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Social performance and fiscal policy:
an application to MIMIC

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Abstract

In traditional macro-economic modelling aggregate consumption is often viewed as an indication of social welfare. This paper adopts a more general concept of welfare. It proposes a criterion that allows household equivalence and income weighting. This criterion, called `social performance', enables an explicit valuation of leisure. It is applied to MIMIC, a general equilibrium model of the Dutch economy. Eight ways of fiscal policy reform are critically reviewed.

Keywords: social welfare, household equivalence, money metrics, weighted income indices, MIMIC, fiscal policy.

1. Introduction

CPB Netherlands Bureau for Economic Policy Analysis has developed a general equilibrium model called MIMIC.[1] Its main purpose is the analysis of proposals that affect the Dutch welfare state. Within the model households choose between leisure and consumption. They are described on a relatively disaggregated level. This makes MIMIC particularly suitable for the analysis of policy proposals that influence labour supply, such as income support policies and tax reforms.

In line with macro-economic traditions, much attention has been paid to variables like consumption, employment and production. Sofar though, no attempt has been made to assess the welfare experienced by Dutch households directly.[2] For this reason a research project was initiated. Its goal was to explore how welfare issues can be given more attention in the evaluation process of policy proposals. The current paper is its result.[3]

Assessing policy proposals on the basis of individual welfare levels can be eased by the use of an aggregation rule. In principle many rules are possible. The class of rules chosen in this paper is described in section 2. This class is referred to as social performance. It requires assumptions about welfare comparisons between households to be specified explicitly. Such information had not been included in MIMIC sofar. Therefore, during the research project the model was extended. The extensions are described in section 3. In section 4 eight alternative fiscal policy proposals will be compared on the basis of social performance. They were previously analysed in Gelauff and Graafland (1994). The analysis based on social performance will add some nuance to their conclusions. Besides, it will bring to light `hidden' effects of an important model assumption. In section 5 the main results will be summarized.

[1] MIMIC is an acronym for '*MI*cro *M*acro model to analyse the *I*nstitutional *C*ontext'. The model has been developed by the Division of Applied General Equilibrium Models (TAE). A detailed description can be found in Gelauff and Graafland (1994).

[2] In this paper the term 'welfare' will be used exclusively instead of the alternative 'utility'.

[3] The author thanks Johan Graafland, Roel Jongeneel, Pierre van Mouche, André Nibbelink and Ate Nieuwenhuis for stimulating and supporting him. He is indebted to Lans Bovenberg, Henk Don, Casper van Ewijk, Michiel Keyzer, Theo van de Klundert, Ruud Okker, Pieter Ruys, Herman Stolwijk and Ton Storcken, who all gave critical comments on earlier versions of this paper. He also wants to thank Anniek van Steen for revising his English.

2. Individual welfare and social performance

A classic axiom adopted by many economists is that households associate welfare levels to social states. These levels can in principle be used as arguments of a social welfare function:

$$U(X) = U(u_1(X),..,u_N(X)) \qquad (1)$$

In *(1)* X denotes a social state and $u_h(X)$ is the welfare level that household h associates to X. N is the number of households in the economy. The bundle of goods that h consumes in X will be denoted as x_h^X. In this section it will be assumed that a household perceives a social state X as x_h^X. Household welfare levels are assumed to be fully comparable between households. All household welfare functions will be represented by an augmented function $u(x_h^X; \alpha_h)$, which measures welfare per household member. The vector α_h is meant to capture differences in welfare generating abilities (see e.g. Deaton and Muellbauer, 1980). It is assumed that intrahousehold inequality does not exist (see Blackorby and Donaldson, 1991). $u(.)$ will thus be interpreted as a function generating individual welfare levels.

Individual welfare levels are often assumed to have an ordinal interpretation only. However, this assumption implies awkward consequences with respect to the form that a social welfare function can take (see Gevers, 1979 and Roberts, 1980). Therefore, we choose a fixed numerical representation of the welfare levels. The augmented direct money-metric welfare function $m(p;x_h^X,\alpha_h;\alpha_j)$ can be used to ease this choice (see Donaldson, 1992). It denotes the minimum per capita income in terms of a price p that household j needs to be as well off as household h, if the latter had consumption bundle x_h^X. For fixed values v and r the function $m_h^X = m(v;x_h^X,\alpha_h;\alpha_r)$ is a positive monotonic transformation of a well-behaved $u(.)$.[4] We specify the following social welfare function:

$$M^X = \sum_h n_h \cdot m_h^X \qquad (2)$$

[4]For $u(x_h^X,\alpha_h)$ to be well-behaved, $u(x_r^X,\alpha_r)$ must be quasiconcave in x_r^X. Further, for each x_h^X there must be at least one bundle x_r^Y, such that $u(x_h^X,\alpha_h) = u(x_r^Y,\alpha_r)$.

Here n_h denotes the number of members in household h. M^X will be called social income. Similar to national income it can be expressed as an index with respect to a fixed base situation B:

$$G^X = (M^X - M^B) / M^B \qquad (3)$$

This social welfare function will be referred to as a `social performance index'. $g_h^X = (m_h^X - m_h^B) / m_h^B$ can likewise be called an individual performance index. It measures the relative change of h's money metric due to a transition from situation B to X.[5] G^X can be written as a weighted mean of individual performance indices:

$$G^X = \Sigma_h \, n_h \cdot \, w_h \cdot \, g_h^X \qquad (4)$$

$$w_h = m_h^B / M^B \qquad (5.a)$$

Social income weighs a household's individual performance index by its contribution to social income in the base situation.[6] Thus, a percentage increase of those considered rich is given more weight than a percentage increase of those considered poor.[7] Other schemes computing weights differently are possible, e.g.:

$$w_h = 1/\Sigma_i \, n_i \qquad (5.b)$$

This method weighs each individual performance index equally. It is due to Ahluwalia and Chenery (1974). We propose the following generalisation of weighting schemes *(5.a)* and *(5.b)*:

$$w_h(\zeta) = (m_h^B)^{-\zeta} / \; \Sigma_i \, n_i \cdot \, (m_i^B)^{-\zeta} \qquad (5.c)$$

[5]Notice the similarity between the standard equivalent variation $m(v;x_h^X,\alpha_h;\alpha_h) - m(v;x_h^B,\alpha_h;\alpha_h)$ and
$m_h^X - m_h^B$.

[6]Note that individual performance indices cannot *directly* be compared between households.

[7]'Those considered rich' are those who associate relatively high welfare levels to the base situation.

Each value of ζ defines a social performance index *(SPI)*:

$$SPI(X) = \Sigma_h \, n_h \cdot \, w_h(\zeta) \cdot \, g_h^X \qquad (6)$$

The parameter ζ can be interpreted as a measure of social preference for equality. Setting it equal to -1 yields G^X. $w_h(0)$ defines weighting scheme *(5.b)*. Any choice of $\zeta > 0$ accords more weight to the individual perfomance indices of those considered poor. Large values of ζ lead to rules similar to Rawls's social justice criterion (see Rawls, 1971 and Klasen, 1994).

3. Applying social performance to MIMIC

MIMIC, CPB's general equilibrium model of the Dutch economy, consists of different submodels. One of them describes how households derive welfare levels from social states. If these levels were comparable between households they could directly be used for evaluations of social performance. However, there is no reason to assume such comparability, since it was never imposed upon the model. In this section MIMIC's current household model will first be briefly described. After that additional assumptions meant to justify interhousehold comparability will be proposed.

MIMIC discerns seventeen categories of households. Its household model focuses on labour supply by households that consist of two adult members. These households will be referred to as families. Together families account for more than half of the Dutch population. Actions of family members can in principle be chosen by mutual coordination. A description of these interactions would involve a complex game-theoretic approach. MIMIC though, has opted for a more conventional way of programming. Each household has a breadwinner. In the family case this is defined to be the adult who earns the larger part of family income. The other adult is the partner. A critical assumption is that the breadwinner's labour supply is exogenous. This assumption is based on research by e.g. Theeuwes and Woittiez (1993), who conclude that labour supply by Dutch breadwinners is relatively insensitive to changes of the wage rate.

MIMIC assumes that there are two types of breadwinners, one that succeeds in finding a *full-time* job and another type that does not find a job *at all*. As a consequence, MIMIC does not have part-timers among its breadwinners.

Whereas labour supply by breadwinners is fixed, partner behaviour constitutes the core of MIMIC's household model. Its starting point is a household *h* maximizing the following welfare function:

$$u_h(c,l) = \left((c/\beta)^{-\rho} + \gamma^{1+\rho} \cdot l^{-\rho}\right)^{-1/\rho} \qquad (7)$$

In *(7)* c and l are the two goods that household *h* can choose. c is material consumption measured in prices of 1985 and l is leisure measured in hours per week. The partner's labour supply can simply be found as total time available minus leisure.

It should be stressed that in this formulation partner labour has a negative impact on welfare. This is a rather narrow conception of labour that can justly be criticized.[8] Note, however, that this criticism does not apply to the breadwinner's labour supply. A household with an unemployed breadwinner who finds a job will increase its welfare due to parameter shifts in an augmented welfare function that will presently be constructed.

The welfare function in *(7)*, which is *not* comparable between households, contains three parameters. β denotes per capita consumption. It expresses the notion that households tend to relate their own consumption to their social position. In the literature this external effect is known as the `relativity-of-utility' effect (see e.g. Van de Stadt *et al.*, 1985). A name that we prefer is `relativity of consumption'. It can be interpreted as the `keeping-up-with-the-Jones' effect. MIMIC assumes that a single household is too small to influence this reference consumption.[9] The parameter ρ determines the elasticity of substitution. A small value of ρ indicates that the household can substitute consumption and leisure quite easily. Large values imply that the household views the two goods rather as complements. ρ is thus a degree of convexity of the welfare isoquants. The parameter γ indicates the household's relative preference for leisure. The larger its value the more importance the household accords to leisure. The parameter values of ρ and γ are calibrated in such a way that labour supply elasticities accord with those found in the literature.

Using these values in the full model Gelauff and Graafland (1994) generate a so-called `base projection'. This is a projection of the expected development of the Dutch economy, assuming that current policies remain unchanged. This base projection will be used as the fixed base situation needed for computations of social performance. The base projection specifies consumption for households in each category. Labour supply is derived as well. Making assumptions about the original time endowments, leisure can be obtained as its complement. Average values of consumption and leisure in the base projection for each of MIMIC's seventeen household categories are presented in table 3.1.

[8]Nevertheless, this type of model is encountered quite frequently in the literature. Applications can be found in e.g. Deaton and Muellbauer (1980).

[9]Still, this is an important deviation from the assumption that a household perceives a social state as its own consumption bundle, which was made in section 2.

Table 3.1 Main data used to compute social performance indices

	c [a]	l [b]	γ [c]	ρ [c]
Working breadwinners				
- with children partner high skilled	65.8	28.2	0.24	-0.75
- with children partner low skilled	56.4	32.7	0.45	-0.66
- without children partner high skilled	71.1	37.6	0.30	-0.76
- without children partner low skilled	57.8	47.6	0.58	-0.69
Benefit receiving breadwinners				
- unemployed breadwinner with children	47.6	31.6	0.32	-0.72
- unemployed breadwinner without children	51.9	44.0	0.29	-0.77
- disabled breadwinner with children	35.3	31.7	0.30	-0.74
- disabled breadwinner without children	39.3	45.1	0.20	-0.79
- soc. assisted breadwinner with children	31.5	40.0	0.06	-0.74
- soc. assisted breadwinner without children	29.4	60.0	0.04	-0.79
Household types without partner				
- working single persons	39.7	20.0	0.44	-0.73
- unemployed single persons	29.1	40.0	0.06	-0.77
- disabled single persons	22.9	40.0	0.04	-0.79
- soc. assisted single persons	25.4	40.0	0.01	-0.79
- single parents	33.6	30.0	0.01	-0.79
- students	1.1	20.0	0.00	-0.79
- aged persons	30.9	50.0	0.01	-0.79

[a] Annual consumption measured in 1000 guilders of 1985, equilibrium values attained in the base projection.

[b] Leisure measured in hours per week, equilibrium values attained in the base projection.

[c] Parameter values used in equation *(7)*.

The estimates of ρ and γ reported in Gelauff and Graafland (1994) exclusively relate to categories of households that adjust their labour supply. Social performance requires suitable values for the remaining categories to be specified as well. Additional ρ values are copied from more or less similar household categories. For example, the parameter value for employed single persons is set equal to the average of the values corresponding to the two types of childless families with a working breadwinner. Missing values

for γ are chosen in such a way that the marginal rate of substitution between leisure and consumption yields reasonable values in the base situation.[10]

The resulting category-specific welfare functions $u_h(.)$ can be rescaled by positive monotonic transformations $\varphi_h(.)$, without any consequences for MIMIC's household behaviour. This observation can be used to make welfare levels attained by different households *at least more* comparable. For practical purposes we require $\varphi_h(.)$ to be an affine transformation:

$$u(c_h^X, l_h^X; \alpha_h) \equiv \varphi_h(u_h(c_h^X, l_h^X; \gamma_h, \rho_h)) = \delta_h \cdot u_h(c_h^X, l_h^X; \gamma_h, \rho_h) + \epsilon_h \qquad (8)$$

Thus, α_h, which is assumed to guarantee interhousehold comparability, consists of γ_h, ρ_h, δ_h and ϵ_h. Empirical results reported by Schiepers (1993) will be used to find plausible values for δ_h and ϵ_h. He defines an equivalence scale as the ratio of the money amounts that two households need in order to feel equally well off.[11] Although his research applies to material consumption only, his results will nonetheless be used as a rough benchmark here.

Table 3.2 Mean scale estimates (Schiepers, 1993)

	Number of children →		
Number of adults ↓	0	1	2
1	1.00	0.67	0.52
2	0.69	0.56	0.47

The values in Table 3.2 represent equivalence scales per household member. According to this table a two-adult household without children would need $2 \cdot f\,690.-$ = $f\,1380.-$ to reach the same per capita welfare level as a single adult household spending $f\,1000.-$. The values in Table 3.2. will be referred to as mean scales *(ms)*. The average single-parent household in the Netherlands has about *1.5* child. Therefore, its mean scale has

[10] $(\partial u_h(.)/\partial l) / (\partial u_h(.)/\partial c)$ can be interpreted as h's reservation wage.

[11] In the notation used in section 2, Deaton and Muellbaur (1980) define an equivalence scale as $n_h \cdot m(v; x_h^X, \alpha_h; \alpha_h) / n_r \cdot m(v; x_h^X, \alpha_h; \alpha_r)$.

been computed as $(2 \cdot 0.67 + 3 \cdot 0.52) / 5 = 0.58$. Aged households in MIMIC are assumed to consist of one person, which implies a mean scale of *1*. The average number of children of a family *with* children is assumed to be *2*. In the base situation *B* we require the rescaled welfare *level* to equal material consumption times the mean scale, because the latter applies to material consumption only:

$$u(c_h^B, l_h^B; \alpha_h) = c_h^B \cdot ms_h \qquad (9)$$

Once more for practical reasons, it is assumed that corrections for *changes* in welfare are obtained by setting δ_h equal to the household's mean scale:

$$\delta_h = ms_h \qquad (10)$$

Combining *(8)*, *(9)* and *(10)* we find:

$$\epsilon_h = ms_h \cdot (c_h^B - u_h(c_h^B, l_h^B; \gamma_h, \rho_h)) \qquad (11)$$

$u(x_h^X; \alpha_h)$, which is now assumed to be comparable between households, can be rescaled into $m(v; x_h^X, \alpha_h; \alpha_r)$. This allows the computation of social performance indices according to equation *(6)*. A household from the category `working breadwinner, with children, partner low-skilled' will be chosen as the fixed household *r*. The virtual price that *r* faces in *B*, $\partial u(x_r^B, \alpha_r)/\partial x_h^X$, will be used as the fixed price *v*.

4. Fiscal policy and social performance

In section 8.1 of their book on MIMIC Gelauff and Graafland (1994) analyse eight alternative proposals of tax reform. In the current section we shall discuss the impact they have on social performance. The eight proposals at issue all have an equivalent influence on the government's budget.[12] The monetary amount involved equals *0.2%* of national income. They are financed by a reduction in non-wage consumption of the public sector.[13]

For the time being, we shall concentrate on the first three proposals. They involve a reduction in the marginal tax rates applying to the first, second and third bracket, by respectively *0.7*, *3.2* and *7.7* percentage points. These proposals will be referred to as P^1, P^2 and P^3.

We shall call the analysis by Gelauff and Graafland (1994) macro-based because their conclusions are strongly founded on macro results. Some of the results they use are shown in Table 4.1

Table 4.1 Selected results of a tax reduction[a]

	Income tax rates		
	1	2	3
	P^1	P^2	P^3
Prices	Percentage changes[b]		
Wage rate	-0.58	-0.25	-0.10
Consumption price	-0.26	-0.09	-0.02
Volumes			
Private consumption	0.26	0.21	0.17
Production	0.22	0.06	-0.02
Employment	0.30	0.12	0.01
Labour supply (pers.)	0.11	-0.08	-0.06
Labour supply (hours)	0.11	0.01	-0.07

[12]They yield, however, slightly different balance-of-payments effects.

[13]Caution is called for when comparing alternatives that differ in public non-wage expenditure since the latter is not included in MIMIC's welfare functions.

Unemployment rate[c]	-0.14	-0.08	-0.07

[a] A tax reduction of 0.2% NNP financed by a reduction of non-wage government expenditure.

[b] Cumulated differences between the alternative and the base projection.

[c] Absolute changes.

P^1 is seen to be the most effective proposal in terms of increasing employment and decreasing unemployment. The net real wage in the first bracket increases. This causes a substitution effect that tends to dominate the income effect. Therefore, both aggregate labour supply and consumption increase. Since households earn more, union demands for wages can remain modest. As a result the domestic price level decreases, which incites private consumption and exports. This stimulates labour demand even more than labour supply, so that in the end unemployment falls. A reduction in the second-bracket tariff is less effective. This is because relatively many partners with a high labour supply elasticity do not earn enough to benefit. Breadwinners now gain comparatively more often, but their labour supply does not respond. However, due to income effects labour supply by partners even tends to fall. Therefore, the increase in both consumption and labour supply is smaller than under P^1.

These effects become even more important when the marginal tariff in third bracket is reduced. Gelauff and Graafland (1994) find the third proposal the least effective way of tariff reduction. Evaluating the various proposals in terms of employment creation, the rank order from the best to the worst would be: P^1, P^2, P^3.

Table 4.2 Social performance indices[a]

	Income tax rates		
	1	2	3
	P^1	P^2	P^3
$\zeta = -1$	0.01	0.03	0.04
$\zeta = 0$	0.01	0.02	0.03
$\zeta = 1$	0.01	0.02	0.03

[a] A tax reduction of 0.2% NNP financed by a reduction of non-wage government expenditure.

The simulation runs that were used to construct Table 4.1 contain results concerning the average choice made by each of the seventeen types of MIMIC households. These

results can directly be used in computations of money metrics and social performance. Table 4.2 shows some social performance indices for the three proposals. They imply a reversed rank order. The most effective proposal according to the macro-based criteria turns out to be the least effective in terms of social performance. Besides, the increase in social income seems modest when the original *0.20%* `injection' of national income is taken into account.[14]

The difference between the macro-based conclusions and those implied by social performance can be explained mainly by two reasons.

First, the macro-based analysis indirectly sees an increase in labour supply by partners as a positive effect, because it tends to increase employment by generating wage moderation. The reduction in welfare caused by the implied fall in leisure is not taken into account.

Second, the small value of social performance that is associated to P^1 in particular can largely be attributed to the relativity-of-consumption hypothesis. It states that MIMIC households derive their welfare from the ratio between their own and per capita consumption. A policy giving every household the same relative increase in consumption will not effect a change of this ratio. As a consequence no household will gain from it. On the other hand, MIMIC has no mechanism to moderate the appreciation of leisure. Therefore, if the same policy causes households to increase their labour supply it will unavoidably make them worse off. Under these circumstances social performance will automatically be reduced as well.[15]

The first proposal brings about a large increase in consumption and labour supply at the same time. The increase in consumption has hardly any positive effects on social performance. On the contrary, partners who increase their labour supply, do have a negative impact on it. P^2 stimulates labour supply less strongly. Therefore, it yields more social performance. Because P^3 induces a fall of labour supply, it generates the highest value of social performance.

The relativity-of-consumption hypothesis turns out to be a problematic aspect when it comes to aggregating welfare from MIMIC's household model. This is because

[14] m_h^X does not *value* non-wage consumption in the public sector. Therefore, a transfer to the private sector can be regarded as an exogenous injection (see footnote 13).

[15] The index remains positive because a number of unemployed breadwinners finds a job.

consumption causes a negative externality in MIMIC.[16] The optimal policy, in terms of social performance, is a dramatic reduction of partner employment. This reduces consumption spectacularly. The average household hardly cares, however, since its *relative* consumption remains unchanged. The increased possibilities of leisure will, on the contrary, be highly valued.

This analysis is not likely to arouse much approval in society. It is true that households somehow compare their own consumption to what their neighbours have. However, the idea that they only value their share in the aggregate may be pushed too far. Some empirical evidence indicates that the relativity-of-consumption hypothesis holds partially. Van Herwaarden *et al*. (1977) estimate `welfare functions of income' for many individuals. They find that approximately *30%* of an increase in income leaks away through what they call `reference drift'. `Preference drift', the claim that people develop new desires when their current needs are satisfied, is kept responsible for another *50%* `loss'.

Table 4.3 Selected results assuming an exogenous reference consumption[a]

	Income tax rates			border value		allowances			
VAT rate	1	2	3	1	2	basic	labour		
	P^1	P^2	P^3	P^4	P^5	P^6	P^7		P^8
Prices	Percentage changes[b]								
Wage rate	-0.83	-0.35	-0.17	-0.53	-0.13	0.12	-1.	5	3 -0.31
Consumption price	-0.37	-0.14	-0.05	-0.22	-0.04	0.04	-0.	4	4 -0.57
Volumes									
Private consumption	0.38	0.23	0.18	0.28	0.18	0.17	0.	2	3 0.37
Production	0.37	0.10	0.01	0.20	0.00	-0.07	0.	3	4 0.24
Employment	0.50	0.18	0.06	0.30	0.03	-0.15	0.	8	1 0.22

[16]Negative externalities may cause inefficiencies that can be removed by Pigovian taxes. As a consequence plain tax reductions might lower social performance.

Labour supply (pers.)	0.20	-0.05	-0.03	0.04	-0.03	-0.13	0.	0	1
0.07									
Labour supply (hours)	0.22	0.06	-0.04	0.12	-0.03	-0.13	-0.	2	4
0.08									
Unemployment rate[c]	-0.19	-0.09	-0.08	-0.13	-0.05	0.00	-0.	8	6
-0.09									

[a] A tax reduction of 0.2% NNP financed by a reduction of non-wage government expenditure.

[b] Cumulated differences between the alternative and the base projection.

[c] Absolute changes.

How such intermediate forms can be incorporated in MIMIC is an interesting question. However, we shall not pursue the subject here. In order to evade MIMIC's extreme position, we adjust the relativity-of-consumption hypothesis.[17] We assume that it is only valid within MIMIC's base projection. Per capita consumption in the base projection will be further used as the reference consumption in all the other social states.[18]

In this formulation the reference consumption could be interpreted as expected per capita consumption. Alternatively, it could be an indication of per capita consumption in a comparable foreign country conducting a business-as-usual policy.

New assumptions about the nature of the reference consumption cause a modification of MIMIC's household behaviour. This makes new simulations necessary. We have presented some aggregated results in Table 4.3. The effects are stronger than those in Table 4.1, because additional consumption is now appreciated more than before. Because the direction of the effects is unchanged, the macro analysis given by Gelauff and Graafland (1994) is still supported by the new results. Besides, the indices of social performance bear more correspondence to the macro-based analysis now.

Table 4.4 shows the new consumption and leisure results for each of the categories. Nearly all households benefit from a tariff reduction in the first bracket. Therefore, the tariff reduction has to be modest. It will be relatively more important for households earning low incomes, who constitute a large share of the population. On average, these households experience a relatively strong substitution effect. This leads them to increase consumption at the expense of leisure. An income effect induces them to choose additional consumption. The total effect is a sharp increase in consumption, which is not anymore deflated by an automatic rise in the households' reference consumption. Thus,

[17] This must not be interpreted as a rejection of the hypothesis.

[18] In fact this is also an extreme position, since it assumes a constant reference consumption.

social performance increases. Although the increase is tempered by a simultaneous reduction of leisure, the eventual equal-weights index is *0.13%*.[19]

A smaller fraction of the Dutch households benefits from the second proposal. This means that under P^2 the tariff reduction can be larger. Only households with a partner earning an income in the second bracket experience a substitution effect. This applies to childless households in particular. As a consequence, employment rises less strongly than under P^1. This means that positive feedback effects on the government's budget are comparatively small. All together, the second proposal causes a much smaller increase in consumption than the first one. This is only offset partially by a smaller increase in labour supply. The resulting social performance index is only *0.09%*.

The third proposal is beneficial for high incomes only. Because only a small group is affected, the tariff at issue can be sharply reduced, from *60%* to *52.3%*. This nearly amounts to an abolition of the third bracket. Only households with a partner earning an income in this bracket experience a substitution effect. These households can hardly increase their labour supply anyway, since they do not have much leisure left. Compared with the second proposal, childless families tend to reduce their consumption and increase their leisure. These effects balance, so that the social performance indices of the second and the third proposal are identical. In this way social performance contrasts with the analysis by Gelauff and Graafland (1994), who let labour supply turn the scale.

[19]The term 'equal-weights' refers to the weighting of individual performance indices here.

Table 4.4. Per category results and social performance indices, β exogenous[a]

	Income tax rates			border value		allowances		VAT
	1	2	3	1	2	basic	labour	rate
	P^1	P^2	P^3	P^4	P^5	P^6	P^7	P^8
Consumption effects:	Percentage changes[b]							
Working breadwinners								
- with children partner high skilled	0.69	0.33	0.23	0.41	0.26	0.08	1.07	0.45
- with children partner low skilled	0.54	0.20	0.25	0.34	0.28	0.22	1.24	0.38
- without children partner high skilled	0.81	0.73	0.22	0.79	0.15	-0.01	0.78	0.50
- without children partner low skilled	0.66	0.26	0.22	0.48	0.17	0.15	1.02	0.42
Benefit receiving breadwinners								
- unemployed breadwinner with children	0.78	0.01	0.09	0.35	0.15	0.19	-0.59	0.42
- unemployed breadwinner without children	0.87	0.49	0.21	0.76	0.24	0.10	-0.53	0.48
- disabled breadwinner with children	0.74	-0.19	-0.13	0.17	-0.11	0.34	-0.59	0.41
- disabled breadwinner without children	0.94	0.19	-0.14	0.61	-0.11	0.19	-0.31	0.50
- soc. assisted breadwinner with children	0.35	-0.18	-0.09	0.03	-0.07	0.69	-1.42	0.31
- soc. assisted breadwinner without children	0.36	-0.13	-0.11	0.03	-0.10	0.74	-1.52	0.33
Household types without partner								
- working single persons	0.46	0.48	0.44	0.49	0.25	0.11	1.30	0.33
- unemployed single persons	0.60	0.07	0.23	0.26	0.32	0.14	-2.00	0.32
- disabled single persons	0.56	-0.14	-0.12	0.23	-0.10	0.27	-2.05	0.32
- soc. assisted single persons	1.05	0.15	0.17	0.49	0.11	0.75	1.79	0.66
- single parents	0.28	0.21	0.45	0.14	0.43	0.31	0.23	0.33
- students[c]	-0.46	-0.25	-0.16	-0.33	-0.12	0.20	-1.52	0.23
- aged persons	0.23	0.17	0.19	0.16	0.32	0.45	-1.85	0.26
Leisure effects:	Percentage changes[b]							
Working breadwinners								
- with children partner high skilled	-0.61	0.17	0.11	-0.12	0.11	0.39	1.01	-0.21
- with children partner low skilled	-0.27	0.08	0.07	-0.05	0.06	0.12	0.22	-0.08
- without children partner high skilled	-0.64	-0.85	0.16	-0.67	0.12	0.36	1.42	-0.29
- without children partner low skilled	-0.32	-0.03	0.08	-0.20	0.06	0.20	0.40	-0.11
Benefit receiving breadwinners[d]								
- unemployed breadwinner with children	-0.35	0.07	0.06	-0.07	0.06	0.25	0.09	-0.12
- unemployed breadwinner without children	-0.42	-0.34	0.10	-0.40	0.09	0.25	0.18	-0.18
- disabled breadwinner with children	-0.36	0.05	0.03	-0.03	0.02	0.26	0.00	-0.12
- disabled breadwinner without children	-0.40	-0.34	0.04	-0.04	0.03	0.24	-0.12	-0.17
Social performance indices:	Percentages							

$\zeta = -1$	0.14	0.10	0.10	0.11	0.10	0.12	0.31	0.12	
$\zeta = 0$		0.13	0.09	0.09	0.11	0.09	0.12	0.27	0.11
$\zeta = 1$		0.12	0.08	0.08	0.09	0.09	0.11	0.23	0.11

[a] A tax reduction of 0.2% NNP financed by a reduction of non-wage government expenditure.

[b] Cumulated differences between the alternative and the base projection.

[c] Most students do not earn enough for fiscal compensation. Their gains follow the price effects in Table 4.3.

[d] A household with a socially assisted breadwinner has to give up nearly everything its partner earns. Therefore, these households are assumed to supply no partner labour at all.

The fourth proposal, P^4, represents an increase in the border of the first bracket. Households earning incomes below the border do not benefit. The increase can therefore be nearly *2000* guilders. Labour supply increases, because rationed housholds, who mainly `stick' to the kink corresponding to the partner's first bracket, have to supply more labour before they reach this kink. A majority of those who reach this kink has no children. Therefore, childless households also show stronger labour supply effects under P^4. Compared with the first proposal, the increase in consumption and labour supply is relatively modest. The fourth proposal yields an equal-weights social performance index of *0.11%*. This is in between the indices corresponding to P^1 and P^2.

P^5 represents an increase in the border of the second bracket. Because very few households benefit, this border can be increased by more than *50.000* guilders. This means that an important part of the former third bracket is now taxed according to the lower second bracket tariff. Like P^3 this nearly amounts to an abolition of the third bracket. Therefore, the effects of third and the fifth proposal are nearly identical.

The sixth proposal, P^6, involves an increase in the basic allowance. Because all households benefit, the increase is no more than approximately *300* guilders. It brings about an income effect for nearly all households. This induces them to increase their consumption, while families enjoy more leisure at the same time. The result is a relatively sharp rise in social performance. The *0.12%* social performance index is the one-but-highest value found sofar. However, Gelauff and Graafland (1994) draw another conclusion, since they do not value the increase in leisure at all. They find that P^6 yields the smallest increase in private consumption. In terms of employment creation they also call P^6 the least effective proposal.

The seventh proposal, P^7, spends its resources on a rise in the labour cost allowance. It turns out to be an effective weapon against inactivity in MIMIC. Table 4.3 shows that this proposal causes a sharp decrease in unemployment. It is more than four times as strong as the reduction caused by the first proposal. This generates a large positive

feedback on the government's budget, which extends the scope of tax reduction. Households with an employed breadwinner experience large income effects. This induces them to enjoy more leisure. However, rising employment causes gross wages to fall. Because they are indexed, benefit incomes fall sharply too. Only workers are fiscally compensated, so that most households dependent on the social sector face a considerable decrease in their consumption. Social Performance is dominated by the workers' gain. The equal-weights index is *0.27%*. Nevertheless, nearly *40%* of the population faces a decreasing welfare. This becomes visible when a large social preference for equality is taken into account. For values of ζ exceeding *4*, P^7 yields the lowest social performance index.

The final proposal reduces the VAT tariff. Since all households benefit, the tax reduction per household has to be modest. Similar effects can be brought about by an appropriate combination of the other tax proposals, in which P^1 would play an important role. This explains that P^8 generates lower social performance indices than P^1. Nevertheless, its results are comparatively good.

It is remarkable that the reported performance indices are relatively insensitive to changes of the parameter that indicates the social preference for equality. Only the proposal that increases the labour cost allowance seems responsive to the use of different weighting schemes. The insensitivity can at least partly be explained by the fact that we use average household results. In general, averaging should be avoided when social performance indices are computed.[20] Indices obtained in this way may fail to account for important distributional effects. Note, however, that in P^6 and P^8 the use of different weighting schemes has relatively little effect, because the gains are more or less equally divided between the household categories.

[20]We used group results because we lacked data on a more desaggregated level.

5. Summary

The purpose of this paper is to compare `social states' in the general equilibrium model MIMIC, explicitly on the basis of household welfare levels.

Section 2 assumes a money-metric welfare function that allows full comparability of welfare levels between households. A weighted mean of relative changes of such levels can be used as a social welfare function. The social performance index derives a weighting scheme from the money metrics in a fixed social state, taking account of a social preference for equality.

In section 3 social performance is applied to MIMIC. In order to allow interhousehold comparability, additional model assumptions are introduced. They are based in particular on equivalence scales reported by Schiepers (1993).

Section 4 evaluates eight alternative ways of tax reform previously analysed by Gelauff and Graafland (1994). In the evaluation process they use mainly criterions like aggregate consumption and employment. This probably causes their results to be biased towards material consumption. Section 4 employs social performance analysis to test and if necessary supplement their findings.

Our analysis indicates that the current specification of MIMIC prevents a sensible application of the tools of welfare theory. Due to the `relativity-of-consumption' hypothesis a general increase in consumption will hardly have any welfare consequences. However, after eliminating the externality that gives rise to this effect, many of the conclusions drawn by Gelauff and Graafland (1994) are seen to be supported by social performance analysis. Some nuance is put forward as well. For example, Gelauff and Graafland (1994) find an increase in the basic allowance ineffective in terms of generating employment. Nevertheless, the proposal yields rather high values of social performance. This is explained by the fact that households experience a large increase in their leisure. On top of this a modest increase in consumption is granted to nearly everyone.

The parameter that indicates society's preference for equality has a limited impact on the social performance indices reported here. This is probably because we had to use average household results. Social performance indices obtained in this way may obscure important distributional effects.

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