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MIKLÓS SZABÓ:

GENERATIONAL ACCOUNTING FOR HUNGARY

FISCAL SUSTAINABILITY AND INTERGENERATIONAL REDISTRIBUTION

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SUPERVISOR: PROF. MÁRIA AUGUSZTINOVICS

I. Introduction

In Hungary the demographic structure will go through a dramatic change in the next 50 years. Life expectancy is growing and the drop in fertility rate leads to a higher dependency ratio. These issues are becoming even more important as the present welfare system exerts a heavy pressure on Hungary's budget as indeed it does in many other European countries.

One of the most important questions in the debate on the fiscal implications of aging is whether traditional indicators can provide a comprehensive view on this phenomenon. We argue that traditional indicators such as the annual budget deficit and official government debt do not give a full picture of the current state of public finances. Some economists even say that these indicators are 'illusory' concepts. We need to look for new indicators that shed light on the intertemporal dimension of fiscal policies and assess their effects both on the sustainability of fiscal policy and on intergenerational redistribution.

Solvency requires that the government must satisfy the intertemporal budget constraint rather than any static, backward-looking criterion. The definition of solvency is that the present value of spending must not exceed the present value of taxes plus current assets. This is a crucial element of the generational accounting method that was developed by Alan Auerbach, Jagadeesh Gokhale and Laurence J. Kotlikoff.

The essence of generational accounting is to record how the public sector, assuming the current rules of spending and taxes remain in place, gives and takes away from each generation over their remaining lifetime. The difference of the present value of tax payments over the present value of benefits over the rest of the life-time gives a single informative indicator that identifies the net fiscal burden of each generation.[1]

In Chapter II the generational accounting method is discussed, starting with the 'fiscal balance rule' introduced by Kotlikoff [1993], then it is explained how generational accounts are constructed and how the 'residual approach' (Bonin [2001]) produces the generational imbalance measures. Chapter III shows our results, the net tax profile as well as the generational accounts that are calculated by using a slightly different definition of net taxes than Gál et al. [2005]. Our calculations show that the Hungarian fiscal policy was not on a sustainable path in 2001. In case of Hungary the main reason for the generational imbalance is the change in the demographic structure. If it would not change, the absolute generational

[1] The method has been applied in 25 countries so far. The country studies I am aware of are listed in Table A1 in the Appendix.

imbalance would be halved from 12.5 million Ft to 6.1 million Ft. Cancelling the (net) debt would also help to ease the problems but to a lesser extent.

We have also analysed the effect of cyclical adjustment. There are temporary and cyclical effects that, by definition, do not last forever, so one can get a clearer picture of the true fiscal position if these cyclical effects are filtered out. Our results show that the absolute generational imbalance did not change significantly. Its series became ”smoother”, i.e. they fell less and rise less than the original relative imbalance values.

Following Bonin [2001] we applied the 'sustainability approach' that gives a critique of the residual approach. The notions of 'cohort deficit' and 'sustainability gap' were introduced and calculated for the base year of 2001. The sustainability gap as a ratio of base year GDP was 206,4% in 2001. If we take into account policy decisions of the 1997 pension reform that will come into effect after 2001 (e.g. increase of the pension age to 62 for both men and women, etc.) then the sustainability gap falls to 115,1%.

Finally, we have also analysed the effects of stylised policy reforms. Four scenarios were assessed: (1) Change of the tax base: what would happen if taxes on labour income would be decreased and taxes on consumption increased? (2) Raise in pensions and cut of government purchases. In cases (3) and (4) the 'deficit neutrality' assumption was dropped and the effects of a comprehensive tax cut (Case 3) and a simple raise in pensions (Case 4) were analysed. Our results show that the long term fiscal position did not change significantly in Cases 1 and 2, but worsened in Cases 3 and 4.

II. The Generational Accounting Method

Kotlikoff [1993] constructed a model and defined the fiscal balance rule that might be considered the theoretical benchmark of generational accounting. In order to define generationally neutral fiscal policy Kotlikoff [1993] uses a two-period overlapping generations model in which people live for two periods, only young people work, and old people consume what they have saved when they were young. Writing down the model and using simple manipulations it can be shown that the steady-state budget constraint will be the following:

$$m^1 + \frac{m^2}{1+n} = g + (r-n)b \,. \tag{1}$$

where n is population growth, g is government spending, r is the interest rate, b is government debt, while m^1 and m^2 are lifetime net tax payments paid when young and old, respectively. All variables are expressed as per capita of the young generation, except m^2 that is expressed as per capita of the old. The above equation can be rearranged as

$$m = g + \frac{r-n}{1+n}\left((1+n)b - \frac{m^2}{1+r}\right). \tag{2}$$

where m is the present value of lifetime net taxes in steady-state, i.e. $m = m^1 + \frac{m^2}{1+r}$.

This is what Kotlikoff [1993] calls the fiscal balance rule. Whenever the government changes one of the parameters in (2) and does not adjust any other variables in order to balance the change on the steady-state budget then it redistributes resources between generations.

Now let us turn to how generational accounts are constructed. Consider a given base year t. The generational accounts show the present value of net tax payments of an average member of a generation until death. For those generations already alive it looks like this:

$$GA_k = \sum_{i=t}^{k+D} \tau_{i,i-k} S_{i,i-k} (1+r)^{t-i} \,, \ \forall k \le t \tag{3}$$

where $S_{i,j}$ is the probability in period i that a person aged j will be alive in the next period. For future generations a similar expression can be applied:

$$GA_k^f = \sum_{i=k}^{k+D} \tau_{i,i-k} S_{i,i-k} (1+r)^{t-i} \,, \forall k > t \tag{4}$$

The first step of producing generational accounts is the calculation of net taxes. Net taxes are broken down into a set of tax and transfer payments for which $\tau_{i,j} = \sum_{l} \tau^{l}_{i,j}$, where $\tau^{l}_{i,j}$ is a l-type tax payment made by a j-year old in period i. As we calculate net taxes $\tau^{l} > 0$ means taxes, while $\tau^{l} < 0$ refers to transfers. The aggregate value of a particular tax or transfer category must equal the sum of individual payments by cohort weighted by the cohort size.

$$T_t = \sum_{j=0}^{D} \tau_{t,j} P_{t,j} \, , \tag{5}$$

In the next step the net taxes are extrapolated that is done by using the so-called 'growth rule'. It is usually assumed that productivity growth increases individual age-specific payments and per capita net government purchases at a constant rate, g. Future payments can be expressed in terms of the base year's profile as

$$\tau_{t+i,j} = (1+g)^{i} \tau_{t,j} \, , \tag{6}$$

It follows that the life cycle net tax payments of a member of a cohort born in the base year will be given by the following expression:

$$\left(\tau_{t,t}, \tau_{t+1,t}, \ldots, \tau_{t+D,t}\right) = \left(\tau_{t,t}, (1+g)\tau_{t,t-1}, \ldots, (1+g)^{D} \tau_{t,t-D}\right) \tag{7}$$

In other words, life cycle net tax payments are calculated by using cross-sectional information from the base year.

One of the most important categories within the generational accounting framework is the intertemporal budget constraint of the government.

$$\sum_{i=t}^{\infty} N_i = \sum_{i=t}^{\infty} G_i + B_t \, , \tag{8}$$

It states that the (present value of) net tax revenues of the government (N_i) must (at least) equal the (present value of) government purchases (G_i) and (net) government debt (B_t). As the main purpose of generational accounting is to combine the intertemporal perspective of government finances with the generational perspective it is useful to reformulate (8) in terms of generational accounts:

$$\sum_{k=t-D}^{\infty} N_k = \sum_{i=t}^{\infty} G_i + B_t \, , \tag{9}$$

where N_k denotes the net tax payments made by the generation born in *k* from the base period until death. Rearranging the left hand side of (9) by splitting it into two groups (present and future generations) we get the following:

$$\sum_{k=t-D}^{t} P_{t,t-k} GA_k + \sum_{k=t+1}^{\infty} P_{k,0} GA_k^f = \sum_{i=t}^{\infty} G_i + B_t \ , \tag{10}$$

where $P_{i,j}$ denotes the number of *j*-year olds in period *i*. The intertemporal budget constraint can be considered as a 'no free lunch' condition. Someone either today or later will have to pay for what we spend at the present.

Generational accountants calculate the burden of present generations by extrapolating net taxes of the base year as well as net government purchases. The net government debt is also known for the base year. If we take a look at equation (10) we can see that only the aggregate burden of future generations are unknown, but they can be calculated residually by rearranging (10):

$$\sum_{k=t+1}^{\infty} P_{k,0} GA_k^f = \sum_{i=t}^{\infty} G_i + B_t - \sum_{k=t-D}^{t} P_{t,t-k} GA_k \tag{11}$$

Now the question arises how to calculate the burden of a particular future generation. The general assumption is that generational accounts of future generations are equal except for economic growth. Algebraically the assumption looks like this:

$$GA_{t+j} = \left(\frac{1+g}{1+r}\right)^{j-1} GA_{t+1}, \qquad j = 1, \ldots \tag{12}$$

Substituting it back to (11) the generational account of future generations is given by

$$GA_{t+1}^f = \frac{\sum_{i=t}^{\infty} G_i + B_t - \sum_{k=t-D}^{t} P_{t,t-k} GA_k}{\sum_{k=t+1}^{\infty} P_{k,0} \left(\frac{1+g}{1+r}\right)^{k-t-1}} \tag{13}$$

In the numerator we have the residual from the intertemporal budget constraint, while the denominator can be interpreted as the sum of "discounted" future population. The notion of "residual approach" comes from the fact that the generational account of future generations is calculated residually from the intertemporal budget constraint.

The next and final step is to identify whether the base year fiscal policy is sustainable by comparing the generational accounts of newborn and future generations.. The measures frequently used are the 'absolute or relative generational imbalance' that show the difference and the ratio of future and the newborn generation's accounts, respectively. If the absolute (relative) generational imbalance is different from zero (unity) than generational accounting suggests that the base year fiscal policy is not sustainable.

The residual approach have certain problems, particularly the distinction between net taxes and net government purchase as well as not using all information from the demographic projection. We will discuss these issues in the following chapter.

III. Generational accounting in Hungary

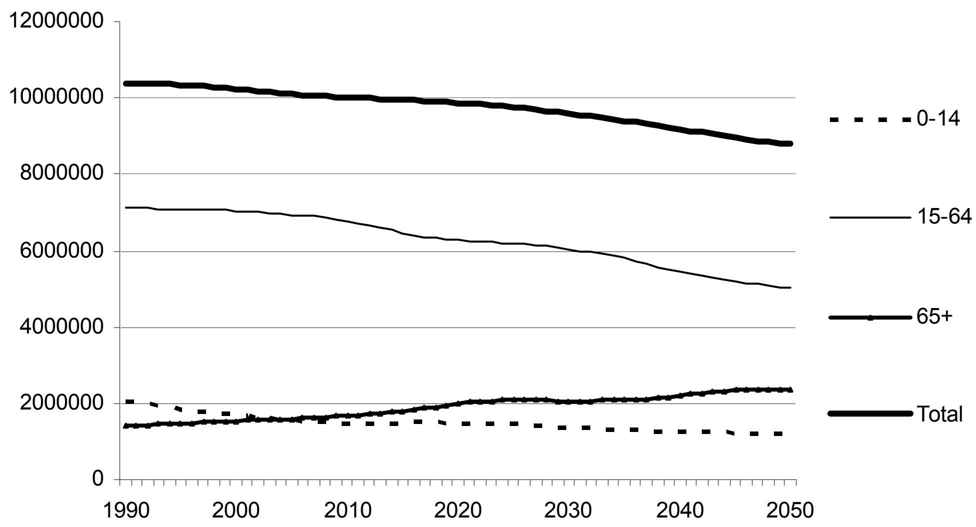
To date there have been four GA studies for Hungary: Gál et al.[2000] and Gál et al.[2002] for the general public sector, Gál et al.[2001] for the pension system. The most recent and most comprehensive one is Gál et al.[2005], which covered the period of 1992-2001 and produced generational accounts for each of the 10 years. Our calculations in this thesis draw heavily on their work, using and extending their basic GA model.

Demography and parameter assumptions

Demographic situation

Figure 1 shows the development of the Hungarian population for three particular age groups: young (less than 14 year olds), middle-aged (15-64) and old people (65 and older).

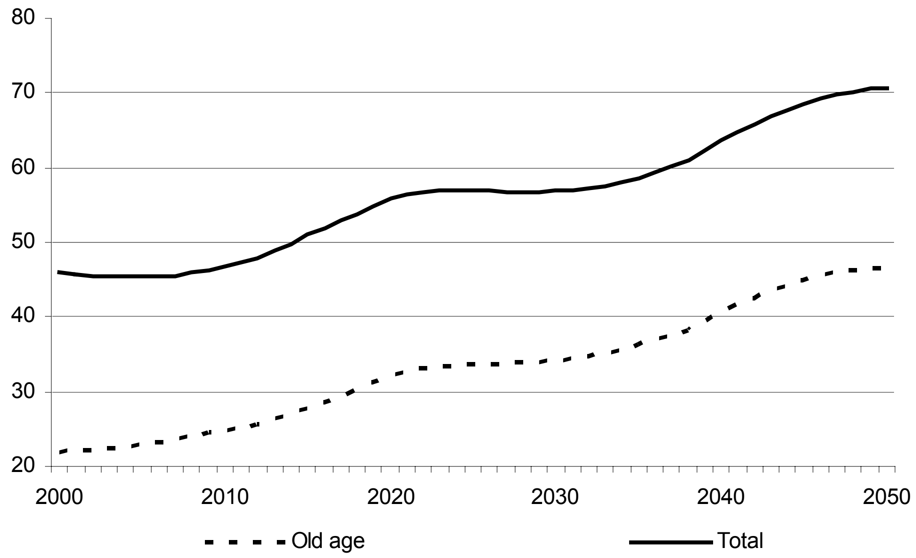
Figure 1: Demographic projection for Hungary (Base case scenario), 2000-2050



One can identify two different phenomena from Figure 1: the Hungarian population will decline over time as well as its composition by age will change significantly. According to the Base Case forecast of the Hungarian Statistical Office (KSH [2003]), the Hungarian population will fall from more than10 million in 1990 to 8.74 million in 2050.

However, the age composition of the population will also undergo a dramatic transformation. As Figure 2 shows, both the old-age and the total dependency ratios will increase significantly.

Figure 2: Dependency ratios, 2000-2050



The old-age dependency ratio (ratio of old-aged people to middle-aged ones) will rise from 23% to 46.5%, while the total dependency ratio (ratio of young and old-aged people to middle aged ones) will increase from 45.5% to 70%. Both of these movements have major consequences for the sustainability of the Hungarian public finances.

Discount rate and growth parameter

In order to be able to calculate the present value of lifetime net tax burdens we will have to choose a discount rate. Generational accounting considers all future payments in present value terms so we need to specify an interest rate for discounting. We have chosen a single uniform discount rate to take all future tax payments and government spending back to the base-year. In terms of (un)certainty public receipts and expenditures are somewhere between non-risky long-term government bonds and risky market assets, so, accordingly, the discount rate should range between the average rates of return on these assets. Consequently we have opted for a standard discount rate of 5% per annum. Nevertheless, sensitivity tests are necessary, which we have done as well. Projection of future tax payments and receipts demands an assumption on the annual rate of productivity growth. In this study, as in most other studies, a constant rate of productivity growth is applied set at 1.5 per annum. Like the discount rate it is also subjected to a sensitivity test.

Incidence assumptions

In our own calculations we follow the conventions used by European Commission [1999] and also adopted by Gál et a.[2005]. Again, following the standards applied by most former GA studies we assume that the incidence of all tax payments and transfer receipts falls directly on the respective taxpayers or transfer recipients. Workers bear the labour income tax burden, suppliers of capital bear the burden of capital taxation, consumers bear the burden from indirect taxes. Similarly, transfers are regarded as beneficial only for the transfer recipient.

Age-specific tax and spending profiles

Gál et al.[2005] distinguishes between three different types of tax and transfer categories:

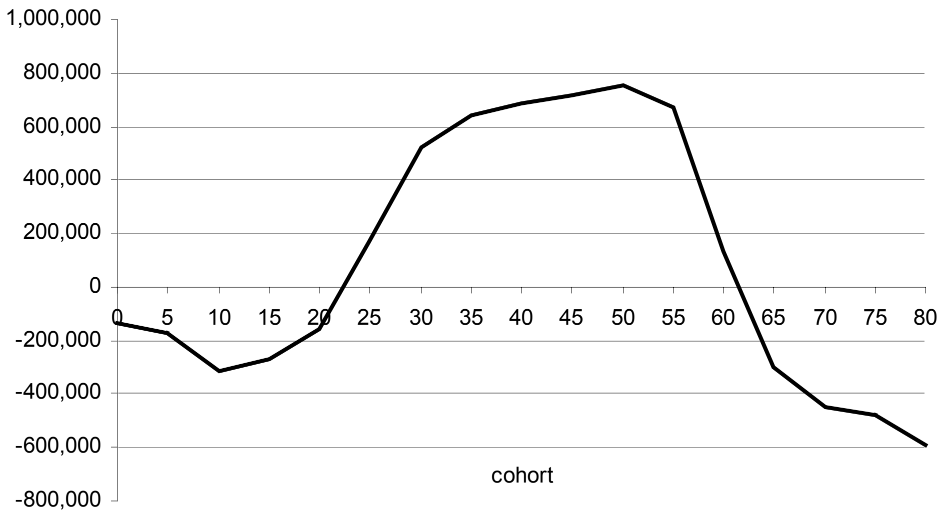
- tax and transfer categories for which the age distribution is known;
- tax and transfer categories for which the age distribution is not known but should be constructed in principle;
- net government purchases - the so-called G-categories (mainly public goods).

As Gál et al.[2005] intended to follow the conventions used by comparative GA studies as closely as possible, their net taxes consisted of only those tax and spending categories that fell into the first category. Those items in the second and third group were considered as net government purchases. We chose a different approach in that items in the second group were included among net taxes assuming they have a flat age distribution.

The net tax profile

Figure 3 shows the net tax profile for the base year 2001 calculated by using the new net zax definition.

Figure 3: The net tax profile (Base year: 2001, Ft)



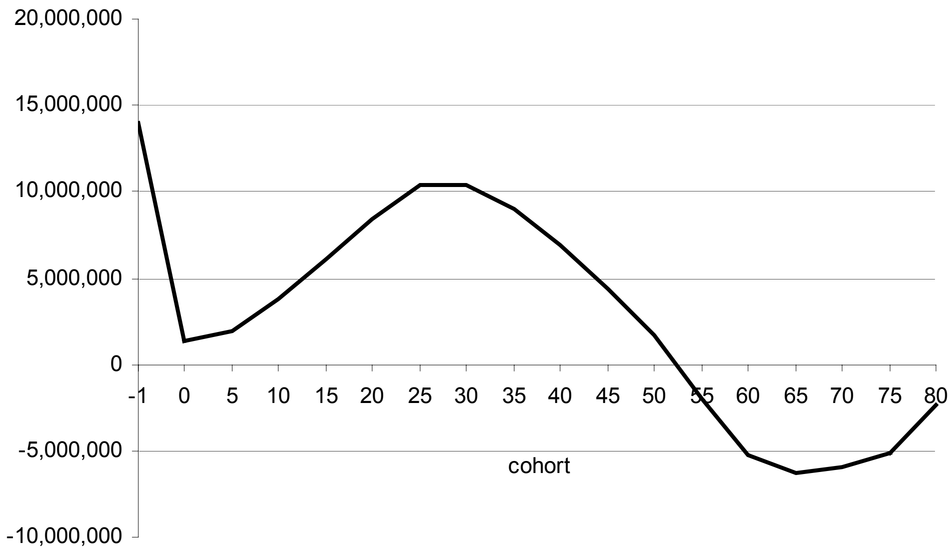
It is important to stress the incidence assumptions used when calculating the net taxes. Net taxes do not necessarily show actual tax payments: e.g. it is common practice of GA studies to assume that young people ”pay” consumption and value added taxes, I reality they do not pay these taxes, but GA studies assume that they bear the burden of these taxes.

Net taxes paid by the newborns were -136,859 Ft in 2001, i.e. their benefits were higher than their tax burden by this amount in 2001. The curve crosses the horizontal axis at the 22 year olds, they are the ones whose tax payments more or less equal to the benefits thy receive. The maximum point is around the age of 40-45, who pay a lot of taxes but do not receive high benefits. The curve crosses the horizontal axis again at the 60 year olds. Those older than 60 receive a lot of benefits (mainly pensions and health care services), while they do not pay certain taxes and contributions.

Generational accounts for 2001

Figure 4 shows the generational accounts by age for the base year of 2001.

Figure 4: Generational accounts (Base year: 2001, Ft)



The major drop at the beginning of the curve is explained by the fact that we include the future generations' accounts on this Figure (the -1 year olds), and their accounts are considerably higher than those of the newborns. In other words, it shows that there is a great generational imbalance. The newborns' accounts equal to about 1.4 million Ft. One could falsely argue that these generations (and those with a positive account) would be better off without the state. But this argument does not take into account the public goods (more precisely all items not included among the net taxes) provided for everyone.

It is also misleading to compare the generational accounts of different cohorts as they are calculated for different lengths of remaining lifetime. Generational accounts are forward-looking and they show the present value of the net tax burden for the remaining lifetime of each cohort. The accounts of the elderly are typically negative but only shows that most of their contributions have been made at an earlier stage in their lifetime. As people become older they become entitled to pension benefits and use the health care system more often, and their generational accounts simply represent that.

The maximum point is around the 25 year olds, whose generational account is 10.8 million Ft. These cohorts have finished their studies and their active years are ahead of them while they will get most of their benefits in the distant future and those payments are discounted heavily. Those older than 50-51 years can expect positive accounts, i.e they are net beneficiaries of the redistribution system. It can also be seen that while the net tax curve was decreasing continually after a certain age, it cannot be said for the generational accounts. The reason is that very old people will enjoy the benefits for a shorter period, while those around the pension age (60-65 year olds) can expect to get these benefits for 15-20 years.

The effect of demographic change and the official debt

What explains the significant differences in the net tax burdens of generations? It is common practice in the generational accounting literature to analyse to what extent can the differences be explained by the demographic change or by the official debt.

Table 1 shows our findings. In case of Hungary the main reason for the generational imbalance is the change in the demographic structure. If it would not change, the absolute generational imbalance would be halved from 12.5 million Ft to 6.1 million Ft. Cancelling the (net) debt would help to ease the problems but to a lesser extent.

Table 1: Reasons for generational imbalance (Base year: 2001, Ft)

	Base case	**No demographic change**	**Zero net debt**
Newborns' accounts	1,408,386	6,105,166	1,408,454
Future generations' accounts	13,999,395	9,675,143	11,990,814
Absolute generational imbalance	12,590,809	6,105,166	10,582,360
Sustainability gap	206.4%	118.1%	173.4%

In their comparative study Kotlikoff and Leibfritz [1999] present similar results for other countries. If the demographic structure remained constant, the generational differences would vanish in the USA, the Netherlands and Italy, and the imbalance would even turn into positive in Canada, Denmark and Norway.

The effect of cyclical adjustment

The essence of generational accounting is to take the fiscal policy of the base year as given and project that into the future. It also means however, that all factors affecting the current fiscal policy will be projected into the future and it may or may not create a bias in the calculations. There are temporary and cyclical effects that, by definition, do not last forever and we will get a clearer picture of the true (or structural) fiscal position if these cyclical and one-off effects are filtered out.

Cyclical adjustment of the budget deficit is a commonly used tool by several international organisations. The European Commission (European Commission [2002]), the European Central Bank (Bouthevillain et al.[2001]), the International Monetary Fund (Hagemann [1999]) and the Organisation for Economic Cooperation and Development (van den Noord [2000] and OECD [2004]) all produce estimations for cyclically adjusted budget balances.

The cyclical adjustment procedure usually takes three steps. First, the business cycle position of the economy is identified, then in the second step the sensitivity of the budget items affected by the business cycle is calculated, and finally the cyclical components are subtracted from the actual values that gives the cyclically adjusted or structural deficit. When identifying the economy's cyclical position all institutions except the European Central Bank employ an aggregated approach. The filtering itself is usually done by either using a simple econometric technique called the Hodrick-Prescott filter or with a production function. The method is called ”aggregated” as the fiscal elasticities produced either by economic estimation or some other way are multiplied by an aggregate output gap. In other words, this approach disregards the composition of the output gap. It is problematic because taxes and spending will differ considerably if GDP growth is lead by an increase in consumption or in export.

Disaggregated approaches such as the one applied here employ ”disaggregated” gaps for the macroeconomic bases of all budget items affected by the economic cycle. These bases are private consumption for consumption and value added taxes, private sector wages and employment for personal income taxes and social security contributions and the number of unemployed for the unemployment benefits, etc.

In the GA literature the importance of cyclical adjustment has been realised only recently (see e.g. Gjersem [2001], Manzke [2002], Patxot and Bonin [2004]). The most comprehensive study is Manzke [2002] that covers the period of 1995-2000 for Germany. We employ a similar, disaggregated approach that is quite close to the European Central Bank's model and explained in detail in Deutche Bank publications (Deutche Bundesbank [1997], [2000]).

Most studies of cyclical adjustment take into account four tax categories: (1) personal income taxes, (2) profit taxes, (3) social security contributions and (4) indirect taxes. On the expenditure side only unemployment benefits are considered but in case of Hungary pension benefits are also included because of the particular pension formula. Table 2 shows the magnitude and proportion of the budget items covered in this study for the year 2001.

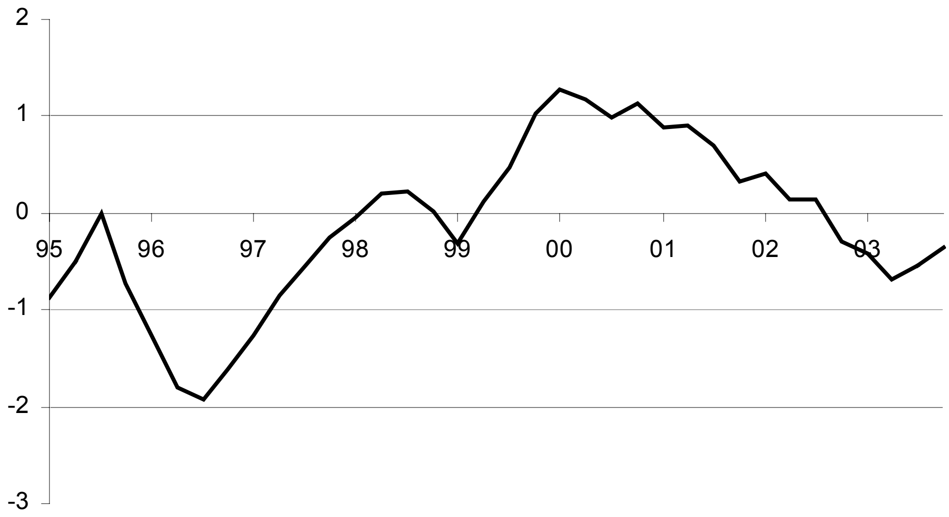
Table 2: Budget items covered in this study, 2001 (million Ft)

Revenues	Million Ft	Ratio	**Expenditures**	Million Ft	Ratio
Personal income tax	1,116,658	17.6	Unemployment benefits	49,105	0.7
Social securitz contributions	1,465,283	23.1	Pensions	1,213,380	17.9
VAT	1,243,899	19.6			
Other consumption and excise taxes	539,679	8.5			
Profit tax	351,855	5.6			
Total	6,332,365	100	Total	6,765,127	100

Source: Ministry of Finance, ÁHIR database.

The first step is to calculate the cyclical component of the macroeconomic bases of the corresponding budget items. We have used the already mentioned Hodrick-Prescott filter, which is a very simple, transparent econometric technique, but not without its own problems. It is argued that the choice of the smoothing parameter is arbitrary and the method is quite mechanical as there is no economic theory behind it. Moreover, as the filter is basically a moving average process there is an end-point bias problem, and the filter can give biased results if there are structural breaks in the time series. As an illustration we show the output gap for the period of 1995-2003.

Figure 5: Output gap, 1995-2003 (%)



Fiscal elasticities

In the next step the elasticities of budget items to their bases are calculated by an error correction model. Writing down an error correction model is helpful as it makes it possible to distinguish between short and long term effects. The long term parameters were estimated by the following equation:

$$y_t = \alpha + \beta x_t + u_t \tag{14}$$

The estimated long term equations are presented in Table 3.

Table 3: Long term parameters

pit_t	=	-3,341	+	**1,352** $avewage_t$
		(-3,527)		(16,258)
$proftax_t$	=	-3,274	+	**1,030** $profit_t$
		(-2,809)		(12,263)
vat_t	=	-2,416	+	**1,028** $cons_t$
		(-1,269)		(7,743)
$unempben_t$	=	0,059	+	**0,995** $unemp_t$
		(0,897)		(192,95)

Note: t-values in brackets.

All long term parameters are significant and their magnitude seem to be acceptable. In case of VAT, profit tax and unemployment benefits the parameter is equal to 1 that is reasonable, while the parameter is greater than 1 for the personal income tax that points to the progressive nature of that tax type. It was not possible to get economically meaningful results for the social security contributions and for pensions so we have adopted results of other studies, which were 0.9 for social security contributions and 1 for pensions (see P.Kiss and Vadas [2005] and OECD [2004]).

The short term parameters were estimated the following way:

$$\Delta y_t = \gamma \Delta x_t + \delta (y - \alpha - \beta x)_{t-1} + u_t \qquad (15)$$

Table 4 shows the estimated long term equations:

Table 4: Short term parameters

Δpit_t	=	-0.001 (-0,194)	+	1,494 $\Delta avewage_t$ (2,367)	-	**0,292** $(pit + 3{,}341 - 1{,}352 avewage)_{t-1}$ (-2,273)
$\Delta proftax_t$	=	0,020 (1,037)	-	0,140 $\Delta profit_t$ (-0,233)	-	**0,276** $(proftax + 3{,}274 - 1{,}030 profit)_{t-1}$ (-2,868)
Δvat_t	=	0.010 (0,496)	+	1,993 $\Delta cons_t$ (1,483)	-	**0,913** $(vat + 2{,}416 - 1{,}028 cons)_{t-1}$ (-5,530)
$\Delta unempben_t$	=	-0,001 (-0,297)	-	0,934 $\Delta unemp_t$ (30,064)	-	**0,549** $(unempben - 0{,}059 - 0{,}995 unemp)_{t-1}$ (-4,205)

Note: t-values in brackets.

The short term parameters are both negative and significant as expected, and their magnitudes also seem to be acceptable. It means that in all four cases all conditions of the error correction model are fulfilled and the corresponding variables are cointegrated.

It is now possible to calculate the cyclically adjusted deficit, and they are presented for the period of 1995-2003 in Table 5. The second column of the table shows results for a case in which we have assumed unit elasticity for all budget items. It makes sense as all cases in which the budget elasticities are different from unity can be considered as results of some discretionary decision by policy-makers. P.Kiss and Vadas [2005] argue that the notion of ”constant fiscal policy” may be interpreted as unchanged total tax burden which corresponds to unit fiscal elasticities.

Table 5: Cyclical component of budget deficit as a ratio of GDP, 1995-2003

Year	**Estimated fiscal elasticities**	**Unit fiscal elasticities**	ECB method	HNB method
1995	**-0,3**	**-0,2**	-0,4	0,1
1996	**-0,6**	**-0,6**	-1,0	-0,6
1997	**-0,5**	**-0,5**	-0,9	-0,3
1998	**-0,2**	**-0,3**	-0,4	0,0
1999	**0,4**	**0,4**	0,1	-0,1
2000	**0,2**	**0,2**	0,2	0,0
2001	**0,2**	**0,2**	0,0	-0,1
2002	**0,2**	**0,3**	0,5	0,4
2003	**0,1**	**0,1**	0,8	0,4

Source: Own calculations and P.Kiss and Vadas [2005]

The sign of the cyclical components are similar to those of P.Kiss and Vadas [2005] and their magnitudes are of similar order too. The differences in the results must come from the slightly different estimation methods, the data used and the coverage of budget items.

Let’s now turn our attention to the cyclically adjusted generational imbalance measures. The values of budget items did not change significantly after the cyclical adjustment so one would expect that the generational accounts would not change either. It is not necessarily true as small differences in the present might become huge in the long run. However, Table 6 justifies our earlier conjecture and the absolute generational imbalance did not change much. Its series became ”smoother”, i.e. they fell less and rise less than the original relative imbalance series.

Table 6: Absolute generational imbalance, 1995-2001 (constant 2001 prices, Ft)

		Following cyclical adjustment	
Year	Base case	**Estimated fiscal elasticities**	**Unit fiscal elasticities**
1995	10,859,107	**10,395,821**	**10,469,913**
1996	4,327,679	**6,015,494**	**6,073,590**
1997	8,923,556	**8,221,906**	**8,228,140**
1998	16,815,752	**16,465,560**	**16,479,165**
1999	12,127,985	**12,694,100**	**12,701,357**
2000	12,618,070	**12,920,927**	**12,936,973**
2001	12,590,809	**12,828,259**	**12,818,871**

The sustainability approach

The generational imbalance measure is produced using what Bonin [2001] calls the ”residual” approach. There are some problems with this approach, and we list these problems in this section.

Firstly, it is not obvious where the dividing line is between net taxes and net government purchases. There are two opposing views in the GA literature. One, which follows the seminal papers by Auerbach et al. [1991], [1992] and forms the basis of all international comparative studies in this subject, puts more emphasis on who pays for government services tan who benefits from them (see Buiter [1995). It has been argued, however, that although certain goods and benefits are not included among net taxes (e.g. public goods) they definitely increase people ‘s welfare. Therefore, generational accounts of present generations are not affected by net government purchases and they are biased estimates of individual’s welfare.

Ter rele [1997] and Raffelhüschen [1999] suggest a completely different solution, in which all taxes and spending categories (including all public goods) are included among net taxes. In other words, net government purchases are diminished. The interpretation of generational accounts is completely transformed and they become a welfare indicator (Bonin and Patxot [2004]).

As we mentioned earlier Gál et al.[2005] distinguished between three different budget categories: (1) tax and transfer categories for which the age distribution is known, (2) tax and transfer categories for which the age distribution is not known but should be constructed in principle and (3) net government purchases. Contrary to Gál et al.[2005] who include only (1) among the net taxes, we chose a different approach in that items in the second group were included among net taxes assuming they have a flat age distribution. Table 7 shows generational accounts for the three different net tax definitions (base case, our approach, and the one in which net government purchases are zero).

Table 7: Generational accounts with different net tax definitions (Base year: 2001, Ft)

Generation's age in 2001	Base case	G includes only public goods	G = 0
Future	15,727,098	13,999,195	6,749,238
0	2,865,599	1,408,386	-4,705,808
1-5	3,356,485	1,918,196	-4,116,595
6-10	5,116,753	3,738,032	-2,046,821
11-15	7,435,546	6,095,118	470,933
16-20	9,752,625	8,459,162	3,032,033
21-25	11,642,204	10,419,788	5,290,757
26-30	11,542,761	10,371,646	5,457,866
31-35	10,113,184	8,997,978	4,318,782
36-40	7,917,028	6,860,792	2,429,026
41-45	5,397,083	4,418,943	314,853
46-50	2,567,255	1,673,956	-2,074,161
51-55	-1,134,407	-1,951,022	-5,377,386
56-60	-4,510,749	-5,243,942	-8,320,284
61-65	-5,679,194	-6,326,394	-9,041,925
66-70	-5,424,876	-5,974,027	-8,278,160
71-75	-4,711,234	-5,154,505	-7,014,387
76-80+	-2,181,581	-2,366,325	-3,141,475
Absolute generational imbalance	12,861,498	12,590,809	11,455,046
Realtive generational imbalance	5.49	9.94	-1.43

Source: Gál et al.[2005] and own calculations

The table shows that the results are considerably different in the three cases, and it raises the problem of manipulation of generational accounts. In the third case the relative generational imbalance is negative but it does not signal redistribution from present generations to future ones, simply is the result of the newborns' accounts being negative and that of future generations being positive.

Bonin [2001] mentions two other problems of the residual approach. This approach only uses the number of future newborns from the demographic projection so does not use all information on demography. It is not clear the burden of future generations is the result of what fiscal policy exactly. It is only partially true that it is the result of ”constant fiscal policy”. Future generations ”pay” according to the residual derived from the intertemporal budget constraint.

The ”cohort deficit”

Bonin [2001] suggests a solution where he employs a narrow definition of net taxes and produces separate ”accounts” for net government purchases exactly the same way as generational accounts are constructed. For each generation (cohort) the difference between the present value of net government purchases and generational accounts calculated on the basis of the narrow net taxes definition is the ”cohort deficit”. It shows whether the net taxes paid by each generation is enough to finance net government purchases for them in their remaining lifetime. If the deficit is positive then net taxes paid by this generation for the remaining of their lifetime is not enough to finance their share of net government purchases for the same period. It also follows that in order for fiscal policy to be sustainable in the long run there must be generations with negative cohort deficit.

Table 8 shows generational accounts, the net government purchases ”accounts” and the cohort deficit for different cohorts. The cohort deficit is simply the negative of the generational account calculated by the broad definition of net taxes suggested by ter Rele [1997] and Raffelhüschen [1999].

Table 8: Generational accounts and cohort deficits (Base year: 2001, Ft)

Generation's age in 2001	Generational account	Government purchases "account"	Cohort deficit
0	1,408,386	6,114,194	4,705,808
1-5	1,918,196	6,034,791	4,116,595
6-10	3,738,032	5,784,853	2,046,821
11-15	6,095,118	5,624,185	-470,933
16-20	8,459,162	5,427,128	-3,032,033
21-25	10,419,788	5,129,030	-5,290,757
26-30	10,371,646	4,913,780	-5,457,866
31-35	8,997,978	4,679,196	-4,318,782
36-40	6,860,792	4,431,767	-2,429,026
41-45	4,418,943	4,104,090	-314,853
46-50	1,673,956	3,748,117	2,074,161
51-55	-1,951,022	3,426,364	5,377,386
56-60	-5,243,942	3,076,342	8,320,284
61-65	-6,326,394	2,715,531	9,041,925
66-70	-5,974,027	2,304,133	8,278,160
71-75	-5,154,505	1,859,882	7,014,387
76-80+	-2,366,325	775,151	3,141,475

As net government purchases are distributed evenly among individuals, it is not surprising that the net government purchases accounts are decreasing by age. As people get older they will receive these benefits for a shorter period. We can also see that the cohort deficit turns negative at around the age of 50, which is quite early compared to the results of other studies (for Germany it was closer to 60, see Bonin [2001]). A likely explanation for this is the high rate of inactivity in the Hungarian population, especially among those aged 50 or older.

The "sustainability gap"

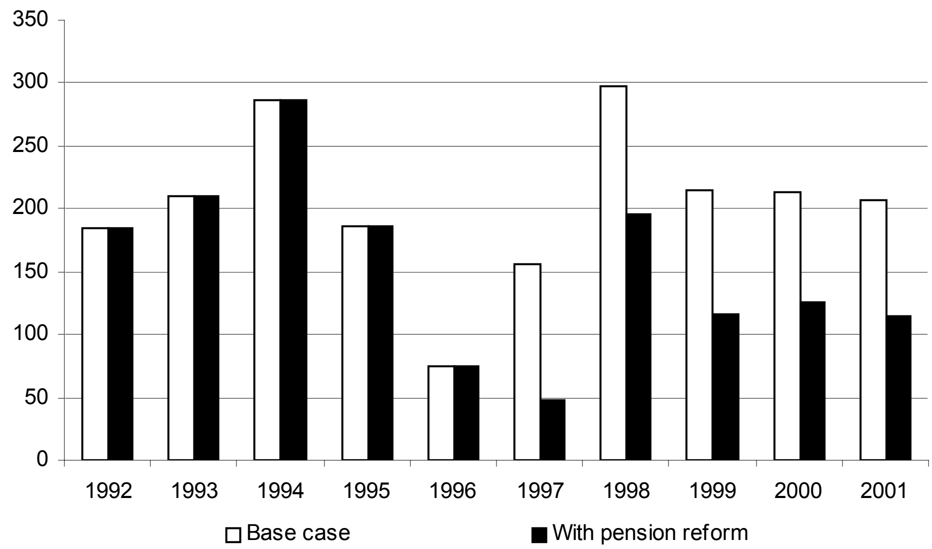
The sustainability approach attempts to resolve the deficiencies of the residual approach (Auerbach [1997], Raffelhüschen [1999], Bonin [2001]). The starting point of this approach is that the "constant fiscal policy" assumption stays in place but the intertemporal budget constraint does not hold. Generational accounts of future generations are based on the base year's fiscal policy and also they are affected not only by the number of future newborns but the whole demographic projection.

Next we introduce the concept of the "sustainability gap", which measures the difference between the revenue and expenditure side of the intertemporal budget constraint. In other words it shows the revenue demand that needs to be covered by adjusting the future level of taxes, benefits or government purchases. It can also be interpreted as what the present value of future primary surpluses or deficits would be if the government would not be restricted by the intertemporal budget constraint. In algebraic terms it looks like this:

$$SG_t = \sum_{i=t}^{\infty} G_i - \sum_{k=t-D}^{t} N_k - \sum_{k=t+1}^{\infty} \overline{N}_k + B_t \qquad (16)$$

where the 'bar' in the third term refers to the fact that the burdens of future generations are calculated assuming of constant fiscal policy and not residually from the intertemporal budget constraint. The sustainability gap can be produced for each base year and it is shown on Figure 6 for the period of 1992-2001. Both the base case and the one which takes into account the pension reform are shown.

Figure 6: Sustainability gap, for base years 1992-2001 (as a ratio of base year GDP)



Let's start with the base case. The sustainability gap as a ratio of base year GDP was 206,4% in 2001. This is the financial need of the government that would put the fiscal policy of 2001 onto a sustainable path. If we take into account those policy decisions of the pension reform that will come into effect after 2001 (e.g. increase of the pension age to 62 for both me and women, etc.) then the sustainability gap falls to 115,1%. These numbers show that fiscal policy was not sustainable in 2001, and future governments will need to either raise net taxes or cut net government purchases.

These numbers are very high but that kind of imbalance is not unique if we compare it with calculations made for other countries. Table 9 shows the sustainability gap for selected European countries. The base year for these calculations was 1995 so one needs to be careful when making comparisons.

Table 9: Sustainability gap for some European Union countries (Base year: 1995, as a ratio of base year GDP)

Country	Sustainability gap
Austria	192,5
Belgium	18,8
Denmark	71,2
Finland	253,2
France	81,3
Germany	136,0
Ireland	-4,3
Italy	107,3
Netherlands	75,9
Spain	151,9
Sweden	236,5
UK	184,8

Forrás: Raffelhüschen [1999].

The sustainability gap in 1995 was higher in Sweden and Finland than in Hungary (in 2001) and was at a similar level in Austria and in the UK.

It is common practice in the new GA literature to report the sustainability gap in terms of the base year GDP. However, one could argue that the sustainability gap is the present value of debt accumulated in an infinite horizon so it ought to be divided by the present value of GDP for that same period. Algebraically,

$$\kappa = \frac{SG_t}{\sum_{i=t+1}^{\infty} GDP_{t,i}} \qquad (17)$$

The sustainability gap calculated this way was 7,1% for the base case and 3,96% with pension reform in 2001.

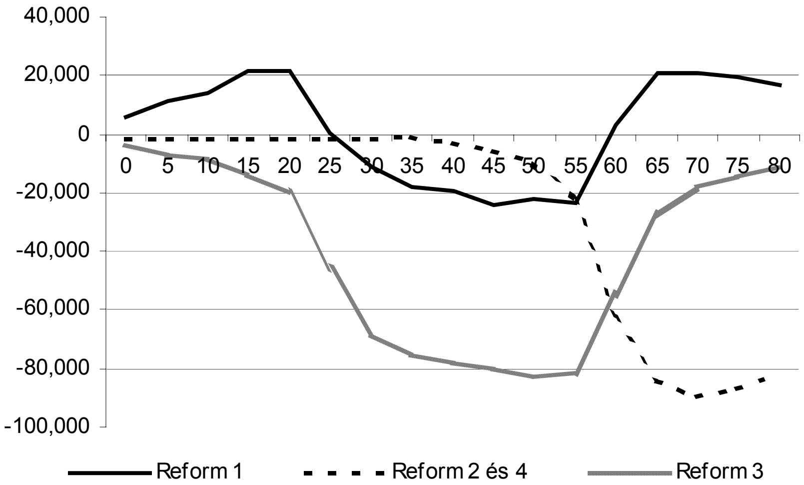
Effects of changes in tax and benefit rules on generations' welfare and fiscal sustainability

The generational accounting method is capable of identifying the possible effects of changes in the tax-benefit rules. We will analyse for four stylised policy scenarios. (1) Change of the tax base: what would happen if taxes on labour income (i.e. personal income taxes and social security contributions) would be decreased and taxes on consumption increased. (2) Raise in pensions and cut of government purchases. Both options are deficit neutral, i.e. decrease in some taxes (raise in expenditure) is exactly offset by increase in some other taxes (cut in expenditure). In cases (3) and (4) the deficit neutrality assumption is dropped and the effects of a comprehensive tax cut (Case 3) and a simple raise in pensions (Case 4) are analysed. Herer are the four scenarios in detail:

1. Reform 1: Cut of personal income tax and social security contributions by 10% and raise of consumption taxes by 16%,
2. Reform 2: Raise of pensions by 20% and cut of net government purchases by 12%,
3. Reform 3: Cut of personal income tax, social security contributions and consumption taxes by 10%,
4. Reform 4: Raise of pensions by 20% (without cutting government purchases).

Figure 7 shows the difference between the new and the old net tax profiles for the year of 2001.

Figure 7: Difference between old and new tax profiles (Base year: 2001, Ft)



There are only three curves on the figure because in cases (2) and (4) the new net tax profiles are the same. As we mentioned before neither net taxes nor generational accounts do not catch the effects of changes in net government purchases.

Positive values on Figure 4.10 suggests that the corresponding generation's net tax burden is increased. Case 2, 3 and 4 are trivial as both raising pensions with or without cutting government purchases (Cases 2 and 4) and cutting taxes (Case 3) will decrease net taxes (i.e. will be welfare improving). In Case 1 net taxes of younger and older cohorts increase while that of middle aged people decrease. It is not surprising as pensioners "pay" consumption taxes but do not (or rarely) pay income taxes while the young will have to face an increased burden of consumption taxes in the present while paying less income taxes in the future. Middle aged pay most of taxes on labour income so their overall net tax burden will be lower.

The question still remains how generational accounts and more importantly cohort deficits are affected. Table 10 reports these for the base case as well as for the four policy scenarios.

Table 10: Generational accounts and cohort deficits (Base year: 2001, Ft)

	Base case		Reform 1		Reform 2		Reform 3		Reform 4	
Generation's age in 2001	Generational account	Cohort deficit	Generational account	Cohort deficit	Generational account	Cohort deficit	Generational account	Cohort deficit	Generational account	Cohort deficit
0	1.408.386	4.705.808	1.550.621	4.563.572	1.055.500	4.324.991	373.960	5.740.234	1.055.500	5.058.694
1-5	1.918.196	4.116.595	2.042.433	3.992.358	1.539.947	3.770.669	805.061	5.229.730	1.539.947	4.494.844
6-10	3.738.032	2.046.821	3.807.769	1.977.084	3.358.289	1.732.382	2.507.477	3.277.377	3.358.289	2.426.565
11-15	6.095.118	-470.933	6.082.749	-458.565	5.676.684	-727.401	4.718.187	905.998	5.676.684	-52.499
16-20	8.459.162	-3.032.033	8.317.227	-2.890.099	7.992.064	-3.216.191	6.935.155	-1.508.027	7.992.064	-2.564.936
21-25	10.419.788	-5.290.757	10.166.941	-5.037.911	9.916.882	-5.403.336	8.804.770	-3.675.739	9.916.882	-4.787.852
26-30	10.371.646	-5.457.866	10.105.683	-5.191.903	9.794.479	-5.470.353	8.789.032	-3.875.252	9.794.479	-4.880.699
31-35	8.997.978	-4.318.782	8.763.535	-4.084.339	8.317.796	-4.200.104	7.526.774	-2.847.578	8.317.796	-3.638.600
36-40	6.860.792	-2.429.026	6.688.274	-2.256.507	6.056.102	-2.156.147	5.549.489	-1.117.723	6.056.102	-1.624.335
41-45	4.418.943	-314.853	4.333.174	-229.084	3.499.825	111.774	3.298.585	805.505	3.499.825	604.265
46-50	1.673.956	2.074.161	1.684.726	2.063.391	648.845	2.649.497	768.038	2.980.079	648.845	3.099.271
51-55	-1.951.022	5.377.386	-1.809.324	5.235.687	-3.116.376	6.131.576	-2.594.494	6.020.857	-3.116.376	6.542.740
56-60	-5.243.942	8.320.284	-4.984.871	8.061.213	-6.473.984	9.181.165	-5.618.958	8.695.300	-6.473.984	9.550.326
61-65	-6.326.394	9.041.925	-6.065.825	8.781.355	-7.471.488	9.861.155	-6.555.394	9.270.925	-7.471.488	10.187.018
66-70	-5.974.027	8.278.160	-5.762.756	8.066.889	-6.942.187	8.969.824	-6.133.312	8.437.445	-6.942.187	9.246.320
71-75	-5.154.505	7.014.387	-4.993.031	6.852.913	-5.916.249	7.552.945	-5.268.100	7.127.982	-5.916.249	7.776.131
76-80+	-2.366.325	3.141.475	-2.302.888	3.078.039	-2.677.426	3.359.559	-2.408.982	3.184.133	-2.677.426	3.452.577

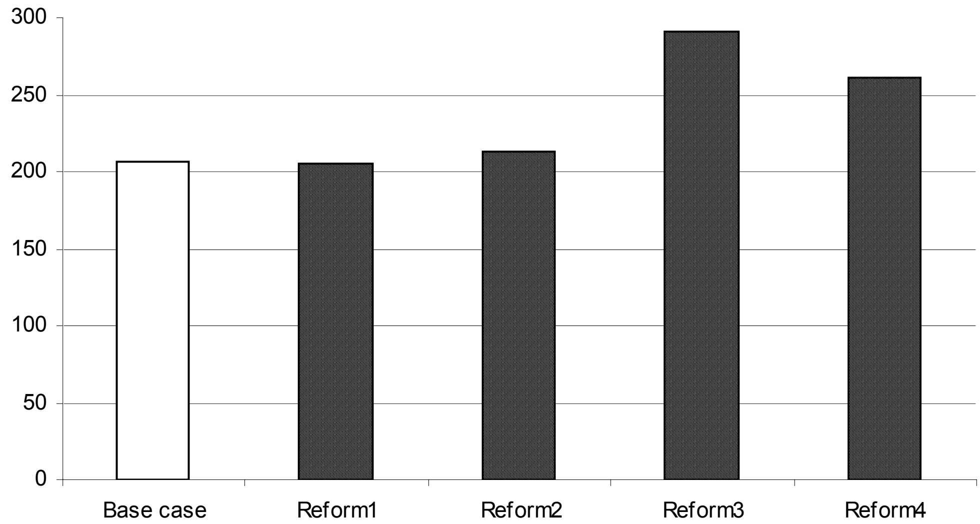
In Cases 2 and 4 generational accounts are lower than in the base case. It is reasonable, as we have argued before, generational accounts of present generations only show changes in net taxes and not changes in government purchases. The biggest winners are those around the pension age as they can enjoy the benefits of increased pensions immediately and for a long time. In Case 3 lowered taxes lead to lower generational accounts (and higher cohort deficits) for all present generations.

The case of broadening the tax base (Case 1) is more complex. The accounts of old people will be higher as consumption taxes (that represents majority of the taxes within their net taxes) are increased. Typically they do not pay income and payroll taxes so cannot enjoy the benefits of lower rates. The very young are also ”losers” of the reform as they will need to pay higher consumption taxes immediately and for long periods while they will enjoy the lower rates of personal income taxes and social security contributions 10-20 years later in their active years. All other generations (those between 15 and 50 years) are net gainers of this reform option. Labour income taxes will be lower immediately and for a long time and although they need to pay higher taxes on consumption, these extra burdens will be much lower than the lower labour income taxes.

Finally, let us emphasise that although the generational accounts are equal in Cases 2 and 4, cohort deficits are not. The latter pick up the effects of changes in net government purchases and, we argue, are better measures of generational welfare than generational accounts. Cohort deficits will be higher in Case 4 than in Case 2, i.e. all present generations pay less for the government purchases in Case 4 than in Case 2.

Having discussed the intergenerational redistribution dimension, let us now turn to the issue of how fiscal sustainability is affected in the four cases. Figure 8 shows the sustainability gap for four scenarios as well as for the base case.

Figure 8: Sustainability gaps (Base case: 2001, as a ratio of base year GDP)



The sustainability gap does not change significantly in Cases 1 and 2, but increases in Cases 3 and 4. The latter two cases are straightforward. GA models report worsening of the long-term fiscal position in cases where the government only increases expenditures or lower taxes. Fewer middle aged people in the future would have paid less personal income taxes and social security contributions anyway, now with lower rates they contribute even less to the budget. It is not obvious how consumption tax revenues from old people will be affected (more older people and lower consumption tax rates), but the fewer young will definitely contribute less to the budget coffers, and as a result of Reform 3 the sustainability gap increases to 291,3% of GDP. In Case 4 higher pensions are not balanced with higher contributions or taxes and the sustainability gap becomes higher at 261.2%.

In the other two cases it is not obvious how the fiscal position is affected. If higher pensions are "financed" by lower government purchases then basically the structure of the expenditure side is altered. The sustainability gap is slightly increased to 212.6% of GDP. Reform 1 is the most intriguing case. There are two unambiguous effects:

- Fewer active people paying personal income taxes and social security contributions at lower rates resulting in lower revenues,
- More older people paying consumption taxes at higher rates will result in higher revenues.

According to the demographic projection of KSH [2003] the number of young and middle aged (active) people will fall by 30% by 2050 and they will pay consumption taxes at higher rates. These effect eventually result in a more or less unchanged long-term fiscal position, the sustainability gap being 205.1% of GDP.

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Appendix

Table A1: Generational Accounting Country Studies

Country	Study
Argentina	Altamiranda [1999]
Australia	Ablett [1998]; [1999]
Austria	Keuschnigg et al. [1999]; Mayr [2004]
Belgium	Delli and Lüt [1999]; Stijns [1999]
Brasilia	Villela Malvar [1999]
Denmark	Jensen and Raffelhüschen [1999a], [1999b]; Lau [2000]; Jensen et al. [2002]
South-Korea	Auerbach and Chun [2003]; Auerbach et al. [2004]
United States	Gokhale et al. [1999], Bommier et al. [2004], Chojnicki and Docquier [2004]
United Kingdom	Banks et al. [1999], Cardarelli and Sefton [1999]; Cardarelli et al. [2000a]; Cardarelli et al. [2000b]
Finland	Feist et al. [1999]; Vanne [2003]
France	Levy and Doré [1999]; Crettez et al. [1999]
Netherlands	ter Rele [1997]; Hebbink [1997]; Bovenberg and ter Rele [1999a], [1999b]; Hebbink [2000]
Ireland	McCarthy and Bonin [1999]
Japan	Takayama et al. [1999]
Canada	Corak [1998]; Oreopoulos [1999]
Hungary	Gál et al.[2000]; Gál et al.[2001], Gál et al.[2002], Gál et al.[2005]
Germany	Bonin et al. [1999]; Raffelhüschen and Walliser [1999]; Bonin and Feist [1999]; Manzke[2002]; Seidel [2003]
Norway	Steigum and Gjersem [1999], Steigum [2002]
Italy	Sartor [1999], Franco and Sartor [1999], Coda Moscarola [2001]; Sartor et al.[2003]
Portugal	Auerbach et al. [1999]
Spain	Berenguer et al. [1999]; Bonin et al. [2001], Meseguer [2001]
Sweden	Hagemann and John [1999], Lundvik et al. [1999]
Thailand	Kakwani and Krongkaew [1999]
New-Zealand	Baker [1999]