Cyclically Neutral Generational Accounting

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Abstract

The paper introduces a key methodological innovation into generational accounting. By incorporating cyclically adjusted balances into the forward-looking budget projections underlying the concept we isolate pure policy effects, which render comparisons across time and countries of the fiscal sustainability indicators obtained truly meaningful. We also show that a demographic effect and a debt effect may drive fiscal sustainability measures over time and establish a routine to control for these effects in the generational accounting framework. An empirical application for Spain illustrates that our proposed decomposition of indicators is empirically relevant. Standard generational accounting suggests that fiscal sustainability in Spain has improved substantially in preparing for the EMU. However, calculation of the pure policy effects reveals that this actually has not been the case.

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1. Introduction

The Stability and Growth Pact (SGP) drew the attention of decision makers to the development of public deficits and debt. However, while the ad-hoc deficit and debt ceilings in the EMU specified in the Treaty of Maastricht are perhaps useful in the realm of practical budget planning, they may not be informative with regard to the actual stance of fiscal policy.

On the one hand, in the short term, government revenue and expenditure levels vary over the business cycle even when the underlying fiscal policy parameters are constant. An exact picture of debt policies underway requires eliminating cyclical effects from government balances. There are several approaches to disentangle cyclical and structural components in current government balances, for an overview see European Commission (2004). These methods generally build upon econometric analysis of correlations between government revenue and expenditure, and some measure of economic activity. The common feature is that de-trending is based on past government experiences. Hence we may speak of backward-looking techniques.

On the other hand, in the medium and long term, current deficits or surpluses may turn out to be more or less sustainable when demographic dependency rates deteriorate. This means that for constant and even for cyclically neutral fiscal parameters, a given budgetary imbalance can develop into larger or smaller deficits in the future depending on the composition of government expenditure and revenue, in particular by age. In assessing current fiscal policy, according to the neoclassical model of debt in a general equilibrium framework, intertemporal sustainability matters, since it affects consumption patterns of rational individuals optimizing over the life-cycle. The various methods for evaluating fiscal sustainability available from the literature, surveyed by Baldassare and Franco (2001), are generally forward-looking.[1] The most advanced of these techniques develop projections for the future path of primary imbalances and generate estimates of the fiscal policy adjustments required to stabilize government debt at some predetermined rate of GDP.

[1] Hamilton and Flavin (1985) started a strand of the literature that statistically tests the present value intertemporal budget constraint of the government. These studies use past budgetary policies in order to verify whether governments running deficits during one period make implicit promises to creditors to run offsetting surpluses during another period. However, in the context of policy evaluation, the obvious shortcoming of this approach is that sustainability of fiscal policies in the past does not permit conclusions about fiscal policy in the future, especially as exogenous shocks (such as demographic trends) may change the long-term consequences of current policies for public finances.

Where measures of fiscal sustainability have been repeatedly calculated, the experience is that the results can vary substantially over very short periods. However, the swings are only partly due to structural changes in fiscal policy. As the primary imbalance at the start of the projections varies over the business cycle, the measured intertemporal fiscal imbalances tend to fluctuate cyclically as well. In order to determine if fiscal policy is actually expansive or contractive, it is necessary to separate the cyclical and structural components in fiscal sustainability measures as well. Conceptually this is also a prerequisite for meaningful cross-country comparisons, as individual countries, in a given year, are likely to be captured at different stages of the business cycle.

In this paper, we expand the standard forward-looking analysis of fiscal imbalances by integrating backward-looking de-trending procedures. Specifically, we incorporate the method by Girouard and André (2005), which is the basis for the standardized measure of the *cyclically adjusted budget balance* reported by the European Commission, into *generational accounting*, a widespread framework for applied fiscal sustainability analysis in a changing demographic environment developed by Auerbach, Gokhale and Kotlikoff (1991, 1992). Furthermore, besides the cycle effect, we find other sources of mismeasurement of the pure policy effect –the demographic effect and the debt effect– and establish a process to control for this in the Generational Accounting framework.

Our empirical application deals with Spain where public deficits showed a remarkably strong decline during the second half of the 1990s. In preparing for the EMU the deficit-to-GDP ratio fell from 5 percent in 1996 to 0.14 percent in 2004. As a result, according to conventional generational accounting measures it seems that fiscal sustainability has improved by a wide margin. However, this picture might be quite different after applying the decomposition process proposed I this paper as we show in Section 3.

The remainder of the paper is organized as follows. In the next section, we outline the standard GA method and the modifications needed in order to disentangle the pure policy effect from the cycle and other effects hiding it. Section 3 illustrates the method by means of an application to the Spanish case along the period 1996-2004. Finally Section 4 comes is devoted to conclusion.

2. Isolating Cyclical and Structural Components in Fiscal Imbalances

This section first presents the conventional practice of generational accounting, which measures the intertemporal fiscal imbalance in government budgets. We demonstrate that the generated fiscal sustainability measures tend to perpetuate initial business cycle conditions. Next, we give a short introduction into Girouard and André (2005) method of adjusting the components of current fiscal imbalances for business cycle effects. Finally we give account of the method proposed to disentangle the true change in sustainability from other factors influencing the Generational Accounting calculations.

2.1. Conventional Generational Accounting

Auerbach, Gokhale and Kotlikoff (1991, 1992) proposed generational accounting to assess redistribution between current and future generations through public debt in face of demographic changes.[2] The method is based on the old theoretical notion that debt cannot increase at a faster rate than GDP forever since otherwise, in a dynamically efficient economy, the taxes needed to service interest payments converge to an infinite value (Domar, 1944). Specifically, generational accounting defines a sustainable fiscal policy as one capable of meeting the intertemporal budget constraint of the government in absolute terms:

(1) $$D_{t_0} = \sum_{t=t_0}^{\infty} S_t (1+r)^{t_0 - t} \quad ,$$

where S_t is the primary public surplus in period t, D_{t_0} is the value of public debt in the base period t_0, and r is the discount rate applied to take the value of future payments back to the base period.[3] In other words, a sequence of future primary surpluses is considered sustainable, if its aggregate present value is sufficient to pay for the initial level of government liabilities. Most fiscal sustainability measures in the literature start from this or a closely related definition of fiscal sustainability. For example, the tax-gap indicator proposed by Blanchard et al. (1990), the most prominent alternative to the fiscal

[2] Our representation of the generational accounting is somewhat unusual, since it does rely on the calculation of rest-of-life net tax burdens, or generational accounts. While these are a key element of many generational accounting studies, they are irrelevant for the metric of fiscal sustainability employed throughout this paper. See Bonin (2001) for a comprehensive standard introduction into the method, and Havemann (1994) and Buiter (1997) for critical assessments of generational accounting.

[3] There is no unique approach to the debt measure. The choice is between gross or net values, market or face values. See Baldassare and Franco (2001) for a discussion of the various possibilities.

sustainability measures of generational accounting, is based on the sustainability condition that the aggregate present discounted value of the ratio of primary deficits to GDP is equal to the negative of the current level of debt to GDP. This condition is weaker than the one set up before– it allows any positive debt-to-GDP ratio in absolute terms as long as it converges to zero in present value terms. In contrast, generational accounting requires that the debt-to-GDP ratio converges to zero in absolute terms over an infinite time horizon.

No matter which sustainability concept is applied, a major difficulty is obtaining a meaningful long-term projection for primary imbalances. In order to capture the effect of demographic changes on public budgets, generational accounting groups the primary surplus by cohort. Let P_{jt} be the number of the population of age j in period t, J the maximum age and τ_{jt} the average per-capita net tax payment by persons of age j in period t, then

(2) $$S_t = \sum_{j=0}^{J} P_{jt}\tau_{jt} \, .$$ [4]

Testing the sustainability condition (1) hence requires a population forecast and a forecast of age-related per capita net tax payments. For the former, generational accountants normally refer to official demographic projections. With regard to the latter, the basic concept is to assume that age-related per capita revenue and spending levels stay constant from the base period in terms of real per capita GDP:

(3) $$\tau_{jt} = \tau_{jt_0}(1+g)^{t-t_0} \, ,$$

where g is the per-capita real GDP growth rate. The vector of age-specific net tax payments in the base period is obtained from micro data on age-related tax payments and benefits receipts, which are rescaled such that individual net tax payments weighted by cohort size add up to the actual primary imbalance in the base period as measured by the national accounts.

If the primary imbalances computed on the basis of (2) and (3) violate the intertemporal financing condition (1), fiscal policy is unsustainable. To finance the difference between the absolute value of initial debt and aggregate primary surpluses, the so-called *sustainability gap*, fiscal policy must be adjusted at some future point in time. For example, if the sustainability gap is positive, per-capita revenue has to increase, or

[4] Net tax payments are defined as the sum of taxes paid minus the total of transfers received. Since Raffelhüschen (1999) net taxes generally also include government consumption. It is treated as a non-age-related expenditure. This means that for each age group the level of net taxes shifts by a constant amount.

per-capita spending has to fall relative to what is predicted on the basis of the initial fiscal parameters. In this sense, the sustainability gap constitutes an intertemporal financial liability of the government. We will call fiscal policy that increases (decreases) the sustainability gap expansive (contractive).

In principle, evaluating the sustainability gap is sufficient to indicate the extent of intertemporal imbalance in government finances. Nevertheless the outcome of the forward-looking projections is normally summarized through a metric that allows for a simple interpretation. We follow Auerbach (1997) in expressing the sustainability gap in terms of the aggregate discounted value of future GDP. This value is projected in the same spirit as the sustainability gap– GDP per worker in the base period is updated for labor productivity growth, and linked to a projection of the future labor force. The resulting indicator represents the share of intertemporal liabilities in intertemporal economic resources. It is the change in the primary balance (as a share of GDP) in each future period that would ensure repayment of past debt.

Obviously this synthetic indicator does not say anything as to the timing of the actual policy adjustments as the effects of demographic changes on primary balances gradually develop. In fact generational accounting, like many studies of age-related budget dynamics, does not attempt at an accurate description of future developments. The purpose is rather to make a statement on current fiscal parameters. This leads to the adoption of a constant policy approach. Effects of future changes in behaviors or policies in response to a changing demographic environment are not embodied in the prediction of primary imbalances. Generally the mechanistic forecasting scheme given by (3) is only modified to incorporate two factors that are consistent with the constant policy perspective: (a) the continuation of structural trends not related to demography, e.g., per capita health expenditure growing at a faster rate than real GDP, and (b) the effects of changes already introduced in legislation, but not yet showing up in current payment levels. This in particular concerns the results of pension reforms which are often slowly unfold.[5]

However, considering that $S_{t_0} = \sum_{j=0}^{J} P_{jt_0} \tau_{jt_0}$ it is obvious that constant growth updating according to (3) not only perpetuates initial fiscal policy parameters, but also

[5] In this case we incorporate particularities of the Spanish pensions system. In particular the maturing of the system and the inflation adjustment of non entry pensions is considered.

the initial economic conditions, to the extent that primary imbalances, for constant fiscal policy, vary over the business cycle.

In fact, one of the main limitations of the GA sustainability indicators is that it tend to perpetuate the initial business cycle conditions reflected both in S and in τ above. This aspect is important for a correct interpretation of generational accounts. In general, government tax revenue increases and transfer spending falls during a boom, whereas the opposite happens during a recession. Accordingly life-time net tax burdens measured by the generational accounts and the sustainability gap develop pro-cyclically. As a consequence, fiscal policy might appear more or less sustainable, depending just on the macroeconomic stance in the base period of the projection. There are different solutions to avoid business-cycle bias in the generational accounts. A first approach would be to take a period which average utilization of economic capacity as the starting point for the calculations. This idea has not yet been applied by generational accountants, who are generally aiming at evaluation of contemporaneous fiscal policy, which might be different from that in the period that was neutral with respect to the economic cycle. Another option applied by Feist et al. (1999) to Finland, consist of departing from the contemporaneous government budget as a starting point, but making discrete adjustments during the forecast that design a return to what is considered a cyclically neutral state. The typically ad hoc nature of the required assumptions on the transition could be a serious point of criticism against this approach. In this paper we propose a more systematic procedure, which could be also directed to international comparisons as relays in a previous adjustment of the initial budget according to a homogenous procedure, like the CABB method developed by the European Commission. As we will se later, this procedure permits to disentangle the change in sustainability measured by GA not only in the cyclical effect but also in another two effects that might hidden the pure policy effect: a demographic and policy effect.

2.2. Eliminating the cyclical component in budged balances

As said in the introduction the need to evaluate the sensitivity of public budget to the business cycle has motivated the apparition of several techniques. The different approaches mainly differ according to the way to identify the cycle in economic activity and the sensitivity of budget items to the cycle (Noord, 2000). The main issue is nevertheless the first, as the measurement of potential output (or trend output) and hence of output gap, will affect the measurement of the sensitivity of budget aggregates to economic activity.

Two main options arise. On the one hand, according to the mechanical approach, the so-called *trend* long run level of output is directly extracted from observed output data using econometric smoothing devices like Hodrick-Prescott filters. Having an important technical drawback –the end point bias–[6] this method has the advantage of being transparent and hence it is makes possible establishing non arbitrary standard comparable methods, necessary in the context of policy agreements like the GSP. On the other hand a more theory based approach (the production function approach) uses the elements of the production function in order to measure long run level of output, called now *potential output*. The improvement in micro foundations has the drawback of increasing the arbitrariness in the decisions of key variables like the structural unemployment rate, the rate of technological change, the way it affects to productive factors, etc.

The European Commission started using a HP filter, while gradually has moved towards a production function approach.[7] Nevertheless there are still some countries for which the HP filter has been estimated due to a lack of data. In particular the EC method estimates the potential output based on a Cobb-Douglas production function, were the inputs are the capital stock and potential labour. The latter is estimated combining data on the working age population; a measure of trend total factor productivity trend labour force obtained throw the HP filter; and the NAIRU unemployment rate, derived form a Kalmar filter Phillips curve approach.[8]

[6] The output gap in underestimated for the last observations.

[7] The EC, the OCDE use a broadly similar approach. See EC (2002b) for a comparison of results. The Commission method is described in EC (2002a, 2003a,) and EC (2001, 2, 3b). Results are shown in both publications while the later gives a general overview of the state of public finances in the EMU in the context of the Stability Growth Pact.

[8] See EC (2002b) for details.

Once the output gap and the structural level of unemployment are estimated the second step consist of determining the sensitivity of revenues, expenditures and the resulting budget to the cycle. To that effect the elasticities of budget components are estimated from past data and used to obtain the future aggregates. In particular, in the last updating of those estimates, Girouard and André (2005) [9] obtain the adjusted tax (T_t^*) or expenditure (G_t^*) as

$$\frac{T_{i,t}^*}{T_{i,t}} = \left[\frac{Y_{i,t}^*}{Y_{i,t}}\right]^{\varepsilon_{t_i y}} \tag{4}$$

$$\frac{G_{i,t}^*}{G_{i,t}} = \left[\frac{U_{i,t}^*}{U_{i,t}}\right]^{\varepsilon_{g,u}} \tag{5}$$

being Y_t the observed and Y_t^* the potential output; U_t and U_t^* actual and structural unemployment; $\varepsilon_{t_i,y}$ the elasticity of the *i* th tax category with respect to the output gap; and $\varepsilon_{g,u}$ the elasticity of current primary expenditure with respect to the ratio of structural to actual unemployment.[10] From the expenditure side only unemployment expenditure is considered to be affected by the cycle, while from the revenue side, personal and corporate income tax, indirect taxation and social security contributions are included. Once elasticities are estimated the CABB, S_t^*, can be estimated for the base year or any future year.

The EC employs an average revenue and expenditure elasticity calculated from the values estimated by OECD. In our case it is interesting to keep the aggregates as desegregated as possible in order to be able to predict the different demographic dependency of each of them. Hence we employ the disaggregated elasticity. In particular,

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[9] This is the method employed by the OECD Secretariat. Other ways of estimating the sensitivity of budget items to the cycle are first introducing control variables in the regression analysis in order to control for discretionary changes in policy. In a different setting it is possible to develop standard-shock simulations in calibrated macro-econometric models. The previous updating was Van der Noord (2000), who obtains those elasticities in order to evaluate the size of automatic stabilizers, and Giorno *et al.* (1995).

[10] In the last updating (Girouard and André, 2005) those elasticities are simplified, being separated only in two components: elasticity of the tax proceeds with respect tot eh tax base –which depends on the structure of the tax system– and the elasticity of the tax base with respect to the cyclical indicator, which is estimated from time series data. The previous updating

the following table shows the values estimated for Spain in comparison to the rest of the countries.

	Corporate Tax	Personal Tax	Indirect taxes	Social security contributions	Current expenditure	Total balance
Spain	1.15	1.92	1.00	0.68	-0.15	0.44
OECD Average	1.50	1.26	1.00	0.71	-0.10	0.44
Euro area	1.43	1.48	1.00	0.74	-0.11	0.48
New EU members	1.38	1.15	1.00	0.71	-0.06	0.42

In the Spanish case, the value of -0.15 for the current expenditure corresponds to a value of -3.3 for the unemployment expenditure.

2.3. Decomposing changes in fiscal sustainability

So far, using the procedure explained above we eliminate from τ , and hence *S*, the cyclical component, obtaining cyclically net taxes and budget balance $\tau *$ and *S**. Hence, if we rewrite equation (1) replacing *S* by *S** we can in compute cyclically neutral generational accounting, obtaining the SG from,

(6) $$D_{t_0} = \sum_{t=t_0}^{\infty} S_t^* (1+r)^{t_0 - t} + SG_{t_0} ,$$

Nevertheless, the resulting series of sustainability indicators are not yet enough informative about the evolution of sustainability along the period. If we were to start our generational accounting exercise one year later, we would estimate equation (7), which is equation (6) delayed one year and considering that $D_{t_0+1} = D_{t_0} - S_{t_0}$

(7) $$D_{t_0+1} = \sum_{t=t_0+1}^{\infty} S_t^* (1+r)^{t_0+1-t} + SG_{t_0+1} ,$$

Being infinite the last period considered postponing a year the calculations should in principle not affect results by a big amount. Nevertheless, in practise there are some issues that should be taken into account.

Fist the *debt effect*. In principle the difference between D_{t_0+1} and D_{t_0} should be just S_{t_0} , as one can check by rearranging (6) and subtracting (7) from (6). Nevertheless, debt is usually affected by some other factors besides the current budget balance, like valuations changes, variation in public assets, etc. Hence, when measuring sustainability from a different base year, a wealth effect can be hiding the policy changes.

Second a *discounting effect* usually present in any GA computations arises, as long as the starting year changes. In principle the implicit debt –the sustainability gap– measured by equation (6) and (7) is the same except for the effect of discounting. The discounting reduces the relevance of future positive of negative monetary flows. In this case we expect positive primary surplus for some years but eventually, when the ageing process starts pushing public finances, the primary surplus will fall below zero. As long as our base year approaches this time period the sustainability gap is measured to be bigger. The discounting effect is very small for a single year and its relevance is even reduced by using a synthetic indicators like kappa, but this effect will be higher, the longer the series of GA indicators. We will avoid this discounting effect by comparing sustainability indicators obtained using the same base year as explained below.

Finally in order to obtain the pure policy effect, we need to tackle with what we could call the *demographic effect*. As suggested by equation (2) the primary surplus in each year depends not only on policy –reflected in net tax payments, $\tau*$– but also on the population structure of the base year. Hence when we change the baseyear, the corresponding change in the sustainability index might be over or understating the policy adjustment due to a changes in the age structure of population. We can illustrate it by further inspecting equations (6) and (7).

Previously, we rewrite (2) as (2')

(2') $$S_t = \sum_{j=0}^{J} P_{jt}\tau^*_{jt} = \mathrm{P}_t\mathrm{T}^*_t$$

where P_t and T^*_t are, respectively, the population vector and the cyclically adjusted net tax vector for year *t*. And using (2') we rewrite equation (6) as (6') and (7) as (7'). To simplify the discussion we assume that there is no discounting ($r = 0$) and that there is no growth updating of tax payments ($g = 0$) so that T once it is rescaled to observed aggregates it stays constant. Then we obtain

(6’) $$D_{t_0} = \mathrm{P}_{t_0}\mathrm{T}_{t_0} + \mathrm{P}_{t_0+1}\mathrm{T}_{t_0} + \sum_{t=t_0+2}^{\infty}\mathrm{P}_t\mathrm{T}^*_{t_0} + SG_{t_0},$$

and

(7’) $$D_{t_0+1} = \mathrm{P}_{t_0+1}\mathrm{T}_{t_0+1} + \sum_{t=t_0+2}^{\infty}\mathrm{P}_t\mathrm{T}^*_{t_0+1} + SG_{t_0+1}$$

Comparing those two equations we can observe that the difference between he SG measure in t_0 (SG_{t_0+1}) and t_0+1 (SG_{t_0+1}), involves different effects. First the abovementioned wealth effect –as long as there are windfall gains or loses, and the following equality does not hold $\left(D_{t_0+1} = D_{t_0} + \mathrm{P}_{t_0}\mathrm{T}_{t_0}\right)$. Second the change in taxes which is nevertheless a mixture of a pure policy change –change in τ – and what we call the demographic effect, due to the fact that net tax payments are initially weighted using a different population vector.

In the following we propose a procedure to measure all the abovementioned effects in order to disentangle these from the pure policy change hidden in the evolution of the GA sustainability indicators.

We proceed in the following steps. First we subtract the evolution of the SG obtained from equation (1) with the evolution of the change in cyclically neutral SG – estimation of equation (6)–, to obtain the cyclical effect. Second we estimate the series of SG that come from equation (8), which is equation (7) replacing D_{t_0+1} by D_{t_0} .

(8) $$D_{t_0} = \sum_{t=t_0+1}^{\infty} S^*_t (1+r)^{t_0+1-t} + SG_{t_0+1} ,$$

Then subtracting those estimates from those obtained from equation (6) we isolate the wealth effect for each year.

Finally we estimate the following equation

(9) $$D_{t_0} = \sum_{t=t_0+1}^{\infty}\sum_{j=0}^{J} P_{j,t_0}\tau_{j,t_0+1}(1+r)^{t_0+1-t} + SG_{t_0+1},$$

obtained by plugging a modified (2) – the surplus for given year is obtained combining the tax profiles from the same year with the population structure of the previous year – into (8). This last series of estimates allows us to obtain the demographic effect for each year as the difference between the value of the SG obtained from (8) and the value obtained from (9).

We are now ready to obtain the pure policy effect as a residual, by subtracting all the isolated effects from the total effect. Nevertheless, we can also obtain the pure policy effect by using the last series of SG. Note that along the procedure we have eliminated successively the cyclical effect (equation 6), the debt effect (equation 8) and finally the demographic effect (equation 9). Hence, we can compute the change in the SG between two subsequent years by subtracting the value of this last series –which contains only the policy effect– from the cyclically neutral SG estimated from equation (6).

In the following section we show an illustration of this disentangling procedure applied to the Spanish case for the period 1996-2004.

3. Application: A time-series of GA results for Spain

In this section we apply the methodology explained above to the Spanish case. In the first subsection we summarize the data needed for the calculations and in the second subsection we present the results.

3.1 Baseline assumptions and data

The computation of the sustainability gap requires a very long-term demographic forecast, to determine future cohort size, projections of per capita tax payments and transfers receipts by age and gender and aggregate figures for those categories. Our projections start from year 1996 while aggregates are updated up to 2004.

Given that our time horizon exceeds the usually adopted by official population projections we extend it for a longer period by setting the same assumptions using the usual component method.[11] We depart from historical demographic levels of individual mortality and fertility, and then broadly follow the demographic hypotheses adopted by

[11] The usual component method is employed. In particular, the discrete and deterministic algebraic formulation proposed by Leslie (1945) is extended to distinguish between ganders and to incorporate migration.

INE (2005). More specifically, population projections account for a –progressively decelerating– increase in individual survival probabilities until 2050. By then, according to recent evidence, life-expectancy at birth will have increased by about five years, reaching 81 years and 87 years for males and females respectively. Total fertility is assumed to recover linearly from the very low 2000 rate of 1.14 to a level of 1.5264 by 2021, and to remain constant thereafter. Immigration is assumed to decrease gradually, from the initial observed levels to 260.000 in 2060. Our demographic projections predict that old-age dependency – defined as the number of persons aged 65 and above as a share of persons aged 20 to 64 – will jump from below 25% in 1996 to a maximum of nearly 62% by 2050. In the long term, as fertility rates remain below replacement level and life-expectancy increases, the dependency ratio converges towards 52%, twice its current value.

One of the most critical parts of generational accounting concerns the construction of profiles describing how fiscal legislation assigns individual claims and liabilities against the public sector to specific age groups. In Appendix 1 the data sources employed in obtaining the age profiles are detailed. Finally the aggregates are obtained form IGAE (1998-2003) and are reclassified in order to correspond to the available microeconomic profiles. Table 1 shows the aggregates for the periods taken in the analysis.

3.2. Results

a) The effects of the business cycle on sustainability:

In Figure 1 the evolution of kappa for each subsequent year is reported showing a substantial variation over a relatively short period. The value of this sustainability index starts being 3.69 in 1996 and falls down almost monotonically to 1.96 in 1999. From then on it is increasing again reaching a final value of 4.26 in 2004. This extreme variation illustrates the main concern of this paper: the value of the Generational accounting sustainability indicators are, indeed, very sensitive to the business cycle. Furthermore, this variation seems to be strongly correlated to the output gap estimated through the EC method, as shown in Figure 1 in levels and Figure 2 in variations.

By contrast, the value of kappa once the budget balance is cyclically adjusted varies to a lesser extent as it can be seen in Figure 3 –in levels– and Figure 4 –in changes. Interestingly for the period 1997-98 the change in sustainability has a different sign before and after correcting for the cycle. Hence, the first conclusion of our analysis is that the cyclical adjustment matters. But in the following we will show that there are other factors influencing the change in the sustainability indicators produced by GA.

b) What determines the change in sustainability?

Figure 4 shows the change in kappa before and after the cycle correction. In the following we take the later and apply the decomposition process explained above to separate the pure policy effect and other effects.

Table 1 shows the complete results for two sustainability indicators: kappa and SG. In the first two columns of panel a), the value of the sustainability indicator –either kappa of SG– is shown before and after the cycle correction, i.e. estimating equation (1) and (6). The next two columns show the series of sustainability indicators obtained estimating equation (8) –when previous debt is used–, and from equation (9) –when both previous debt and previous population–.

Below, in panel b) the effect decomposition is shown. First column 1 computes the cycle effect as the difference between the change in sustainability before and after cycle correction. Second the wealth effect is computed subtracting column 3 from 2. Third, the demographic effect is calculated as the difference between column 3 and 4. As said above the policy effects can be obtained as a residual. But it can be also obtained subtracting from column (4), the sustainability indicator in column (2) for the previous year, as both are free of cycle effects and contain the same population and wealth figures. As said above, we avoid the discounting effect by comparing sustainability indicators obtained using the same base year.

It is interesting to note that results obtained for each indicator are fairly similar though sizable differences remain. In fact there should be a difference as long as kappa considers not only the effect on the SG –a measure of the total amount of intertemporal implicit debt in present value on the base year– but it relates this figure to a measure of future earnings capacity –the sum of the present value of future GPD. The cycle correction affects both figures in the same direction (reduces them in an expansion and increases then in a recession) affecting twice the kappa ratio, which, consequently, varies to a greater extent.

Regarding the cycle effect, by comparing column 5 in pane b) for both indicators, we can see first that the impact of cycle neutralization –the perceptual change in the indicator– is higher in the case of kappa. Second, the sign of the change evolves as expected: while the output gap is improving from -3.3 in 1996, to +2.2 in 2000, the cycle effect is negative (sustainability improves) in both indicators; similarly while the output gap is worsening from +2.2 in 2001 to -0.5 in 2004, the cycle effect is positive (sustainability is worsening). Only in period 2000-2001 when the output gap stays constant at +2.2 the sign is not the same, due to the difference in the two indicators.

With respect the wealth effect we can see –in both indicators that there has been a positive windfall gain for all the periods except for the last one. Obviously, the size of the effect obeys to the scale of the indicator. In this case the measure given by the sustainability gap is a direct measure as it gives the absolute amount in present value terms of the base year, while the value given by kappa relates this one and for all windfall gain, to the intertemporal earning capacity of the economy.

Results differ quite a lot in the case of the demographic effect, although it is relatively small. Interestingly even the sign is the opposite in most periods. The reason seems to be that the SG is capturing the long term effects of approaching an older population.[12] Note the value of the wealth effect increases monotonically along the period. On the contrary kappa gives positive effect –an improvement in sustainability– in five periods more. The reason is that the denominator captures the short term positive effects of the huge entry of immigrants during this period.

Finally the policy effect gives similar values and the same direction for both indicators, showing the robustness of the decomposition process. Overall the cyclical and the policy effect show to be the most important. Figure 5 shows the size and direction of those effects. Note that from the initial evolution of kappa, strongly correlated with output gap – Figure 1– we have eliminated the cycle effect obtaining only two periods of improvement –1996-7 and 1998-9 in Figure 4. In Figure 5 we show again the change in cyclically neutral kappa, together with the pure policy effect obtained through the decomposition. Along the expansive phase of the business cycle, while the output gap is improving, we find the only two episodes of policy improvement, period 1996-7 and 1998-9. Policy shows to worsen in the rest of periods, especially in 1997-8, 1999-2000

[12] Although we are always considering the same demographic scenario –it does not make much sense to change demographic scenarios by delaying the base year one year– the fact of starting one year latter affects the calculations as seen in section 2.3.

and 2003-4. This contrast the general perception, that Spain is an outstanding example of the fiscal consolidation process in the EU.

Several authors have stressed the importance of this process. The explaining factors quoted are several. First an exogenous factor clearly shown in Table 1, the sharp decrease in interest payments. Second, government consumption contention plays an imporant role: between 1995 and 1997 public expenditure fell by 3.2% of GDP being responsible of 75% reduction in deficit. On the one hand there was an expenditure cut concentrated in specific budget figures. In particular the civil servants wages decreased from 11.3% to 10.4% of GDP from 1996 to 2001 (Mulas, Onrubia y Salinas, 2004). On the other a bunch of legal and institutional budgetary discipline measures were implemented in order to control increase in government expenditure[13]. The success of those measures in changing the budgetary model was probably reinforced by the so-called Maastricht effect (González-Páramo, 2001).[14]

Third, on the revenue side, a direct taxation reform directed to increase disposable income was instrumented affecting 1999 revenues. Nevertheless, as can be seen in Table 1, the resulting change in indirect tax revenue produced a slight increase in fiscal pressure over all.[15] Undoubtedly, the increase in government tax revenues due to the expansive phase of the business cycle has helped in this process. Furthermore in 1996 a privatization program started leading to a partial or total sell of 36 public companies. Although the SEC95 EU accounting rules do not allow including those revenues in the deficit figure, it is clear that public debt can be reduced implying a reduction in interest payments in the following periods.

Our results mitigate that optimistic view, despite observed improvements in some budget aggregates. By looking at Table 1, we can se the evolution of the budget figures in terms of GDP, along the period. Some positive tendencies are the following: Unemployment expenditures decrease substantially along the period, though increase slightly in 2001, 2003 and 2004. Total revenue increases in all the periods except in

[13] Among those measures we could find the 11/1996 Act (*Ley de Medidas de Disciplina Presupuestaria* 27-12-1996).

[14] De Castro, González-Páramo and Hernández de Cos (2004) perform an analysis of the dynamic relationship between public revenues and expenditure. Their results support the hypothesis that in recent years there has been a change in dynamic relationship between both variables probably as a result of the fiscal consolidation process.

[15] Later, from 1999 on, as inflation was not corrected in the income tax structure, the share of this revenues in GDP continued increasing or kept constant despite the slowdown in the business cycle (Mulas, Onrubia y Salinas, 2004).

2000 and from 2002 to 2004. Total age related expenditure decreases except for the period 2002 and 2004 mostly due the fall in unemployment expenditures and to the decrease in pension expenditure until 2003. On the contrary non-age-related expenditures increase along the period.

Overall, the cyclically adjusted budget balance shows no decreasing tendency but an erratic evolution. Interestingly, the first two upward picks in 1997 and 1999 coincide with the two positive policy effects. Nevertheless the last pick in 2003 does not imply a positive policy effect, probably due to the increase in age related expenditures like contributory pensions. This tendency also explains that in period 2000 to 2003 the cyclically adjusted budget balance and the corresponding kappa evolve in opposite directions, showing the advantages of combining short run cyclically neutral measures of fiscal sustainability with long run indicators as we do here. That the initial effort driven by the Maastricht effect might explain the positive policy effect in 1997 and 1999, while the strong negative policy effect in 2004 is clearly driven by the increase and pensions expenditure in the last year which indeed has long term impacts.

Summarising, it seems that the main job in consolidation process is done by the improvement of the interest payments that fall constantly from 5.34% in 1996 to 2.05% of GDP in 2004 (See Table 1). On the other hand it is true that things could have gone a lot worse and, at least, Spain has not wasted the expansive phase of the business cycle and has done some effort directed to fiscal consolidation. Nevertheless the strict policy effort seems to be a lot smaller that expected.

4. Conclusions

Generational accounting has become a widespread applied technique, especially well suited to evaluate the effects of demographic ageing on intertemporal fiscal sustainability. One of the main drawbacks of this technique is the sensitivity of the sustainability indicators obtained with respect to the business cycle.

In this paper we propose a methodological modification in Generational accounting to overcome this limitation. We show first that the cycle correction matter in accounting for changes in sustainability. Second it is proven that, besides the cyclical effect the demographic and the wealth effect should be isolated in order to extract the pure policy effect.

The method is illustrated using data for the Spanish case. We show that the actual fiscal consolidation process in Spain is very limited. The main driving force of this seems to be the decrease in interest payments. Furthermore, our exercise shows an overall decrease in sustainability along the period, despite a positive wealth effect and two episodes of policy tightening, reflected in a high primary surplus. The responsible seem to be the negative demographic effect as long a s the ageing process is approaching and the increase in expenditures –specially contributory pensions– that worsens the sustainability perspectives in 2004, even though the primary surplus is above the initial level.

Table 1 Budget aggregates years 1996-2004 (% GDP)

a) Current aggregates

Taxes/Year	**1,996**	**1,997**	**1,998**	**1,999**	**2,000**	**2,001**	**2,002**	**2,003**	**2,004**
Vat Tax	4.92	5.04	5.23	5.73	5.68	5.51	5.57	5.75	5.96
Personal Income Tax	7.26	7.40	7.17	6.71	6.47	6.64	6.66	6.48	6.50
Social Security Contributions	12.23	12.20	12.14	12.21	12.03	12.18	12.15	12.23	12.20
Excise Taxes	2.82	2.92	3.08	3.08	2.79	2.66	2.58	2.52	2.61
Capital Income Tax and Other Taxes	3.75	3.82	3.78	4.18	4.30	4.02	4.38	4.29	4.65
Total Age Specific Revenue	**30.98**	**31.38**	**31.41**	**31.91**	**31.27**	**31.02**	**31.34**	**31.28**	**31.92**
Transfers									
Contributory Pensions	9.89	9.74	9.54	9.32	9.10	8.81	8.74	8.64	9.14
Non Contributory Pensions	0.31	0.33	0.34	0.29	0.28	0.26	0.25	0.24	0.23
Unemployment and Temporary Incapacity	2.81	2.49	2.17	2.02	1.92	1.98	2.11	2.10	2.15
Health Expenditure	5.53	5.44	5.42	5.43	5.18	5.18	5.21	5.29	5.29
Family and Long Term Care	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Educational Expenditure	4.72	4.61	4.55	4.54	4.35	4.30	4.31	4.35	4.41
Total Age Specific Expenditure	**24.09**	**23.43**	**22.85**	**22.42**	**21.66**	**21.36**	**21.45**	**21.44**	**22.05**
Non Age Specific Net Expenditure	6.50	6.37	6.84	7.02	7.26	7.12	7.47	7.51	7.97
Primary Balance	**0.40**	**1.58**	**1.73**	**2.47**	**2.35**	**2.54**	**2.42**	**2.33**	**1.91**
Interest Payments	5.34	4.75	4.28	3.54	3.22	3.03	2.69	2.35	2.05
Current Balance	**-4.95**	**-3.17**	**-2.56**	**-1.07**	**-0.87**	**-0.50**	**-0.27**	**-0.03**	**-0.14**
Initial –past year- Debt	**60.41**	**64.10**	**62.34**	**60.30**	**56.60**	**54.94**	**51.82**	**49.09**	**45.57**
Output Gap	-3.3	-2.2	-0.8	0.7	2.2	2.2	1.1	0.2	-0.5
Cyclically Adj Primary Balance	1.57	2.34	2.00	2.23	1.63	1.82	2.06	2.26	2.08

b) Cyclically neutral aggregates (% cyclically neutral GDP)

Taxes/Year	**1,996**	**1,997**	**1,998**	**1,999**	**2,000**	**2,001**	**2,002**	**2,003**	**2,004**
Vat Tax	4.92	5.04	5.23	5.73	5.68	5.51	5.57	5.75	5.96
Personal Income Tax	7.49	7.56	7.23	6.67	6.34	6.51	6.60	6.47	6.53
Social Security Contributions	12.10	12.11	12.11	12.24	12.12	12.27	12.19	12.24	12.18
Excise Taxes	2.82	2.92	3.08	3.08	2.79	2.66	2.58	2.52	2.61
Capital Income Tax and Other Taxes	3.74	3.81	3.78	4.19	4.30	4.03	4.39	4.29	4.65
Total Age Specific Revenue	**31.07**	**31.44**	**31.43**	**31.90**	**31.23**	**30.98**	**31.32**	**31.28**	**31.93**
Transfers									
Contributory Pensions	9.56	9.52	9.47	9.38	9.30	9.00	8.84	8.66	9.10
Non Contributory Pensions	0.30	0.32	0.34	0.29	0.28	0.27	0.25	0.24	0.22
Unemployment and Temporary Incapacity	2.64	2.38	2.14	2.05	2.01	2.08	2.15	2.11	2.13
Health Expenditure	5.35	5.32	5.38	5.46	5.30	5.29	5.26	5.30	5.26
Family and Long Term Care	0.80	0.81	0.82	0.84	0.85	0.85	0.84	0.83	0.83
Educational Expenditure	4.57	4.51	4.51	4.58	4.44	4.39	4.36	4.36	4.39
Total Age Specific Expenditure	**23.22**	**22.87**	**22.65**	**22.59**	**22.18**	**21.88**	**21.71**	**21.49**	**21.92**
Non Age Specific Net Expenditure	6.28	6.23	6.78	7.07	7.42	7.28	7.56	7.53	7.93
Primary Balance	**0.40**	**1.58**	**1.73**	**2.47**	**2.35**	**2.54**	**2.42**	**2.33**	**1.91**
Interest Payments	5.34	4.75	4.28	3.54	3.22	3.03	2.69	2.35	2.05
Current Balance	**-4.95**	**-3.17**	**-2.56**	**-1.07**	**-0.87**	**-0.50**	**-0.27**	**-0.03**	**-0.14**
Initial –past year- Debt	**60.41**	**64.10**	**62.34**	**60.30**	**56.60**	**54.94**	**51.82**	**49.09**	**45.57**
Output Gap	-3.3	-2.2	-0.8	0.7	2.2	2.2	1.1	0.2	-0.5
Cyclically Adj Primary Balance	1.57	2.34	2.00	2.23	1.63	1.82	2.06	2.26	2.08

Table 2. Decomposition of Changes in fiscal sustainability indicator (kappa)

1. Kappa

a) series of sustainability indicators

	1. (Eq 1) Current budget	2. (Eq 6) Cyclically neutral (CN)	3. (Eq 8) CN previous debt	4. (eq 9) CN previous debt and population
1996	3.68938	2.22908		
1997	2.65045	1.69844	1.53564	1.51954
1998	2.64632	2.3068	2.25293	2.25829
1999	1.96023	2.25007	2.20052	2.19494
2000	2.1623	3.05187	2.98921	3.09149
2001	2.36249	3.22906	3.16545	3.21463
2002	2.82654	3.26221	3.24658	3.30749
2003	3.30418	3.38222	3.36353	3.42602
2004	4.26339	4.06272	4.06804	4.14943

b) Isolating the policy effect

	Δ1-Δ 2 Cyclical Effect	2-3 Wealth Effect	3-4 Demographic Effect	Policy Effect	Δ1 Total Effect
1997	-0.50829	0.1628	0.0161	-0.70954	-1.03893
1998	-0.61249	0.05387	-0.00536	0.55985	-0.00413
1999	-0.62936	0.04955	0.00558	-0.11186	-0.68609
2000	-0.59973	0.06266	-0.10228	0.84142	0.20207
2001	0.023	0.06361	-0.04918	0.16276	0.20019
2002	0.4309	0.01563	-0.06091	0.07843	0.46405
2003	0.35763	0.01869	-0.06249	0.16381	0.47764
2004	0.27871	-0.00532	-0.08139	0.76721	0.95921

2. Sustainability Gap

a) series of sustainability indicators

	1. (Eq 1) Current budget	2. (Eq 6) Cyclically neutral (CN)	3. (Eq 8) CN previous debt	4. (eq 9) CN previous debt and population
1996	770,443	481,378		
1997	577,732	378,545	342,261	328,150
1998	605,230	531,835	519,416	503,324
1999	469,269	534,910	523,130	506,047
2000	557,853	770,403	754,587	734,941
2001	634,668	848,792	832,069	811,491
2002	786,437	897,779	893,477	869,407
2003	955,281	975,891	970,500	942,861
2004	1,283,240	1,228,986	1,230,596	1,197,260

b) Isolating the policy effect

	Δ1-Δ 2 Cyclical Effect	2-3 Wealth Effect	3-4 Demographic Effect	Policy Effect	Δ1 Total Effect
1997	-89,878	36,284	14,111	-153,228	-192,711
1998	-125,792	12,419	16,092	124,779	27,498
1999	-139,036	11,780	17,083	-25,788	-135,961
2000	-146,909	15,816	19,646	200,031	88,584
2001	-1,574	16,723	20,578	41,088	76,815
2002	102,782	4,302	24,070	20,615	151,769
2003	90,732	5,391	27,639	45,082	168,844
2004	74,864	-1,610	33,336	221,369	327,959

Figure 1. Standard Generational Accounting Indicator and Output Gap

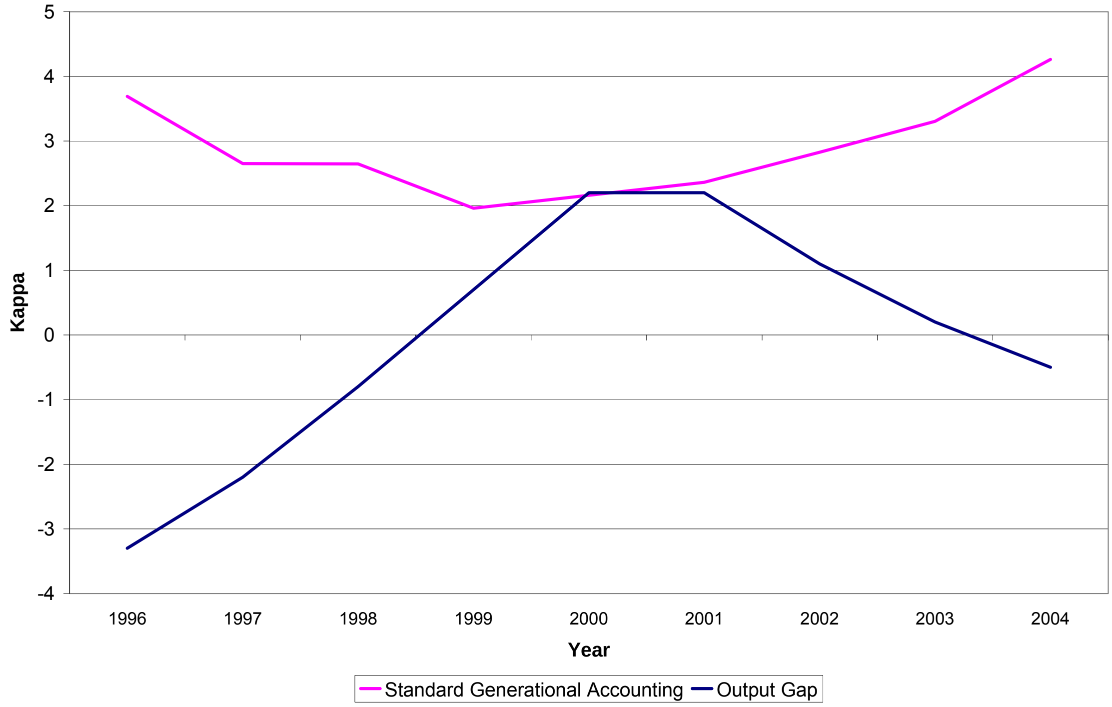


Figure 2. Standard Generational Accounting Indicator and Output Gap (Differences)

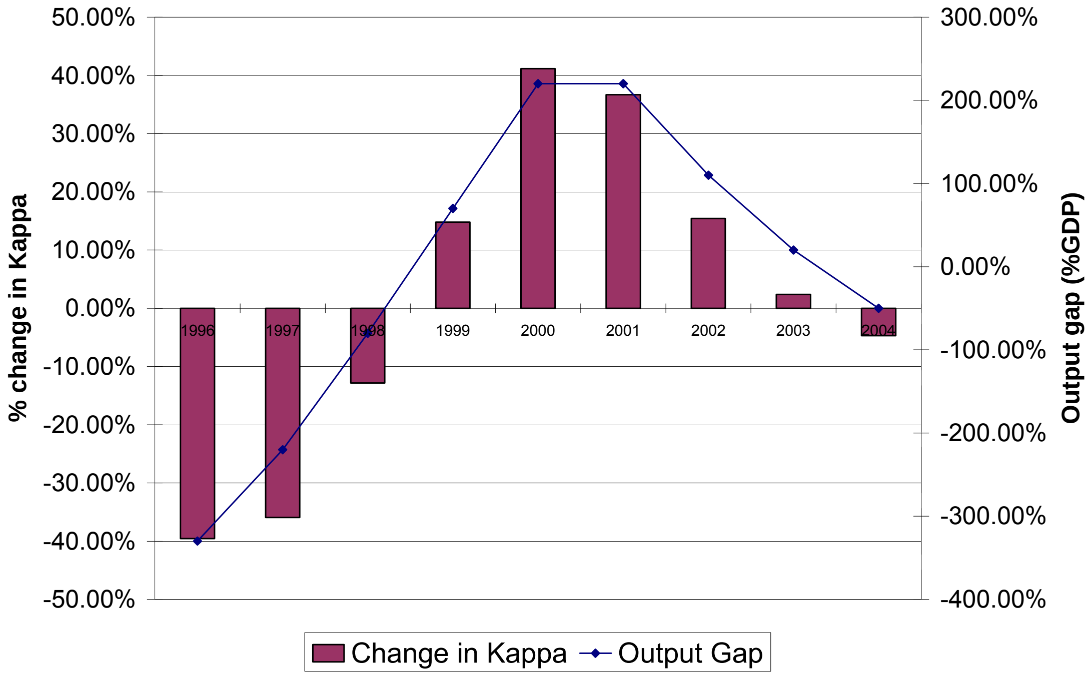


Figure 3. Standard vs. cyclically neutral Generational Accounting

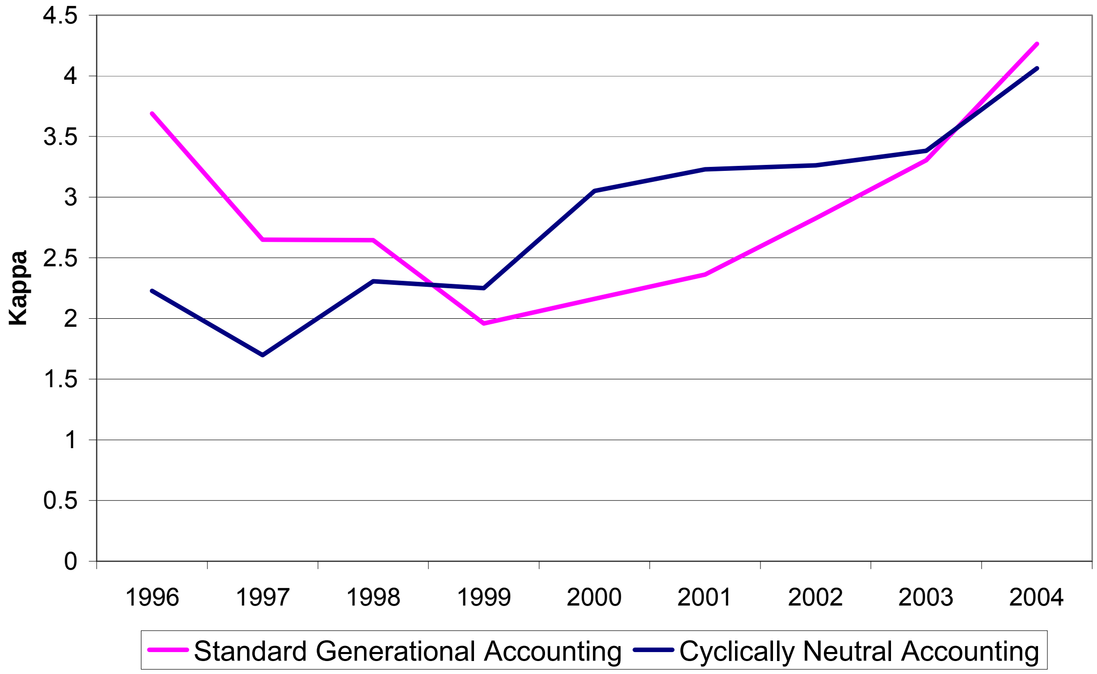


Figure 4. Standard vs. cyclically neutral Generational Accounting (Differences)

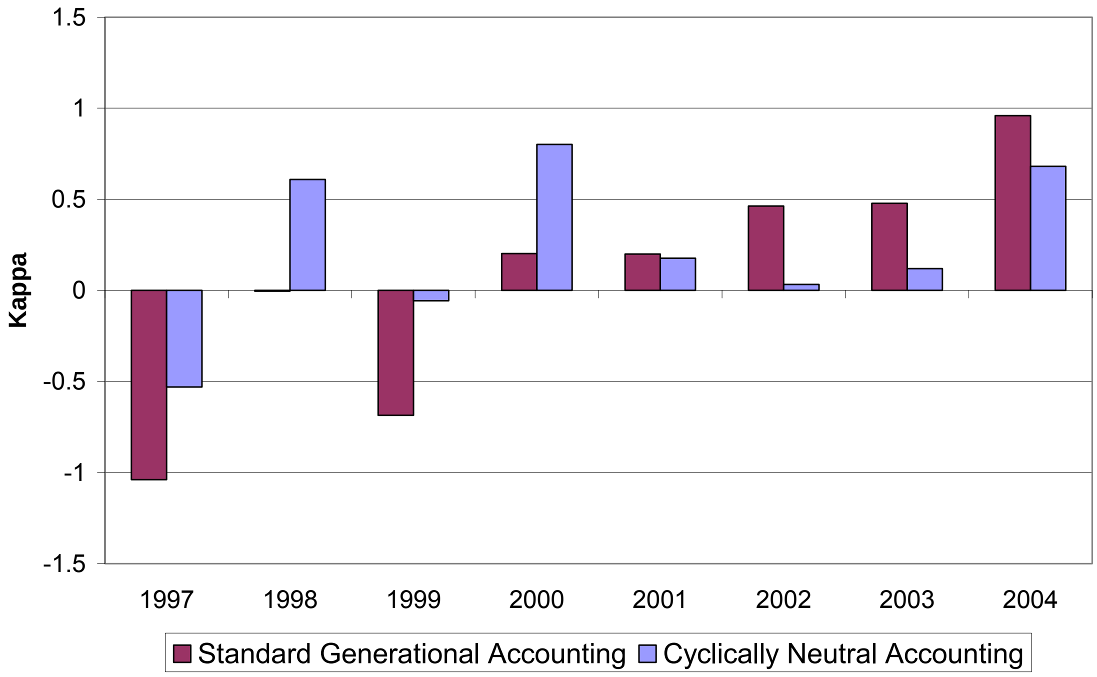
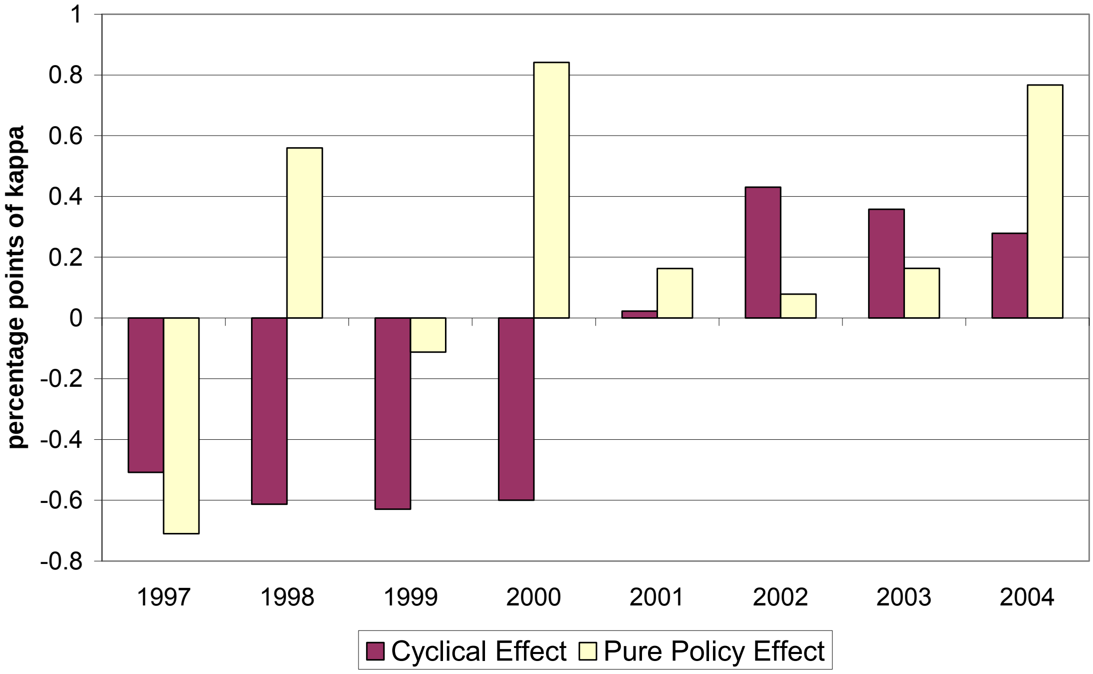


Figure 5. Decomposition of Changes in Fiscal Sustainability Indicator



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