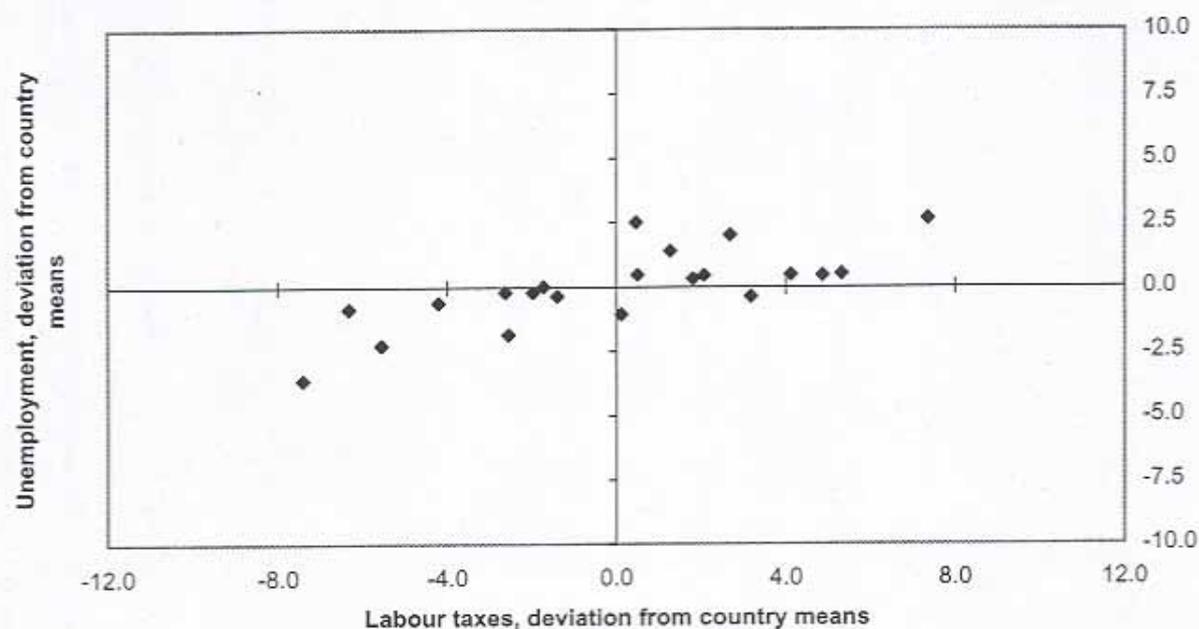


Figure 2. Unemployment and labour taxes in the Anglo-Saxon countries

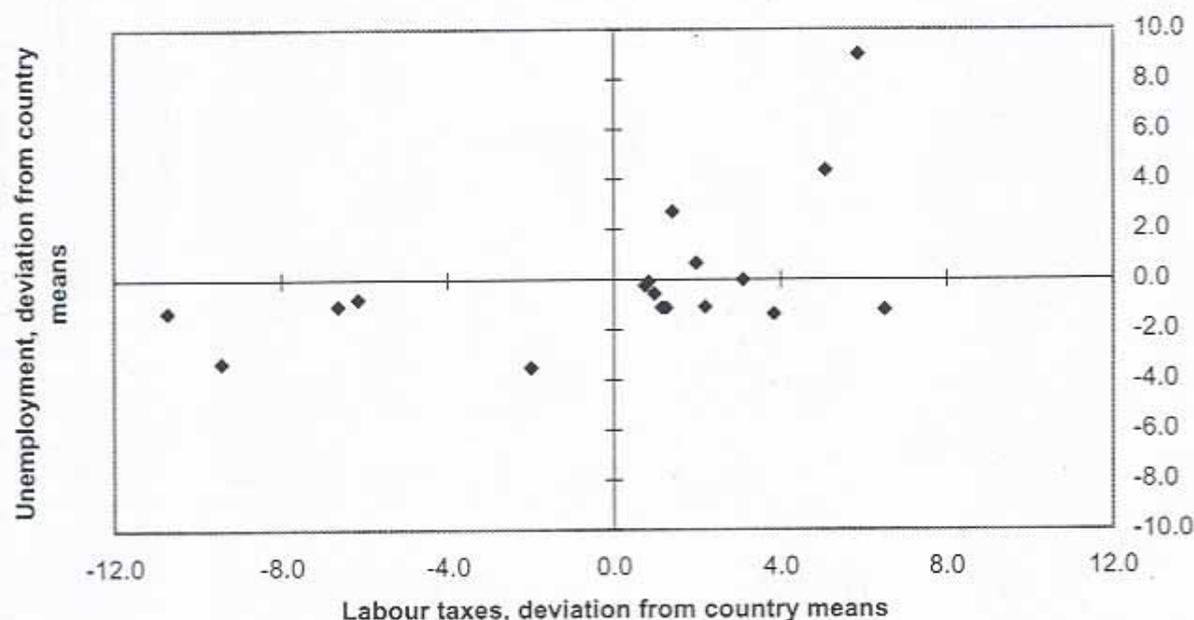


Figure 3. Unemployment and labour taxes in the Nordic countries

This difference between continental Europe and the rest of the industrial world is also reflected in the behaviour of the capital-labour ratio. The IMF estimates that between 1970 and 1995 the capital-labour ratio more than doubled in the European Union, whereas it only rose by 25% in the US. The Summers-Heston data on capital stocks deliver a similar message. Between the end of the 1960s and the early 1990s, the average capital stock per employee increased by some 65% and 100% in the US and Canada,

respectively, and by 130%, 150%, 175% and 280% in Italy, France, Germany and Spain, in spite of broadly similar growth rates in all these countries.²

A crucial implication of our argument is that the effect of higher labour taxes on unemployment operates through higher real wages. This prediction is also strongly supported by the data: after accounting for productivity and income growth, higher tax rates on labour are indeed shifted onto higher gross wages in continental Europe, but not in the other OECD countries. For each percentage point rise in labour taxes, real wages go up in Europe by a bit less than half a percentage point.

1.4. Policy implications

The policy implications of our results are simple and relevant at the same time. First of all, our findings should lead to a reassessment of the distorting effects of taxation, and in particular of labour taxes. If our results are correct, the rise of labour taxes in continental Europe has been extremely costly in terms of unemployment, economic growth and investment. Moderating the overall level of taxation, and mostly of taxes on labour, is thus one of the main challenges currently faced by the European Union.

Secondly, our results suggest that there may be benefits in reforming the tax structure. In continental Europe, labour taxes are found to be more distorting, in terms of unemployment and growth, than consumption taxes or capital income taxes. To put it bluntly, we find hardly any distorting effects of both consumption and capital taxes. Taken at face value, these results imply that revenue-neutral reform aimed at shifting the burden of taxation away from labour onto consumption or capital may enhance efficiency. Available data on tax bases and tax rates imply that a five-point cut in the tax rate on labour would open a budget gap of about 3% of GDP in European countries on average. To close this gap, the capital tax rate would need to go up by 10 percentage points, or the tax rate on consumption would need to go up by 4 percentage points. Note that, while capital tax rates are measured with error, which may explain our finding, this caveat is less likely to apply to consumption taxes.

1.5. The existing literature

If the explanation is so simple and straightforward, why have so few papers pointed out that labour taxes are a key determinant of European unemployment? As reported by Blanchard and Katz (1997, pp. 66–7), 'the role of taxes was a main focus of a multi-country study organised by Richard Layard and Steve Nickell in the mid-1980s. The cross-sectional evidence within Europe does not reveal much correlation between tax

²As noted by Blanchard (1997), the labour share of income fell in continental Europe but not in other industrial countries over this same time period. This paper does not attempt to address this other stylized fact, even though it is not inconsistent with our proposed explanation of the European unemployment problem. An increase in labour taxes causing higher unemployment can also reduce the labour share of income if the long-run elasticity of substitution between capital and labour is sufficiently high – see for instance Caballero and Hammour (1996).

rates and unemployment rates, nor between changes in tax rates and changes in unemployment.' Our study confirms these previous findings in the cross-section of 14 OECD countries. The cross-sectional variation in the unemployment rates is dominated by fixed effects at the country level. This is not too surprising: as documented for instance by Nickell (1997), labour market legislation differs markedly across countries but has not changed much since the late 1960s or early 1970s. Labour tax changes significantly predict changes in unemployment rates *over time*, however. Moreover, this correlation is strong and evident among the highly unionized countries of Continental Europe, and much less so in countries with competitive labour markets or in the Nordic countries characterized by highly centralized trade unions. Thus, the correlation between labour taxes and unemployment is only captured by simultaneously exploiting the time series and cross-country variations of the data, and by distinguishing among countries on the basis of their labour market institutions. This distinction as well as the emphasis on time series (as opposed to cross-country) correlation was missing in most previous studies on European unemployment – see Box 1.

Finally, some of the ideas in this paper are clearly related to Bruno and Sachs (1985) and Phelps (1994). The theoretical analysis in both books was not cast in terms of modern growth theory, however. They had more ambitious goals, and their analysis also focused on business cycle phenomena and on international linkages. The empirical analysis also differed from ours in the choice of economic variables, and they did not group countries according to labour market institutions.

Box 1. Labour taxes and unemployment: a comparison with previous results

We obtain evidence of a highly significant and very large effect of labour taxes on the unemployment rate for countries in continental Europe. In the tables below, the estimated coefficient of labour taxes on unemployment ranges from about 0.3 to over 0.5, depending on the specification. The less parsimonious specification, which is perhaps more realistic, yields an estimate of 0.30–0.35 (columns 5 and 6 in Table 9). We obtain this result using five-year averaged data for a sample of 14 OECD countries (70 panel observations). Two recent papers, by Nickell and Layard (1999) and Blanchard and Wolfers (1999) adopt a similar empirical strategy, with small panels and five-year averaged data. It is thus natural to ask whether results significantly differ across studies, and why.

The empirical work closest to ours is the one conducted by Nickell and Layard (NL, from here onwards). They regress (the log of) the unemployment rate on a variety of controls, including proxies for macroeconomic policy stance, labour market institutions, total tax rates and time dummies. The sample size is 40 (20 OECD countries over two five-year periods, 1983–8 and 1989–94). Their estimated tax coefficient is about 0.22, smaller than ours but in the same ballpark.

(They use power functions so their estimated coefficient of 0.027 must be multiplied by the average unemployment rate in the sample 7.9%.) The reasons for this discrepancy are many: number of countries, time period, definition of taxes, and regression specification. But the crucial reason is that NL constrain the estimated coefficient on labour taxes to be the same for *all* the countries in the sample. As shown in Figures 1–3, we find evidence of substantial heterogeneity across groups of countries. In fact, when we impose the (rejected) constraint that all countries have the same coefficients, we too obtain a smaller estimate, like NL.

A much smaller coefficient of 0.018 is obtained by Blanchard and Wolfers (BW). Their sample size is 160 (20 OECD countries over eight periods of time, five-year averages throughout 1960–96) and their estimation method is non-linear least squares. This estimation method allows them to separately identify country- and period-specific unobserved effects from those of observed shocks and institutions (some measures of institutions remain rather crude, however). There are two crucial differences between our paper and the results reported in BW. First, BW does not exploit the time variation that is in the data, whereas we do. They measure tax rates as the 1960–96 average for each country and interact them with time-specific dummy variables. As a result, country-specific information on the time variation of tax rates is lost. Moreover, like in NL and unlike here, all countries are constrained to have the same estimated coefficient on tax rates.

Our results on wages (in particular, the evidence of forward shifting of taxation in continental Europe but not in the Anglo-Saxon countries) are consistent with those of Alesina and Perotti (1997). They find a positive relation between labour taxes and unit labour costs in manufacturing in a sample of annual data from 14 OECD countries (the same as ours, except that they have Denmark instead of Spain). They too grouped countries according to their labour market institutions, and in particular according to the role of trade unions. Yet their country classification differs from ours in some cases, for they followed the qualitative classification suggested by Calmfors and Driffill (1988) while we rely directly on coverage and density data.

Other papers investigating the empirical evidence on wages, unemployment and taxation, with mixed results, are Padoa Schioppa (1990), Tyrväinen (1994), and Tullio (1987). Bean (1994) and OECD (1994) survey this strand of literature.

1.6. Outline

The paper outline is as follows. Section 2 summarizes the theoretical predictions (the details of the theory are summarized in Appendix A). Section 3 describes the data, while Section 4 looks at the econometric evidence. Section 5 concludes the paper.

2. THE THEORY

In this section, we summarize the main ingredients and predictions of the theory presented in Appendix A. (It is a general equilibrium growth model with equilibrium unemployment, with three building blocks.)

2.1. Policy

The focus of the analysis is on the consequences of taxation, not on the composition of spending. Thus, we neglect the question of what are the economic consequences of alternative forms of government spending. To preserve the general equilibrium analysis, however, we need to specify how the government spends the revenue it collects. We assume that government spending takes two forms only: unemployment subsidies and government consumption, the latter being treated as a residual variable that plays no role except to balance the budget. We distinguish between taxes on labour and on capital income. Tax rates are kept constant over time. Unemployment subsidies and government consumption are a constant fraction of per capita income (this is necessary to have balanced growth).

2.2. Equilibrium unemployment

Employment is determined by competitive firms, ensuring that the marginal product of labour is equal to the real wage with a constant-elasticity demand for labour. Wages are the result of bargaining between a monopolistic union and firms. The union is large enough to be able to negotiate over wages, but small enough to take fiscal policy variables and the interest rate as given. Thus, unions operate at the firm or sector level. The union objective is to maximize the expected income of workers net of taxes, taking into account the employment effect of higher wages. This is a static bargaining problem: when the union formulates its wage demands, it takes the existing capital stock as given, but it does not take into account the effect of future wages onto the firm's decision to accumulate capital. (This amounts to assuming sequential wage bargaining and the absence of reputational links across periods.) Equilibrium investment does depend on expected future wages, but future wages will be set next period and are not affected by current wage negotiations. Hence, the union correctly takes future expected wages as given, and perceives no link between current wages and firm's investment. (This, a standard time inconsistency problem in monopolistic wage setting, is further discussed in section 2.5.2 below.)

Equilibrium wage formation is illustrated in Figure 4 for the extreme case of a monopolistic union who has all the bargaining power. (In a more general formulation where bargaining power is split more evenly between the firm and the union the mark-up of the equilibrium wage over the unemployment subsidy is positively related to the bargaining power of the union.) The vertical axis measures wages net of taxes; the

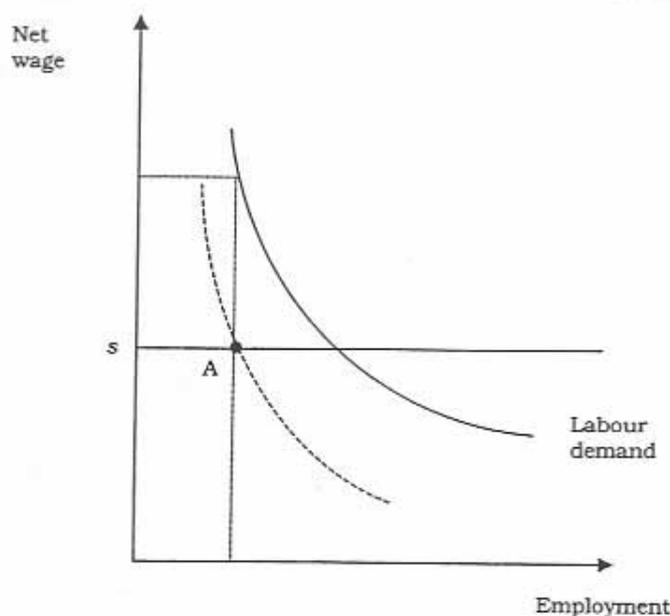


Figure 4. Equilibrium unemployment

horizontal axis measures employment. The solid downward sloping curve is labour demand. The dotted curve is the marginal revenue curve (net of taxes) as perceived by the monopolistic trade union. The solid horizontal line is individual income if unemployed, also net of taxes. Equilibrium employment is determined by the intersection of the marginal revenue curve with income if unemployed, point *A*, where the monopolistic union equates marginal revenue of employed workers to the relevant opportunity costs, namely their earnings when unemployed. Net wages are then read off the labour demand curve at the equilibrium employment level.

What are the consequences of a higher tax rate on labour income? Since the vertical axis measures wage income net of taxes, as the tax rate rises, the labour demand curve shifts to the left in a parallel fashion, and so does the marginal revenue curve. If the horizontal line is unaffected by the tax hike (or not affected to the same extent), point *A* moves to the left: equilibrium employment falls, and the net wage remains unaffected (by the assumption of constant elasticity of labour demand). Thus, gross wages rise in proportion to the tax. Higher taxes on labour are entirely shifted onto higher costs, and equilibrium unemployment rises.

The key assumption behind this result concerns the tax treatment of income if unemployed. Taxes on wage income reduce employment because they drive a wedge between income if employed and if unemployed. But how reasonable is the assumption that income if unemployed is not taxed? Clearly, this assumption is correct if income when unemployed is earned in the underground economy, or if it proxies for the utility from additional leisure time. Indeed, in a number of industrial countries the underground economy is the main source of income for many unemployed workers. In other countries, however, the size of the underground economy is not very large, and the main source of income for unemployed workers is an unemployment subsidy. The issue then concerns the tax treatment of unemployment subsidies.

Table 3. The tax treatment of labour incomes and unemployment benefits

Are unemployment benefits subject to income taxes and social security contributions?			
Income tax → Soc. sec. contr. ↓	YES	Reduced rate	NO
YES	CAN, NET, NOR, SWE		
Reduced rate	UK	AUS, FIN, FRA, SPA	
NO	ITA, USA	BEL	GER, JAP
Effective tax rates on subsidies implied by OECD data			
1961–91 average	Tax rates on labour (1)	Tax rates on unemployment subsidies (2)	(1)–(2)
Australia	15.8	2.1	13.7
Belgium	39.2	27.3	11.9
Canada	22.9	10.9	12.0
Finland	28.2	14.0	14.2
France	39.8	31.0	8.8
Germany	36.3	8.0	28.3
Italy	34.0	-4.4	38.4
Japan	21.3	6.1	15.2
Netherlands	44.6	29.7	14.9
Norway	37.0	20.8	16.2
Spain	24.8	16.2	8.6
Sweden	42.2	15.8	26.4
UK	24.2	1.2	22.9
USA	24.1	0.8	23.3
All (average)	31.0	12.8	18.2

Notes: The reported tax rate on unemployment subsidies, τ^S , is the implicit tax rate computed from the definition of the net-of-tax replacement rate (RR): $RR^{NET} = RR^{GROSS}(1 - \tau^S)/[1 - (\text{labour tax rate})]$ using OECD point-wise information on replacement rates, and our data on labour tax rates.

Sources: OECD *Jobs Study* (1994: ch. 8, Annex 8.B) and OECD (1998) 'Benefit systems and work incentives'.

This varies considerably across countries, as documented in Table 3. The upper panel provides information about the institutional arrangements (the source is the 1998 OECD Report on Benefit Systems and Work Incentives). In most countries, unemployment subsidies enjoy partial or full exemptions from either income taxes or social security contributions. The lower panel seeks to provide a quantitative estimate of the tax wedge between wages and unemployment subsidies. The OECD *Jobs Study* (1994) reports data on gross and net-of-tax average replacement rates for a few years (1961, 1971, 1981, 1991). Computing country means and exploiting our data on labour taxes for the same years, we recovered the implied effective tax rates on unemployment subsidies. The tax wedge is clearly positive (18% on average), and varies across countries (it ranges from more than 38% in Italy to less than 9% in France and Spain). Ultimately, however, the issue of whether there is a relevant tax wedge between income if employed or

unemployed is empirical. And, as we shall see, the empirical evidence speaks quite clearly in favour of the tax wedge hypothesis.

2.3. Dynamics

Over time, the economy is driven by the process of capital accumulation. The key ingredient here is the assumption that savings and investment both grow with the marginal product of capital. This is a common assumption. If the capital stock is below its steady state value, the marginal product of capital is higher than in the steady state, and the economy catches up. The opposite happens if capital is above the steady state. Exogenous changes in employment (such as those due to higher tax rates on labour) affect the steady state capital stock through the capital–labour ratio, between capital and *employed* workers. Thus, a permanent drop in the employment rate also reduces the steady state (per capita) capital stock, since there are fewer employed individuals in the population. As a result, any permanent change in the employment rate also sets in motion a dynamic adjustment to the new steady state. Intuitively, for a given capital stock, lower employment implies a higher capital labour ratio, so capital becomes less productive at the margin, and this induces less investment and a slower growth of per capita income. Eventually a new steady state is reached, with the same capital–labour ratio but a lower per capita capital stock.

This link between employment and investment (or growth) is a common feature that plays a critical role in business cycle analysis. Oddly enough, it has been neglected in the theory of economic growth, possibly because it is typically assumed that labour markets are competitive and deliver full employment. Once employment is regarded as endogenous, the variables determining employment also affect growth during the transition.

How long the transition to the steady state lasts is an empirical issue. According to many empirical studies, convergence to the steady state can be long lasting. For instance, when the convergence rate is close to 3% per year – a figure implied by our empirical findings – it takes about 23 years to bridge 50% of the gap between the actual and steady state capital stock. Such a long convergence process is very important from a practical point of view.³ Why convergence to the steady state takes so long for open economies too is an open puzzle in the literature, to which this paper has nothing to add.

2.4. Policy effects

What are the consequences of alternative tax structures? We consider a permanent and unexpected increase in taxation. To focus on one policy intervention at a time, we

³The productive technology could even be specified so that the model admits 'endogenous' growth, in which case all dynamic effects are permanent. With the more standard assumptions about technology, endogenous growth is a transitory phenomenon.

assume that the government consumption share is appropriately adjusted so as to keep the government budget balanced at any instant of time.

A higher capital tax rate reduces the net rate of return on investment and hence the steady state capital stock, as well as the level of per capita income and real wages. During the transition all these variables grow more slowly. Employment is not affected, not even during the transition, as real wages absorb all the consequences of the higher tax rate. (These effects motivate the common view that capital taxes are highly distorting and, from an efficiency point of view, should be avoided as much as possible, see for instance Rebelo, 1991).

Here, not only do labour taxes have a similar effect, but they also reduce employment as illustrated in Figure 4. The fall in employment in turn reduces the steady state capital stock, just like a higher tax rate on capital. In the transition to the new steady state, investment, per capita income and real wages all grow at a slower rate (recall that real wages are proportional to the unemployment subsidy, which in turn is assumed to be a constant fraction of per capita income).

Which tax rate has a bigger negative impact effect on growth is ambiguous, and depends on the characteristics of the economy. For example, if all tax rates are the same at the outset, a rise in labour taxes is unambiguously costlier to growth than a rise in capital taxes. The reason is that the tax on labour affects the return of capital as the capital tax but, in addition, it also reduces savings.

Figure 5 presents the predicted evolution over time. The employment effect of higher taxes on labour is permanent, whereas the growth effect is temporary.⁴ Real wages rise on the impact of higher labour taxes. Firms cut employment and, for a given capital stock, the capital-labour ratio rises. In the long run, however, investment is reduced and the economy returns to a new steady state, with the same capital-labour ratio, the same real wage, but a permanently lower level of employment and of per capita output. Thus, whereas in the short run higher labour taxes have opposite effects on employment and real wages, in the long run the wage effect vanishes but the employment effect remains. This asymmetry in the long-run equilibrium effects of labour taxes on wages and employment can make it difficult for empirical research to detect the policy distortions. In particular, an empirical finding that in the long run there is no lasting effect of taxes on wages is entirely consistent with the view that taxes have a permanent effect on employment.

Raising unemployment subsidies permanently has the same qualitative effect as a higher labour tax: in the short run, real wages increase, employment falls and growth is slowed down. In the long run (with a Cobb-Douglas technology) the employment effect and the output effect remain, but the real wage and the capital labour ratio return to their steady state value. Finally, note that taxes on consumption have no effect on unemployment nor on investment. The reason is that consumption taxes do not drive a

⁴ If the productive technology is specified so that the model has endogenous growth, then all growth effects are permanent – see Appendix A.

