Public finance solutions

A tax shift away from low-paid labour may fight unemployment

SUMMARY

Unemployment in Europe is heavily concentrated among low-skilled workers. It has therefore been suggested that structural unemployment could be reduced by shifting the tax burden away from low-skilled labour and away from the production of consumer services, which are intensive in the use of such labour. This paper finds that a tax shift away from low-paid labour may raise aggregate employment and welfare, but only if wage formation is sufficiently responsive to changing tax incentives. The analysis also suggests that non-negligible employment and welfare gains could be reaped by offering tax concessions or subsidies to those parts of the consumer service sector which compete most directly with low-productivity home production and with underground economic activity.

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Public finance solutions to the European unemployment problem?

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1. INTRODUCTION

Unemployment in Europe is heavily concentrated among low-skilled workers. It is often argued that the high rates of joblessness among the low-skilled are partly due to the income support programmes of the welfare state, since unemployment benefits and social assistance benefits establish a floor for the wages of low wage earners, inducing them to price themselves out of the labour market. Most economists agree that a general cut in benefit levels would tend to stimulate employment by lowering reservation wages. However, although some countries with generous benefit systems may have scope for pursuing such a policy, most European governments remain unwilling to implement major benefit cuts, since this would compromise the fundamental equity goals of the welfare state.

Recent proposals for public finance reforms in Europe have therefore focused on measures intended to improve employment opportunities for the low-skilled and to strengthen incentives for job search without cutting seriously into the living

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standards of transfer recipients. For example, Drèze and Malinvaud (1994) and Alogoskoufis *et al.* (1995) have proposed to reduce or eliminate social security contributions and payroll taxes for low wage earners. Drèze and Malinvaud propose that the revenue should be recouped via higher VAT or via higher indirect taxes on energy use, whereas Alogoskoufis and his co-authors suggest that tax cuts for the low-skilled could be financed through higher taxes on high income earners. Another frequent proposal – advocated by Van der Ploeg (1997) among others – is to introduce an Earned Income Tax Credit designed to increase the after-tax income of low wage earners, thereby improving their incentive to seek work without directly cutting benefit levels. The common aim of these and similar proposals is to shift the tax burden away from low-skilled labour so as to pave the way for lower pre-tax wage rates (or lower employer wage costs) for these workers without reducing their take-home pay.

Some scholars like Drèze and Sneessens (1994), Lindbeck (1996a,b) and Sørensen *et al.* (1995) have also suggested that the labour market position of the low-skilled could be improved by granting tax subsidies or direct subsidies to market-based production of certain labour-intensive personal services: in particular, those which are close substitutes for services produced in the informal economy. By lowering tax wedges on such 'consumer services', the relative demand for low-skilled labour might be increased, and at the same time resources could be shifted from low-productivity home production and from underground activity into legal market-based production.

Proposals such as these have received considerable attention from the OECD (1994, 1995) and the European Commission (1994). The present paper discusses the costs and benefits of such public finance reforms, assuming that tax cuts or direct subsidies to certain groups or sectors will have to be financed by higher distortionary taxes on other groups or sectors. I arrive at two main conclusions: (1) A shift of the tax burden away from low income earners may raise aggregate employment and welfare, but only if pre-tax wage rates are sufficiently responsive to changing tax incentives. A tax reform like this involves considerable risks, and it has the greatest probability of success if all groups in society are allowed to take part in the financing of the tax cuts for low wage earners. (2) Subsidies or tax concessions to consumer services are likely to raise overall employment and welfare, although they are not *the* solution to the European unemployment problem.

Section 2 offers a brief overview of the taxation of labour income in a number of western European countries. Against this background I discuss the effects of taxation on wage formation and employment, and the case for increasing the progressivity of labour income tax by shifting the tax burden away from low wage earners. Section 3 proceeds to discuss the costs and benefits of subsidizing consumer services in a second-best world of distortionary taxation and distorted labour markets. Section 4 sets up a computable general equilibrium model designed to quantify the effects of tax cuts for the low-skilled and for consumer services. Section 5 concludes.

2. SHIFTING THE TAX BURDEN AWAY FROM LOW-SKILLED LABOUR

2.1. The taxation of labour in western Europe

Table 1 offers a snapshot of the level and structure of labour income taxation in Europe in 1994. The total average tax rate measures the total direct and indirect tax bill relative to the employer's total pre-tax labour cost, while the total marginal tax rate is defined as the total direct and indirect tax liability on an additional unit of gross labour income. As we shall see below, the marginal and the average tax rate are likely to have quite opposite effects on employment.

The figures in Table 1 measure the total (average or marginal) percentage tax wedge between the employer's gross labour cost and the real after-tax wage available to the employee when direct as well as indirect taxes have been subtracted. The tax wedges are given for single workers with income levels corresponding to 66.6%, 100% and 200% of the income of the average production worker (APW), respectively. By comparing the total average tax rates for the three different income levels, one gets an impression of the overall degree of progressivity of the system of labour income taxation.

In all selected countries except the UK, the total average tax rate for the average production worker is very close to 55%. Total marginal tax rates for the average production worker are also fairly similar across countries, ranging from about 60 to 67%, with a somewhat lower figure for the UK. Marginal tax rates are only slightly lower for workers earning just two-thirds of the income of the average production

Table 1. Effective tax rates on labour income for single workers: 1994 (% of gross labour cost)

Country	Total average tax rate (t^a)			Total marginal tax rate (t^m)			$CRIP = (1 - t^m)/(1 - t^a)$		
	0.66**APW*	*APW*	2**APW*	0.66**APW*	*APW*	2**APW*	0.66**APW*	*APW*	2**APW*
Denmark	55.4	58.9	66.7	63.7	67.3	75.5	0.81	0.80	0.74
Finland	47.9	53.0	60.4	59.6	66.1	69.5	0.78	0.72	0.77
France	53.9	56.0	58.2	56.0	60.6	59.3	0.95	0.90	0.97
Germany	52.9	56.1	58.1	63.1	64.0	52.9	0.78	0.82	1.12
Italy	53.7	56.0	59.9	60.5	60.5	90.6	0.85	0.90	0.23
Netherlands	49.9	53.4	54.8	59.4	63.8	65.7	0.81	0.78	0.76
Sweden	54.2	55.8	61.9	58.8	58.8	69.3	0.90	0.93	0.81
United Kingdom	37.1	42.0	44.3	47.5	48.7	52.7	0.83	0.88	0.85

Notes: The figures include personal income taxes, social security contributions by employers and employees, plus consumption taxes. The total average tax rate is given by the formula $t^a = (a + c)/(1 + c)$, where a is the total direct average tax rate, and c is the average effective indirect tax rate on consumption. The total marginal tax rate is given by $t^m = (m + c)/(1 + c)$, where m is the total direct marginal tax rate. *APW* = income level of average production worker.

Source: Danish Ministry of Finance, based on OECD data.

worker. Despite the high marginal tax rates, the tax system in most countries (except in the Nordic area) does not seem to be very progressive, as witnessed by the fact that the average tax rate does not rise very much with the level of earnings. The main reason probably is that social security taxes are typically proportional and sometimes even regressive, due to ceilings on the total amount of social security tax.

Differences in average tax rates across income brackets provide one indication of the degree of tax progressivity, but it is also of interest to know how progressive the tax system is at some given income level. One popular measure of progressivity is the so-called Coefficient of Residual Income Progression (CRIP), defined as $(1 - t^m)/(1 - t^a)$, where t^m is the marginal tax rate and t^a is the average tax rate. This measure, given in the last three columns of Table 1, can be shown to equal the elasticity of after-tax income with respect to pre-tax income. If the CRIP is equal to 1, the tax system is purely proportional, and the further the parameter falls below unity, the *higher* is the degree of tax progressivity. Measured in this way, the tax systems of Finland and the Netherlands seem fairly progressive at the earnings level of the average production worker, whereas tax progressivity for the average worker appears to be rather modest in most of the other countries.

2.2. Taxation and employment

If taxes on low-paid workers were cut, would this lead to an employment-promoting fall in their pre-tax wage rates, or would it simply generate a corresponding rise in their after-tax wages? Moreover, how would aggregate employment and economic efficiency be affected if the revenue loss had to be neutralized through higher taxes on high income earners? The answers to these crucial questions depend on the assumptions made about the structure of the labour market. In Table 2 I have summarized the implications of alternative labour market theories for the impact of taxation on employment, distinguishing between the effects of a change in tax progressivity (measured by CRIP) for a given average tax rate, and the effects of a change in the average tax rate for a given degree of progressivity.[1]

In the standard textbook model of a *perfectly competitive labour market,* the individual is assumed to be able to vary his or her working hours freely, and aggregate employment is usually measured in terms of the total number of hours worked. Suppose now that the government decides to increase tax progressivity by raising the marginal tax rate on labour income while keeping the average tax rate constant through, say, an increase in the personal exemption level in the income tax system.

[1] Bovenberg and van der Ploeg (1994) and Pissarides (1996) analyse the effects of taxation in the four different types of labour market model. The effects of taxation in union bargaining models have been studied carefully by Hersoug (1984), Lockwood and Manning (1993) and Holmlund and Kolm (1995), among others, while Hoel (1990) and Pisauro (1991) have analysed tax effects in efficiency wage models. Ljungqvist and Sargent (1995) and Pissarides (1996) illuminate the effects of taxes in different types of search model.

Since the after-tax wage rate obtainable by working an extra hour is now lower than before, workers will react by working fewer hours, thereby substituting leisure for material consumption. Measured in terms of hours worked, employment will therefore go down.

Suppose instead that the degree of tax progressivity is held constant, but that the average tax rate on labour income is raised. For all those who are already employed, the fall in disposable income will have a negative income effect on the demand for leisure, inducing these individuals to work longer hours. On the other hand, when the average tax rate goes up, the marginal tax rate will also have to be raised to keep the degree of tax progressivity constant. The rise in the marginal tax rate will cause substitution away from consumption towards leisure, and one can show that this substitution effect will dominate, provided the uncompensated elasticity of labour supply with respect to the marginal after-tax real wage is positive (see Bovenberg and van der Ploeg, 1994). Hence the net effect on the aggregate number of hours worked is negative.

The standard competitive model may have some relevance for certain segments of the labour market, but most European labour markets are clearly dominated by various imperfections. Modern labour market models differ with respect to the type of imperfection on which they focus; yet they all have very similar implications regarding the employment effects of taxation, as indicated in Table 2.

In *union bargaining models*, involuntary unemployment emerges as a result of the monopoly power of labour unions. Wages are set in a process of bilateral bargaining between employers and unions, and the latter are assumed to trade off a desire for higher real net wages against a desire for higher employment of their members. When the marginal tax rate is raised, it becomes less costly for the union to 'buy' more jobs through wage moderation, since a given fall in the pre-tax wage will now

Table 2. Labour market effects of taxation

	Union bargaining model	Efficiency wage model	Search model	Standard competitive model
Employment effect of a rise in tax progressivity [a]	Positive	Positive	Positive	Negative
Employment effect of a rise in the average tax rate [b]	Negative	Negative	Negative	Negative [c]
Nature of efficiency loss from tax progressivity	Distortion of labour–leisure choice	Reduced work effort	Reduced efficiency of job matching	Distortion of labour–leisure choice

[a] For a given average tax rate.
[b] For a given degree of tax progressivity (measured by CRIP) and a given level of real after-tax benefits.
[c] Provided the uncompensated net wage elasticity of labour supply is positive.

Sources: For references to the relevant literature, see footnote 1.

lead to a smaller fall in the after-tax wage. For a given average tax rate, a higher marginal tax rate will therefore moderate union wage claims and stimulate employment, when working hours are institutionally fixed. In the case where unions and employers bargain over working hours as well as over wage rates, a higher marginal tax rate may encourage unions to drive up the wage rate, thereby reducing the number of working hours 'sold' to employers, since the higher marginal tax reduces the individual union member's net gain from working an extra hour. Still, because of the fall in individual working hours, it can be shown that the number of persons employed will increase (see Sørensen, 1997b).

For a given degree of tax progressivity, the effect of a rise in the average tax rate on labour income depends on the indexation rule for unemployment benefits. If real after-tax benefits are kept constant, as assumed in Table 2, a rise in the average labour income tax rate implies a rise in the net replacement ratio (the ratio of after-tax benefits to after-tax wages), and unions will then push for higher pre-tax wages because the net income loss from employment is reduced. Hence employment will fall.

Consider next the effects of taxation in *efficiency wage models* where wages are set unilaterally by employers. The key assumption in these models is that the firm may raise the productivity of its employees by raising its wage rate relative to the going market wage. For example, a higher relative wage may boost worker morale and induce employees to work harder in order to keep a job which has now become relatively more attractive. A higher relative wage may also raise average labour productivity by reducing the firm's quit rate and the ensuing need to take on new workers who must be trained before they are fully productive. If these 'efficiency wage effects' are sufficiently strong, it will be profitable for the representative firm to raise its wage above the Walrasian market clearing level. When all firms react in this way, the end result is a level of wages generating involuntary unemployment. This unemployment serves to discipline workers and improves productivity by inducing them to work harder and to quit less frequently. However, a higher marginal tax rate implies that a rise in the relative wage will generate a smaller net gain for the individual worker. A higher pre-tax wage will thus become less effective as a means of raising labour productivity. From the viewpoint of each employer, the optimal level of the firm's relative wage rate will therefore go down, and in the new general equilibrium, employment will be higher as a result of lower wages. By contrast, if the average tax rate on labour income is raised and tax progressivity as well as after-tax unemployment benefits are unchanged, the discipline and productivity-enhancing effects of unemployment will be weakened because the unemployment option becomes relatively more attractive. In order to (partially) restore productivity, employers therefore bid up the level of wages, resulting in higher equilibrium unemployment.

Let us finally turn to the effects of taxation in *models of labour market search*. These models come in several variants, but they share the common assumption that

workers and firms are imperfectly informed about the existence and characteristics of vacant jobs and unemployed job seekers, respectively. Both parties therefore have to go through a time-consuming and costly search process before vacancies can be matched with job seekers. In one popular variant of the job search model, the matching of vacancies and job seekers is seen as the outcome of an exogenous 'matching technology', which depends on the transparency and flexibility of the labour market and which has the number of vacancies and the number of unemployed workers as 'inputs'. Once an employer with a vacant job has been matched with a job seeker, a situation of bilateral monopoly arises, since neither party is able to find another match instantaneously and costlessly. The wage is therefore set in a bilateral bargaining process which aims to maximize some weighted average of the rents of the two parties. When the marginal tax rate goes up, it becomes optimal to shift more of the total rents from the job match towards the employer via a lower wage rate, resulting in lower equilibrium unemployment. The reason is that a higher marginal tax rate raises the cost to the employer of providing workers with a given increase in the after-tax wage, and at the same time it reduces the cost to the employee of conceding more profits to the employer via a lower pre-tax wage. On the other hand, if the average tax rate on labour income increases while after-tax unemployment benefits are held constant, the net income loss from unemployment will go down, stimulating longer job search periods and strengthening the bargaining position of a job seeker who has been matched with an employer. In this case the job search model therefore predicts that wages and unemployment are driven up.

It is quite striking that all of the modern labour market theories capable of explaining involuntary unemployment as an equilibrium phenomenon imply that increased tax progressivity (a rise in the marginal tax rate for a given average tax rate) will moderate wages and promote employment, whereas a rise in the average tax rate will tend to drive up the wage level. In recent years, several scholars have investigated whether the tax effects on wage formation predicted by these models are in fact borne out by the data. Table 3 summarizes the findings of eleven recent empirical studies covering nine western European countries. The table shows estimates of the long-run elasticity of the pre-tax real wage rate with respect to the average and the marginal retention ratios, defined as 1 minus the average tax rate and 1 minus the marginal tax rate, respectively. A figure of zero in Table 3 means that the corresponding elasticity was found to be insignificantly different from zero, while an interval $[x, y]$ indicates that the elasticity was found to lie between x and y, depending on the specification and the estimation method used. According to the models of involuntary unemployment described above, the elasticity of pre-tax wages with respect to the average retention ratio should be negative, partly because a lower average tax rate increases tax progressivity for any given marginal tax rate, and partly because a lower average tax rate on labour income reduces the net replacement ratio if after-tax unemployment benefits are kept constant. In contrast,

the elasticity with respect to the marginal retention ratio should be positive, since a higher value of this ratio implies lower tax progressivity. It is seen from Table 3 that most of the studies lend empirical support to these hypotheses. However, the magnitudes of the estimated tax rate elasticities also differ dramatically across studies and countries, so at the present stage there is great uncertainty regarding the quantitative impact of taxation on wage formation.

It might be tempting to conclude from the analysis above that tax progressivity

Table 3. Estimated effects of taxation on pre-tax real wages

Study	Country and estimation period	Estimated long-run elasticity of the pre-tax real wage rate with respect to the Average retention ratio $(1 - t^a)$	Marginal retention ratio $(1 - t^m)$
Malcomson and Sartor (1987)	Italy, 1968–80	[−1, 0.35] [a]	[0.97, 1.62] [a]
Lockwood and Manning (1993)	United Kingdom, 1954–87	[−1.64, −2.40]	[0.65, 1.40]
Holmlund and Kolm (1995)	Sweden		
	Time-series data 1975–92	[−0.73, −1.15]	[0.10, 0.15]
	Micro panel data 1989–92	0	[0.19, 1.22]
Tyrväinen (1995a)	Finland 1970–90	−1	0.3
Hansen *et al.* (1996)	Denmark, 1970–92		
	Unskilled blue-collar males	−3.43	1.51
	High-income white-collar	0	−1.10
Lockwood *et al.* (1995)	Denmark, 1970–92		
	Blue-collar males	−0.99	1.18
	High-income white-collar males	−0.04	−0.77
	Low-income females	0.59	−0.29
Hansen (1996)	Denmark, 1970–92		
	Blue-collar males	−0.55	1.38
Graafland and Huizinga (1996)	Netherlands, 1966–93	[−0.49, −0.61]	[0.13, 0.18]
Wulfsberg (1996)	Norway,		
	Micro panel data 1978–91	−1.11	1.61
Nymoen and Rødseth (1996)	Norway, 1978–94	−0.45 [a]	−0.45 [a]
Tyrväinen (1995b)	Germany, 1972–92	−1	0
	Finland, 1972–90	−1	0.3
	France, 1972–92	−0.42	0
	Italy, 1972–91	−1	0.6
	Sweden, 1972–90	0	0
	UK, 1972–91	0.25	0

[a] Implicit long-run elasticities calculated by the author.

Note: The elasticities reported assume a given level of real after-tax unemployment benefits.

should be increased considerably in order to reduce involuntary unemployment. Yet the fact that tax progressivity may be good for employment does not imply that there are no efficiency costs associated with high marginal tax rates in imperfect labour markets. Going back to Table 2, the bottom part of the table summarizes the nature of the efficiency loss from tax progressivity which has to be set against the welfare gain from lower involuntary unemployment. In the union bargaining model with endogenous working hours, a higher marginal tax rate induces unions to set shorter individual working hours. This generates a welfare loss, since the pre-existing tax wedge combined with monopolistic wage setting has already pushed the value of the marginal product of labour above the representative union member's marginal valuation of leisure. Hence the labour–leisure choice is distorted in a manner similar to the tax distortion occurring in the standard competitive labour market model. In efficiency wage models, where work effort is treated as a continuous variable, a higher marginal tax rate will lower average labour productivity by reducing the effectiveness of (high) wages as an instrument for promoting work effort. Finally, in search models a rise in the marginal tax rate will lower the efficiency of the job matching process. With a higher tax at the margin, it becomes less profitable for job seekers to search for jobs paying higher pre-tax wage rates. This reduces the average length of job search periods and leads to poorer matches between workers and firms, assuming that job search is a productive activity helping to improve the informational basis for job matches. The willingness of employed workers to move towards more productive, higher-paid jobs will likewise be weakened by a higher tax rate on marginal income gains (see Ljungqvist and Sargent, 1995), and when unemployment falls due to the higher marginal tax rate, it will take longer and hence be more costly for firms to fill their job vacancies.

In other words, increased tax progressivity is no free lunch, which is hardly surprising. Yet there is a crucial difference between the efficiency effect of tax progressivity in the standard competitive model and in modern models of imperfect labour markets. In the conventional neoclassical model, there is always an unambiguous efficiency cost of moving from a proportional income tax to a progressive tax generating the same revenue, since the progressive tax system involves a higher marginal tax rate and hence a greater labour–leisure distortion. By contrast, in models with involuntary unemployment, the welfare gain from lower unemployment may initially outweigh the efficiency costs from introducing some degree of tax progressivity. Thus there may be an optimal amount of tax progressivity which could be defended on pure efficiency grounds as a means of reducing involuntary unemployment, without any appeal to equity considerations. This optimal degree of tax progressivity will be reached at the point where the gain in the representative worker's expected utility from additional progressivity (resulting in lower unemployment risks) is just offset by the loss of expected utility arising from the various distorting effects of higher progressivity.

Sørensen (1997b) shows that modern labour market models do in fact imply the existence of an optimal degree of tax progressivity which can be motivated by pure efficiency concerns. Furthermore, by calibrating and simulating prototype versions of these models, he finds that the optimal degree of tax progressivity may be at least as high as the progressivity built into existing western European tax systems. One standard argument against tax progressivity is that high marginal tax rates tend to discourage skill upgrading through education and training, by lowering the return on human capital investment. There are several modifications to this argument. First, via the impact on wage formation, a more progressive tax system is likely to lead to a wider dispersion of *pre-tax* wage rates across skill types, since more progressivity implies lower average tax rates for low-skilled workers and higher average tax rates for high-skilled workers. To some extent, the negative incentive effect of higher tax progressivity will thus be offset by a rise in the relative wages of high-skilled workers. Second, in most of western Europe education and training are heavily subsidized by the government. Even if there are positive externalities from education, the present heavy education subsidies might justify some amount of tax progressivity to prevent overinvestment in human capital. Indeed, given current subsidy levels, the main private opportunity cost of human capital investment consists of the after-tax wages forgone during the period of education and training. In these circumstances, a purely proportional labour income tax does not reduce the return on human capital investment at all, since a proportional tax reduces the worker's opportunity cost of education by the same percentage as it reduces his or her subsequent earnings. Since the return on investment in *non-human* capital is currently rather heavily taxed, a purely proportional labour income tax might therefore seriously distort the pattern of investment in favour of human capital formation. Some amount of labour tax progressivity is therefore defensible on pure efficiency grounds even when human capital investment is allowed for, as shown by Nielsen and Sørensen (1997).

In other words, once one allows for pre-existing labour market imperfections and tax distortions, it is not obvious that the rise in tax progressivity implied by tax cuts for low income earners would generate major efficiency costs. In section 4 of this paper I shall try to throw further light on the employment and welfare effects of a restructuring of labour income tax.

3. SUBSIDIZING CONSUMER SERVICES

In recent years, several European governments have attempted to increase the relative demand for low-skilled labour by granting direct subsidies or tax concessions to private production of certain labour-intensive personal services. For instance, the German government allows a deduction from taxable income for a limited amount of expenditure on domestic service and various 'home services', and the French Chèque Emploi Service programme likewise offers tax deductions and administra-

tive simplifications for households employing domestic and home service workers on a part-time basis. The Danish government has introduced a subsidy scheme for home services delivered from VAT-registered firms to households, and the Belgian and Finnish governments have experimented with labour market programmes involving subsidies to households employing long-term unemployed individuals to provide a specified range of personal services.

As Drèze and Sneessens (1994) observe, subsidy schemes like these have been motivated by a belief that taxes and regulations erect artificial barriers to many forms of personal service production. The idea is that a removal of these barriers would improve the allocation of time and the division of labour in the private sector, while at the same time generating new (legal) job opportunities for low-skilled workers. Yet this type of policy remains controversial. If the overriding goal is to stimulate demand for low-skilled labour, several other policy measures would seem more directly targeted at this goal. These measures might include a general lowering of the tax burden on low-skilled labour, as discussed above, and direct wage subsidies or 'employment vouchers' for the long-term unemployed, as advocated by Snower (1994).

However, there may indeed be a case for selective (tax) subsidies to those parts of the private service sector which compete most directly with home-produced services and with services provided by the 'underground' labour market. Legal market-based production of these labour-intensive private consumer services is often crowded out by untaxed low-productive activity in the informal economy, so the existing tax system may cause special barriers to employment growth in this particular area. In the discussion below, I shall therefore focus on the potential for employment and welfare gains from (tax) subsidies targeted at the private consumer service sector. In my terminology, the 'informal economy' comprises legal home production as well as illegal production activity in the underground economy, sometimes referred to as 'illicit work'. 'Consumer services' are defined as privately produced personal services which are near-perfect substitutes for services delivered from the informal economy. Thus, consumer services include household services such as cleaning, washing, gardening, window cleaning, domestic service and hairdressing, plus repair and maintenance of other consumer durables. In the model-based analysis presented in section 4, restaurant services are also included, since these services are a close substitute for cooking and eating at home. In most western European countries, consumer services defined in this way make up 10–15% of total private consumption.

Most activity in the informal economy consists of the production of consumer services. The total amount of home production is quite large relative to activity in the market for paid labour. In the countries of western Europe, the amount of time spent on home production by males typically varies between 20 and 50% of total male working time in the market, while female working time in home production varies between 80 and 400% of female market work (Bonke, 1995). Huge resources

are thus tied up in home production, suggesting that the tendency of the tax system to discriminate against market-based production of consumer services could cause serious distortions of resource allocation. The amount of illicit work performed in the underground economy appears to be much smaller relative to activity in the official market economy, typically ranging from 1 to 3% of GDP in north-western Europe (Van Eck and Kazemier, 1988; Hansson, 1989; Isachsen and Strøm, 1985; Mogensen *et al.*, 1995).

3.1. Is there a case for subsidizing consumer services?

Incentives for increased production of consumer services in the formal market economy could consist either of direct subsidies or tax subsidies. Tax subsidies could take the form of a VAT reduction or VAT exemption for consumer services, exemption from payroll and social security taxes for workers employed in the consumer service sector, or income tax deductions for consumers purchasing these services. Direct subsidies could be wage subsidies for consumer service sector employment or price subsidies amounting to some fraction of the price paid by the consumer. From an administrative and political viewpoint, these various methods of subsidization may have different merits and demerits, but they all work through the same channel: that is, by reducing the relative consumer price of consumer services. Because of this fundamental equivalence, I shall use the term 'subsidies' to refer to tax subsidies as well as direct subsidies, and I shall not discuss the pros and cons of different modes of subsidization.

In the public policy debate, subsidization of consumer services has been seen mainly as a means of fighting unemployment among low-skilled workers. Yet there may be a case for such subsidies even in the hypothetical situation of a smoothly functioning labour market, with real and relative wage rates adjusting to eliminate all involuntary unemployment. The basic point is that, whenever certain economic activities cannot be taxed for practical reasons, serious distortions may result from attempts to levy high taxes on closely substitutable activities. Admittedly, a subsidy to consumer services would twist consumer demand in favour of service consumption, at the expense of consumption of other goods. Since the world is already full of economic distortions, one might ask: why should we add this additional one? However, in a second-best world it is crucial to avoid the fallacy of simply 'counting distortions' and concluding that fewer distortions are always preferable. Adding an extra (small) distortion may be welfare improving if it serves to offset large pre-existing distortions. In the present context, one such pre-existing distortion is the direct and indirect tax burden on legal market-based service production. This pre-existing tax burden implies that home production and underground production of consumer services are profitable even if the marginal productivity of labour and capital in the informal economy is considerably below the marginal product of these factors in the official consumer service sector. If initial tax rates are high, the

marginal productivity gap between the formal and the informal economy will be large. A (tax) subsidy to formal consumer services will then generate a large productivity gain by shifting resources from the informal to the formal economy, and this gain may well outweigh the efficiency loss from twisting consumer demand in favour of services.

Another important pre-existing distortion is the tendency for the tax system to induce substitution towards untaxed leisure. A subsidy to consumer services may exacerbate this distortion in two ways. First, it may necessitate a rise in the marginal income tax rate. Second, it may be the case that some consumer services are complementary to leisure, and cheaper services will then further stimulate leisure consumption. On the other hand, if consumer services are substitutes for leisure, a service subsidy will tend to offset the excessive consumption of leisure generated by pre-existing taxes.

The theory of optimal commodity taxation, surveyed by Sandmo (1976) and Stern (1990), is a natural framework for analysing the complex second-best trade-offs described above. Drawing on earlier work by Sandmo (1990), Jacobsen and Sørensen (1997a) offer such an analysis of the optimal taxation of consumer services. Public expenditure is assumed to be financed through a proportional labour income tax, an indirect tax on consumer services and an indirect tax on the consumption of other goods and services. The question is how much revenue should be raised through each of these taxes, given that a certain amount of total revenue needs to be collected, and assuming that the government wishes to minimize the total deadweight loss from distortionary taxation. It turns out that consumer services should carry a relatively low indirect tax burden (and possibly receive a net subsidy) if these services are substitutes for leisure, and if labour supply to the market is not too elastic. This is intuitive, since a low (compensated) labour supply elasticity implies a low efficiency cost of the income and excise taxes serving to finance the subsidy for consumer services. The optimal tax rule also implies that the case for a low tax burden on consumer services tends to be strengthened, the greater the proportion of these services which is delivered from the informal economy. Intuitively, with a large informal economy there is a greater potential for aggregate productivity gains from switching resources into the formal economy, through a favourable tax treatment of market-produced services.

On the other hand, the analysis in Jacobsen and Sørensen (1997a) also shows that consumer services should carry a relatively *high* indirect tax burden if service consumption is *strongly complementary* to consumption of leisure. In this situation the tax on consumer services serves as an indirect way of taxing leisure, thereby offsetting the tendency of the tax system to discourage labour supply.[2] However,

[2] This may be seen as an application of the famous Corlett–Hague rule of optimal commodity taxation, according to which there should be relatively high indirect taxes on goods and services which are consumed jointly with leisure (see Corlett and Hague, 1953–4).

even if one assumes that the total consumption of consumer services is complementary to leisure, it is still possible that a rise in the consumer price of services (generated through heavier excise taxes) would fail to increase labour supply to the market. The reason is that the higher service price stimulates home production of services at the expense of market production, so labour may well be reallocated from the market into home production at the same time as consumption of leisure goes down along with the *total* consumption of services. In the presence of home production, complementarity between consumer services and leisure is therefore *not* a sufficient condition to warrant the use of high taxes on services as a means of stimulating labour supply to the market. The existence of the informal economy thus increases the likelihood that a favourable tax treatment of consumer services is optimal.

The presence of involuntary unemployment would appear to strengthen the case for a relatively low net fiscal burden on consumer services. There are two ways in which subsidization of consumer services could lower the equilibrium rate of unemployment in an imperfect labour market. First, by making informal service production less profitable, the subsidies might reduce wage pressure by cutting into the net income obtainable by workers outside the official labour market. Second, since consumer services are often intensive in the use of low-skilled labour, a stimulus to demand for these services might reduce overall equilibrium unemployment by increasing the relative demand for unskilled workers, who suffer from a particularly high incidence of unemployment.

Furthermore, when households cannot work as much as they would like to in the official labour market, part of their involuntary leisure time will be transformed into additional working time in the informal economy. With diminishing marginal productivity of labour in the informal economy, the rationing of jobs in the formal economy will then raise the marginal productivity gap between the two sectors, thereby *increasing* the productivity gain from a reallocation of resources away from the informal towards the formal service sector. The existence of unemployment benefits also tends to increase the productivity gap between the formal and the informal economy, since low-productivity informal activity becomes more attractive if it is possible to collect unemployment benefits while at the same time engaging in home production or in underground production.

4. SHIFTING TAXES AWAY FROM SERVICES AND LOW-PAID LABOUR: A QUANTITATIVE ASSESSMENT

Having discussed some qualitative aspects of tax reforms designed to increase the demand for low-skilled workers, I shall now try to quantify the likely employment and welfare effects of such reforms, using a computable general equilibrium model developed and documented by Jacobsen and Sørensen (1997b). This model incorporates several types of labour skill and allows explicitly for the interaction

between the formal and the informal economy. Section 4.1 briefly describes the model and its calibration, and sections 4.2 and 4.3 report on some tax reform simulation experiments.

4.1. Structure of the INFOSIM model

The structure of the simulation model (named 'INFOSIM') is illustrated in Figure 1, while Appendix A provides information on the key specifications. The model describes a stationary long-run perfect-foresight equilibrium in a small open economy with a predetermined total stock of financial wealth. All production factors are perfectly mobile within the domestic economy, and capital is perfectly mobile internationally. Households are divided into people of working age and a group of transfer recipients ('pensioners') who are not active in the official labour market. Working-age households are subdivided into white-collar workers and skilled and

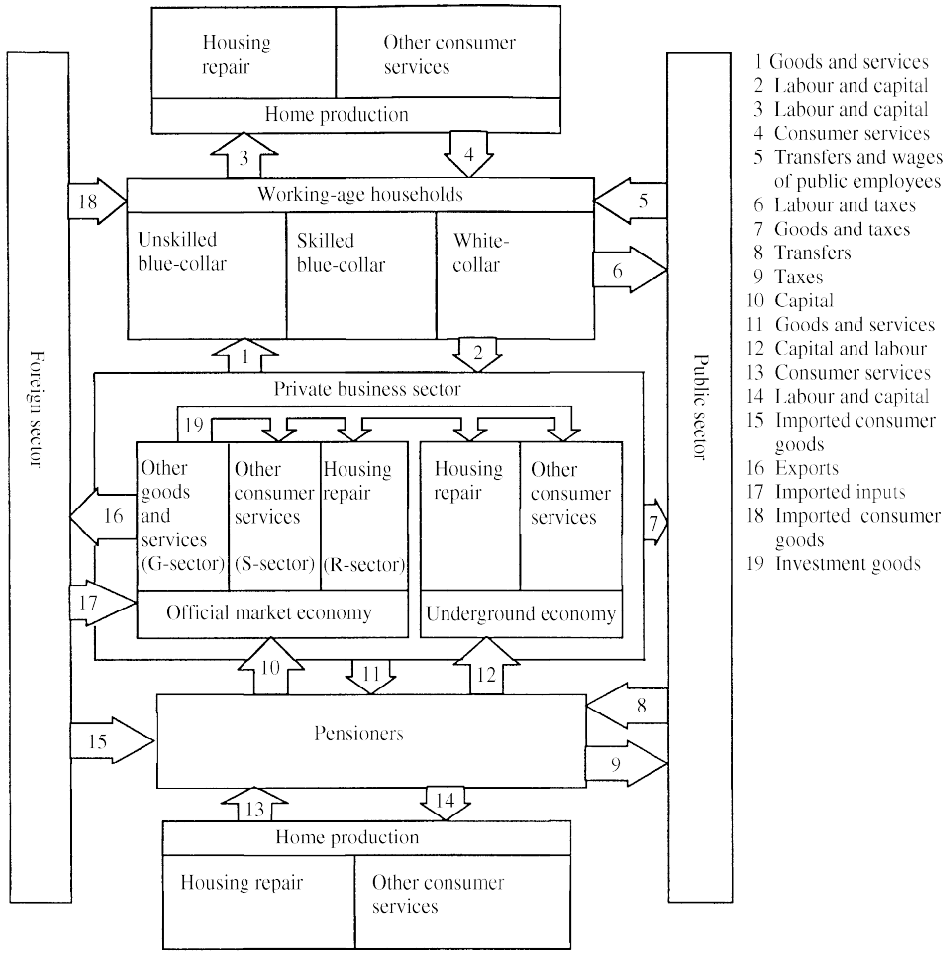

Figure 1. Structure of INFOSIM

unskilled blue-collar workers. The private business sector encompasses an official market economy producing housing repair (R-sector), other consumer services (S-sector), and other goods and services (C-sector), plus an underground economy delivering housing repair and other consumer services. The informal economy also includes home production, which is split into home-produced housing repair services and home production of other consumer services.

Perfect competition prevails in all output markets and in the S-sector labour market, whereas the markets for skilled and unskilled blue-collar labour in the C-sector and in the R-sector are characterized by non-competitive wage setting (see below). The INFOSIM model thus incorporates a 'dual' labour market in which blue-collar wage rates are persistently higher in the manufacturing and construction sectors (sometimes referred to as the 'primary' sector) than in the service sector (sometimes dubbed the 'secondary' sector). Such a wage differential is typical of most OECD economies, including the Danish economy, which served as a basis for calibrating the INFOSIM model (see Sørensen, 1997a). Bulow and Summers (1986) explained the persistent wage differential in favour of the primary sector by arguing that primary sector firms pay high efficiency wages to elicit sufficient work effort from their employees, whereas there is little need for efficiency wages in the secondary sector, where job functions tend to be simpler and easier to monitor. In a European context this explanation might be supplemented by the observation that monopolistic union wage setting often plays an important role in the manufacturing and construction sectors, whereas trade unions are typically weak in the consumer service sector.

Since unions also tend to be weak or non-existent in the markets for high-paid labour, the INFOSIM model takes the market for white-collar labour to be competitive, with flexible wages and working hours. Because white-collar workers are mobile across all sectors in the economy, they all earn the same wage rate regardless of their sector of employment. All blue-collar workers in the primary sector are assumed to work the same hours, which are institutionally fixed. Those blue-collar workers who do not manage to find a high-paying job in the C-sector or in the R-sector allocate themselves between unemployment and work in the S-sector, being free to adjust their working hours in the consumer service sector to the preferred level.

A general equilibrium is established when (1) firms maximize profits and households maximize expected utility at the going wages and prices, (2) all product markets clear, and (3) S-sector wage rates and working hours have adjusted such that the expected utility of each unemployed blue-collar worker equals the expected utility of an employed S-sector worker of the same skill category. In this equilibrium the 'good' blue-collar jobs in the C- and R-sectors are rationed, with blue-collar workers in these sectors enjoying strictly higher utility than their colleagues in the S-sector and in the unemployment pool. Blue-collar wage rates in the primary sector

are given by the non-competitive wage-setting schedules described below, so instead of competitive wage adjustment in the C- and R-sectors, equilibrium is obtained by endogenous adjustment of the unemployment rates for skilled and unskilled blue-collar workers.

The parameter values in the INFOSIM model have been chosen such that the initial general equilibrium of the model replicates a dataset for the Danish economy around 1994 as closely as possible. The dataset includes survey-based data on the size and pattern of illicit work, gathered by the Danish Rockwool Foundation Research Unit. The magnitude of the home production sectors was calibrated rather conservatively on the basis of the Danish time budget studies carried out by Pedersen (1995). Table 4 reports the values of the most important parameters in the model. Empirical parameter estimates have been used wherever such estimates for Denmark were available.

Calibrating the wage-setting schedules for primary sector blue-collar workers is a hazardous task, given the widely diverging empirical estimates of tax elasticities reported in Table 3. Estimates of the elasticity of wages with respect to the rate of unemployment benefit also vary considerably. For example, in the recent empirical studies by Holmlund and Kolm (1995), Graafland and Huizinga (1996), Hansen *et al.* (1996) and Smith and Pedersen (1996), the estimated benefit elasticity varies between 0.1 and 0.9. In my income tax reform simulations, I therefore consider a scenario with conservative tax and benefit elasticities as well as one with high elasticities. Specifically, I assume that the pre-tax real consumer wage (W/P) of blue-collar workers in the C- and R-sectors is given by the wage equation

$$\begin{aligned}&\log(W/P) = \alpha_0 - 0.1\log(u) + \alpha_2\log(1-t^a) + \alpha_3\log(1-t^m) + \alpha_4\log(B/P)\\ &\text{High-elasticity scenario:}\quad \alpha_2 = -1.0,\ \alpha_3 = 0.8,\ \alpha_4 = 0.8\\ &\text{Low-elasticity scenario:}\quad \alpha_2 = -0.5,\ \alpha_3 = 0.2,\ \alpha_4 = 0.3\end{aligned} \tag{1}$$

where u is the unemployment rate and (B/P) is the real after-tax rate of unemployment benefit.

Appendix B offers one possible microeconomic foundation for this wage equation in terms of a union bargaining model. The elasticity of the real wage rate with respect to the unemployment rate has been set at -0.1, reflecting the very robust empirical finding of Blanchflower and Oswald (1994). The elasticities in equation (1) are assumed to be identical for skilled and unskilled blue-collar workers, with the constant α_0 being adjusted so as to generate the empirically observed skilled–unskilled wage differential in the initial equilibrium. Notice that since the elasticity α_4 is less than 1, a rise in the consumer price index P generated by a rise in indirect consumption taxes will have a cost-push effect on the nominal wage rate W and hence on the employer's real product wage. Tyrväinen (1995b) finds strong evidence of such a cost-push effect of indirect taxes on product wages in OECD Europe.

Table 4. Selected parameter values in INFOSIM

Substitution elasticities	
Goods versus leisure	0.45
Consumer services versus other goods and services	0.15
Domestic value-added versus imported inputs	0.30[a]
White-collar versus blue-collar workers in C-sector	0.30
White-collar versus blue-collar workers in S- and R-sector	0.50
Skilled versus unskilled workers in C-sector	1.21[b]
Skilled versus unskilled workers in S- and R-sector	1.91[b]
Wage shares in value-added in	
C-sector	0.58[c]
S-sector	0.61[c]
R-sector	0.77[c]
Output elasticities in the informal economy	
Elasticity of output of home-produced consumer services w.r.t.	
Labour input	0.5
Capital input	0.2
Elasticity of 'underground' output of consumer services w.r.t.	
Labour input	0.4
Capital input	0.3
Population shares	
White-collar workers	0.11[d]
Skilled blue-collar workers	0.25[d]
Unskilled blue-collar workers	0.28[d]
Transfer recipients	0.36[d]
Implicit wage and price elasticities	
Implicit uncompressed real net wage elasticity of labour supply for	
White-collar workers	0.11
Skilled blue-collar workers in S-sector	0.18
Unskilled blue-collar workers in S-sector	0.20
Labour force as a whole	0.03
Implicit relative price elasticity of aggregate demand for 'Other consumer services' delivered from the official market	0.90
Other parameters	
Relative price elasticity of export demand	4.84[a]
Consumer budget share of housing services	0.25[c]
Import share of consumption of other goods and services	0.25[c]
Real pre-tax rate of return	0.10
Selected policy instruments	
General VAT rate	0.25
Average excise tax rate in consumption of 'Other goods and services'	0.17
Marginal labour income tax rate for	
White-collar workers	0.62
Skilled blue-collar workers	0.495
Unskilled blue-collar workers	0.495
Unemployment benefits: average pre-tax replacement ratio for	
Skilled blue-collar workers	0.58
Unskilled blue-collar workers	0.65
Marginal (and average) tax rate on capital income	0.451
Imputed taxable rate of return on owner-occupied housing	0.02

[a] Estimated from Frandsen *et al.* (1996).
[b] Estimated from Risager (1993).
[c] Estimated from Danish National Income Accounts, Statistics Denmark.
[d] Estimated from National Income Accounts and Population and Social Statistics, Statistics Denmark.

4.2. Effects of tax cuts for low income earners

As noted in section 2, some participants in the European policy debate have called for the introduction of an Earned Income Tax Credit (EITC) as a means of stimulating employment without cutting the absolute level of unemployment benefits. It is often argued that the EITC should be phased out as the worker's earned income increases, since this would limit the government revenue loss. This proposal has been criticized for generating very high effective marginal tax rates in the income interval where the phase-out takes place, thus capturing low wage earners in a poverty trap. In the Danish policy debate it has therefore been proposed to introduce a *general* Earned Income Tax Credit: that is, a tax credit granted in the same absolute amount to all (fully) employed taxpayers regardless of their level of earned income. Such a general EITC would still imply a larger *relative* tax cut for low wage earners because the tax credit would make up a larger proportion of the lower incomes.

Table 5 presents INFOSIM simulations of such a general EITC amounting to 1% of the labour income of the lowest-paid workers (the unskilled in the S-sector). The first two columns assume that the revenue loss is recouped via a uniform increase in the marginal tax rate on *all* income from labour and transfers, and that pre-tax benefit rates are indexed to pre-tax wage rates. This tax reform implies a rise in the average tax rate for all transfer recipients (including the unemployed) and for white-collar workers, and a fall in the average tax rate for other employed workers, with the unskilled obtaining the largest tax cut.

The simulation in the first column of Table 5 is based on the high elasticities of wages with respect to tax and benefit rates stated in equation (1). In this scenario we see that the tax reform stimulates employment and cuts into unemployment, despite the fact that higher tax progressivity tends to amplify the distortion of time allocation in the competitive segments of the labour market (note that employment is measured in hours whereas unemployment is measured in terms of the number of persons unemployed). The positive employment effects of the tax reform arise mainly from its impact on wage setting in the non-competitive primary sector labour market, where the rise in the marginal tax rate as well as the fall in average tax rates and in after-tax unemployment benefits induce wage moderation. Another positive effect on employment is generated by the fall in the average tax rate on S-sector workers combined with the rise in the tax burden on benefits. Both of these tax shifts raise the utility of S-sector workers above the utility level of the unemployed, inducing some of the unemployed to seek employment in the consumer service sector, where jobs are not rationed. Activity in the informal economy is stimulated by the rise in the marginal income rate, but on the other hand it is discouraged by the fact that the workers moving into jobs in the official market have less time available for work in the informal economy. In the underground economy, the former effect slightly dominates, but in home production the latter effect turns out to

Table 5. Effects of tax cuts for low income earners

Effects on tax rates, employment and welfare	EITC financed by a higher marginal tax rate on all labour and transfer income[a]		EITC financed by a higher tax rate on all labour income[b]		Cut in basic marginal labour income tax rate financed by higher VAT[a]	
	High tax and benefit elasticities (1)	Low tax and benefit elasticities (2)	High tax elasticities (3)	Low tax elasticities (4)	High tax and benefit elasticities (5)	Low tax and benefit elasticities (6)
Tax rates (percentage point change)						
Marginal income tax rate	0.5	0.9				
Marginal labour income tax rate			0.8	1.5		
VAT rate					1.0	1.8
Employment (% change in hours worked)						
Total official employment	0.5	−0.1	0.2	−0.7	0.5	−0.1
Total underground employment	0.1	1.8	0.6	2.9	0.9	3.7
Total employment in home production	−1.6	0.2	−0.5	2.9	−0.8	1.4
Unemployment (percentage point change)						
Skilled blue-collar workers	−0.6	−0.0	−0.4	0.5	−0.5	0.1
Unskilled blue-collar workers	−0.8	−0.1	−0.6	0.5	−0.7	0.1
Total unemployment	−0.6	−0.1	−0.4	0.4	−0.5	0.1
Welfare (change in % of private consumption)						
White-collar	2.60	1.36	2.08	0.29	1.70	−0.03
Skilled blue-collar employed in C- and R-sector	−0.08	−0.38	−0.44	−1.28	0.02	−0.21
Skilled blue-collar employed in S-sector	−0.23	−0.79	0.04	−0.11	−0.79	−1.70
Unemployed skilled blue-collar	−0.16	−0.57	0.03	−0.08	−0.57	−1.22
Unskilled blue-collar employed in C- and R-sector	−0.14	−0.28	−0.44	−1.06	−0.08	−0.16
Unskilled blue-collar employed in S-sector	−0.22	−0.82	0.05	−0.13	−0.79	−1.73
Unemployed unskilled blue-collar	−0.15	−0.56	0.03	−0.09	−0.54	−1.18
Transfer recipients	−0.05	−0.40	0.05	−0.13	−0.51	−1.15
Aggregate utilitarian welfare	0.37	−0.08	0.16	−0.56	0.10	−0.51

[a] These simulations assume that pre-tax benefit rates are indexed to pre-tax wage rates.
[b] These simulations assume that real after-tax benefit rates are kept constant. The magnitude of the benefit elasticity of wage rates is therefore irrelevant.

Notes: The EITC (Earned Income Tax Credit) is granted in the same absolute amount to all (fully) employed workers. The tax credit amounts to 1% of the labour income of the lowest-paid workers. The cut in the basic marginal labour income tax rate takes the form of a 1 percentage point cut in the marginal tax rate on labour income up to a threshold equal to the labour income of the lowest-paid workers. The amount of tax cut granted to employed workers is thus identical in all scenarios.

Source: Simulations of the INFOSIM model.

be the dominant one, since the previously unemployed had a relatively high activity level in home production.

The bottom part of Table 5 reports the effects of the tax reform on the welfare of each socioeconomic group and on aggregate welfare. Changes in consumer welfare are measured by the equivalent variation indicating the hypothetical change in (lump-sum) income which would have the same effect on the household's expected utility as the policy reform considered. The welfare changes are expressed as a percentage of the consumer's expected total consumption (which equals his or her expected net income in the present model where no net saving takes place). Since all household types have identical utility functions in the INFOSIM model, it is meaningful to calculate aggregate 'utilitarian' welfare by weighting the welfare of each socioeconomic group by its population share. Notice that a policy measure could in principle increase aggregate utilitarian welfare by moving people from unemployment into employment in the primary sector, even if all of the socioeconomic groups indicated in Table 5 were to suffer a welfare loss. The reason is that workers in the primary sector have strictly higher utility than the unemployed.

From Table 5 it is seen that an EITC financed by a higher marginal tax rate on all labour and transfer income generates an aggregate welfare gain in the high-elasticity scenario. The aggregate gain stems partly from higher employment in the high-paying primary sector and partly from a significant rise in the welfare of white-collar workers. The latter effect may seem surprising, since one might expect the fall in blue-collar wage rates in the primary sector to induce substitution away from white-collar labour towards blue-collar labour. However, the substitution elasticity between white-collar and blue-collar workers is low (between 0.3 and 0.5), so the substitution effect is dominated by the fact that higher blue-collar employment increases the marginal productivity of white-collar labour, resulting in a rise in demand for white-collar workers. Since the net wage elasticity of white-collar labour supply is rather low (about 0.1), the final outcome is a noticeable rise in pre-tax white-collar wage rates, which raises white-collar welfare *despite* the increase in the average tax rate on white-collar labour. Another surprising effect is that the welfare of the low-paid workers employed in the S-sector goes down even though these workers benefit from the largest drop in the average tax rate. The explanation is that the welfare of the unemployed is reduced by the higher tax burden on benefit income. This generates an inflow of previously unemployed workers to the S-sector, until the pre-tax wage rates in this sector have fallen to a level where S-sector workers no longer enjoy higher welfare than the unemployed. The reason for the slight fall in the welfare of primary sector workers is that these individuals experience only a very small cut in their average tax rates, so the wage-dampening effect of higher marginal tax rates together with lower net benefits generate a fall in real disposable income for these groups.

Unfortunately, the aggregate welfare gain from an EITC financed by income tax is crucially dependent on the assumption of a fairly high primary sector wage

elasticity with respect to tax and benefit rates. This is revealed by column (2) in Table 5, which is based on the low-elasticity scenario given in equation (1). With low elasticities the initial dampening effect of higher marginal tax rates on wages in the non-competitive segments of the labour market becomes too weak to offset the negative effects of higher marginal tax wedges in other sectors, including the added incentive to shift resources into low-productivity activities in the informal economy. Although the number of unemployed persons is still slightly reduced, there is also a slight drop in official employment measured in hours. Because official economic activity is no longer stimulated, the necessary rise in the marginal income tax rate is larger, and the end result is a modest fall in aggregate welfare. It may seem surprising that white-collar workers still experience a welfare gain even though total activity does not increase. The reason is that the shift from formal to informal service production causes *relative* consumer demand within the official market economy to shift in favour of the C-sector, which is relatively intensive in the use of white-collar workers, thus generating a rise in the relative demand for these workers and serving to raise their relative wage rates.

The effects of a general EITC financed by a higher marginal income tax rate may be compared to the proposal of Drèze and Malinvaud (1994) to eliminate the employer's social security tax on labour income below a certain level and to finance the revenue loss through a rise in the VAT rate. This policy would work very much like a general Earned Income Tax Credit, since it would imply the same absolute tax cut for all employed workers with incomes equal to or higher than the stipulated threshold level. One minor difference is that the Drèze–Malinvaud proposal would imply a fall in the marginal tax rate for the lowest-paid workers with incomes below the threshold, but the main difference would, of course, be the proposal to finance the tax cut via a higher rate of VAT. Columns (5) and (6) of Table 5 exhibit my simulation of the Drèze–Malinvaud proposal by assuming a cut in the marginal income tax rate of one percentage point for *labour* income up to a threshold corresponding to the income of the lowest-paid group of workers. For all worker groups in the INFOSIM model, this tax cut generates an initial income effect which is exactly the same as that implied by the EITC considered in the other columns of Table 5. The table reveals that the Drèze–Malinvaud proposal to finance the labour tax cuts through a higher consumption tax rather than a higher marginal income tax implies a smaller positive (or a larger negative) employment and welfare effect of the tax reform. The reason is that finance via a higher marginal income tax rate has a dampening effect on primary sector wage rates, whereas a higher consumption tax has a cost-push effect on wage rates, as I explained in my comments on equation (1).

Both the Drèze–Malinvaud reform and an EITC financed by a rise in the general income tax rate imply that benefit recipients contribute to the financing of tax cuts for employed workers. One might argue that if policy-makers are willing to reduce the living standards of the unemployed and of individuals outside the labour market, it would be more straightforward to cut benefit rates directly rather than reducing

the net replacement ratio through labour tax cuts financed by higher direct or indirect tax rates on all taxpayers. It is therefore of special interest to investigate whether it is possible to raise employment and aggregate welfare through a restructuring of labour taxes *without* reducing the real after-tax incomes of transfer recipients. The INFOSIM simulations reported in columns (3) and (4) of Table 5 assume that the real net rate of unemployment compensation as well as other real net transfer rates are kept constant. The two columns show the simulated effects of a general EITC amounting to 1% of the pre-tax wage income of the lowest-paid group of workers, financed by a uniform rise in the marginal tax rate on all *labour* income. This is very similar to the proposal of Alogoskoufis *et al.* (1995) to eliminate social security taxes and payroll taxes on low levels of labour income, financed by higher marginal tax rates on high wage earners. With high tax elasticities,[3] we see that this reform lowers unemployment and raises aggregate welfare. Since it protects transfer recipients from a fall in their real after-tax benefit incomes, the reform also prevents a fall in the welfare of the low-paid S-sector workers. The welfare of the higher-paid primary sector workers is reduced because their pre-tax wages are dampened by higher marginal tax rates, whereas white-collar workers benefit from the higher activity generating an increase in the demand for their skills. Unfortunately, however, column (4) in Table 5 indicates that the aggregate employment and welfare gains are turned into losses if primary sector wage rates are not very responsive to the restructuring of the labour income tax. In particular, the difference in outcomes between the high-elasticity and the low-elasticity scenarios is higher than in the cases where benefit recipients are allowed to take part in financing the tax cuts, so the risks associated with a reform which fixes real net benefits seem to be greater.

The alternative elasticity values assumed in Table 5 fall well within the range of empirical estimates found in the literature, so a policy of general tax cuts for low income earners involves a considerable amount of uncertainty. Going beyond the INFOSIM model, one might also worry that a lower tax burden on low wage earners could attract more unskilled immigrants in the short run and could increase the relative supply of unskilled workers in the long run via reduced incentives for education and skill upgrading. However, labour mobility within the EU is still limited, and although western Europe faces considerable migration pressures from north Africa and eastern Europe, these pressures are generated by income differentials which are many times larger than the changes in the relative income positions of low wage earners that could be generated by realistic tax reforms. Moreover, although increased labour tax progressivity certainly reduces the incentive to move up the income ladder through education and training, we saw at the end of section 2.2 that existing subsidies to education combined with current

[3] The benefit elasticity is irrelevant in this case, since real net benefits are kept constant.

taxes on the return on non-human capital do call for some amount of tax on the return on human capital investment via a progressive labour income tax. Thus, although the neglect of international labour mobility and human capital investment implies that the INFOSIM model tends to underestimate the efficiency costs of increased labour tax progressivity, the model probably does not seriously underestimate the potential welfare gains from a lower fiscal burden on low-skilled labour.

4.3. Effects of subsidizing consumer services

The INFOSIM model is particularly suited for simulating the effects of tax concessions or subsidies to consumer services, since it explicitly describes the interaction between the formal and the informal economy. The first two columns of Table 6 summarize the effects of an 'optimal' price subsidy for the purchase of legal market-produced 'other consumer services' delivered from the S-sector. The reason why the subsidy is not extended to housing repair is that this sector makes relatively little use of unskilled labour (see Sørensen, 1997a). The 'optimal' price subsidy in Table 6 is found as the subsidy rate which yields the maximum aggregate utilitarian welfare gain relative to the initial equilibrium with no subsidy. All of the simulations are based on the low tax and benefit elasticities of wage formation stated in equation (1), and they assume that the pre-tax rate of unemployment benefit and other transfer rates are indexed to the general level of pre-tax wage rates. This means that benefit recipients are affected by changes in factor prices and tax rates in the same manner as employed workers.

In column (1) of Table 6, the subsidy is assumed to be financed by higher indirect taxes on the consumption of goods and services other than consumer services. According to the table, the optimal price subsidy of 48% to consumer services other than housing repair could be financed by a 9.6 percentage point rise in the VAT on all other goods and services. In the INFOSIM model, this policy has a significant impact on the labour market by shifting labour resources from the informal to the formal economy. Since the large price subsidy to legal market-produced consumer services makes informal service production much less attractive, the number of hours worked in the underground economy and in home production goes down by about 38% and 60%, respectively. The stronger impact on home production is due to the fall in unemployment combined with the fact that the unemployed are particularly active in home production. As working hours are released from informal activity and more people move into official employment, the number of hours worked in the official labour market goes up by more than 4%. Total unemployment goes down by somewhat less than this, since part of the rise in official employment comes from an increase in the number of hours worked by those who were already employed in the competitive segments of the labour market. The fall in unemployment is particularly large among unskilled workers, as one would expect given that production of 'other' consumer services makes intensive use of unskilled labour.

Table 6. Effects of optimal price subsidies to 'other' consumer services

	Initial equilibrium calibrated to Danish data		Hypothetical initial low-tax equilibrium[a]	
	Financed by Excise taxes (1)	Financed by Income taxes (2)	10 percentage points lower initial marginal income tax rate (3)	10 percentage points lower initial VAT rate (4)
Optimal price subsidy (% of consumer price)	48	29	40	47
Tax rates (percentage point change)				
Excise tax rate	+9.6	0	+8.3	+10.5
Marginal income tax rate	0	+2.5	0	0
Employment (% change in hours worked)				
Total official employment	+4.3	+1.8	+3.0	+3.4
Total underground employment	−37.8	−23.3	−34.3	−36.9
Total employment in home production	−60.1	−39.9	−53.0	−60.0
Unemployment (percentage point change)				
Skilled blue-collar workers	−2.7	−1.2	−1.5	−2.0
Unskilled blue-collar workers	−3.6	−1.7	−2.4	−2.9
Total unemployment	−2.6	−1.2	−1.6	−2.0
Welfare (change in % of private consumption)				
White-collar	−1.1	+4.2	−6.3	−2.3
Skilled blue-collar employed in C- and R-sector	+4.5	+0.3	+4.6	+3.9
Skilled blue-collar employed in S-sector	+1.9	+2.1	+0.7	+0.6
Unemployed skilled blue-collar	+1.4	+1.5	+0.5	+0.5
Unskilled blue-collar employed in C- and R-sector	+3.5	+0.1	+3.7	+2.9
Unskilled blue-collar employed in S-sector	+3.5	+3.1	+1.9	+2.1
Unemployed unskilled blue-collar	+2.4	+2.1	+1.3	+1.4
Transfers recipients	+3.1	+3.0	+1.9	+2.1
Aggregate utilitarian welfare	+2.8	+1.8	+1.8	+1.9

[a] Both of these scenarios assume finance by excise taxes.

Note: The simulations assume that pre-tax benefit rates are indexed to wage rates, and they are based on the low tax and benefit elasticities reported in equation (1).

Source: Simulations of the INFOSIM model.

The consumer service price subsidy raises the number of persons employed in several ways. First, by stimulating the demand for labour in the S-sector, it drives up wages in this sector, inducing the unemployed to take an S-sector job. Second, the shift from low-productivity informal service production to formal service production that is much more productive at the margin generates an overall gain in real incomes. Since this stimulates demand for all goods and services, it is also beneficial for employment in the primary sector of the economy. Stated differently, because of the overall productivity gain in service production combined with the initial high level of unemployment, it is possible to satisfy the increased total demand for consumer services without drawing labour resources away from the primary sector. Since unemployed skilled blue-collar workers are particularly active in the informal

economy, their welfare gain from the reform is limited because the price subsidy to official service production depresses the income obtainable from informal service production. Hence the welfare gain of skilled blue-collar workers in the S-sector is also limited, since the equilibrium utility level of these workers cannot exceed that of their unemployed colleagues. Because skilled blue-collar workers in the primary sector do not face such direct competition from the unemployed, their welfare gain is seen to be much larger. The other socioeconomic groups also share in the welfare gains from the improved efficiency of resource allocation, with the exception of white-collar workers. The welfare loss for this group is due to the fact that the consumer service price subsidy and the higher indirect tax rate on other goods and services raise consumer demand for S-sector and R-sector output relative to demand for the output of the C-sector. Since the C-sector makes much more intensive use of white-collar labour than the S-sector and the R-sector, the relative demand for white-collar workers falls, generating a welfare-reducing fall in wage rates for this group.

Financing consumer service subsidies by higher excise taxes distorts household choices between consumer services and other goods and services. It also distorts the labour–leisure choice, since any consumption tax reduces the real consumer wage. Column (2) in Table 6 assumes alternatively that the price subsidy to 'other' consumer services is financed by a uniform rise in the marginal tax rate on all labour and transfer income. This mode of finance does not distort the consumption pattern, but it still interferes with household choices between leisure and material consumption, and it also offsets part of the incentive to shift resources out of informal service production. Since the substitution elasticity between consumer services and other goods and services is rather low in the INFOSIM model, whereas the elasticity of substitution between goods and leisure is somewhat higher (see Table 4), the efficiency loss from finance through higher marginal income tax rates is also larger. As a consequence, the optimal consumer service price subsidy (which maximizes the aggregate utilitarian welfare gain) and the overall employment and welfare gains from subsidization become lower in the case of finance via higher income taxes, as can be seen by comparing columns (1) and (2) in Table 6. In particular, the welfare gains for blue-collar workers in the primary sector are now considerably smaller than was the case under finance by higher excises. The reason is that, while primary sector workers are able partly to shift higher excise taxes on to employers via higher wage rates, a rise in the marginal income tax rate dampens the pre-tax wages of these workers. However, even though the aggregate welfare gain from subsidization is now lower than before, it is interesting to note that a subsidy financed by income taxes generates a Pareto improvement by raising the welfare of all socioeconomic groups, including white-collar workers. Thus, while financing by higher excises shifts relative consumer demand away from the output of the C-sector, financing through higher income taxes is neutral towards the pattern of consumer demand. Hence the drop in the relative demand for white-collar workers is much smaller under income

tax finance, allowing these workers to share in the general efficiency gains from the reallocation of resources towards the formal economy.

The policy experiments in columns (1) and (2) of Table 6 are based on an initial equilibrium calibrated to a dataset for Denmark where direct and indirect tax rates are very high. Thus, the initial marginal labour income tax rate for white-collar workers is 62% and the VAT rate is 25%, giving strong incentives for informal service production. It might be thought that other countries with lower initial tax distortions would not necessarily gain from introducing consumer service subsidies. In column (3) of Table 6, I therefore consider the effects of such a subsidy in a hypothetical case where all initial marginal income tax rates are 10 percentage points lower,[4] whereas the simulation in column (4) assumes instead that the initial VAT rate is 10 percentage points lower. We see that the service price subsidy is still beneficial in these hypothetical cases, but the optimal subsidy rates and the ensuing employment and welfare gains are smaller when initial tax distortions are smaller, as one would expect.

Just as the level of initial tax rates is important, it must be stressed that the effects of consumer service subsidies are highly sensitive to the initial size of the informal economy. Simulations with the INFOSIM model suggest that the larger the initial 'base' of informal economic activity which can be reallocated towards the official market sector, the larger are the employment and welfare gains from subsidizing consumer services. Given the lack of hard reliable evidence on the extent of informal economic activity, this is a very important source of uncertainty, providing the motivation for the rather conservative calibration of the home production sectors in the INFOSIM model.

Finally, it should be noted that the structure of preferences assumed in the INFOSIM model (see Appendix A) implies that consumer services and other goods and services are equally substitutable for leisure. Hence the model cannot capture any efficiency effects arising from the fact that consumer services might be more or less substitutable for leisure than other goods. The assumption of equal substitutability *vis-à-vis* leisure seems the most neutral one to make in the absence of reliable a priori information on the exact degrees of substitutability.

5. SUMMARY AND CONCLUSIONS

This paper considered some recent proposals to fight structural unemployment in Europe by shifting the burden of taxes away from low-skilled labour and away from the production of consumer services which are intensive in the use of such labour.

A tax shift away from low-skilled labour would increase the progressivity of the labour income tax. This is controversial, since recent tax reforms have tended to

[4] Initial government budget balance is ensured by adjusting a lump-sum transfer instrument in the model accordingly.

move in the opposite direction. Strongly progressive taxes involving high marginal tax rates generate several potential distortions such as discouragement of work effort, human capital formation, labour mobility and entrepreneurship, as well as labour reallocation towards the informal economy and towards jobs offering non-pecuniary benefits. On the other hand, modern models of imperfect labour markets suggest that there may be an efficiency case for a certain amount of tax progressivity, since progressive taxes make wage increases less attractive to employers and employees, thereby reducing involuntary unemployment.

Another policy option currently debated in several European countries is that of reducing the net fiscal burden on the production of personal services which compete with services delivered from the informal economy and which make intensive use of low-skilled labour. A policy of low taxes on or direct subsidies to market-produced consumer services might improve resource allocation for two reasons. First, it would tend to reallocate labour and capital from low-productivity informal service production towards more productive activity in the formal service sector. Second, by raising the relative demand for low-skilled labour, it would tend to reduce overall equilibrium unemployment. At the same time, subsidies to consumer services would distort the allocation of resources *within* the market sector, and the financing of the (tax) subsidies would necessitate increases in existing distortionary taxes on other activities. Despite these offsetting factors, second-best optimal tax analysis suggests a case for a relatively low tax burden on consumer services in the plausible scenario where these services are substitutes for leisure and where labour supply is not very elastic.

To assess the costs and benefits of the public finance reforms outlined above, I simulated a computable general equilibrium model incorporating the informal economy and a 'dual' labour market with competitive as well as non-competitive segments and several skill types. The first set of simulations considered a shift of the tax burden away from low-paid employed workers, via an Earned Income Tax Credit or through an elimination of social security and payroll taxes on labour income below a certain level. The simulation results can be summarized as follows: (1) A shift of the tax burden away from low-paid labour is a risky policy. If pre-tax wage rates are fairly sensitive to changes in tax and benefit rates, such a tax reform will reduce total unemployment and raise aggregate welfare, but if wage rates are not very responsive to changing tax incentives, the reform may lead to lower economic activity and welfare. Given the present state of uncertainty regarding tax effects of wage formation, it is hard to say which outcome is the more likely one. (2) A tax shift away from low-paid labour is most likely to raise employment and welfare if the recipients of public transfers share in the financing of the tax cuts. If real after-tax benefit rates are kept constant, the outcome of the tax reform is particularly sensitive to the elasticities of wage rates with respect to average and marginal tax rates. (3) Tax cuts for low-paid workers are more likely to raise employment and welfare if they are financed by a higher marginal income tax rate

than if they are financed by higher consumption taxes, since the former mode of finance has a moderating effect on blue-collar wage rates whereas the latter financing method stimulates higher nominal wage claims.

I also simulated the effects of subsidizing consumer services, arriving at the following main conclusions: (1) Subsidizing those parts of the consumer sector which compete most directly with low-productivity home production and with underground economic activity will produce non-negligible employment and welfare gains, despite the fact that such subsidies and their financing will generate some additional distortions in certain dimensions. This result appears to be rather robust, even though the magnitude of the welfare gain is relatively sensitive to the initial size of the informal economy and to the magnitude of initial tax distortions. (2) The aggregate welfare gains will be larger when consumer service subsidies are financed via higher indirect taxes on other goods and services than when they are financed through a higher marginal income tax rate. On the other hand, the latter mode of finance seems capable of generating a welfare gain for all major socioeconomic groups.

Discussion

Vidar Christiansen

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The main achievement of this paper is to integrate such a wide range of issues as unemployment, wage formation, labour supply decisions, the underground economy and taxation. With the increasing specialization of our profession, it is refreshing to see Peter Birch Sørensen's versatile efforts to bring together these various elements within a coherent framework, and to explore the general equilibrium effects through the use of numerical simulations.

Unemployment is the major economic problem of Europe today, and hence any serious policy proposal addressing it deserves our attention. But also from a public finance perspective I am pleased to see this attempt to integrate the conventional optimum tax approach with the unemployment problem. I believe many tax theorists have become increasingly uneasy about the state of optimum tax theory within Walrasian models while the real world exhibits persistent unemployment.

The labour market models presented in the paper reflect the state of the art in this field. A crucial question is how well they reflect the functioning of European labour markets. This is important as the numerical analysis of the paper demonstrates the crucial role of wage formation.

It is not hard to accept that the models capture some important labour market aspects. It is of considerable interest that the various models seem to produce results that are surprisingly robust. But we should keep in mind that these models are still in

an infant stage. They are still rather simple. And the relevance to a particular economy depends on the actual structure of the labour market. I believe that the *efficiency wage model* is of somewhat limited relevance in economies characterized by strict firing regulations and high job security. An objection to the relevance of the *job search theory* has been the American experience that a very high fraction of unemployed workers are rehired by their previous employers (Feldstein, 1976). Probably of greater interest in a European context is that one may question the significance of the job search model when one observes that there are typically numerous applicants for each vacant job. Moreover, a person who is eligible for unemployment benefits is not free to search as long as he wants for a new job. If offered a job, he may have to accept it or forfeit the unemployment benefit.

Likewise, most models deal with taxes in a very simplified way. The *trade union models* normally assume that there is a representative trade union member facing marginal and average tax rates that can be changed independently of one another. In practice, trade union members have different labour and non-labour incomes, different family characteristics, etc. and face different marginal and average tax rates that are interrelated across income levels. The empirical studies of tax effects on wage formation normally use aggregate time-series and do not allow for the microeconomic diversity that microeconometricians would like to emphasize.

The modelling should allow for institutional diversity, such as the degree to which there is centralized bargaining. With many trade unions each trade union is likely to take the total unemployment as given. In the polar case of a single union, it will fully internalize the effect on unemployment, and it is harder to get unambiguous tax effects (Calmfors, 1982).

The intuition behind the effects of taxes in the union bargaining model is very much based on the trade-offs between disposable income and the risk of unemployment caused by the trade unions. In a union monoply model, the wage would be determined by this trade-off. But in a bargaining model there are two parties, and there is a need to consider also the responses to taxes of the employers with whom the unions bargain, and the nature of the bargaining process. It has been shown (Moene, 1988; Flanagan *et al.*, 1993) that the outcome of the bargaining process depends heavily on the kind of conflict facing the two parties if no agreement is reached. As far as I know, the role of alternative bargaining assumptions for tax implications has not been much studied.

I like the general idea of an *optimum* degree of progressivity allowing for employment effects and labour supply distortions. However, I find the concern about labour market tightness less relevant, as it is hard to believe that tax reforms are likely to push unemployment down to a suboptimal level.

Three cases are made for subsidizing consumer services: (1) Unemployment may be reduced. (2) The conventional income tax distortion of labour supply may be alleviated. (3) Resources may be retrieved from the underground economy.

The inclusion of the underground economy is an interesting extension of the

standard theory. It is assumed that there is diminishing marginal productivity to labour in the underground economy, which limits the activity level in that sector. Interpreted in a physical sense this is not at all obvious. Nevertheless, I think this is a useful assumption that can be given a slightly different interpretation. Assume that people are reluctant to buy services in the black market, so that black market services are imperfect substitutes for ordinary market services. To expand the black market, the price of its services will have to be reduced in order to lead more people into temptation, and in that sense there is a diminishing marginal return.

The alleviation of the income tax distortion has received a good deal of attention in the literature that I do not find sufficiently reflected in Sørensen's discussion. Sørensen's model is essentially a Corlett–Hague (CH) model, where he introduces a distinction between leisure used for household production and 'proper leisure' used for recreation and enjoying life. This is most useful for getting a better understanding of how consumers allocate their time. But it does not change the qualitative structure of the analysis because the distortion is between labour supply on the one hand and all other uses of time on the other hand. We can perceive the latter as an aggregate corresponding to the leisure concept of the CH model.

Differentiation of commodity taxes will distort the bundle of market goods, and will be beneficial only if it alleviates the pre-existing labour supply distortion. The main result of CH is that this will happen if one commodity is a closer substitute for leisure than the other. The intuition is simple: if hiring a gardener is a substitute for giving up one's own leisure to weed the garden, making gardening services cheaper will stimulate labour supply.

In Sørensen's analysis there is no explicit mention of the role of the relative degree of substitutability between the respective commodities and leisure. The leisure concept needs more clarification as it is unclear when it includes time for household production. It is argued that a subsidy is more likely to be efficient 'if labour supply is not too elastic'. But the reason why a subsidy may be desirable in the first place is that a serious labour supply distortion arises if labour supply is sufficiently elastic.

In the CH model it is simply postulated that only distortionary taxes are available. In Sørensen's words, 'certain economic activities cannot be taxed for practical reasons'. In modern second-best theory, tax distortions are normally attributed to asymmetric information. In the Mirrlees–Stiglitz model there are two types of consumer, each with a wage rate reflecting skill that is known only to the consumers themselves. A government that wants to redistribute income from high-skilled to low-skilled consumers encounters a self-selection constraint. The income point intended for the low-skilled person must not be so generous as to induce the high-skilled person to mimic the low-skilled person. The potential role of excise taxes within this model is to alleviate the self-selection constraint (see Edwards *et al.*, 1994). A good should be subsidized if its consumption is positively related to labour supply. The reason is that one should avoid favouring the mimicking high-skilled person who can use his high skill to earn a relatively low income with a limited

labour supply. This is a very simple prescription that is akin, but not identical, to the CH result.

A political objection to subsidies to consumer services is that high-income people will benefit because they are assumed to have a large share of this consumption. Sørensen shows that general equilibrium effects on wages pull in the opposite direction. This illustrates a classic dilemma in economic policy analysis: it is hard to convince politicians that there is such a thing as general equilibrium effects that may offset or outweigh the direct effects with which politicians tend to be preoccupied.

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This paper constitutes a welcome contribution to the ongoing debate on the policy options for solving the European unemployment problem. In particular, by focusing on ways to solve the very high unemployment rate among low-skilled workers, it takes a step in the right direction towards reducing long-term structural unemployment. Following the Drèze and Malinvaud (1994) manifesto to use public finance solutions to shift the tax burden away from low-skilled labour and away from the production of consumer services which are intensive in the use of such labour, the paper proceeds to evaluate some of these proposals in a systematic way.

The basic argument can be summarized in a nutshell with the help of Figure 2. Let L^d and L^s be the labour demand and supply schedules of low-skilled labour (L_u). Demand shifted downwards during the 1980s due to the already standard (but not undisputed: see Nickell and Bell, 1997) explanations related to technological bias, globalization of the economy and ladder effects (i.e., the fact that skilled workers can perform unskilled tasks but not the opposite). Thus, the market clearing wage is W^* with a corresponding employment level equal to L^*. However, given the presence of wage floors (minimum wages, unemployment benefits, etc.) indicated by W_m, employment is reduced to $\underline{L}$, giving rise to unemployment equal to $\bar{L} - \underline{L}$. In order to get back an efficient level of employment, an employment subsidy/tax exemption equal to $W_m - W^*$ could be offered to firms, shifting their labour demand to $L^{d'}$. The problem is how to finance that subsidy. In general, the proposals examined in this paper advise an increase in the progressivity of the labour income tax (e.g., social security contributions) because the supply elasticity of skilled labour is believed to be less than that of low-skilled labour. Suppose, for simplicity, that skilled labour supply is completely inelastic. The increased tax will then be shifted on to workers, whose wage will fall, while labour costs (and therefore skilled employment) remain unaltered.

Obviously, an initial reaction to this proposal is to object to the idea of offsetting one distortion (the wage floor) with another distortion (higher taxes, at least for some workers). Why is the wage not allowed to fall to its equilibrium level, W^*? The usual reaction to this objection is well known, and I will not elaborate much on it

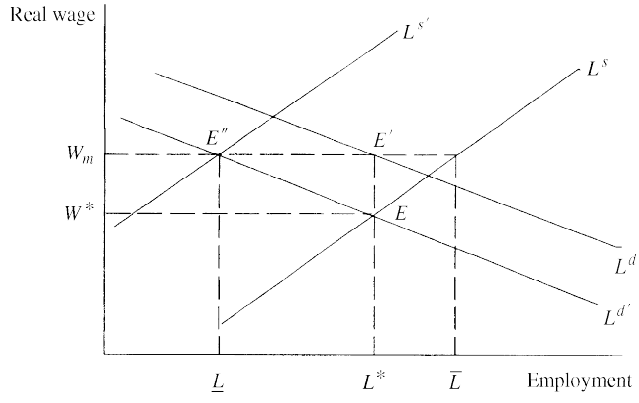

Figure 2. Labour market schedules

here: wage inequality will increase and, as the recent defeat of the Conservative Party in the UK election proves, this counts for a lot in public opinion. Moreover, as recently stressed by Richard Freeman (1994), criminal activities may rocket: the number of people in gaol or on bail is about 2% of the labour force in the USA. This liberal argument is not without merit, particularly if it is complemented by higher education and better training of low-skilled workers. In this case, labour supply will shift upwards to $L^{s'}$, maintaining a reasonable income at W^* with equilibrium employment at $\underline{L}$ and no involuntary unemployment. Although these reforms work slowly and are costly, they are more in the current European trend towards fiscal consolidation.

So, there is some reason to sympathize with the results in this paper. However, having to play the devil's advocate, in what follows I will summarize the pros and cons of the different alternatives, distinguishing among the following different cases:

Reduce taxes of minimum wage earners. The main suggestion here is to scale the exemption so that it disappears around median wages (see Drèze and Malinvaud, 1994). The problem here is that, since there is a proportion of about 5–10% minimum wage earners in most European countries (see Dolado *et al.*, 1996), there will be an increased marginal ESIC (employers' social insurance contributions) rate between the minimum and the median wage affecting 40–5% of skilled workers. Even if the current trend favouring more skilled labour is quite strong, the numbers above are sizeable enough to imply a drawback in the hiring by firms of the latter type of workers.

Minimum wages cum subsidies. Following Drèze and Sneessens (1997), the size of the subsidy, as a proportion of W^*, turns out to be the ratio between the targeted unemployment rate (u) and the labour supply elasticity (η^s). If we take u to be 7% (the current u is about 10%) and η^s in the interval between 0.1 and 0.2, the

corresponding ballpark estimate of the subsidy will amount to 35–70% of the equilibrium wage, quite a large sum in budgetary terms for many countries.

Abolish minimum wages. Here, there are two possibilities. First, if the unemployment benefit remains unaltered, then there is a need to introduce an 'earned-income credit' (EIC) for the employed workers to avoid unemployment traps. And second, if benefits are abolished as well, in order to avoid excessive wage inequality, 'participation income' schemes for both employed and unemployed workers will be needed. In both cases, the budgetary cost of the schemes may be too high, given the number of workers involved.

Subsidies to personal services. The idea here is to subsidize the production of consumer services which are immune from competition stemming from machines. The underlying rationale is to tax those services which are complementary to leisure and to subsidize those which are substitutes. Among the latter, clear examples are the assistance to elderly or disabled, childcare and house repairs, but there are also instances of the former: environmental protection, cultural and recreational activities, etc. Here it should be noted that, as the experience in Belgium and France shows, the subsidies should be targeted on specific groups (notably, young workers and the long-term unemployed). Moreover, there are also some adverse side-effects which should be considered. First, rich people consume a larger proportion of consumer services, so we may end up subsidizing those who need it the least. Second, it is not clear whether these subsidies represent a greater incentive for unemployed or employed workers. For instance, a detailed survey carried out in Spain in the late 1980s discovered that most of the underground economy (about 10% of employment) comprised people who had a job and were taking a second job to complement their already low wages. And, finally, given the presence of unions or efficiency considerations in the wage setting of low-skilled workers (babysitters is a good example of the latter), the subsidy/tax exemption can increase immigration, jeopardizing the current European agreements in this respect.

Lastly, there are several issues which are hardly reviewed in the paper and yet might be important: (1) Alternative financing systems like the implementation of a CO_2 tax or a General Income Tax; after all, the opinion that there is not much room for higher progressivity in Europe may be well grounded and these schemes may need to be considered. Yet will such systems be consistent with the current low inflation rates in Europe? (2) What is the optimal timing for the introduction of the public finance changes considered in the paper? The recent agreement between employers and unions about reducing high firing costs in Spain constitutes a clear instance of the right moment to enhance low-skilled employment through the schemes discussed above. And (3) the introduction of EIC is advised in several parts of the paper. Yet we see these schemes operating only in the Anglo-Saxon economies. Hence, what

are the political economy arguments for the introduction of such schemes, and are they viable on the continent?

In sum, high levels of structural unemployment and long-duration unemployment have now existed for so long that they have become a common feature of the economic landscape in Europe. Hence, a fundamental change is needed in our attitudes towards this problem. Are public finance solutions the right tool? From the gains estimated in this paper the answer has to be: no. But there is no doubt that, if carefully designed, they would be a step in the right direction.

General discussion

Leonardo Felli argued that the paper ignored the effects of the policies advocated on the supply side of the labour market. The model had taken the level of skills as being innate to the workers. If it allowed for the accumulation of human capital, the suggested tax policies may well have perverse effects. In particular, heightened progressivity of taxation would reduce the incentives to acquire skills, and thus increase the supply of unskilled workers. At the same time, if low-skill and high-skill jobs are not perfect substitutes, the availability of low-skill jobs will not rise even as the supply of unskilled workers goes up. Consequently, this policy may serve only to increase unemployment among the unskilled and low-skilled workers.

Charles Wyplosz thought that encouraging the growth of the unskilled labour force was likely to take western Europe away from its comparative advantage, which, surely, does not lie in low-skill products. Further, any measure proposed in the paper for alleviating the unemployment problem may be dynamically inefficient. Daniel Cohen noted that there was an inherent generational problem – we may want to improve the condition of the current generation of workers but, in the process, we should not create future generations of unskilled workers.

David Begg enquired about the appropriate jurisdiction for the recommended policies. With a mobile European labour market, a subsidy in one country would inevitably have some spillover effects in others. Would there be identifiable cross-country conflicts, and if so, what kinds of co-ordinating mechanism could be devised to avoid these? Daniel Cohen felt that the paper did not resolve an important question: does tax affect the number of hours of work supplied by the workers, or does it affect the participation rate? Orazio Attanasio also commented on the modelling of labour supply. He pointed out that labour supply choice is probably determined at the household, rather than individual, level. Given that schemes such as the EITC are administered at the household level, the incentive effects of taxes and subsidies affect the joint participation choices of spouses.

Georges de Ménil was uncomfortable with the presumption that economists should shy away from the so-called politically infeasible policies. He cautioned the Panel against ready acceptance of political constraints – for instance, the idea that we

cannot advocate reducing minimum wages because it is politically unpalatable. The recent agreement in Spain concerning medium-term contracts for new entrants in the labour market suggested that what was unpalatable once need not always remains so, especially if economists are prepared to champion such policies actively. Juan Dolado felt that, while economists may have a role to play, it is the changed circumstances of the Spanish labour market that had contributed to the policy shift. While the proportion of workers with temporary jobs had been very low in the past, now it was as high as 30% in Spain. As median-voter models would suggest, this change had made it far easier to introduce policies that favoured temporary workers.

APPENDIX A. KEY SPECIFICATIONS IN THE INFOSIM MODEL

The household sector in the INFOSIM model includes eight socioeconomic groups all of which are assumed to have identical preferences. Each household type has a CES utility function U with substitution elasticity ρ between goods (G) and leisure (L), i.e.

$$U = U(G, L) = [\omega G^{\rho-1/\rho} + (1-\omega) L^{\rho-1/\rho}]^{\rho/\rho-1},\ 0 < \omega < 1 \tag{A1}$$

For a working-age household holding a job in the official labour market, the consumption of leisure equals the total time endowment (normalized at unity) minus the time spent on work in the formal economy (N_m), on home production of housing repair (N_{hr}), on home production of other consumer services (N_{hs}), on underground production of housing repair (N_{br}), and on underground production of other consumer services (N_{bs}):

$$L = 1 - N_m - N_{hr} - N_{hs} - N_{br} - N_{bs} \tag{A2}$$

The utility derived from goods consumption is a Cobb–Douglas aggregate of the consumption of housing services (assumed to be proportional to the housing stock K_d with proportionality factor β) and consumption of other goods, X:

$$G = G(\beta K_d,\ X) = A(\beta K_d)^{\gamma} X^{1-\gamma},\ 0, > \gamma < 1 \tag{A3}$$

The composite X-good is a CES aggregate of 'other goods' (C) and of 'other consumer services' (that is, consumer services other than housing repair), with these other services consisting of home-produced services H and services S bought in the official or in the underground market. Thus we have

$$X = X(C,\ S + H) = [\omega_c\ C^{\varphi-1/\varphi} + (1-\omega_c)\ [S + H(N_{hs},\ K_{hs})]^{\varphi-1/\varphi}]^{\varphi/\varphi-1},\ 0 < \omega_c < 1 \tag{A4}$$

where K_{hs} is the capital stock invested in home production of 'other consumer services'. Housing repair services do not enter the utility function (A4), since they generate utility only indirectly by serving to maintain the consumer's housing stock. Finally, the utility flow from the consumption of 'other goods' is specified as a Cobb–Douglas function of consumption of domestically produced goods (C_d) and of imported goods (C_i):

$$C = C(C_d,\ C_i) = (C_d)^{\alpha} (C_i)^{1-\alpha},\ 0 < \alpha < 1 \tag{A5}$$

The Cobb–Douglas specifications adopted in (A3) and (A5) were motivated by the

observation that the consumer budget shares of housing consumption and of imported non-durables have been fairly stable over time in Denmark.

The technologies for home production of housing repair services (H_r), for home production of other consumer services (H_s), for underground production of housing repair services (B_r), and for underground production of other consumer services (B_s) are described by the following Cobb–Douglas functions:

$$H_r(N_{hr}, K_{hr}, K_d) = A_{hr}(N_{hr})^a (K_{hr})^b (K_d)^{1-a-b},\ 0 < a + b < 1 \tag{A6}$$

$$H_s(N_{hs}, K_{hs}) = A_{hs}(N_{hs})^c (K_{hs})^d,\ 0 < c + d < 1 \tag{A7}$$

$$B_r(N_{br}, K_{br}) = A_{br}(N_{br})^z (K_{br})^{1-z},\ 0 < z < 1 \tag{A8}$$

$$B_s(N_{bs}, K_{bs}) = A_{bs}(N_{bs})^v (K_{bs})^{1-v},\ 0 < v < 1 \tag{A9}$$

Notice from (A6) that a higher housing stock K_d increases the marginal productivity of labour and capital allocated to housing repair. Note also from (A7) that home production of other consumer services is subject to diminishing returns, due to the fixity of the physical infrastructure of the household.

The household is endowed with a predetermined stock of net financial wealth V, which earns the real world interest rate i subject to the marginal capital income tax rate t^k. Let us denote the pre-tax wage rate by w and the marginal labour income tax rate by t^m. Furthermore, let P^r, P^s and P^c indicate the consumer prices of housing repair services, of other consumer services, and of other goods, respectively. The household budget constraint may then be written as follows:

$$\begin{aligned} &P^c C + P^s S + p^d K_d + p^{hs} K_{hs} + p^{hr} K_{hr} + p^{bs} K_{bs} + p^{br} K_{br} = \\ &\quad w(1-t^m)N_m + i(1-t^k)V + T + (1-F)P^s B_s(N_{bs}, K_{bs}) \\ &\quad +(1-F)P^r B_r(N_{br}, K_{br}) + P^r H_r(N_{hr}, K_{hr}, K_d), \\ &F = \overline{F} > 0 \text{ with probability } \pi, \\ &F = 0 \text{ with probability } 1-\pi \end{aligned} \tag{A10}$$

The ps in equation (A10) are the user costs associated with the various forms of capital use. These user costs include the after-tax interest rate plus exogenous depreciation rates as well as the various indirect taxes on household capital. The variable T is a government transfer including ordinary transfers *plus* the tax reductions stemming from tax credits and deductions from the income tax base. The parameter π is the probability that the consumer will be detected by the authorities when he engages in underground activities. In that case he will have to pay a fine equal to the proportion $\overline{F}$ of his income from black market activities and will have to adjust his consumption accordingly.

Equation (A10) implies that the consumer undertakes gross savings equal to the total depreciation of the various forms of household capital. The demand for housing repair equals the depreciation of the housing stock, which is included in the user-cost variable p^d on the left-hand side of (A10). The consumer may save expenses on housing repair services by producing some of these services for himself. This is the reason for the appearance of the term $P^r H_r$ on the right-hand side of (A10).

Ex ante the consumer must decide on the allocation of his time and of his total capital

stock across alternative uses, before he knows whether or not he will be caught engaging in underground activity. If he is detected ex post, he will be fined and will obtain utility $U(F=\overline{F})$, whereas his utility will be $U(F=0)$ if he is not caught. The consumer determines his allocation of time and capital ex ante with the purpose of maximizing expected utility $\pi U(F=\overline{F}) + (1-\pi)U(F=0)$, given the preference structure and the household technologies described by equations (A1) to (A9), and given the budget constraint (A10). Ex post it is revealed whether or not the consumer will be fined, and he then determines the allocation of his available income over the non-durable goods C_d, C_i and S in a utility-maximizing manner, given his predetermined allocation of capital and time. In the aggregate, the proportion of consumers who end up being fined is equal to π.

All equations describing household behaviour in the INFOSIM model are derived from the solution to the maximization problem specified above. For white-collar workers and blue-collar workers employed in the S-sector the amount of time worked in the official labour market (N_m) is an endogenous decision variable. The employment status of a blue-collar worker is determined ex ante before any other decisions have to be made. Unemployed workers as well as pensioners obviously do not have to decide on the amount of hours worked in the official economy, and the same goes for blue-collar workers in the C-sector and the R-sector where individual working hours are set exogenously.

The demands for labour and capital emanating from the three official business sectors of the INFOSIM model are derived from profit maximization, assuming competitive product markets. Each official business sector produces output Q by means of a CES production function of imported inputs M and domestic value added Y, with substitution elasticity σ:

$$Q = Q(M, Y) = [\mu M^{\sigma-1/\sigma} + (1-\mu)Y^{\sigma-1/\sigma}]^{\sigma/\sigma-1},\ 0<\mu<1 \tag{A11}$$

Domestic value added is a Cobb–Douglas function of the inputs of capital K and labour hours N,

$$Y(K, N) = A_Y K^{\eta} N^{1-\eta},\ 0<\eta<1 \tag{A12}$$

and total labour input is a CES aggregate of the inputs of white-collar labour (N_w) and blue-collar labour (N_b), with substitution elasticity ε between the two types of labour:

$$N(N_w, N_b) = [\tilde{\omega}(N_w)^{\varepsilon-1/\varepsilon} + (1-\tilde{\omega})(N_b)^{\varepsilon-1/\varepsilon}]^{\varepsilon/\varepsilon-1},\ 0<\tilde{\omega}<1 \tag{A13}$$

The input of blue-collar workers is specified as a CES function of the inputs of skilled (N_s) and unskilled (N_u) workers, allowing a substitution elasticity λ:

$$N_b(N_s, N_u) = [\Omega(N_s)^{\lambda-1/\lambda} + (1-\Omega)(N_u)^{\lambda-1/\lambda}]^{\lambda/\lambda-1},\ 0<\Omega<1 \tag{A14}$$

While all official business sectors are characterized by the general technological structure described above, the parameter values in equations (A11) to (A14) differ across sectors in order to replicate the benchmark dataset.

The INFOSIM model is closed by imposing equilibrium conditions on all output markets, choosing the exogenous price of imported goods as the numeraire, and specifying institutions for wage determination, assuming perfect mobility of all production factors

within the domestic economy and perfect international mobility of capital. All output markets are taken to be competitive. The markets for white-collar labour and the S-sector markets for the two types of blue-collar labour are also competitive, with wage rates adjusting to equilibrate demand and supply. By contrast, the C-sector and the R-sector are characterized by non-competitive wage setting for blue-collar labour (see Appendix B below), generating involuntary unemployment. The blue-collar workers who do not find jobs in the high-paying C- and R-sectors allocate themselves endogenously between unemployment and S-sector employment, such that these two latter alternatives yield the same level of expected utility.

APPENDIX B. FOUNDATIONS OF THE 'INFOSIM' WAGE EQUATIONS

The INFOSIM wage equations for blue-collar workers reported in equation (1) of the main text are consistent with the modern theories of imperfect labour markets reviewed in section 2.2. This appendix illustrates how a wage equation like (1) may be derived from a union bargaining model.

Suppose that the preferences of the trade union for labour of category i can be described by a utility function V_i which depends on the number of employed union members N_i and on the members' real after-tax wage rate given by $[W_i - T(W_i)]/P$, where $T(W_i)$ is the total labour income tax bill generated by the pre-tax nominal wage rate W_i (assuming fixed working hours) and P is the consumer price index. More specifically, suppose that

$$V_i = (N_i)^{\beta}\left[\frac{1}{\sigma}\left(\frac{W_i - T(W_i)}{P}\right)^{\sigma} - U^{a}\right], 0 \leqslant \beta \leqslant 1, \sigma \leqslant 1 \tag{B1}$$

where U^a is some standard against which the utility from the union's wage rate is measured, capturing the union's concern with the relative income position of its members, and where the parameters β and σ determine the marginal utilities from increased employment and from increased wage rates.

Suppose next that the nominal wage rate is set in a bargaining process which maximizes the Nash product Ω given by

$$\begin{aligned}&\Omega = \lambda \log(V_i) + (1 - \lambda) \log(\Pi),\\ &\Pi = [pF(N_i, X) - W_i(1 + s)N_i - p_x X]/P, F_1 > 0, F_{11} < 0\end{aligned} \tag{B2}$$

where Π is the real profit of employers, with p and F denoting the output price and the production function, respectively, X being a vector of inputs of factors other than labour of category i, p_x being the vector of prices of these other inputs, and s indicating the payroll tax or social security tax rate levied on employers. In determining its wage claim, the ith union takes the input X of other factors as given. This assumption is reasonable if employers negotiate with representatives of many different types of skilled and unskilled labour, organized in separate craft unions. Employers have the right to manage and hence choose the employment level in accordance with the usual marginal productivity condition $pF_1(N_i, X) = W_i(1+s)$.

The solution to the bargaining game specified above yields a 'mark-up' equation of the form:

$$\frac{1}{\sigma}\left(\frac{W_i(1-t^a)}{P}\right)=\left(\frac{1}{1-kv\sigma}\right)U^a,$$
$$v \equiv \frac{1-t^m}{1-t^a},\ t^m \equiv T'(W_i),\ t^a \equiv \frac{T(W_i)}{W_i}$$
$$k=\frac{\lambda(1-\alpha)}{\lambda\beta\varepsilon(1-\alpha)+\alpha(1-\lambda)},\ \alpha \equiv \frac{W_i(1+s)N_i}{pF(N_i,X)}, \tag{B3}$$
$$\varepsilon \equiv -\frac{W_i(1+s)}{F_{11}(N_i,X)N_i}$$

Following Holmlund and Kolm (1995), suppose next that the union's valuation of the 'outside opportunities' available to its members is a weighted average of the utility value of the average disposable real wage $W(1-t^a)/P$ for similar types of labour and of the utility value of the real after-tax rate of unemployment benefit B/P, with the weight given to the latter variable depending positively on the unemployment rate u:

$$U^a=[1-f(u)]\ \frac{1}{\sigma}\left(\frac{W(1-t^a)}{P}\right)^{\sigma}+f(u)\ \frac{1}{\hat{\sigma}}\left(\frac{B}{P}\right)^{\hat{\sigma}},f'>0,\ \hat{\sigma}\leqslant\sigma \tag{B4}$$

Notice that the elasticity $\hat{\sigma}$ may be smaller than the elasticity σ, since (increases in) unemployment benefits may be considered less valuable than (increases in) wages, say due to availability-for-work requirements, mobility requirements or other conditions attached to the collection of benefits.

Substituting (B4) into (B3) and imposing the symmetry condition $W_i = W$, we end up with the wage equation

$$\left(\frac{W(1-t^a)}{P}\right)^{\sigma}=\frac{\sigma}{\hat{\sigma}}\left(\frac{1}{1-kv\sigma/f(u)}\right)\left(\frac{B}{P}\right)^{\hat{\sigma}} \tag{B5}$$

Noting from (B3) that α and hence k will generally depend on W, one may derive the following elasticities from (B5):

$$\frac{\partial\log(W/P)}{\partial\log(1-t^a)}=-\left(\frac{1+mkv/f(u)}{1-\eta[1-\varepsilon(1-\alpha)]mvk/f(u)}\right),$$
$$m \equiv \frac{1}{1-\sigma kv/f(u)}>1,\ \eta \equiv \frac{\partial k}{\partial\alpha}\ \frac{\alpha}{k}<0 \tag{B6}$$

$$\frac{\partial\log(W/P)}{\partial\log(1-t^m)}=\frac{mkv/f(u)}{1-\eta[1-\varepsilon(1-\alpha)]mvk/f(u)} \tag{B7}$$

$$\frac{\partial\log(W/P)}{\partial\log(u)}=-\frac{mvkuf'(u)/(f(u))^2}{1-\eta[1-\varepsilon(1-\alpha)]mvk/f(u)} \tag{B8}$$

$$\frac{\partial\log(W/P)}{\partial\log(B)}=\frac{\hat{\sigma}}{\sigma} \tag{B9}$$

If the wage elasticity of labour demand ε is not too far above unity – an assumption which is certainly supported by empirical evidence (Hamermesh, 1993) – we see that the denominators in (B6) to (B8) will be positive and greater than 1, since the labour share α is positive but less than 1. This means that the elasticities in (B6) and (B8) will be negative, whereas the elasticities (B7) and (B9) will be positive, as assumed in equation (1) of the main text. Notice also that $\partial\log(W/P)/\partial\log(1-t^m)$ is numerically smaller than $\partial\log(W/P)/\partial\log(1-t^a)$ and that it is possible for the elasticities (B6) and (B9) to be (numerically) smaller than unity, as assumed in the 'low-elasticity' policy scenarios.

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