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# BANK OF FINLAND DISCUSSION PAPERS

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19 • 2001

Erkki Koskela  
Research Department  
21.9.2001

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A partial survey

Suomen Pankin keskustelualoitteita  
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### Labour taxation and employment in trade union models: A partial survey\*\*

The views expressed are those of the author and do not necessarily reflect the views of the Bank of Finland.

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# Labour taxation and employment in trade union models: A partial survey

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## Abstract

This paper uses a union bargaining framework, where the wage rate is negotiated between the representatives of employees and employers and firms unilaterally determine employment, to discuss the relationship between labour taxation and employment. In imperfectly competitive labour markets higher labour taxes – income and payroll taxes – will increase labour costs and have negative effects on employment. Tax progression tends to moderate wages and boost employment. Moreover, if labour tax bases are unequal due to tax exemptions, the structure of labour taxation matters so that the tax wedge may not be a sufficient statistic to describe the channel of influence of labour taxation. Finally, distortionary effects of labour taxes in more corporatist economies should be smaller than in economies with more decentralised wage bargaining. Empirical evidence – though not always very strong – supports these notions.

Key words: union bargaining, labour taxation, tax progression

JEL classification numbers: J51, H20, H22

# Työn verotus ja työllisyys neuvottelumalleissa: katsaus kirjallisuuteen

Suomen Pankin keskustelualoitteita 19/2001

Erkki Koskela  
Tutkimusosasto

## Tiivistelmä

Tutkimuksessa tarkastellaan neuvottelumallia, jossa työmarkkinajärjestöt neuvottelevat palkoista ja yritykset sen jälkeen päättävät työllisyydestä, ja johdetaan tämän perusteella hypoteeseja työn verotuksen ja työllisyyden välisestä riippuvuudesta. Epätäydellisesti kilpailevilla työmarkkinoilla työn verotuksen – palkansääjien tulovero ja työnantajien sosiaaliturvamaksut – näytetään lisäävän työvoimakustannuksia ja vähentävän työllisyyttä. Työn verotuksen progressio puolestaan johtaa maltillisempiin palkkavaatimuksiin ja näin parempaan työllisyyskehitykseen. Jos työn verotuksen eri muotojen veropohjat ovat erilaisia verottomuuden vuoksi, on myös työn verotuksen rakenteella merkitystä, eikä ns. verokiilaa voi pitää riittävänä indikaattorina kuvaamaan työn verotuksen vaikutuksia. Työmarkkinoiden rakenne – missä määrin neuvottelut ovat koordinoituja – voi niin ikään vaikuttaa siihen, miten verotus ja työllisyys liittyvät toisiinsa. Empiirinen todistusaineisto – joskaan ei aina kovin voimakas – on sopusoinnussa näiden hypoteesien kanssa.

Asiasanat: neuvottelumalli, työn verotus, veroprogressio

JEL luokittelu: J51, H20, H22

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# 1 Reasons for unemployment

During the last 30 years or so the unemployment in Europe has been developed quite differently from what we have seen in the United States. Since the early 1970s unemployment rate in Europe has had a tendency to rise with the exception of a boom in late 1980s. In the United States unemployment rate has started to go down since the beginning of 1980s with a small exception in the early 1990s (see Figure 1). Even though there has been a rising trend in the average European unemployment, there are differences across countries in Europe. A sharp example of this phenomenon has been the development of unemployment in two Iberian countries, Portugal and Spain. Figure 2 indicates how from the late 1980s the unemployment rate in Spain used to be about 20 per cent for a long time, while Portugal's unemployment rate fluctuated between 4 and 8 per cent during the same period.

What could explain these two facts, high average European unemployment compared with the development in the United States and differences across European countries? Originally economists suggested two alternative explanations. According to one view different economic shocks in Europe and United States could explain different unemployment development. In this context it is often referred to productivity shocks and oil crises in the 1970s and higher European real interest rates in the 1980s when monetary policy was tightened to mitigate inflation as potential shocks to explain unemployment differences. While these shocks may explain the rise of unemployment for some time, it is hard to argue convincingly that these can account for a continuing rise in European unemployment. Moreover, and importantly, they cannot explain different country experiences; shock differences have simply been too small.

The second argument stressed the potential role of labour market institutions. Though labour markets are not homogenous in Europe, they are on the average "rigid" in Europe and "flexible" in the United States in terms of employment protection legislation, properties of unemployment benefit systems and wage flexibility. Here rigidity means high employment protection, liberal unemployment benefit systems and rigid wages. This labour market institution view was presented e.g. by OECD (1994). A problem with that explanation is the following one: In Europe the rigidity of labour markets was very high in early 1970s when unemployment rate was still low. After that labour markets have become more flexible while at the same time unemployment rates have increased.

Recent research has provided some preliminary evidence in favour of the view according to which accounting for the interaction between economic shocks and labour market institutions can go a long way to explain both the higher European unemployment rate and cross-country differences within Europe. The idea here is simple: the more rigid the labour markets are, the higher unemployment effects are associated with negative economic shocks. For instance when the benefit replacement ratio is very high and the duration of unemployment benefits long, negative economic shocks tend to give rise to long-term unemployment, which is for various reasons hard to eliminate when economies start to recover. For empirical evidence of this view according to which rigidities

Figure 1.

### Unemployment: USA versus EU

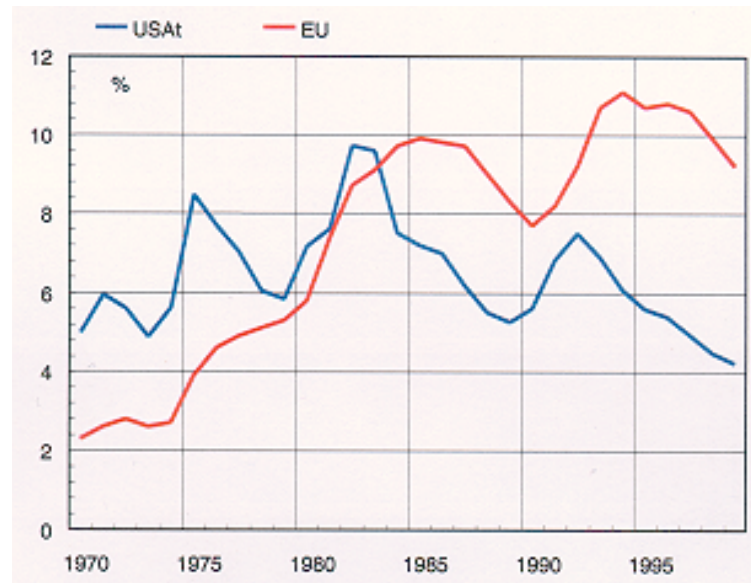
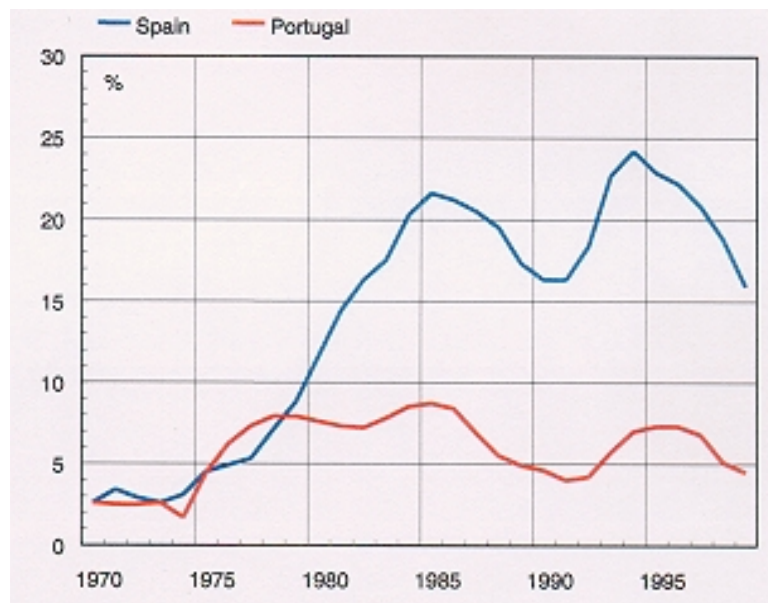


Figure 2.

### Unemployment: Spain versus Portugal



may cause hysteresis, see Blanchard and Wolfers (2000) and Ball (1999).<sup>1</sup> Recently, Bover, Garcia-Perea and Portugal (2000) have presented some further evidence for this view by making a systematic analysis of Spanish and Portuguese labour market institutions. Their analysis reveals that Spain and Portugal have been like night and day in this regard. In Spain the actual level of employment protection is higher, the unemployment benefit system is more generous for workers – in terms of eligibility criteria, the benefit replacement rate and benefit

<sup>1</sup> Ljungqvist and Sargent (1998) provide an interesting and complementary theoretical analysis of how an improvement in unemployment compensation programmes may reduce the capability of economies to adjust to adverse economic shocks.

duration – trade unions are stronger and wage flexibility is lower. As Spain and Portugal have experienced more or less similar economic shocks as neighbouring countries, a natural explanation for the difference in unemployment rates is that the impacts of economic shocks depend on labour market institutions. This is not, however, the whole story. As has been shown by Blanchard-Portugal (2001), a similar unemployment rate in Portugal and the United States can hide different labour market details.

In the literature about the determinants of unemployment the potential role of labour taxation has recently started to get more attention. Why labour taxation might matter in this respect? First, a rise in wage taxation will tend to lead to higher wages and thereby to higher labour costs. Second, a rise in the payroll taxes levied on firms might also lead to higher labour costs if the payroll tax increases do not lead to a corresponding fall in the before-tax wage rate. In this paper we review both theoretical and empirical literature associated with the relationship between labour taxation and unemployment. More specifically, we are interested in three sets of issues. First, how do labour taxes affect wage formation and employment? Second, does the structure of labour taxation matter i.e. is the labour tax wedge – the sum of income and payroll tax rates divided by the total labour costs – the sufficient statistic to describe the channel of behavioural effects of labour taxation? Third, does the progression of labour taxation affect wage formation and thereby employment?

We proceed as follows. Section 2 provides a brief survey of some theoretical issues associated with the relationship between labour taxation and employment, while in section 3 we present a selected review of empirical evidence. Finally, there are some concluding remarks.

## 2 Labour taxation and employment in trade union models: theoretical aspects

There are alternative approaches to model employment and its relationship to taxes like i) competitive labour market approach, ii) the efficiency wage hypothesis according to which wages are not only a cost factor, but also an incentive device (see e.g. Shapiro and Stiglitz 1984) iii) search and matching models, which emphasize the labour market frictions, job creation, job destruction and technological changes (see e.g. Pissarides 2000) and iv) union bargaining models. The competitive labour market approach does not seem to be a realistic way to view European labour markets with high unemployment rates. As for the other approaches ii)–iv) they are complementary to each other by stressing different aspect of labour market phenomenon. In order to exposit the potential role of labour taxes I use a union bargaining approach, which emphasizes the role of trade unions in wage setting and the determination of employment. Undoubtedly this is a natural approach in the European case, where either the union density rate of workers or/and the coverage of collective bargaining

agreements are very high.<sup>2</sup> In fact, in most cases the results can be shown to be valid in other models of labour market behaviour which provide alternative and complementary explanations of unemployment.

## 2.1 The right-to-manage approach for wage and employment determination

For presentation purposes we use the so-called right-to-manage approach (RTM) according to which the wage rate is negotiated between the representatives of employees and employers, while the firms after that unilaterally determine employment.<sup>3</sup> Next we describe briefly the main elements of the RTM approach with labour taxes.

### A. Firm behaviour

We postulate the following profit function for the representative firm

$$\pi = pY - \tilde{w}L - rK \quad (2.1)$$

where  $Y$  = output,  $L$  = employment,  $K$  = capital stock,  $p$  = producer price,  $\tilde{w} = w(1+s)$  = the gross wage,  $s$  = payroll tax rate, and  $r$  = the price of capital. The production function is assumed to be of CES-type in a simplified form

$$Y = f(L, K) = \left[ L^{\frac{\sigma-1}{\sigma}} + K^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}, \quad (2.2)$$

where  $\sigma$  is elasticity of substitution between labour and capital. We assume firms have price setting power in the goods markets and the demand for goods is of constant elasticity type  $Y = D(p) = p^{-\varepsilon}$ , where  $\varepsilon$  is the price elasticity of goods demand. It can be shown that the wage elasticity of labour demand resulting from the profit maximization is of the form

$$\frac{L_{\tilde{w}} \tilde{w}}{L} = \eta_{L, \tilde{w}} = -\sigma + \varepsilon(\sigma - \varepsilon), \quad (2.3)$$

---

<sup>2</sup> See e.g. OECD Employment Outlook 1997. Outside the United States and Japan, most workers in the OECD have their wages determined by collective agreements, which are negotiated at the plant, firm, industry or national level. In some countries the union density rate has recently decreased, but at the same time the coverage of collective bargaining agreements has remained at the very high level or even become wider. In continental Europe collective bargaining coverage is typically 90% thus making trade union models relevant in analysis.

<sup>3</sup> Using the monopoly union model, where the trade union fixes the wage rate and firms after that determine employment, or the efficient bargain model, where both the wage rate and employment are subject to a simultaneous negotiation, yields qualitatively similar results.

where  $x \equiv \tilde{w}L/cY$  describes the cost share of labour and  $c = c(\tilde{w}, r)$  the unit costs of production.<sup>4</sup> As we will indicate later on, the properties of wage elasticity of labour demand are an important aspect in terms of how labour taxation matters for wage formation, labour demand and equilibrium unemployment.

## B. Trade unions and wage determination

The objective function of trade unions is written as the sum of the welfare of employed and unemployed trade union members and for simplicity as a linear function

$$V^* = [w(1-t) + ta]L + b(N-L), \quad (2.4)$$

where  $N$  = labour force,  $b$  = outside option for unemployed,  $t$  = income tax rate levied on employed members of the trade union, and  $a$  = tax exemption. Along the lines in the literature we assume that the threat points for the firm and the trade union are  $\pi^0 = 0$  and  $V^0 = bN$  respectively. Therefore, the Nash maximand for the wage negotiation can be written as

$$\text{Max}_w \Omega = V^\beta \pi^{1-\beta} \quad \text{s.t. } \pi_L = 0 \quad (2.5)$$

where  $V = V^* - V^0 = [w(1-t) + ta - b]L$  and  $\beta$  describes the relative bargaining power of trade union. We can solve the Nash bargaining problem implicitly to give

$$w^N = \left( \frac{b - ta}{1 - t} \right) \frac{(\beta \eta_{L, \tilde{w}} + (1 - \beta)x(1 - \varepsilon))}{\beta(1 + \eta_{L, \tilde{w}})} \quad (2.6)$$

According to (2.6) the negotiated wage rate depends on the outside option of the trade union  $b$ , the wage elasticity of labour demand  $\eta_{L, \tilde{w}}$ , the relative bargaining power  $\beta$  as well as taxation parameters  $t$ ,  $a$  and  $s$ . The proportional payroll tax will affect the wage formation only if it will modify the wage elasticity of labour demand  $\eta_{L, \tilde{w}}$ . It is well known that if the production function is of Cobb-Douglas type, the wage elasticity is not affected by the proportional payroll tax rate. Next we discuss the role of these factors.

## 2.2 On the determinants of wage formation

First, it is straightforward to see that the higher outside option and the higher relative bargaining power of the trade union lead to the higher wage rate, i.e.  $w_\beta, w_b > 0$ . Second, an increase in tax exemption works like a subsidy so that the trade union is willing to accept a lower wage the higher is the tax exemption i.e.  $w_a < 0$ . Third, one can see from equation (2.3) that an increase in the price elasticity of goods demand – i.e. the higher is the degree of economic integration

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<sup>4</sup> See e.g. Hamermesh (1993).

in the goods markets – raises the wage elasticity of labour demand. An increase in the wage elasticity of labour demand make it harder for the trade union to extract rent from wage negotiations. This will lead to wage moderation, i.e.  $w_\epsilon < 0$ .<sup>5</sup>

## A. Income and payroll taxes

What about the effects of the constant income tax rate  $t$  and the constant payroll tax rate  $s$ ? As for the income tax rate it is straightforward to show that higher income tax increases the before-tax wage, but less than one-to-one. Hence, tax burden of income taxation is divided for both sides of the labour market so that the income tax rate elasticity of wage rate is between one and zero, i.e.

$0 < \omega_t = \frac{w_t(1-t)}{w} < 1$ . This means that the higher marginal income tax rate will

increase the total labour costs. This result, however, depends on the assumption that the wage income is taxed at the higher rate than unemployment income. If their tax rates are the same, then the marginal income tax rate will have no effect on wage formation because the income tax rate does not affect the difference between the after-tax wage income and the after-tax unemployment income.<sup>6</sup>

As for the effect of the proportional payroll tax rate, it depends on the precise properties of the production function (2.2). If the production function is of Cobb-Douglas type with the elasticity of substitution between labour and capital being one, then the payroll tax will have no effect on the negotiated wage rate. This is because under Cobb-Douglas production function the wage elasticity of labour demand is constant and the wage elasticity is the only channel via which the payroll tax might affect the wage formation. Under these circumstances the total labour costs will increase one-to one with the payroll tax rate.

What happens if the elasticity of substitution differs from one? First, it can be shown that the change in the cost share of labour with respect to the gross wage rate is given by<sup>7</sup>

$$\frac{\partial x}{\partial \tilde{w}} = \frac{x}{\tilde{w}}(1-x)(1-\sigma) \begin{cases} > \\ = \\ < \end{cases} 0 \Leftrightarrow \sigma \begin{cases} < \\ = \\ > \end{cases} 1 \quad (2.7)$$

Therefore the cost share of labour from the unit production costs is positively (negatively) related to the gross wage  $\tilde{w}$  when the elasticity of substitution is smaller (higher) than one. By looking at the equation (2.3) one can see that under the plausible assumption  $\sigma < \epsilon$  a larger cost share of labour  $x$  implies higher wage elasticity of labour demand in absolute terms. Hence when the elasticity of substitution is smaller than one, the trade union benefits less from demanding higher wages and the wage rate falls. By contrast when the elasticity of substitution exceeds one, the reverse happens; labour demand becomes less elastic

<sup>5</sup> In fact there is some (weak) empirical evidence which supports for the view that higher economic integration will increase the wage elasticity of labour demand (see e.g. Slaughter 2001). See also Nickell (1999a).

<sup>6</sup> See e.g. Koskela and Schöb (1999b).

<sup>7</sup> For the details, see e.g. Koskela-Schöb (1999a) or Koskela-Schöb (2001).

and the trade union benefits more from demanding higher wages and the wage rate increases. Therefore we have

$$w_s \left\{ \begin{array}{l} < \\ = \\ > \end{array} \right\} 0 \text{ as } \sigma \left\{ \begin{array}{l} < \\ = \\ > \end{array} \right\} 1. \quad (2.8)$$

We can also show that under the assumptions made the payroll tax elasticity of the wage rate is between zero and minus one, i.e.  $-1 < \omega_s = \frac{w_s(1+s)}{w} \leq 0$ . Thus the tax burden is divided between both sides of the labour market so that the higher payroll tax rate will increase the gross wage rate and vice versa.

## B. Structure of labour taxation

Does it matter for wage formation and thereby for labour demand, whether labour taxes are levied on firms or on members of trade union? According to conventional wisdom the answer is no. The only thing which would matter would be the tax wedge defined empirically as the gap between the real labour costs of the firm, on the one hand, and the real post-tax consumption wage of the worker on the other (see e.g. Layard-Nickell-Jackman 1991, 209–210). Abstracting from the value-added tax this would mean that the structure of labour taxation is irrelevant.

Using the framework presented above, it can be shown that raising the income tax rate  $t$  and decreasing the payroll tax rate  $s$  so as to keep the tax revenue constant has the effect of decreasing the gross wage  $\tilde{w} = w(1+s)$  and thereby boosting employment if  $a > 0$ . In this case the tax base for the income tax is smaller than that for the payroll tax.<sup>8</sup> On the other hand if the tax bases are equal, tax rates are proportional in the sense that the average tax rate is constant. In this case the irrelevance theorem holds; the structure of labour taxation does not matter for wage formation. We come back to the interpretation of these results in the next section.

## C. Tax progression and wage formation

Does it matter whether taxes are proportional or progressive? We know from the case of competitive labour markets where wage rate and hours of work are determined by demand for and supply of labour, that a tax-revenue neutral rise in progression – which makes the average tax rate steeper – will decrease labour supply. Therefore the wage rate goes up and the unit costs of production become higher and in open economies competitiveness of industries will deteriorate. This is because a higher marginal income tax rate compensated by a higher tax exemption will create a negative substitution effect on labour supply.

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<sup>8</sup> See Holm-Koskela (1997) and Koskela-Schöb (1999). This can be shown to hold under quite general assumptions also in the case of endogenous working hours. See Holm-Kiander-Koskela (2001).



Does this result hold in the case of imperfectly competitive labour markets? The answer is no. Under quite general conditions higher tax progression will lead to wage moderation and thereby boost employment. This has been shown e.g. by Koskela and Vilmunen (1996) in popular models of trade union behaviour.<sup>9</sup> A higher tax progression – a higher marginal tax rate compensated by a higher tax exemption which will keep the tax revenue of government constant – means that the slope of the average tax rate with respect to the tax base becomes steeper. Hence, a smaller share of an increase in the wage rate will be kept by the workers. This makes it beneficial for the trade unions to want lower wage rate because the trade-off between the wage rate and employment becomes more favourable to employment.

Now we can come back to the earlier result according to which the labour tax wedge is not necessarily the sufficient statistic to describe the channel of behavioural effects of labour taxation.

Whether payroll taxes and income taxes are equivalent in terms of the gross wages or not depends on whether a change in the structure of labour taxation affects tax progression in the sense of how rapidly the average tax rate changes with the tax base. Tax progression may change for two reasons: First, if income changes as a result of the tax reform, the actual tax progression will change for any given tax schedule. Second, as the tax rate changes, the tax schedule may change for any given income. Next we elaborate these considerations a bit more.

An appropriate and intuitive way to define (linear) tax progression is to look at the average tax rate progression, which is given by the difference between the marginal tax rate  $t$  and the average tax rate  $t^a$ ,  $ARP = t - t^a$ . The tax system is progressive if ARP is positive and tax progression becomes higher if the difference increases at a given income level.<sup>10</sup> Defining the tax wedge for a worker with respect to the gross wage, the marginal tax wedge is given by

$\tilde{t} \equiv \frac{(t+s)}{1+s}$  and the average tax wedge by

$$ARP = \tilde{t} - t^a = \frac{ta}{\tilde{w}}. \quad (2.9)$$

If there is no tax exemption – i.e. if  $a = 0$  – then changes in the structure of labour taxation do not affect the average tax rate. But in the presence of positive tax exemption tax progression increases as a result of a tax revenue neutral shift ( $dT = 0$ ) towards a higher income tax rate and a lower proportional payroll tax rate, because we get

$$\left. \frac{dARP}{dt} \right|_{dT=0} = \frac{a}{\tilde{w}} \left[ 1 - \frac{t}{\tilde{w}} \frac{d\tilde{w}}{dt} \right]_{dT=0} > 0. \quad (2.10)$$

<sup>9</sup> The wage moderating effect of tax progression has been shown to be a feature of other models which provide complementary explanations for equilibrium unemployment like the efficiency wage models and matching models (for demonstrations, see e.g. Sorensen (1999), Pissarides (1998) and Ljungqvist –Sargent (1995)).

<sup>10</sup> See e.g. Lambert (1993), chapter 6 for a more detailed discussion of the various ways to characterize progression taxation. Our discussion here has assumed for simplicity that the marginal tax rate  $t$  is constant. Of course, one (very commonly used) definition of tax progression is to say that taxation is progressive when the marginal tax rate increases with the tax base.

As the marginal income tax has a smaller tax base than the payroll tax, the increase in the income tax must be higher than the fall in the payroll tax, which increases the marginal tax rate for a given average tax rate.

To conclude, it is the effect a change in the structure of labour taxation has on the progression of the tax schedule in the average tax rate sense, which is crucial. This drives the result according to which structure of labour taxation matters to the extent that it affects progression of labour taxation.

#### D. Labour taxation and corporatism

Earlier when we discussed the potential effects of labour taxes on wage formation and employment we implicitly assumed that trade unions are decentralized in the sense that they do not account for (or perceive) the effects of taxes on the benefits they receive via government budget. For instance, Summers, Gruber and Vergara (1993) have suggested that corporatist labour institutions – labour market institutions with a “high” degree of centralization of wage bargaining – do recognize the linkage between the taxes the workers will pay and the benefits they receive via government budget. Hence, as they will argue, the distortionary effects of labour taxes in more corporatist economies should be smaller than in economies with more decentralized wage bargaining. Alesina and Perotti (1996) provide a complementary analysis focusing on the relationship between the distortionary taxation, competitiveness of industries and degree of corporatism.

### 2.3 On determinants of equilibrium unemployment

In the earlier analysis the outside option for the members of trade union,  $b$ , has been taken as exogenous. If we are interested in the long-run equilibrium effects we have to allow for the endogenous outside option. A usual approach is to assume for simplicity that industries are symmetrical in the sense that  $A_i = A$ , so that the mark-up factor – describing the difference between the wage rate in unionised and competitive sectors - is the same across industries, where mark-up factor can be written as

$$A = \frac{[\beta\eta_{L,\tilde{w}} + (1-\beta)x(1-\varepsilon)]}{\beta(1+\eta_{L,\tilde{w}})} \quad (2.11)$$

According to (2.11) the mark-up depends on the relative bargaining power of trade unions, the wage elasticity of labour demand, the cost share of labour and the price elasticity of goods demand.

In a general equilibrium context the outside option can be defined as  $b = (1-u)w^e + uB$ ,<sup>11</sup> where  $u$  is unemployment,  $w^e$  the wage rate elsewhere and  $B$  = the unemployment benefit. Restricting to the case of constant benefit replacement ratio  $q \equiv B/w$  and  $w = w^e$  gives from (2.6) the equilibrium unemployment rate

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<sup>11</sup> See Layard-Nickell-Jackmann (1991).

$$u^N = \frac{1}{1-q} \left[ 1 - \frac{1-t+c}{A} \right] \quad (2.12)$$

where  $c = ta/w$ . The equilibrium unemployment rate depends among others positively on the benefit replacement ratio,  $q$ , and the income tax rate  $t$ . The effect of the payroll tax rate  $s$  depends on how it affects mark-up factor  $A$  via the wage elasticity of labour demand. To be more precise, the higher is labour demand elasticity, the lower is the mark-up factor. Hence, if for example the elasticity of substitution between capital and labour is smaller than unity, then a higher payroll tax means a higher wage elasticity of labour demand and thereby lower equilibrium unemployment. The labour demand elasticity also increases with the price elasticity of goods demand  $\epsilon$ , which will therefore have a negative effect on equilibrium unemployment.

In the earlier analysis we assumed that changes in the income tax rate alter the relationship between income while in work and income while unemployed. This happens for instance when the unemployed have an access to other income sources, which are not subject to taxation or if there are important leisure values associated with unemployment.<sup>12</sup>

### 3 Labour taxation and employment: some empirical evidence

After briefly sketching out various channels via which labour taxation might affect wage formation and thereby employment, we now turn to look at the empirical evidence of labour taxation from four points of view

- how do income and payroll taxes affect the negotiated wage rate and thereby labour demand?
- is the tax wedge a sufficient statistic to describe the channel of behavioural effects of labour taxes or does the structure of labour taxation matter after all?
- does the progression of labour taxes affect total labour costs?
- does the degree of corporatism in the labour markets affect the relationship between labour taxes and wage formation?

Concerning the first question, there is empirical evidence – though it is not always very strong – according to which both income taxes and payroll taxes will have a negative effect on labour demand. This is because incidence of labour taxes would seem to be levied on both sides of labour markets. Second, the income tax progression seems to have a wage moderating effect, which will boost employment. There is evidence from various countries, which lies in conformity with this view. Usually the argument has been that tax progression can only be justified from equity (= income distribution) point of view so that there is a trade-off between equity and efficiency aspect of labour taxation. In imperfectly competitive labour markets, however, progression also increases the efficiency of the working of labour markets so that from the society point of view it may be

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<sup>12</sup> See e.g. Nickell and Layard (1999), p. 3048–3051 for a more detailed discussion.

justifiable even without income distribution considerations. This is a finding, which has been thus far given too little attention. Third, there is a little bit of evidence that the structure of labour taxation matters for wage determination and employment. This is the issue, which has not yet been researched very much. In what follows we describe these three sets of findings in a more detailed way.<sup>13</sup>

What is the empirical international evidence on the effects of labour taxation on wage formation? There are some recent studies with international data in this matter, like e.g. Nickell-Layard (1999), Nickell (1999) and Daveri-Tabellini (2000). Their results are consistent with each other and easy to summarise as follows.

In these papers it is assumed that what matters in wage formation of labour taxation is the tax wedge, not the structure of taxation. Nickell and Layard (1999) and Nickell (1999b) have used data from 20 OECD over the period 1983–1994. In their research they also controlled for other potential variables which might affect unemployment (see Table 15). They conclude as follows “...the balance of evidence suggests that there is probably some overall adverse tax effect on unemployment and labour input. Its precise scale, however, remains elusive”. More recently, Daveri and Tabellini (2000) have studied the effects of labour taxes on labour demand and unemployment by using panel data from OECD countries over the period 1965–1995. This allows them to simultaneously exploit the time series and cross-country variations of the data and to distinguish among countries on the basis of their labour market institutions. According to their 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 (see Table 1 for some details). They resume their findings as follows “We obtain evidence of a highly significant and very large effect of labour taxes on the unemployment rate in continental Europe ... the estimated coefficient of labour taxes ranges from about 0.3 to over 0.5 depending on the specification” (see Daveri-Tabellini (2000), p. 55). But as one can see from Table 1, their evidence from Nordic countries, while of the same sign, is not statistically significant.

Honkapohja, Koskela and Uusitalo (1999) have used industry data from Finland to study the effect of income and payroll taxes on wage setting on the one hand and the role of gross wages on labour demand on the other hand. In Table 2 the effects of the incidence of the changes in the income and payroll tax on the nominal wage setting are presented across Finnish industries by using the annual data over the period 1960–1997. According to the SUR estimation results the average elasticity of the nominal wage rate changes with respect to changes in the payroll tax rate is  $-0.21$ , while the corresponding figure with respect to the changes in the inverse of income tax is  $-0.56$ .<sup>14</sup> Hence while the incidence of income tax seems to be distributed roughly evenly between both parties of the labour markets, the incidence of the payroll tax would seem to fall more on employers.

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<sup>13</sup> See also the discussion in Leibfritz-Thornton-Bibbec (1997), p. 33–39.

<sup>14</sup> For relatively similar results using the same Finnish data set over the shorter period, see Holm-Honkapohja-Koskela (1995) and using aggregate quarterly Finnish time series data over the period 1961–1994 see Pehkonen (1999) and Kiander-Pehkonen (1999).

Table 1.

**Unemployment and labour taxes  
(1965–1955, five-year averages).  
Source: Daveri–Tabellini (2000)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. variable	U	$\Delta u$	$\Delta u$	$\Delta u$	u	$\Delta u$	u	$\Delta u$
Estimation	OLS	OLS	GLS	OLS	OLS	OLS	2SLS	2SLS
Specification	Country-specific constants	Without constant	Without Constant; With Moving Average Correction	Without t constant; lagged policy variables	Country-specific constants	Without Constant t	Country-specific constants; lagged policy variables	Without Constant; Lagged Policy Variables
Labour tax	0.25*** (0.107)	0.27 (0.221)	0.17 (0.194)	0.28 (0.193)	0.19** (0.097)	0.20 (0.181)	0.36*** (0.157)	0.42* (0.236)
ANGLO								
Labour tax	0.54*** (0.062)	0.54*** (0.120)	0.47*** (0.117)	0.46*** (0.102)	0.35*** (0.080)	0.29** (0.134)	0.59*** (0.089)	0.55*** (0.128)
EUCON								
Labour tax	0.11 (0.162)	0.12 (0.194)	0.16 (0.160)	0.23 (0.16)	0.06 (0.145)	0.02 (0.160)	0.16 (0.186)	0.30* (0.168)
NORDIC								
Unemployment	0.14*** (0.051)	0.04 (0.070)	0.05 (0.056)	0.09* (0.054)	0.12*** (0.046)	0.08 (0.058)	0.15*** (0.057)	0.09* (0.053)
Benefit								
Employment	-1.00* (0.571)	-1.22 (0.734)	-1.15** (0.583)	-0.56 (0.622)	-1.03* (0.542)	-0.84 (0.649)	-1.02 (0.632)	-0.47 (0.614)
Protection								
Benefit	–	–	–	–	YES**	YES***	–	–
Duration <sup>a</sup>								
Growth	–	–	–	–	–	–	0.43 (0.424)	-0.21 (0.191)
N. obs.	84	70	70	70	84	70	84	70
Adj. R <sup>2</sup>	0.93	0.26	0.18	0.35	0.95	0.51	0.92	0.35
RMSE	1.904	2.374	1.078	2.233	1.693	1.924	2.110	2.181
JB test for Normality	0.11	0.05		0.07	0.66	0.000	0.06	
LM test: serial Correlation	0.002	0.06		0.14	0.001	0.04	0.07	

Notes: The dependent variable is the unemployment rate, u, or the change in the unemployment rate,  $\Delta u$ .

<sup>a</sup>Benefit duration is always interacted with time dummies, one for each five-year period. The statistical significance of its coefficient thus refers to the F-test on the joint significance of all estimated coefficients (one for every five-year period). Columns (1), (5), (8): all variables in levels. Columns (2), (3), (4), (6), (7), (9); all variables in first differences. Column (3): estimated by GLS allowing for MA(1) in the error term and correlation across countries (SAS Da Silva method). Column (7): estimated by 2SLS, with fixed effects and lagged tax and benefit rates in the unemployment equation. The growth equation is specified as in Table 12, column (1). Column (8): estimated by 2SLS. The growth equation is specified as in Table 12, column (2). Fixed-effects intercepts not reported. Standard errors in parentheses.

\* = 10% level of significance.

\*\* = 5% level of significance.

\*\*\* = 1% level of significance.

RMSE: Root Mean Square Error. JB test: Jacque–Bera test for normal residuals. A p-value below 0.05 rejects normality at 95% confidence interval. LM test: Lagrange Multiplier test corrected for degrees of freedom (Kiviet, 1986). A p-value below 0.05 rejects the absence of serial correlation at 95% confidence interval.

What about the labour demand (or employment) elasticities in terms of the gross wage rates. Using the same Finnish industry data as in Table 2, results by using SUR estimation are presented in Table 3. Not surprisingly, the long run wage elasticities vary quite a lot across industries, the average long run elasticity being  $-0.68$ . Using labour demand function with the industry data is not, however, necessarily, very reliable because of potential simultaneity problems between wages and income tax variable and output and labour demand. Therefore we have also estimated labour demand functions with the panel data, which consists of 500 biggest Finnish enterprises over the period 1986–1997. Some set of results are

presented in Table 4, which indicates that wage elasticities are a bit sensitive to the estimation method. Since the data is not representative concerning the Finnish industry, one should be cautious about the results; the wage elasticities would seem to be a bit smaller than we got by using time series industry data. All in all, the gross wage costs – affected by labour taxation – would seem to matter for labour demand (and unemployment).

Usually in studies of the effect of labour taxation on wages and employment researchers have used the tax wedge variable with the idea that it does not matter what is the precise structure of labour taxation. By using data from United Kingdom Lockwood and Manning (1993), however, noticed that the tax wedge does not work in the sense that the income and payroll taxes affect differently. The same finding using the industry data from Finland was noticed by Holm, Honkapohja and Koskela (1994, 1995), Honkapohja, Koskela and Uusitalo (1999) (see Table 2) and using the aggregate data by Pehkonen (1999). Tyrväinen (1995a) has provided some international – though not very strong – evidence along the similar lines. This finding lies in conformity with the view that the tax wedge is not the sufficient statistic to describe the behavioural channel of labour taxation if the tax bases of income and payroll taxes are not equal due to tax exemptions. Empirical evidence is not very strong, however, so that further research is needed.

What about the role of tax progression for wage formation? Earlier we noticed that under imperfectly competitive labour markets tax progression tends to moderate wages and thus boost employment. Does empirical evidence supports this notion? The answer seems to be positive. There is evidence from Italy (Malcomson and Sartor 1987), from United Kingdom (Lockwood and Manning 1993), from Sweden (Holmlund and Kolm 1995)) from Finland (Tyrväinen, 1995a, 1995b), Honkapohja and Koskela 1999), which lies in conformity with the hypothesis according to which higher tax progression will moderate wage formation. The evidence from Denmark is much weaker. Lockwood and Slok and Tranaes (2000) have studied the effect of tax progression on wage formation by using Danish earnings data disaggregated by occupation, gender and earnings level. Their result is that whether tax progression moderates or exaggerates wage pressure is income dependent.<sup>15</sup>

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<sup>15</sup> That looks like a reasonable result, which cannot be analyzed by using aggregate data. Labour supply of workers may or may not be rationed. If the trade union negotiates the working hour "on the behalf of workers", then one can show that labour supply is rationed (see e.g. Holm–Kiander–Koskela 2001). On the other hand if workers can decide their working hours, the situation is different. In the former case the tax progression moderates, while in the latter case it exaggerates wage pressure. Hence, to the extent that the determination of working hours varies in different group of workers, the impact of tax progression may vary as well (see Lockwood–Slok–Tranaes (2000) and Hansen-Pedersen-Slok (2000)). Empirical research with panel data from other countries could provide some further light on the issues involved. This kind of data would make it possible to simultaneously study the effects of taxation on working hours, wage determination and employment. For a tax reform analysis focusing on working hours and using micro data from Finland, see e.g. Kuismanen (2000). See also Ilmakunnas (1997).

Table 2. **Wage equations from industry data, D log (w)**  
Source: Honkapohja–Koskela–Uusitalo (1999)

Equation	Industry	D log ((1+s)/q)	D log ((1-t)/p)	D log (u)	Trend	Constant	R <sup>2</sup>
1	Forestry (2)	-0.392 (0.164)	-0.213 (0.275)	0.064 (0.047)	-0.0021 (0.0010)	0.098 (0.031)	0.536
2	Food, beverages, tobacco (3)	-0.248 (0.067)	-0.583 (0.089)	-0.015 (0.013)		0.050 (0.006)	0.809
3	Textiles, clothing, leather (4)	-0.053 (0.034)	-0.711 (0.105)	-0.022 (0.018)		0.049 (0.008)	0.682
4	Pulp and paper (6)	-0.322 (0.079)	-0.585 (0.102)	-0.029 (0.015)		0.037 (0.007)	0.794
5	Printing, publications (7)	-0.036 (0.019)	-0.806 (0.087)	-0.022 (0.015)		0.038 (0.007)	0.767
6	Chemical (8)	-0.010 (0.042)	-0.677 (0.082)	-0.016 (0.014)		0.047 (0.007)	0.714
7	Clay, glass and stone (10)						
	Basic metal (11)						
	Machinery, electronics (12)						
	Transport equipment (13)						
8	Building (15)	-0.167 (0.116)	-0.529 (0.147)	-0.045 (0.022)	-0.0012 (0.0005)	0.068 (0.017)	0.709
	Other construction (16)						
9	Gas, electricity and water (14)	-0.181 (0.092)	-0.620 (0.115)	-0.029 (0.014)	-0.0007 (0.0003)	0.057 (0.011)	0.813
	Trade (17)						
	Restaurants, hotels (18)						
	Transportation (19)						
10	Finance, insurance (20)	-0.399 (0.082)	-0.368 (0.102)	-0.017 (0.014)	-0.0011 (0.0003)	0.057 (0.011)	0.816
	Estate, business services (21)						
	Public, social, personal services (23)	-0.686 (0.134)	-0.236 (0.135)	-0.021 (0.016)	-0.0008 (0.0004)	0.058 (0.013)	0.778
	Average elasticity (weighted by employment)	-0.209	-0.564				

**Standard errors in parentheses.** w = nominal wage, s = payroll tax rate, q = producer price, p = consumer price, t = average income tax rate, u = unemployment rate

Table 3. **Employment equations from industry data**  
Source: Honkapohja–Koskela–Uusitalo (1999)

Equation	Industry	Log (w(1+s)/q)	Log (Y)	Log L(-1)	Log L(-2)	Trend	R <sup>2</sup>	DW	Long-run wage elasticity	Long-run output elasticity
1	Forestry (2)	-.297 (.098)	.454 (.081)	.604 (.075)		-.011 (.003)	.993	1.35	-.750	1.146
2	Food, beverages, tobacco (3)	-.139 (.060)	.441 (.067)	.951 (.123)	-.272 (.103)	-.011 (.004)	.997	1.62	-.434	1.374
3	Textiles, clothing, leather (4)	-.166 (.049)	.375 (.044)	.743 (.047)		-.010 (.002)	.989	1.23	-.643	1.458
4	Wood (5)	-.250 (.057)	.338 (.050)	.719 (.052)		-.006 (.002)	.978	1.58	-.890	1.204
5	Pulp and paper (6)	-.100 (.049)	.140 (.040)	.818 (.046)		-.002 (.001)	.948	1.74	-.550	.772
6	Printing, publications (7)	-.236 (.075)	.500 (.043)	.584 (.039)		-.016 (.004)	.974	1.44	-.567	1.202
7	Chemical (8)									
8	Clay, glass and stone (10)									
9	Basic metal (11)									
10	Machinery, electronics (12)									
11	Transport equipment (13)									
12	Building (15)	-.335 (.075)	.439 (.061)	.526 (.122)	-.154 (.100)	-.008 (.002)	.966	1.35	-.533	.698
13	Other construction (16)	-.270 (.048)	.356 (.043)	.857 (.095)	-.216 (.082)	-.004 (.001)	.959	1.65	-.750	.990
14	Gas, electricity and water (14)									
15	Trade (17)									
16	Restaurants, hotels (18)									
17	Transportation (19)									
18	Finance, insurance (20)	-.032 (.066)	.200 (.047)	1.384 (.128)	-.652 (.104)		.998	1.51	-.120	.743
19	Estate, business services (21)	-.361 (.095)	.254 (.088)	.865 (.059)		.003 (.002)	.941	1.80	-2.671	1.879
20	Public, social, personal services (23)									
21	Average elasticity (weighted by employment)								-.681	1.045

**Dependent variable log (L)**, standard errors in parentheses.



Table 4.

**Employment equations from micro data:****GMM-estimates**

Source: Honkapohja–Koskela–Uusitalo (1999)

	(1)	(2)	(3)	(4)
D log N (t-1)	.036 (.021)	.773 (.110)	.751 (.103)	.711 (.055)
D log N (t-2)	.013 (.017)	-.108 (.025)	-.105 (.024)	-.092 (.020)
D log (w/q)	-.402 (.018)	-.358 (.036)	-.359 (.036)	-.181 (.057)
D log (w/q)(t-1)	-.125 (.020)	.158 (.063)	.151 (.060)	.092 (.044)
D log Y	.247 (.010)	.199 (.025)	.203 (.025)	.137 (.034)
D log Y (t-1)	.101 (.012)	-.101 (.034)	-.097 (.032)	-.078 (.023)
D log K	.064 (.008)	0.056 (.015)	.055 (.015)	.047 (.029)
	Year dummies	Year dummies	Year dummies Industry dummies	Year dummies
	OLS	GMM-instr. For lagged Dependent variable	GMM-instr. For lagged dependent variable	GMM-instr. also for wage rate, capital and output
Wage elasticity (long-run)	-.555	-.598	-.587	-.235
Observations	2329	2329	2329	2329
Firms	410	410	410	410
M2 (d.f.)		.866 (352)	.857 (352)	.634 (352)
Sargan test (d.f.)		31.4 (25)	32.6 (25)	72.7 (66)

Standard errors in parentheses. m2 is a test for AR(2). Sargan-test is a test for validity of instruments.

Finally, we should ask: Is there any evidence along the lines suggested originally by Summers-Gruber-Vergara (1993), according to which labour taxation will have weaker effects on wage formation and employment corporatist economies than in economies where the degree of centralization of wage bargaining is lower? The empirical evidence in Alesina-Perotti (1996) lies in conformity with this view with this view. Moreover, one way to interpret the empirical findings by Daveri-Tabellini (2000), which we discussed earlier, is to say that the results of their research lies in conformity with the notion according to which labour taxation has smaller distortionary effects in corporatist economies (see also empirical findings by Kiander-Kilponen-Vilmunen (2001)). This is an area, where empirical findings are a bit mixed and further research is needed (see Calmfors (2001) for a more detailed discussion).

## 4 Some concluding remarks

What are the conclusions we can draw from the basis of empirical research concerning the relationship between labour taxes, wage setting, labour demand and unemployment?

First, there is empirical evidence – which is not necessarily too strong – according to which both income taxes and payroll taxes will have a negative effect on labour demand. This is because incidence of labour taxes would seem to be levied on both sides of labour markets. This lies in conformity with our theoretical findings. Second, the income tax progression seems to have a wage moderating effect, which will boost employment. There is evidence from various countries, which supports this view. Usually the argument has been that tax progression can only be justified from equity (= income distribution) point of view so that there is a trade-off between equity and efficiency aspects of labour taxation. In imperfectly competitive labour markets, however, progression also increases the efficiency of the working of labour markets so that it is justifiable without income distribution aspects. This is a finding, which has been thus far given too little attention. Third, there is a little bit of evidence that the structure of labour taxation matter for wage determination and employment. This is the issue, which has not been empirically researched very thoroughly. It has usually been mentioned only as a finding against a common notion that the tax wedge is the sufficient statistic to describe the behavioural channel of labour taxation. This is certainly an important area for further empirical research.

All in all, most of empirical research about the wage and the employment effects of labour taxation have been done by using only aggregate time series or aggregate cross-country data. For various reasons – like econometric problems associated with simultaneity between wages and tax variables and output and labour demand and the possibility that various parts of labour markets work differently – panel data set studies would be useful to provide more evidence about the relationships or their lack.

To the extent that changes in labour taxation affect the relationship between income while work and income while unemployed – either because the unemployed have an access to other income sources which are not subject to taxation or because there are important leisure values associated with unemployment – then equilibrium unemployment is altered with changes in labour taxation. In terms of tax policies based theoretical and supporting empirical research we can draw the following conclusions. First, the tax-revenue neutral rise in labour tax progression – either in terms of income tax rate or in terms of payroll tax rate – will moderate negotiated wages, decrease the outside option for workers and thereby lead to lower equilibrium unemployment. Second, in terms of employment effects of income taxation levied on workers, what matters is the relative tax rates of income employed and unemployed, respectively. If the tax rates are the same, tax rate changes will have no wage effect, so that equilibrium unemployment will remain unchanged, but government budget deficit will increase. Third, the structure of labour taxation matters as well. By shifting taxation towards narrower tax base due to tax exemption will increase total tax progression and will thereby boost employment for similar reasons than we presented earlier in the context of tax progression. Hence, even without making tradeoffs between the level of government expenditures and labour taxation it is

possible to use tax policy to affect equilibrium unemployment. But finally, and importantly, the degree of corporatism (= the degree of centralization of wage bargaining) may matter and from this point of view the role of taxation in various countries differ.

## References

- Ball, L. (1999) **Aggregate Demand and Long-Run Unemployment**. Brookings papers on economic activity, 1999:2, 182–251.
- Blanchard, O. – Portugal, P. (2001) **What Hides Behind an Unemployment Rate: Comparing Portuguese and U.S. Labor Markets**. American Economic Review, 91, 187–207.
- Blanchard, O. – Wolfers, J. (2000) **The Role of Shocks and Institutions in the Rise of European Unemployment: the Aggregate Evidence**. Economic Journal, 110, C1–C33.
- Bover, O. – Garcia-Perea, P. – Portugal, P. (2000) **Labour Market Outliers: Lessons from Portugal and Spain**. Economic Policy, 31, 381–428.
- Calmfors L. (2001) **Wages and Wage Bargaining Institutions in the EMU – A Survey of the Issues**. CESifo Working Paper No. 520.
- Daveri, F. – Tabellini, G. (2000) **Unemployment, Growth and Taxation in Industrial Countries**. Economic Policy, 30, 49–88.
- Hamermesh, D. (1993) **Labor Demand**. Princeton University Press, New Jersey.
- Hansen, C.T. – Pedersen, L.H. – Slok, T. (2000) **Ambiguous Effects of Tax Progressivity – Theory and Danish Evidence**. Labor Economics, 7, 335–347.
- Holm, P. – Honkapohja, S. – Koskela, E. (1994) **A Monopoly Union Model of Wage Determination and Taxes: An Empirical Application to the Finnish Manufacturing**. European Economic Review, 38, 285–303.
- Holm, P. – Honkapohja, S. – Koskela, E. (1995) **Employment and Differential Payroll Taxes**. Ministry of Social Affairs and Health Publications, 1995:11, Helsinki (in Finnish).
- Holm, P. – Kiander, J. – Koskela, E. (2001) **Tax Progression, Structure of Labour Taxation and Employment in a Bargaining Model with Endogenous Working Hours**. Manuscript under preparation.
- Holm, P. – Koskela, E. (1997) **Tax Progression, Structure of Labour Taxation and Employment**. Finanzarchiv, 53, 28–46.
- Holmlund, B. – Kolm, A.-S. (1995) **Progressive Taxation, Wage Setting and Unemployment: Theory and Swedish Evidence**. Swedish Economic Policy Review, 2, 423–460.
- Honkapohja, S. – Koskela, E. (1999) **Finland's Depression: A Tale of Bad Luck and Bad Policies**. Economic Policy, 29, 399–436.

- Honkapohja, S. – Koskela, E. – Uusitalo, R. (1999) **Employment, Labour Taxation and the Balance of the Public Sector**. Finnish Economic Journal, 95, 74–95 (in Finnish).
- Ilmakunnas, S. (1997) **Female Labour Supply and Work Incentives**. Labour Institute for Economic Research, Studies, 68, Helsinki.
- Kiander, J. – Kilponen, J. – Vilmunen, J. (2001) **Taxes, Growth and Unemployment in the OECD Countries – Does Collective Bargaining Matter?** VATT-discussion papers No. 235.
- Kiander, J. – Pehkonen, J. (1999) **Finnish Unemployment: Observations and Conjectures**. Finnish Economic Papers, 12(2), 94–108.
- Koskela, E. – Schöb, R. (1999a) **Does the Composition of Wage and Payroll Taxes Matter under Nash Bargaining?** Economics Letters, 64, 343–349.
- Koskela, E. – Schöb, R. (1999b) **Alleviating Unemployment: The Case for Green Tax Reform**. European Economic Review, 43, 1723–1746.
- Koskela, E. – Schöb, R. (2001) **Optimal Factor Income Taxation in the Presence of Unemployment**. Forthcoming in Journal of Public Economic Theory.
- Koskela, E. – Vilmunen, J. (1996) **Tax Progression is Good for Employment in Popular Models of Trade Union Behaviour**. Labour Economics, 3, 65–80.
- Kuismanen, M. (2000) **Labour Supply and Income Tax Changes: A Simulation Study for Finland**. Bank of Finland Discussion Papers, 5/2000.
- Lambert, P.J. (1993) **The Distribution and Redistribution of Income: A Mathematical Analysis**. Manchester University Press, 2nd edition.
- Layard, R. – Nickell, S. – Jackman, R. (1991) **Unemployment. Macroeconomic Performance and the Labour Markets**. Oxford University Press.
- Leibfritz, W. – Thornton, J. – Bibbec, A. (1997) **Taxation and Economic Performance**. Economics Department, OECD, WP No 176.
- Ljungqvist, L. – Sargent, T. (1995) **Welfare States and Unemployment**. Economic Theory, 6, 143–160.
- Ljungqvist, L. – Sargent, T. (1998) **The European Unemployment Dilemma**. Journal of Political Economy, 106, 514–550.
- Lockwood, B. – Manning, A. (1993) **Wage Setting and the Tax System – Theory and Evidence for the United Kingdom**. Journal of Public Economics, 52, 1–29.

- Lockwood, B. – Slok, T. – Tranaes, T. (2000) **Progressive Taxation and Wage Setting: Some Evidence from Denmark.** *Scandinavian Journal of Economics*, 102(4), 707–723.
- Malcomson, J. – Sartor, N. (1987) **Tax Push Inflation in a Unionized Labour Market.** *European Economic Review*, 31, 1581–1596.
- Nickell, S. (1999a) **Product markets and labour markets.** *Labour Economics*, 6, 1–20.
- Nickell, S. (1999b) **Finnish Unemployment: A View from Outside.** *Finnish Economic Papers*, 12 (2), 62–81.
- Nickell, S. – Layard, R. (1999) **Labor Market Institutions and Economic Performance.** In Ashelfelter, O. and Card, D. (eds): *Handbook of Labor Economics*, Vol. 3, 3029–3084.
- OECD (1994) **Jobs Study: Taxation, Employment and Unemployment.**
- OECD (1997) **Employment Outlook.**
- Pehkonen, J. (1999) **Wage Formation in Finland, 1960–1994.** *Finnish Economic Papers*, 12 (2), 82–91.
- Pissarides, C.A. (1998) **The Impact of Employment Tax Cuts on Unemployment and Wages: The Role of Unemployment Benefits and Tax Structure.** *European Economic Review*, 42, 155–183.
- Pissarides, C.A. (1999) **Policy Influences on Unemployment: the European Experience.** *Scottish Journal of Political Economy*, 46, 389–418.
- Pissarides, C.A. (2000) **Equilibrium Unemployment Theory.** MIT Press.
- Shapiro, C. – Stiglitz, J.E. (1984) **Equilibrium Unemployment as a Worker Discipline Device.** *American Economic Review*, 74, 433–444.
- Slaughter, M.J. (2001) **International Trade and Labor-Demand Elasticities.** *Journal of International Economics*, 54, 27–56.
- Sorensen, P.B. (1999) **Optimal Tax Progressivity in Imperfect Labour Markets.** *Labour Economics*, 6, 435–452.
- Summers, L. – Gruber, J. – Vergara (1993) **Taxation and the Structure of Labor Markets.** *Quarterly Journal of Economics*, CVIII, 385–411.
- Tyrväinen, T. (1995a) **Real Wage Resistance and Unemployment: Multivariate Analysis of Cointegrating Relations in 10 OECD Countries.** The OECD Jobs Study Working Paper No. 10.

Tyrväinen, T. (1995b) **Wage Determination, Taxes and Employment: Evidence from Finland.** Bank of Finland Studies E:3.

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