

Fiscal Studies (1996) vol. 16, no. 2, pp. 71-93

Subsidising Consumer Services: Effects on Employment, Welfare and the Informal Economy

NIELS FREDERIKSEN, PETER HANSEN, HENRIK JACOBSEN and PETER SØRENSEN¹

I. THE PROBLEM

It is widely agreed that the opportunities for expansion of aggregate employment in the OECD area must be sought mainly in the private service sector. Thus, because of budgetary problems and voter resistance to higher tax rates, the scope for further expansion of public sector employment seems limited in most OECD countries. Furthermore, the primary sector will undoubtedly continue to release labour resources and, with normal growth rates, there is little prospect of a secular rise in manufacturing employment, since the increase in demand for manufactures is likely to be met through increases in labour productivity. In particular, the ongoing shifts in the international division of labour and the associated transition to the 'knowledge-based economy' within the OECD are likely to destroy a large number of manufacturing jobs for unskilled and low-skilled workers in the OECD area.

In recent years, many policymakers have expressed the hope that these job losses may be compensated by the creation of new private sector service jobs for

¹ Economic Policy Research Unit, Copenhagen Business School.

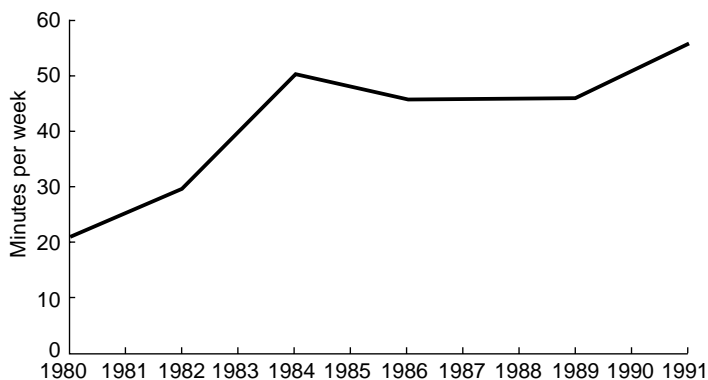
This is a revised version of a paper presented at the conference on 'Employment and Growth in the Knowledge-Based Economy', organised by the OECD and the Danish government, in Copenhagen, 7–8 November 1994. The authors wish to acknowledge useful comments from two anonymous referees. The activities of the Economic Policy Research Unit are supported by a grant from the Danish National Research Foundation.

those workers whose skills are hard to upgrade through training and education programmes. The production of consumer services delivered to the household sector (as opposed to services delivered to the business sector) is often rather intensive in the use of unskilled labour. However, in many western countries, the growth of the consumer service sector seems to have been hampered by serious competition from do-it-yourself activities and from services produced in the 'black' underground economy which are not burdened with the high tax rates levied on the 'white' service sector.

In the case of Denmark, it has been estimated that the increase in direct and indirect tax rates between 1967 and 1992 has, *ceteris paribus*, reduced the demand for white consumer services by 25 per cent by causing white services to be crowded out by services delivered from the informal economy (Heinesen, 1994, p. 37).² Other empirical studies for Denmark have tended to confirm the impression of a significant growth of the informal economy during the last decades. Figure 1 provides a measure of the trend in black labour market activity since 1980, estimated on the basis of questionnaires. Apart from a period in the mid-1980s when employment opportunities in the official labour market improved significantly, there has been a marked rise in the amount of work carried out in the black markets. Black labour seems to be particularly widespread in the consumer service sector, especially in the repair and maintenance of dwellings and of consumer durables. In the early 1990s, Viby Mogensen (1992) estimated that, on conservative assumptions, the total number of black working hours amounted to about 5 per cent of the total number of hours worked in the official labour market.

FIGURE 1

Time Spent on Black Labour per Danish Person Aged 20-69 Years



Source: The Rockwool Foundation Research Unit

² In our terminology, the informal economy includes legal do-it-yourself activities in the home as well as illegal activities carried out in the black markets.

After adjusting for demographic changes, Körmendi (1990) also found evidence of a significant rise in the amount of unpaid work carried out in Danish homes between 1964 and 1987, despite the facts that Danish women entered the official labour market on a large scale during that period and that much household work became mechanised due to the introduction of electric appliances etc. According to Körmendi's estimates, the time spent on unpaid work in the home made up about two-thirds of the total time spent in the labour market for the average adult Dane in 1987.³

In summary, it seems that very substantial labour resources are tied up in the informal economy. Moreover, it appears that part of the growth of the informal sector can be attributed to the rising tax wedges which have made it increasingly difficult for the white service sector to compete with informal service production which escapes taxation, legally or illegally. In Denmark — and in some other OECD countries as well — this observation has led to the suggestion that the consumer service sector should be granted special tax concessions or direct subsidies to compensate for the competitive disadvantage *vis-à-vis* the informal economy.⁴ The hypothesis is that such a policy could create more service jobs in the official economy and could help to twist labour demand in favour of those groups of low- skilled workers who are currently particularly hard hit by unemployment. In fact, the Danish government has already experimented with selective subsidisation of consumer services on a small scale by introducing subsidies to repair and maintenance of private homes as well as subsidies to market-based provision of certain household services such as cleaning and gardening.

Many observers have tended to see the proposed tax concessions or direct subsidies to consumer services as a rather poor substitute for labour market policies aimed more directly at reducing structural unemployment. However, it may be more appropriate to consider the problem in the perspective offered by the theory of optimal taxation.⁵ This theory suggests that, in order to minimise the distorting substitution effects induced by the tax system, the government should impose relatively low tax rates on those white activities that can easily be replaced by services produced in the informal economy beyond the reach of the tax collector. As Harberger (1990, p. 8) has put it, 'If a package of close substitutes contains some important items that by their nature are difficult to tax, then the course of prudence may well be to leave the whole package in the untaxed sector rather than cause sharp tax-induced substitutions by introducing a

³ Juster and Stafford (1991) provide evidence on trends in the allocation of time in a number of countries. Generally, there has been a tendency for the non-market work of men to increase over the last decades, whereas the non-market work of women has declined, reflecting the increasing female labour force participation rates.

⁴ Countries such as Sweden, France and the Netherlands have been debating similar proposals. Furthermore, in late 1994, the European Parliament proposed that labour-intensive services should be included in the category of goods and services that are allowed to be taxed at the reduced rate of VAT within the European Union.

⁵ For a useful non-technical survey of that theory, see Heady (1993).

tax just on a part of the group'. This observation might also justify a direct subsidy to consumer services to neutralise the effect of the tax wedge, if it is deemed desirable to avoid the 'tax expenditure' implied by tax exemption.

The present paper is a first attempt at analysing the effects on employment and welfare of selective subsidies to consumer services by means of an applied general equilibrium model of the interactions between the formal and informal economies.⁶ At the theoretical level, our model seeks to combine ideas from the literature on income tax evasion — for example, Allingham and Sandmo (1972), Cowell (1985 and 1990), Watson (1985), Kesselman (1989), Jung, Snow and Trandel (1994) and Lemieux, Fortin and Frechette (1994) — and the literature on the effects of taxation on the allocation of labour between home production and market production, exemplified by Boskin (1975) and Piggott and Whalley (1994). While these contributions focus either on the underground economy or on the allocation of time between home production and market production, our model provides a broader picture by considering simultaneously the allocation of time between leisure, work in the home, work in the official labour market and work in the underground economy, and by distinguishing between service production and production of other goods. The price to be paid for this added complexity is that we cannot unambiguously predict the qualitative effects of taxes and subsidies on the basis of the analytical solution to our model. Hence we have to resort to numerical simulations. On the other hand, this has the advantage that it allows a quantification of policy effects and enables us to analyse in quantitative terms the sensitivity of our results to changes in strategic parameter values.

We are aware of only one paper (Graafland, 1990) that applies a computable general equilibrium model to the study of tax effects on resource allocation between the formal and informal economies, allowing for home production as well as activity in the black labour market. However, Graafland's model does not contain a distinction between consumer services and other sectors of the market economy, a distinction which is crucial for the present purpose.

As a prelude to our numerical analysis, the next section briefly reviews alternative possible instruments of subsidisation. Section III then discusses the qualitative effects of consumer service subsidies on employment and unemployment, while Section IV describes the nature of the welfare costs and benefits of subsidies. Following this qualitative analysis, Sections V, VI and VII outline a computable general equilibrium model of the Danish economy designed to quantify the effects of subsidising white consumer services. In Section VIII, this model is used to estimate the optimal subsidy to the consumer service sector, while Section IX simulates the effects of subsidisation on the economy under

⁶ The paper summarises some of the main results from a longer and more detailed report on the subject. See Frederiksen, Hansen, Jacobsen and Sørensen (1994). Sørensen (1994) provides a more formal theoretical analysis of some of the issues involved in subsidising consumer services.

alternative assumptions regarding the mode of government finance. Section X illustrates the sensitivity of the welfare effects to changes in some important parameters in the model, while the final section summarises our conclusions and indicates some directions for future research.

II. ALTERNATIVE INSTRUMENTS OF SUBSIDISATION

Subsidies to the consumer service sector could take the form of tax concessions or of direct subsidies. Tax concessions could consist of exemption of consumer service firms from VAT and from payroll taxes and social security contributions. Alternatively, the government could allow households to deduct part or all of their expenditure on the purchase of white consumer services from the personal income tax base. Direct subsidies could take the form of a subsidy to consumer service sector firms in proportion to their total service sales, a subsidy in proportion to the total payroll of these firms or a subsidy in proportion to the number of service hours worked in the consumer's home.

There are several administrative and political difficulties associated with all of these policy instruments, but we do not intend to discuss these problems in the present paper.⁷ Instead, we ask whether there is indeed an economic case for selective subsidisation of consumer services when one abstracts from the administrative and political complexities. Of course, in a complete analysis, one would have to include the administrative costs and account for possible abuses of subsidies etc. If these sorts of costs are believed to exceed the estimated welfare gains from subsidisation reported in this paper, the subsidisation policy would not be worthwhile pursuing.

III. EFFECTS ON EMPLOYMENT AND UNEMPLOYMENT

The various types of subsidies mentioned above all work through the same channel, namely by lowering the relative consumer price of white consumer services. Households are thereby induced to substitute consumer services for the consumption of other goods and services. Since the production of consumer services tends to be more labour-intensive and less import-intensive than other forms of production, this twist of consumer demand tends to increase the aggregate demand for labour, thus stimulating total employment. Hence there will be a 'demand twist effect' on employment. It should be noted that the positive twist effect on employment will emerge even if the subsidies are fully financed, i.e. even if total household disposable incomes do not rise on impact.

The lower relative price of white consumer services also implies that part of the work carried out in the home and in the black labour market will be transformed to work in the official labour market. In other words, the supply of

⁷ Part I of our report (Frederiksen et al., 1994) does include a discussion of some of these problems.

labour to the white market will increase, as employment opportunities in the black market deteriorate and as consumers spend less time on home production. Through a dampening of wage inflation, this rise in labour supply will gradually lead to a further increase in total employment. Thus we may speak of a 'labour supply effect' on aggregate employment. Of course, some of the increase in the registered volume of employment in the official labour market will merely reflect the reallocation of labour from the black to the white labour market and will not represent a rise in total market employment in the economy as a whole.

In the shorter term, unemployment may be expected to fall as a result of the twist effect on labour demand. However, in the longer run, the fall in registered unemployment will tend to be offset by the increased supply of labour to the official labour market. If the hypothesis of a 'natural' rate of unemployment is correct, there will be a permanent fall in unemployment only in so far as the subsidisation of consumer services succeeds in lowering the natural (or 'structural') unemployment rate. It is likely that such a fall in the natural rate will in fact materialise, in so far as the production of consumer services tends to be relatively intensive in the use of low-skilled labour with an above-average unemployment incidence.⁸ However, it should be added that the present version of the simulation model presented below is not well suited to capture such an effect on the structure of labour demand, since the model contains no explicit distinction between skilled and unskilled labour.

IV. THE WELFARE COSTS AND BENEFITS OF SUBSIDISATION

If the subsidies actually lead to a permanent fall in involuntary unemployment, consumers will reap a welfare gain from a reduced degree of rationing in the official labour market.

There is also another important source of welfare gain. Because of the tax wedge, the (value of the) marginal product of labour must be higher in the white service sector for that sector to be able to compete with the untaxed service production in the informal economy. A reallocation of labour away from home production and black service production towards the white service sector therefore generates a productivity gain which provides a basis for higher overall consumption of goods and services and/or higher consumption of leisure.

On the cost side of the cost-benefit calculus, we find two items. First, the selective subsidies will distort competition between the white service sector and the rest of the white economy, enabling service-producing firms to survive even if their factor productivity is lower than the productivity of similar factors

⁸ Danish data made available to us from the Danish Ministry of Business and Industry indicate that the proportion of unskilled workers in total employment in repair and maintenance of housing is about 30 per cent. For other consumer services, the corresponding proportion of unskilled labour is on average equal to 54 per cent, whereas it is only about 38 per cent in the economy as a whole.

employed in the production of other goods. Second, if the subsidies have to be financed by distortionary taxes, there is an additional efficiency loss from the required rise in these taxes.

Despite these efficiency costs, there are reasons to believe that some positive amount of subsidisation will indeed be optimal, because the present tax system discriminates heavily in favour of the informal economy.⁹ The optimal subsidy to consumer services (in the form of tax concessions or direct subsidies) will balance the marginal gain from a reallocation of resources away from the informal economy against the marginal cost of shifting resources away from the rest of the white economy towards the service sector.

Critics have argued that selective subsidies targeted at consumer services represent an inappropriate policy response to the problem of structural unemployment. According to this view, policymakers should instead attack the unemployment problem in a more direct manner by concentrating on measures that will improve the flexibility of labour markets. However, it is worth noting that even if labour markets were flexible enough to ensure full employment, the tax system would still imply a distortion of resource allocation in favour of the informal economy. Even with a fully flexible labour market, there could thus be a second-best case for some subsidisation of white consumer services.

At the same time, the simulation results reported below suggest that the case for selective subsidisation of consumer services does in fact become weaker, the greater the degree of labour market flexibility. To a large extent, the desirability of subsidising consumer services will thus depend on the likelihood that the unemployment problem may be alleviated by other (politically viable) means.

V. A SIMULATION MODEL OF THE 'WHITE', 'GREEN' AND 'BLACK' ECONOMIES

The analysis above suggests that subsidisation of consumer services could indeed generate positive employment and welfare effects. However, to justify the administrative costs, these gains would have to be non-negligible.

Thus there is an obvious need to quantify the likely effects of subsidies to the consumer service sector. Unfortunately, the existing macroeconomic models are not well suited for this purpose, since they incorporate neither a black sector nor a 'green' sector describing the do-it-yourself activities of private households. The Economic Policy Research Unit at Copenhagen Business School has therefore initiated the development of an alternative simulation model which attempts to illuminate the interaction between the white, green and black economies. The structure of the 'first generation' of this computable general

⁹ At least this discrimination is fairly obvious in the case of Denmark, where small and medium-sized enterprises do not enjoy any substantial tax privileges.

equilibrium model is illustrated in Figure 2.¹⁰ It can be seen that the model comprises a household sector, a private business sector, a public sector and a foreign sector.

The *household sector* includes two types of households: the white households may be thought of as rather specialised white-collar workers who do not have any practical possibilities of engaging in black labour. These households allocate their time between leisure, work in the official labour market and service production in the home (do-it-yourself activities). By contrast, the black households also have the possibility of working in the black market for consumer services, in addition to spending time on leisure, on work in the white market and on producing services in the home. The black households face a (low) positive probability of being detected by the tax authorities if they engage in black labour. If they are detected, they will be fined. When deciding their level of black market activity, the black households take into account the probability of detection and the associated fine.¹¹

The *business sector* consists of firms producing consumer services and firms producing other goods and services (the latter will be denoted ‘C-firms’, for brevity). Labour is taken to be the only variable factor of production, and both types of firms demand labour from both types of households. The two types of labour are assumed to be imperfect substitutes for each other. On the other hand, the white consumer services are assumed to be a perfect substitute for services delivered from the black market, which in turn are considered a perfect substitute for services produced in the home. The domestic C-sector exports part of its output of consumer goods to the foreign sector and sells its remaining output to domestic consumers and the domestic government. Households also consume imported goods, which are imperfect substitutes for consumer goods produced at home.

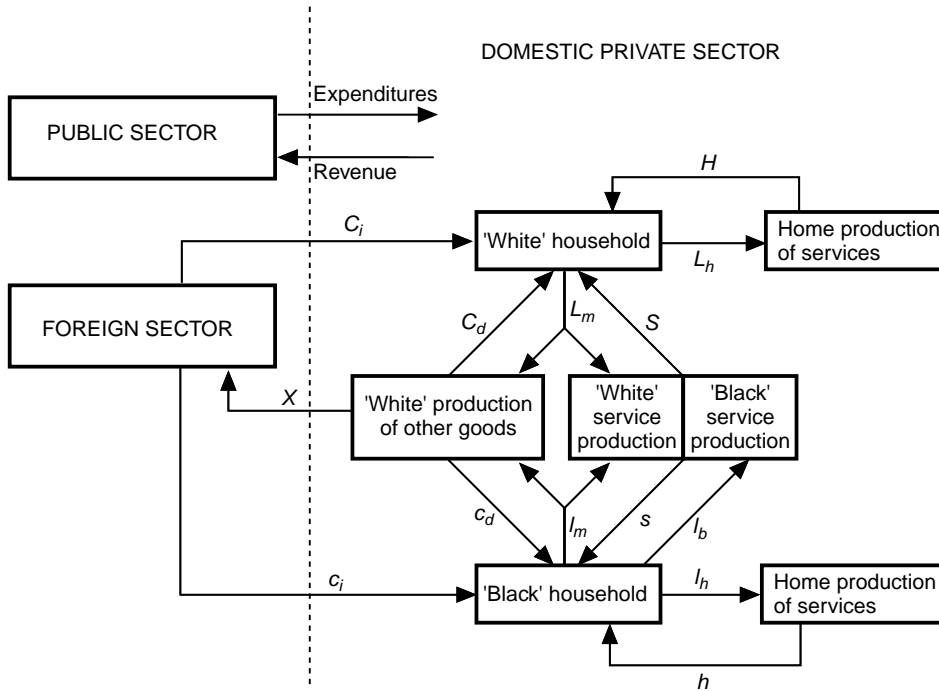
The *public sector* levies a tax on wage income, a tax on business profits, an indirect tax on consumer services and an indirect tax on other goods and services. The government uses tax revenues to finance its purchase of labour services from the two types of households and to finance the purchase of goods as well as expenses on unemployment benefits and other transfers to households. The government may also decide to grant various forms of subsidies to the production or purchase of consumer services. The wage income tax is modelled as a simple linear tax with a constant marginal tax rate combined with an exemption which introduces some progressivity, enabling us to distinguish the average from the marginal tax rate. Since payroll taxes and social security taxes levied on employers are virtually non-existent in Denmark, they have been left out of the model. A flat 5 per cent tax on gross labour income has recently been

¹⁰ The model and its calibration are documented in detail in Frederiksen et al. (1994).

¹¹ In technical terms, the black households maximise their expected utility, given the exogenous probability of detection.

introduced to finance part of government expenditure on unemployment benefits and ‘active’ labour market policies. We have simply incorporated this tax in our estimate of the average value of the total marginal tax rate on labour income.

FIGURE 2
Model of the Interaction between the White, Green and Black Markets



Notation:
 C_d/c_d = Consumption of domestic goods
 C_i/c_i = Consumption of imported goods
 S/s = Consumption of services from the market
 H/h = Home-produced services
 L_m/l_m = Time spent on work in the white market
 L_h/l_h = Time spent on home production
 l_b = Time spent on work in the black market
 X = Export of consumption goods

The behavioural relationships in the model are derived on the assumption that households maximise their (expected) utility, subject to their budget constraints, and that firms maximise their profits, subject to their production functions.¹² We

¹² Household utility functions are of the nested CES type, enabling us to vary the elasticity of substitution between consumption and leisure as well as the elasticity of substitution between consumer services and other goods and services. Business production functions are of a nested Cobb–Douglas type, with aggregate labour input being a CES-index of labour input from the two types of households.

assume that perfect competition prevails in the markets for goods and services. With regard to labour market behaviour, we distinguish two variants of the model. In the so-called ‘fix-wage’ variant, we assume that wage-earners in the official labour market demand and obtain a fixed consumer real wage which is set at a level generating involuntary unemployment in that market. By contrast, the ‘flex-wage’ version of the model assumes that the real wage is fully flexible, adjusting to eliminate any excess supply or excess demand in the labour market.

The fix-wage variant may be interpreted as a model of the short and medium term, whereas the flex-wage variant may be seen as a model of the long run, since real wage adjustment tends to be a time-consuming process. However, even if the two model variants are applied to different time horizons, there is hardly any doubt that the fix-wage model underestimates the degree of real wage flexibility found in real-world labour markets, whereas the flex-wage model undoubtedly overestimates the degree of labour market flexibility. We therefore prefer to see the two model versions as alternative (extreme) bench-mark cases that delineate an interval within which the effects of subsidisation are likely to fall.

Since the fix-wage model applies mainly to the short and medium term, we take the distribution of the population between white and black households to be exogenously given in this model variant. On the other hand, because of the long-run character of the flex-wage model, we assume in this case that the allocation of the population across the two household types adjusts endogenously until black and white households achieve the same level of utility.

The model only describes the production of goods and services for *consumption*. Thus we abstract from saving and investment, since we are concerned with the allocation of resources between the formal and informal economies at any point in time rather than with the allocation of total consumption over time. Because the private sector does not accumulate assets, the model cannot describe the dynamics of government debt accumulation, and hence we assume that the government budget is always balanced. Furthermore, the current account of the balance of payments — which by definition equals the difference between saving and investment — is always zero in the model because saving and investment are both zero. Consequently, the model can be said to illustrate those employment and welfare gains that are consistent with an unchanged government budget position and an unchanged balance-of-payments position.

VI. CALIBRATION OF THE MODEL

In Table 1, we have indicated those white consumer services that we consider to compete most directly with do-it-yourself services and services delivered from the black market, and that are therefore a potential target for subsidies. We have included the consumption of restaurant services, since these are an alternative to

cooking and dining at home. It is seen that white consumer services currently make up about 15 per cent of total registered private consumption in Denmark.

TABLE 1
Consumption of Private Consumer Services in Denmark, 1992

<i>Consumption category</i>	<i>Per cent</i> <i>Proportion of total private consumption</i>
Repair and maintenance of dwellings	3.6
Repair of domestic electrical appliances	0.2
Repair and maintenance of automobiles	3.8
Repair of radio, TV etc.	0.2
Washing and cleaning etc.	0.3
Domestic services	0.3
Hairdressing	0.7
Restaurant services	5.4
Consumer services in total	14.5

Source: Danish national accounts, Danmarks Statistik.

The parameters of our simulation model include a number of substitution elasticities, productivity parameters and budget and wage shares characterising consumer preferences and producer technology. In addition, the model incorporates several government policy instruments. The values of these parameters have been chosen such that the equilibrium of our fix-wage model reproduces a reasonably precise picture of the relevant relative magnitudes in the Danish economy in the early 1990s. We calibrated the model on the basis of the fix-wage variant because the Danish labour market appears to have been characterised by a high level of involuntary unemployment in the early 1990s. The parameter values from the calibrated fix-wage model were then carried over to the flex-wage model.

Table 2 indicates the estimated empirical figures for some strategic private sector variables as well as the corresponding figures emerging in the bench-mark equilibrium in the two variants of our model. Both versions of the model are seen to imply quite realistic levels of consumption of consumer services. The fix-wage model also generates realistic levels of unemployment and of black labour. On the other hand, the time spent on home production seems to be much shorter in the model than in the real world. However, the model incorporates only those home-produced services that households consider to be perfect substitutes for services delivered from the market. It is obviously very difficult to estimate the proportion of unpaid work in the home that is accounted for by the

production of these services. Still, it can be shown that the taste and technology parameters that determine the amount of home production in our model also determine the implicit wage elasticity of labour supply to the official labour market. We therefore chose these parameter values so as to generate an (uncompensated) long-run wage elasticity of labour supply equal to 0.1, corresponding roughly to Smith's (1990) empirical estimate of the long-run labour supply elasticity in Denmark. The parameter values derived through this procedure turned out to imply a level of home production corresponding to the top figures in the last two columns of Table 2. As already suggested, these figures may be seen as a model estimate of that part of home production that is a perfect substitute for services supplied from the market.

TABLE 2
Model versus Reality

<i>Variable</i>	<i>Empirical estimate, circa 1992^a</i>	<i>Per cent</i> Initial model equilibrium	
		<i>Fix-wage model</i>	<i>Flex-wage model</i>
<i>Private sector</i>			
Time spent on home production as a percentage of time worked in the official labour market	66	12.1	3.6
Time spent on black labour as a percentage of time worked in the official labour market	5	5.6	1.0
Registered unemployment rate	12	11.8	6.0
Consumption of consumer services as a percentage of total private consumption	15	15.1	16.3
<i>Public sector</i>			
Public consumption as a percentage of GDP	26	25.6	21.6
Marginal tax rate on labour income	56	56.0	56.0
Effective tax rate on profit income	18	18.0	18.0
Indirect tax rate on consumer services	25	25.0	25.0
Indirect tax rate on other goods and services	32	32.0	32.0

^a Rounded figures.

Comparing the first and third columns of Table 2, we see that the level of activity in the informal economy is much lower in the flex-wage model than it appeared to be in Denmark in the early 1990s. The basic reason for this difference is that the real wage adjusts to eliminate all involuntary unemployment in the flex-wage model. Thus the registered unemployment rate of 6 per cent in the third column represents an estimate only of 'voluntary' unemployment, e.g. search unemployment and normal 'frictional' unemployment. When households can sell all the labour services they want in the official labour market, they have less incentive to engage in home production and black labour in order to maintain their living standards. According to our model, the level of activity in the informal economy therefore falls significantly when households are no longer 'rationed' in the white labour market. This seems consistent with the empirical finding of Lemieux et al. (1994) that labour supply to the underground economy is very sensitive to the net earnings obtainable in the official labour market (although these authors do not explicitly allow for rationing in the white labour market).

Apart from being affected by the wage and price elasticities of labour supply, the effects of subsidising consumer services can also be expected to depend on the relative price elasticity of demand for such services. In the model, we have chosen parameter values that generate an implicit long-run price elasticity of service demand equal to minus one, corresponding to the estimated long-run price elasticity of service demand in the Danish macroeconomic model ADAM.

It should be added that the model is only designed to provide a description of the intersectoral allocation of labour in the Danish economy; it cannot reproduce the national income accounts very accurately since there is no saving and investment going on. However, the relative size of the public sector and the structure of private consumption implied by our calibration of the model correspond quite closely to the Danish national income statistics.

VII. FURTHER ASSUMPTIONS

In the background report underlying this paper (Frederiksen et al., 1994), we have applied the model described above to estimate the effects of several different forms of subsidies to consumer services. Since all of the subsidies work by reducing the relative price of consumer services, their qualitative effects are rather similar, so in the present paper we will focus mainly on the effects of a wage subsidy to firms in the consumer service sector. Furthermore, we shall consider only two alternative methods of financing the subsidy: financing through cuts in government transfer payments and financing through a rise in the distortionary indirect tax rate on other goods and services.

Our calculations assume that a rise in labour supply to the official labour market leads to a corresponding rise in the number of work hours covered by the

unemployment insurance system. We also assume that any rise in the average wage rate in the official labour market induces a proportionate rise in the rate of unemployment benefit. These conservative assumptions are made to avoid overestimating the government's saving on unemployment benefits when labour resources are shifted from the informal to the formal economy.

Total public sector employment and government purchases of goods and services from the private sector are kept constant throughout the analysis.

Because consumer utility functions are explicitly specified in the model, it is possible to calculate the effects of government policy on consumer welfare. We measure the welfare effects by the so-called equivalent variation, defined in Varian (1984, p. 264). The equivalent variation indicates the hypothetical change in (lump- sum) income that would have the same welfare effect as the policy change considered, given the prices and wages prevailing before the policy change. In other words, the equivalent variation measures the exogenous rise in income that would be equivalent to the effect of the policy change from the viewpoint of consumers.

VIII. THE OPTIMAL WAGE SUBSIDY

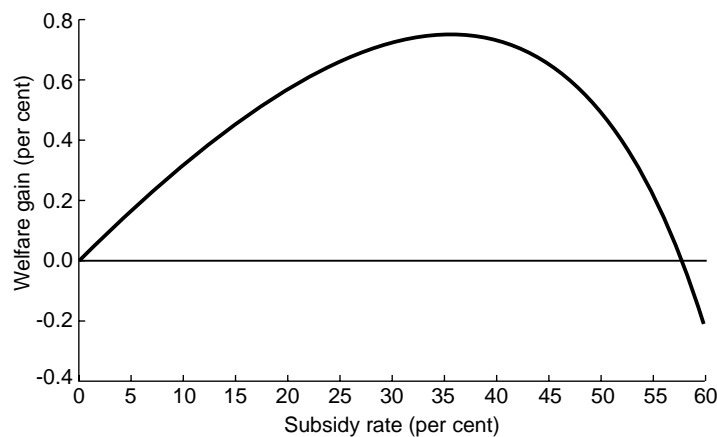
By simulating our model, we found that all the types of subsidies mentioned in Section II will generate a welfare gain to consumers, provided they are not applied in excessive doses. The gross marginal welfare gain from subsidisation stems from the rise in labour productivity associated with a reallocation of resources from the informal to the formal economy, and from the fall in involuntary unemployment (the latter gain arises only in the fix-wage model). The marginal welfare cost of subsidisation consists of the efficiency loss of shifting resources from the rest of the formal economy to the subsidised (and therefore less productive) service sector, plus the efficiency loss from the rise in tax rates, if the subsidies have to be financed by distortionary taxes. Clearly, the maximum net welfare gain — and hence the optimal degree of subsidisation — is achieved where the gross marginal welfare gain is just balanced by the marginal welfare cost.

In Figures 3 and 4, we illustrate the net welfare gains associated with alternative levels of a wage (payroll) subsidy granted to firms producing consumer services. The calculations in the figures are based on the flex-wage model.¹³ Figure 3 indicates the welfare gains when the subsidy is financed through a reduction of 'other transfers', i.e. government transfers other than unemployment benefits. In this case, a maximum welfare gain of 0.74 per cent of private consumption can be reaped by setting the wage subsidy rate at 36 per cent. In our model, the 'other transfers' have a lump-sum character, and Figure 3

¹³ It seems appropriate that the level of subsidisation should be based on long-run considerations. This is why we have estimated the optimal subsidy on the basis of the flex-wage model which applies to the long run.

therefore essentially assumes that the subsidy is financed by a non-distortionary government policy instrument. Indeed, since many transfer programmes tend to have distortionary incentive effects in the real world, the efficiency gains from subsidisation could even be greater than shown in Figure 3 if the subsidy is financed by cuts in transfers.

FIGURE 3
**Welfare Gain (as a percentage of private consumption) from a Wage Subsidy
 Financed by a Cut in Other Government Transfers
 (Flex-Wage Model)**

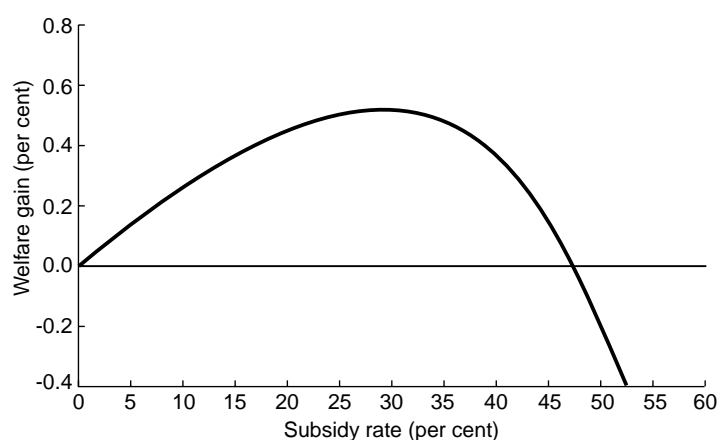


In practice, however, concerns about income distribution effects will often prevent governments from financing subsidies by lowering transfers to households. We therefore show, in Figure 4, the welfare gains in the alternative case where the subsidy is financed through a rise in indirect taxes on goods and services other than consumer services. Because this method of finance tends to exacerbate the distortion of resource allocation between the white service sector and the rest of the business sector, the maximum achievable welfare gain is now only 0.51 per cent of private consumption, and the optimum rate of wage subsidy is only 28 per cent.

To put this figure in perspective, it is worth noting that tax rates and unemployment benefits at the level prevailing in Denmark drive a wedge of about 86 per cent between the marginal productivity of labour in the white service sector and the marginal product of labour in home production in the initial equilibrium of our model. In principle, this means that if he is able to collect unemployment benefits while carrying out home production, it will pay an average Danish worker to engage in do-it-yourself activity even if this activity is $1/(1-0.86) \approx 7$ times less productive at the margin than the corresponding service production delivered from the white market. A wage subsidy of 28 per

cent to white service production will only reduce the combined tax–benefit wedge in favour of home production from about 86 per cent to about 80 per cent. Due to the increased distortions between the white service sector and the rest of the official market economy, it is thus optimal to keep the service subsidy far below the level that would fully eliminate the tax–benefit wedge in favour of the informal economy.

FIGURE 4
**Welfare Gain (as a percentage of private consumption) from a Wage Subsidy
 Financed by Higher Indirect Taxes on Other Goods and Services
 (Flex-Wage Model)**



Figures 3 and 4 suggest that the welfare gain declines fairly rapidly when the optimal subsidy rate is exceeded and that the potential gain may easily turn into an actual loss if the subsidy is set at a very high level. This is just an illustration of the obvious point that it is possible to have ‘too much of a good thing’. Since there will be considerable uncertainty about the exact position of the welfare curves depicted in the figures, our analysis suggests that policymakers should probably be rather cautious and conservative when choosing the level of subsidisation.

If the government has access to a non-distortionary financing instrument such as a reduction of the ‘other transfers’ in our model, it can in principle achieve the maximum welfare gain of 0.74 per cent shown in Figure 3 through several other types of subsidies that work by reducing the relative consumer price of services. However, if the subsidy has to be financed by distortionary taxes, our model implies that a wage subsidy enables policymakers to generate a higher welfare gain than the other instruments of subsidisation. The reason is that the other instruments subsidise the *total* costs of production (including the overhead and capital costs) whereas the wage subsidy subsidises only the *marginal* cost of

consumer service production. When all variable costs are labour costs, a wage subsidy of X per cent will reduce the marginal cost *and hence the consumer price* to the same extent as, say, a sales subsidy of X per cent, but the sales subsidy will be more expensive for the government because it also subsidises the intramarginal overhead costs. The fixed intramarginal costs will likewise be subsidised if the government grants VAT exemption to consumer service firms or if it allows a personal tax deduction for the purchase of consumer services.

Being cheaper, the wage subsidy hence requires a smaller increase in distortionary taxes and therefore tends to have the most favourable employment and welfare effects per krone of public expenditure on subsidies. However, it should be stressed that in a long-run dynamic perspective, there could be favourable supply-side effects from subsidies that also reduce the overhead costs of service firms, especially in those areas where the white market has to be established almost from scratch. Moreover, a wage subsidy would probably have to be supplemented by a subsidy to the estimated labour income of the self-employed in the consumer service sector in order not to discriminate against self-employment in that sector. It is important to bear in mind that our simulation model does not allow for these complications.

IX. THE ECONOMIC EFFECTS OF THE OPTIMAL WAGE SUBSIDY

In the scenario depicted in Figure 4, the optimal wage subsidy of 28 per cent requires a rise in the indirect tax rate on other goods and services of 4.5 percentage points to maintain government budget balance. In Table 3, we have summarised the simulated effects of a 28 per cent wage subsidy financed by an increase in indirect taxation of this magnitude.

TABLE 3

Effects of the Optimal (28 per cent) Wage Subsidy to the Consumer Service Sector^a

<i>Variable</i>	<i>Percentage change</i>	
	<i>Flex-wage model</i>	<i>Fix-wage model</i>
Time spent on home production	-22.5	-33.0
Time spent on black labour	-22.6	-25.0
Employment in consumer service sector	36.5	49.8
Employment in other business sectors	-6.3	0.4
Total employment in official labour market	1.2	5.9
Leisure time	-0.3	-0.8
Registered rate of unemployment (change in percentage points)	-0.1	-4.1
Welfare gain as a percentage of private consumption	0.5	3.6

^a Financed by 4.5 percentage point increase in the indirect tax rate on other goods and services.

The first column of Table 3 shows the effects emerging in the flex-wage model. By lowering the relative price of white consumer services, we see that the subsidy generates a large increase in employment in the white service sector at the expense of a fall in activity in the informal economy. To some extent, the rise in white service sector employment also occurs at the expense of a fall in employment in the rest of the official economy, but total white employment nevertheless goes up, due to an increase in total labour supply to the official market. The consumption of leisure falls slightly, because the wage subsidy enables the service sector to bid up the general level of real wages, thereby increasing the opportunity cost of leisure. Measured in absolute terms, there is no drop in registered unemployment, because the model assumes that the extent of unemployment insurance increases *pari passu* with the rise in total labour supply. Yet the unemployment rate falls slightly, due to the increase in the registered labour force. The welfare gain of 0.5 per cent of private consumption corresponds to the maximum gain shown in Figure 4.

As indicated in the second column of Table 3, the expansionary effects of the wage subsidy become considerably stronger in the fix-wage model, since higher official labour market activity does not drive up the level of real wages in this variant of the model. In addition to a strong expansion of the white consumer service sector, we now also observe a slight rise in employment in the rest of the official economy (the 'C-sector'). This may seem surprising, since the output of the C-sector becomes relatively more expensive. However, this negative demand effect on the C-sector is more than offset by the positive demand effect of rising real incomes and by the positive supply-side effect of lower nominal wage claims made possible by the lower price of service consumption.¹⁴ Total official employment is seen to rise by almost 6 per cent, but the unemployment rate falls somewhat less, due to increased (notional) labour supply to the white market.

Compared with the flex-wage scenario, the welfare gain is also seen to be much larger in the fix-wage model, amounting to an impressive 3.6 per cent of total private consumption.¹⁵ The larger welfare gain can be explained by the reduction in involuntary unemployment, the greater reallocation from the informal to the formal economy, and the greater marginal productivity difference between the formal and informal economies stemming from the fact that rationing in the official labour market generates additional black labour and do-it-yourself activity.

It should be noted that the greater rise in official market activity in the fix-wage model implies a greater automatic improvement of the government budget (compared with the flex-wage model) so that the 4.5 percentage point increase in

¹⁴ The overall consumer price index (and hence the nominal wage level) falls, because the lower price of services is not fully offset by a higher consumer price of other goods, even though the indirect tax on these other goods is raised.

¹⁵ This is a weighted average figure. The gain is higher for the white households and lower (but still substantial) for the black households.

the indirect tax rate on C-sector goods actually generates *more* revenue than needed to finance the wage subsidy. The simulations assume that this additional revenue is transferred back to households in a lump-sum fashion, but in practice it could, of course, also be used to reduce government debt.

In summary, the effects of subsidising consumer services seem very favourable in the fix-wage model. Yet, to put these effects in a proper perspective, it should be kept in mind that more conventional expansionary policy measures would also tend to have rather attractive effects in a set-up where large-scale expansion of employment is possible without driving up the real wage rates claimed by wage-earners.

X. ZERO-RATING AND SENSITIVITY ANALYSIS

In the Danish and international debates, it has been suggested that support for market-based service production could be given by introducing a zero VAT rate on consumer services (or by simply exempting firms in this sector from VAT). It is therefore of some interest to simulate the effects of such a policy measure.

It is also relevant to test the sensitivity of our results to changes in strategic parameter values that are surrounded by uncertainty. In Table 4, we have chosen to illustrate the welfare effects of eliminating the 25 per cent rate of VAT on consumer services, under alternative assumptions regarding the magnitude of the uncompensated elasticity of labour supply to the *white* labour market with respect to the after-tax real wage rate. In our model, this elasticity can vary either as a result of variations in the assumed elasticity of substitution between consumption and leisure, or as a result of variations in the amount of home production and black labour performed in the initial equilibrium. The higher the initial level of activity in the informal economy, the greater the scope for a reallocation of labour towards the formal economy in response to a higher official labour market wage rate, and hence the greater the wage elasticity of labour supply, *ceteris paribus*.

TABLE 4

Welfare Effects of Introducing a Zero Rate of VAT on Consumer Services, under Alternative Assumptions regarding the Uncompensated Wage Elasticity of Labour Supply (Flex-Wage Model)^a

Source of variation in labour supply elasticity	Implicit labour supply elasticity		
	0.05	0.1	0.2
Variation in the elasticity of substitution between consumption and leisure	0.32	0.35	0.41
Variation in the initial size of the informal economy	0.11	0.35	0.90

^a The welfare gains are measured as a percentage of private consumption. The figures assume that the revenue shortfall is neutralised by an increase in indirect taxes on other goods and services.

Table 4 assumes that the revenue lost through the zero-rating of consumer services must be recouped through higher indirect tax rates on other goods and services. The central scenario in the table, with an implicit labour supply elasticity of 0.1, corresponds to the calibration of the model used in the previous simulation experiments. By comparison with Table 3, we see that elimination of VAT on consumer services will have a smaller positive welfare effect than the optimal wage subsidy of 28 per cent. In part, this reflects the fact that abolition of the 25 per cent VAT will only lower the relative consumer price of services by 20 per cent on impact, whereas the optimal wage subsidy will in principle reduce white service prices by 28 per cent. An additional reason for the lower welfare effect in Table 4 is that the wage subsidy is 'cheaper' in terms of revenue loss, because it only subsidises the marginal production cost, whereas VAT zero-rating also subsidises the inframarginal overhead costs, as we explained in Section VIII.

It can be seen that the welfare effects are not very sensitive to variations in the assumed degree of substitutability of consumption and leisure. On the other hand, Table 4 reveals that the effects are fairly sensitive to the assumptions regarding the relative size of the informal economy in the initial equilibrium. The greater the initial amount of green and black activity, the greater the potential welfare gains from subsidisation of white services. This finding underscores the usefulness of additional empirical research on the extent of informal economic activity.

In Frederiksen et al. (1994), we have also analysed how the effects of service subsidies depend on the assumed elasticity of substitution between consumer services and other goods which influences the price elasticity of service demand. This analysis indicated that our results are not very sensitive to changes in this parameter. For instance, the welfare gain from VAT zero-rating varies between 0.31 per cent and 0.42 per cent of private consumption as the implicit relative price elasticity of service demand varies between 0.5 and 1.5.

XI. CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

In this paper, we have reported some simulation results from the first generation of a computable general equilibrium model designed to illustrate the effects of subsidising those consumer services that compete most directly with services produced in the home and in the black market. Not surprisingly, it turned out that the employment and welfare effects of such subsidies depend crucially on the workings of the white labour market. If the consumer real wage is rigid and the initial level of involuntary unemployment is high, there seems to be scope for considerable employment and welfare gains through subsidisation of consumer services, even if the subsidies have to be financed by distortionary taxes. On the other hand, if the real wage is fully flexible, adjusting to eliminate involuntary

unemployment over time, the long-run gains from subsidisation appear to be much more modest.

While our fix-wage model may have some relevance for the shorter term and the flex-wage model may shed some light on longer-run tendencies, neither of our two labour market scenarios seems fully realistic. Moreover, the labour market in the present versions of our model is highly aggregated and does not highlight the important distinction between high-skilled and low-skilled labour.

In ongoing research, we are therefore elaborating on the modelling of the labour market, introducing a distinction between a market for high-skilled ‘insider’ workers, where wage-setting tends to ensure full employment, and a market for low-skilled workers, who tend to suffer from involuntary unemployment because of a rigid, flat wage structure. Such a stylised model of the labour market falls between the two extremes considered in this paper and is consistent with the observation that the incidence of unemployment tends to be much higher among low-skilled workers.

We are also currently working to introduce capital inputs explicitly into the model to study how taxes and subsidies affect the intersectoral allocation of capital in addition to their impact on labour allocation. In this context, we distinguish between housing capital and business capital, and we introduce separate formal and informal markets for repair and maintenance of owner-occupied housing. This is important for two reasons. First, a subsidy to housing repair might generate efficiency losses by exacerbating the existing distortion in favour of housing consumption implied by the favourable tax treatment of owner-occupied housing. Second, the skill composition of labour input in housing repair and maintenance differs significantly from that in the rest of the consumer service sector, with a relatively high proportion of skilled workers in the housing maintenance sector.

Yet another topic for future work would be to study the implications of assuming imperfect substitutability between white, green and black services.

By undertaking such extensions of our model, it should be possible to obtain more reliable estimates of the effects of subsidising consumer services. However, despite its simplicity, we hope that the first-generation model presented in this paper has been of some use by indicating how one could model the interaction between the formal and informal economies to gain a better understanding of the effects of taxes and subsidies on resource allocation and welfare in a service-producing economy.

REFERENCES

- Allingham, M. G. and Sandmo, A. (1972), ‘Income tax evasion: a theoretical analysis’, *Journal of Public Economics*, vol. 1, pp. 323–38.
- Boskin, M. J. (1975), ‘Efficiency aspects of the differential tax treatment of market and household economic activity’, *Journal of Public Economics*, vol. 4, pp. 1–25.

- Cowell, F. A. (1985), 'Tax evasion with labour income', *Journal of Public Economics*, vol. 26, pp. 19–34.
- (1990), *Cheating the Government: The Economics of Evasion*, Cambridge, Mass: MIT Press.
- Frederiksen, N. K., Hansen, P. R., Jacobsen, H. and Sørensen, P. B. (1994), *Subsidiering af forbrugsservice: Virkninger på beskæftigelse, forbrugervelfærd og offentlige finanser* ('Subsidisation of consumer services: effects on employment, consumer welfare, and the public budget'), *EPRU Economic Studies*, no. 3, Copenhagen: Economic Policy Research Unit, Copenhagen Business School.
- Graafland, J. J. (1990), 'Tax policies and interaction between hidden and official economy', *Public Finance*, vol. 45, pp. 70–89.
- Harberger, A. C. (1990), 'The uniform-tax controversy', in V. Tanzi (ed.), *Public Finance, Trade and Development*, (proceedings of the 44th Congress of the International Institute of Public Finance, Istanbul, 1988), Detroit: Wayne State University Press.
- Heady, C. (1993), 'Optimal taxation as a guide to tax policy: a survey', *Fiscal Studies*, vol. 14, no. 1, pp. 15–41.
- Heinesen, E. (1994), 'Efterspørgslen efter forbrugsservice: Estimation af pris- og indkomstelastiteter' ('The demand for consumer services: estimating price and income elasticities'), Rapport til Kommissionen om fremtidens beskæftigelses- og erhvervsmuligheder (report to the government committee on future business and employment opportunities), September.
- Jung, Y. H., Snow, A. and Trandel, G. A. (1994), 'Tax evasion and the size of the underground economy', *Journal of Public Economics*, vol. 54, pp. 391–402.
- Juster, F. T. and Stafford, F. P. (1991), 'The allocation of time: empirical findings, behavioral models, and problems of measurement', *Journal of Economic Literature*, vol. 29, pp. 471–522.
- Kesselman, J. R. (1989), 'Income tax evasion: an intersectoral analysis', *Journal of Public Economics*, vol. 38, pp. 137–82.
- Körmeni, E. (1990), 'Time use trends in Denmark', in G. Viby Mogensen (ed.), *Time and Consumption*, Copenhagen: Danmarks Statistik.
- Lemieux, T., Fortin, B. and Frechette, P. (1994), 'The effect of taxes on labor supply in the underground economy', *American Economic Review*, vol. 84, pp. 231–54.
- Piggott, J. and Whalley, J. (1994), 'The tax unit and household production', National Bureau of Economic Research, Working Paper no. 4820.
- Smith, N. (1990), 'Household labour supply and taxes in Denmark', Center for Arbejdsmarkedsøkonomi, Aarhus, May; forthcoming in *Applied Economics*.
- Sørensen, P. B. (1994), 'Subsidiering af forbrugsservice: En velfærdsteoretisk analyse' ('Subsidisation of consumer services: a welfare-theoretic analysis'), *EPRU-analyse* no. 6, Copenhagen: Economic Policy Research Unit, Copenhagen Business School.
- Varian, H. R. (1984), *Microeconomic Analysis*, second edition, New York and London: Norton.
- Viby Mogensen, G. (1992), 'Hvad er sort arbejde, og hvad ved man om det?' ('What is "black" labour, and what do we know about it?'), *Tidsskrift for Skatteret*, no. 18, April.
- Watson, H. (1985), 'Tax evasion and labor markets', *Journal of Public Economics*, vol. 27, pp. 231–46.