

University of Tartu
Faculty of Economics and Business Administration

**GENERATIONAL
ACCOUNTING AS A TOOL
TO EVALUATE THE FISCAL
SUSTAINABILITY OF
ESTONIA**

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Tartu 2010

ISSN-L 1406-5967
ISSN 1736-8995
ISBN 978-9985-4-0614-4
The University of Tartu FEBA
www.mtk.ut.ee/research/workingpapers

Generational Accounting as a Tool to Evaluate the Fiscal Sustainability of Estonia

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Abstract

Generational accounting is a relatively recent methodology that measures the fiscal burden government policies impose on future generations. Comparing the fiscal burden of future generations to the burden levied on current newborns yields the generational imbalance. Micro data from the Household Budget Survey is combined with data from the national accounts to construct the generational accounts for current and future generations. The results show that as expected there was a relatively mild intergenerational imbalance (64%) in Estonia in 2009. The generational accounts are sensitive to growth forecasts, while population forecasts seem to be of less influence. To achieve intergenerational balance, an imminent and sustained tax rise to increase tax revenue by 9% should be enforced. Alternatively, the indexing of pensions could be made less generous or government net collective expenditures should be cut by approximately 23%.

JEL Classification: H61, H62, H63, H68

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1. INTRODUCTION

During the latest economic downturn, there has been greater emphasis on the solvency of sovereigns. The reasons for that lie in the high budget deficits most countries face due to the grave economic situation – in the European Union the average ratio of government deficit to GDP in 2009 equalled 6.8 per cent, which far exceeds the Maastricht reference value of 3 per cent (Eurostat News Release...2010).

The reasons for the higher deficits lie not only in the decreased revenues countries face, but also in increased expenditures due to various economic stimulus packages and financial sector bailout programs. Due to the nature of these programs, the negative effect on government debt is even larger than on the deficit² (Eurostat Report...2010).

In addition to the aggravation of fiscal positions due to the current economic situation, most developed countries also face an ageing population, which indicate sizeable deficits for the social security systems in the future if current fiscal policy is followed unchanged.

This implies that in order to remain solvent, fiscal policy has to change at some point in time. The nature of these possible changes does not affect the traditional measures of solvency – both raising taxes and decreasing transfers have a positive effect on fiscal balance. But when one considers whether government policy will treat generations born in the future equally to generations currently alive, those details ought to attract more attention.

The aim of this paper is to use generational accounting to evaluate the effects of Estonian fiscal policy on the intergenerational balance in Estonia. The generational accounting methodology allows us to distinguish the effects fiscal policy has on different

² Some of the financial aid countries provide is reported „under the line”, meaning that it is classified as financial transactions not affecting the net borrowing. Since countries often borrow the money in order to finance these operations, the government debt is still affected.

generations. In broad terms, fiscal policy achieves generational balance if it does not favour current generations to future generations or *vice versa* (Auerbach and Chun, 2006: 7). At the same time, the methodology can be used to assess individual fiscal policy decisions based on their effects on intergenerational equilibrium. Although Auerbach (1994) and Haveman (1994) have discussed the possibility of replacing all traditional fiscal indicators with ones derived from generational accounting, this is not considered as the best solution due to several problems (to be discussed later in the paper). However, generational accounting can be used as an additional tool to analyse the distributional effects of fiscal policy that have been less investigated so far. The study described in this paper was concluded during the first half of 2009 and can be considered as the first attempt to apply the methodology in Estonia. The paper is organised in five major chapters. The first chapter comprises an introduction to the study, covering the motivation for studies of fiscal sustainability and giving an overview of the successive chapters.

In the second chapter a critical assessment of the practical solutions used to measure and achieve fiscal sustainability is made using the fiscal rules of the European Union set as an example. Then the theoretical concept of long-term fiscal sustainability is defined and its relations to generational balance explained.

In the third chapter the methodology of generational accounting is studied in detail with additional emphasis on several problems that face a researcher during the process of compiling generational accounts. The solution to these problems is sought, invoking the analysis of previous empirical studies. In the third chapter, an overview of one of the most important theoretical issues in generational accounting is also given – a discussion of the distribution of taxes paid to the government and various benefits received in return over the lifetime of an individual.

Following that, an overview of the data and assumptions used to derive generational accounts for Estonia is described in the fourth chapter. Then the main results are presented and a sensitivity analysis of them is conducted. The author also provides a set of various strategies to reach generational balance in Estonia.

An outline of the results and discussion follows in the fifth chapter. Since the study attempted to measure the effects on the generational distribution of the fiscal policy as a whole, individual groups of expenditures and revenues are examined in less detail. This leaves ground for further research in this area.

2. FISCAL SUSTAINABILITY

The conventional way to measure fiscal sustainability – the analysis of government deficit and debt – are suitable for evaluating the current fiscal situation. The more recent application of the National Accounts framework and additional guidance manuals (i.e. European System of Accounts – ESA 95 and its supplement Manual of Government Deficit and Debt – MGDD) has rendered it possible to obtain internationally comparable data on deficit and debt.

However, there are a number of obstacles that make current deficit and debt less operative in the analysis of long-term sustainability. First, due to the exclusion of the most important government funded pension schemes from the national accounts, the national accounts framework does not account for future demographic changes. The government can always run a policy that enhances the current fiscal situation while affecting the future balances negatively. Even if this policy has a negative effect on long-term balance, it is often preferred when only short-term indicators are used to evaluate sustainability. Therefore, using only current indicators of fiscal sustainability, governments have an incentive to prefer current fiscal balance to long-term balance.

In the European Monetary Union the latter is often the case. The convergence thresholds set in order to assure fiscal prudence in the Excessive Deficit Protocol (EDP – an annex to the Maastricht Treaty) are 3% and 60% of GDP for deficit and debt respectively. While the choice of these precise numbers is more due to a

historical than economic rationale³, they seem to have brought along noteworthy fiscal consolidation in the EU. In the ten years following the Maastricht Treaty, the average ratio of public deficit to GDP in the Euro zone went from 5.5 to 1 per cent (Buti and Giudice, 2002: 6-7). All countries except for Greece managed to lower their deficit to fulfil the 3% criteria by 1997.

Although the initial effectiveness of Maastricht criteria seems to have been proven, there is some criticism toward the thresholds, mainly concerning their theoretical background (or the lack of it) and possible ill incentives they create for national governments. In order for the deficit reduction to have an overall positive effect on the economy, the policies used to reduce deficit have to satisfy three main criteria (Mereste, 2003: 132-133):

- The deficit is mainly reduced by cutting expenditures, and not by raising new revenues (i.e. by increasing existing taxes or enforcing new ones)
- The expenditures that affect the general productiveness of the economy most have to be cut the least
- The deficit reduction has to be consistent over time

When public deficit has to be reduced rapidly, fulfilling the first two norms is very hard to achieve. Usually, raising more revenues is easier legally and politically than cutting expenditures (as expenditures are often set in legal contracts, i.e. work agreements with public sector employees etc). Secondly, long-term investments are often easier to cut, for the legal framework surrounding them is thinner. At the same time, long-term public investments tend to affect the effectiveness and productivity of a society the most. Buti and Giudice (2002: 7-8) claim that as the

³ As Greiner and Semmler (2001:4) put it, the „Golden Rule of Public Finance” is that the public deficit can only be used to finance public investment. Public investment had averaged around 3% of GDP for 1970-s and 1980-s in the countries of the EU. Hence the motivation for a 3% deficit criteria. A 60% criteria for debt is developed based on similar considerations (*Ibid*)

Maastricht criteria were enforced, most countries first tried to run down the deficit by raising new revenue. Only in the course of time, was this replaced by a new strategy of cutting expenditures.

The third norm (the consistency of deficit reduction over time) is also hard to enforce by nominal criteria, which at the same time work as the standards for admission to the Euro zone. They provide an incentive to fulfil the criteria using one-off measures, by selling government assets or enforcing temporary taxes or even manipulating the methodology of the calculation of deficit (Koen and van den Noord, 2004: 5-9). The latter is proven by the reduced fiscal discipline of several Euro area member states compared to the evaluation period preceding admittance (Martino, 2008: 4). One has to admit that there is no strong incentive to maintain fiscal prudence once accepted in the Euro area, while there are no real penalties for the members of the Euro area for breaking the Maastricht rules.

In light of the criticism above, there is a need to find out what the frequently used term – long-term fiscal sustainability – stands for. Next, an attempt is made to define fiscal sustainability, using the most common theoretical approaches. One should, however, bear in mind that there is no broad definition that is applicable in practice.

In general terms, the fiscal policy is sustainable if it can be carried on indefinitely, without additional taxes or transfers or purchases cut. This means that at a particular moment in time the fiscal policy is sustainable if continuing the current policy for a period of unspecified length (e.g. indefinitely) does not lead to an excessive accumulation of debt (Krejdil, 2006: 5).

The above definition seems clear and intuitive. Nevertheless, it is not applicable in practice unless more concrete terms are used to measure sustainability and “excessive debt”. A more operational definition of sustainability is formulated first by Blanchard *et al* (1990) and in later criticisms of this definition. Blanchard states that fiscal policy is sustainable if the ratio of debt to GDP returns to its initial level (*Ibid*: 12). Buiter (2004: 14) suggests using net debt (as a negative of the well-known definition of net worth)

instead of gross debt in this definition. The specification of the definition of debt (net or gross) is relevant when a country has accumulated reserves. In such a case, the country can spend the reserve assets to finance the deficit without really incurring debt.

However, the distinction between these definitions is a statistical, rather than a sustainability question. Although using negative net worth instead of gross debt allows us to set a measurable limit to government sustainability, it does not transform an otherwise unsustainable policy into a sustainable one when infinite time periods are considered.

Krejdil (2006: 7) argues that the above definition is arbitrary in at least two ways. First, there is no reason for debt to converge to its initial or any other stable level in order to guarantee sustainability. Secondly, debt returning to its initial level sometime in the future does not imply that the debt level could not be perceived as excessive in a shorter period by market participants. Therefore, a more general definition of sustainability is to be formulated.

This can be achieved by utilizing the concept of government intertemporal budget constraint, following *ibid* (8-10). First, the link between the change in debt and the primary budget deficit is (budget deficit not containing net interest income):

$$v_t = v_{t-1} \cdot \frac{1+r}{1+y} + ed_t \tag{1}$$

- where
- v_t - ratio of government debt to GDP in the period t;
 - v_{t-1} - ratio of government debt to GDP in the period t-1;
 - r - average real interest rate of net government debt;
 - y - real growth of GDP;

ed_t - government primary budget deficit (budget deficit minus net interest expenditure) in the period t.

The above equation (eq 1) can be extended to calculate the effect of the projected primary deficits to debt ratio for any moment in the future. Assuming the base debt is v_0 it is possible to express the debt for period T as a sum of primary deficits in 0-T and base debt as follows:

$$v_T \left(\frac{1+y}{1+r} \right)^T = v_0 + \sum_{t=1}^T ed_t \left(\frac{1+y}{1+r} \right)^t \quad (2)$$

where v_0 - ratio of government debt to GDP in the period 0;

v_T - ratio of government debt to GDP in the period t-1.

To define the “long-term” in the phrase “long-term sustainability”, equation 2 is taken to the limit of infinity, assuming that T is infinite. This yields the relationship in equation 3:

$$\lim_{T \rightarrow \infty} \left[v_T \left(\frac{1+y}{1+r} \right)^T \right] = v_0 + \lim_{T \rightarrow \infty} \left[\sum_{t=1}^T ed_t \left(\frac{1+y}{1+r} \right)^t \right] \quad (3)$$

Assuming that interest payments on existing debt are not financed by the issuance of new debt, the left hand side of this equation (eq 3) amounts to zero (meaning that the present value of the debt-to-GDP ratio at infinity equals zero). This is also known as the “no Ponzi-game” criteria and is generally the most known assumption for any financial or fiscal activity to be sustainable.

$$\lim_{T \rightarrow \infty} \left[v_T \left(\frac{1+y}{1+r} \right)^T \right] = 0 \quad (4)$$

Taking this assumption, the government intertemporal budget constraint converges to a requirement that the present value of all future primary deficits equal the negative of base debt:

$$\lim_{T \rightarrow \infty} \left[\sum_{t=1}^T ed_t \left(\frac{1+y}{1+r} \right)^t \right] = -v_0 \quad (5)$$

The present value of debt-to-GDP ratio always converges to zero at infinity, if the debt-to-GDP ratio itself converges to a finite level. Even if debt ratio does not converge to a finite level, the fiscal policy can be sustainable. According to the broadest definition of sustainability the debt ratio can grow infinitely, if the growth ratio of debt is smaller than the difference between the interest rate and the growth ratio of real GDP. Therefore, avoiding excessive debt accumulation does not mean that the debt has to be paid off before some future date or that it has to return to some constant finite level. Nevertheless, the government cannot enter into a Ponzi scheme, at least not for an infinite period of time.

Greiner and Semmler (2001) provide a detailed analysis of the long-term sustainability of German fiscal policy. This analysis is practiced in two steps. First, a simple macroeconomic model for the economy is created to forecast several indicators (with an emphasis on the indicators influencing government sector cash flows and debt level). Then the calculated variables are added to the government intertemporal budget constraint (3) in order to check its plausibility.

In the present paper, the long-term sustainability of fiscal policy is put into the context of the intergenerational balance rather than the general sustainability framework. The former, being a narrower definition than the latter, requires that the generational accounts (or the present value of lifetime taxes paid net of transfers and services received by the government) of present and future generations are equal. This adds constraints to the government intertemporal budget constraint, meaning that in addition to not defaulting on debt services, the government cannot default on its other long-term liabilities (concerning transfer payment, medical aid, education expenditures etc) and discriminate future generations against those

alive now. The cash flows (and other individual benefits) future generations exchange with the government have to be of the same present value as those of current generations.

The main standing point for both the broader and the narrower approach is still the same – the government has to operate within the limits of its budget constraint. The government has to pay for its expenditures at some point in time and do this by redistributing income from economic agents. While ordinary sustainability states that the bills of the government have to be paid, the generational balance criteria requires the bills to be paid on equal terms for current and future generations.

In order to evaluate the sustainability of fiscal policy, a large number of predictions and assumptions are usually used. This results in severe uncertainty and very broad confidence intervals about any projected values. The longer the time series being forecasted the greater the uncertainty. This, however, does not mean that all kinds of forecasts (and the analysis of fiscal sustainability) should be rejected. The analysis of long-term fiscal sustainability allows us to detect general mistakes in fiscal policy that are unnoticeable when we restrict ourselves to the study of past time series or the present situation. However, one has to bear in mind the sensitivity of the results to assumptions, and ensure that any final findings are accompanied by the relevant sensitivity tests.

To evaluate the intergenerational balance, often even more heterogeneous sets of data are needed. The data used in order to evaluate this balance has to allow one to study the distribution of benefits delivered by the government and their financing costs between different generations. A special analytical framework – **generational accounting** – has been created to fulfil that task. The next chapter will give a detailed methodological overview of this technique.

3. THE METHODOLOGY OF GENERATIONAL ACCOUNTING

Generational accounting is a relatively recent methodology developed by Kotlikoff, Auerbach and Gokhale in the early 1990s. (see Auerbach *et al* 1994). Generational accounting measures the fiscal burden that government policies impose on future generations. Comparing the fiscal burden of future generations to the burden levied on current newborns allows one to measure the generational imbalance, or in other words, the long-term fiscal imbalance. The methodology also renders possible the evaluation of specific fiscal policy instruments in light of the generational balance.

3.1 Basic principles and formulae

The first step in generational accounting is to calculate the generational accounts for generations currently alive.

The generational accounts of all currently living generations are calculated on the basis of their projected remaining lifetime net tax payments (tax payments less monetary transfers received and government individual consumption expenditures attributed to them). This can be formalised as follows (Kotlikoff, 2002):

$$N_{t,k} = \sum_{s=\max(t,k)}^{k+D} T_{s,k} \frac{P_{s,k}}{P_{t,k}} (1+r)^{-(s-t)} \quad (6)$$

where $N_{t,k}$ - Generational account of a generation born at year k at year t,

$T_{s,k}$ - net taxes of a generation born at year k at year s,

$\frac{P_{s,k}}{P_{t,k}}$ - the ratio of those in a generation born in year k who are alive at year s to those who were alive at year t,

D – life expectancy of a generation born at year k,

r – discount rate.

The basic idea of generational accounting is the presence of an intertemporal government budget constraint – all government expenditures eventually have to be paid. When these expenditures are not paid by current generations, they impose a fiscal burden on future generations. The intertemporal government budget constraint can be formalised as follows (Kotlikoff, 2002: 47):

$$\sum_{k=t-D}^t N_{t,k} + \frac{\sum_{k=t+1}^{\infty} N_{t,k}}{(t+r)^{k-t}} = \sum_{s=t}^{\infty} \frac{G_s}{(1+r)^{s-t}} - W_t^g \quad (7)$$

where G_s - government expenditure not in generational accounts in year s ,

W_t^g - government net assets in year t

In this equation, the left hand side, as the first member, represents the sum of the generational accounts of generations currently alive and secondly the sum of the generational accounts of all generations born in the future. The right hand side consists first of the government's projected future net collective final consumption expenditures (that part of expenditures that are not directly in the generational accounts) and of government net assets. The latter member can be either positive or negative, depending on whether the government has accumulated surpluses or deficits in the past.

The generational accounts of future generations are then calculated as a residual of the sum of government future collective consumption expenditures less the sum of generational accounts of current generations and the government net wealth from equation 7:

$$N_{t,t+1} = \frac{\left(\sum_{s=t}^{\infty} \frac{G_s}{(1+r)^{s-t}} - \sum_{k=t-D}^t N_{t,k} - W_t^g \right) (1+r)}{\sum_{s=t+1}^{\infty} P_s \left[\frac{(1+y_s)}{(1+r)} \right]^{s-(t+1)}} \quad (8)$$

where $N_{t,t+1}$ - generational account of a generation born in year $t+1$

y_s - productivity growth in year s

P_s - size of a generation born in year s

The sum of the generational accounts of all currently living generations and government net wealth are deducted from the sum of projected government net collective consumption expenditures. The denominator is the weighted sum of the future population, where the weights are based on the values for r and y_s . The former is the discount factor of future cash flows, reducing the relative importance of later generations. The relative importance of later generations is on the other hand increased by the projected productivity growth factor y_s .

Although generational accounting is an intriguing tool for evaluating the incidence of fiscal policy, it is definitely not a perfect tool. Haveman (1994: 4-8) points out four main deficiencies of the methodology.

1. Due to the forward-looking nature of generational accounts, one cannot directly compare the accounts of currently living generations to each other.
2. It is much easier to distribute the revenues of government to certain age groups than the expenditures. While tax revenues form a significant portion of overall revenues in developed countries, the individually distributable expenditures often account for a significantly smaller fraction.
3. Generational accounts cannot be computed without making a multitude of projections and forecasts all of which can be imperfect or manipulated. Different studies show that the values of generational accounts have a high sensitivity to changes in presumptions.

4. The assumption that only future generations should bare the burden of unsustainable policy is not fully correct. Government can at any moment in time launch a policy that affects both future and current generations. Therefore, assumptions about government behaviour have to be made to construct generational accounts, making it complicated to use the methodology for *ex ante* analysis.

There has been some indication that the values of generational accounts tend to be sensitive to the choice of base year for the calculations. Feist (2003: 7) claims that the large overestimation of the net tax burdens future Finnish and Swedish generations seemed to be facing according to her previous study was mainly caused by the very difficult economic situation both countries were facing during the base year of 1995.

The more recent studies introduced below have solved some of the problems Haveman indicated. Due to the development of statistical standards a larger fraction of government expenditures can be directly distributed to certain individuals. This allows these expenditures to be directly inserted into the generational accounts, instead of indirectly adding them to the government budget constraint. For example, the expenditures on health and education are distributed directly in more recent studies (i.e. Auerbach and Chun, 2006; Feist, 2003), while this was not done in earlier studies (i.e. Auerbach *et al* 1994).

Auerbach and Chun (2006: 15-16) suggest that government net financial wealth be used in government budget constraint instead of government net wealth. This excludes government non-financial wealth from its current assets and results in a somewhat greater burden on future generations (while the government cannot sell its non-financial assets to finance different expenditures).

The reasoning behind this seems plausible in the opinion of the author of the present paper because it solves many data problems, as there is a lack of statistical accounting for government non-financial assets. It seems rational also on theoretical grounds, but only if all government non-financial wealth is used to provide services to the general public and there is no “excess assets” that

could be sold. The latter is often the case for ex-soviet states, where the privatisation process is not yet fully completed.

Gjersem (2002: 4-5) suggests that natural resources should be included in the net assets variable in addition to net financial assets. The oil-rich countries often earn a significant portion of their revenues from the sale of oil. The traditional use of government budget constraint would yield a biased picture of the size of the budget constraint and the fiscal sustainability of these countries.

The improvements to generational accounting have brought the discipline closer to modelling the true fiscal situation a country is facing. In the author's opinion, discussion of several problems is still relevant. One of the most important questions is the treatment of non-financial wealth – whether natural resources or other assets in excess that can be sold without affecting the level of public services provided. Also, investments in non-financial assets remain one of the less discussed topics in relation to generational accounting.

This paper builds mainly on Cardarelli et al (1999) and Auerbach and Chun (2006). However, a further attempt has been made to provide detailed methodological description of the calculations made at all steps of the calculation process. Also, a link between all used inputs and official administrative or national accounts statistics or official forecasts has been provided in this paper. In authors' opinion, providing a detailed description of inputs and methodology used helps to improve the comparability of generational accounting studies. This is unfortunately not to be found very often in previous related studies.

Another extension this paper provides is the use of variable future growth rate assumption to best capture the effects of convergence of Estonian economy with the EU. Therefore the growth rate is higher in the short- and medium-term forecasts and gets lower in the more distant future.

Sensitivity analysis of the results is conducted in a way similar to Ablett and Tsegai-Bocurezion (2000). In addition to their

approach, an analysis of sensitivity to population forecasts is conducted.

3.2. Theoretical background and requirements for data

The concept of generational redistribution of fiscal policy is very closely related to the distribution of tax burden over the life cycle of an individual. The possible distribution of taxes over the life cycle has usually been linked to theories of consumption and saving. The basic Life-Cycle Hypothesis (LCH), as developed by Fisher, Ando, Harrod and Modigliani (i.e. see Ando and Modigliani, 1967), is the most commonly used tool to analyse consumption and saving behaviour over the life-cycle of individuals. The principal LCH methodology is enhanced by its modern extensions – theoretical concepts of liquidity constraint, bequest motive and precautionary saving. This framework gives us an opportunity to evaluate the distribution of tax burden over lifetimes of individuals in theory.

Labour income is generally believed to have an “inverse-U-shaped” distribution over the age groups, being lower in the beginning of ones career, highest for middle-aged individuals and on the average, lower again for the elderly (see Harding, Warren, 1999: 17). Less experience, and hence, lower productivity together with smaller labour supply (mainly due to studying and raising young children) cause younger individuals to earn less. At the same time, there is not much evidence that older workers experience a drop in productivity on average (Johnson, Neumark, 1996: 1). The main reason that labour income falls for the elderly is naturally related to retiring or switching to part-time jobs and also changes in the sample – first ones to leave the work force are often found to be better off financially than those who work longer (Myck, 2007: 18). Since labour income is “inverse-U-shaped”, labour income taxes tend to behave accordingly.

While the approach to the distribution of taxes on labour income over the lifetime of an individual is relatively straightforward in theoretical literature, there is often less concordance regarding

taxes on consumption. Basic LCH suggests that individuals tend to smooth consumption over their lifetimes with the level of consumption based on rational expectations about their lifetime income. This suggests that the propensity to consume is not constant over the life cycle, being higher for young and elderly and lower for the middle-aged. LCH has received empirical support in Adams and Prazmowski (2003: 14), showing that propensity to consume changes in the course of a lifetime. However, several inconsistencies with LCH in its pure form remain.

First, the propensities to consume and save out of ones disposable income are often influenced by the motive to leave a bequest to ones heirs. The bequests received also tend to affect ones saving behaviour. Modigliani (1986: 10-11) stated that the role of bequests in overall household wealth formation is below 25% with the rest being formed in the natural process of saving.

Secondly, government can alter the saving behaviour of individuals by choosing the level of transfers it distributes to them. This applies specifically well to old age pensions. The more generous the government in its pension policy, the less the individuals have to save in the course of their working life (Feldstein, 1974: 1-5).

Third, individuals may choose to save more than would be rational according to LCH due to precautionary reasons. In a situation involving uncertainty, they might be tempted to gather reserves in case of unexpected falls in income (Banks, *et al* 2001: 2-3).

Fourth, LCH in its pure form is applicable only if younger individuals are allowed to consume more than they earn. This means that they should be able to borrow money using their future income as collateral. Since fiscal institutions following a profit-seeking behaviour are mostly unlikely to provide financing of that kind, they are very often liquidity constrained. This means that their consumption in younger life is always somewhat smaller than desired.

Schwerdt (2005: 5) and Souleles (2002: 18) have shown that even if the abovementioned restrictions are accounted for, excess

sensitivity of consumption to current income is detected. Nevertheless, the mainstream of neoclassical economists seems to consider consumption to be more stable than income over the course of a lifetime of an individual.

In order to evaluate the complete generational incidence of fiscal policy, besides tax incidence one has to also take into account the distribution of government expenditures. Generational accounting treats government expenditures in a rather heterogeneous way. The government monetary transfers can usually be attributed to specific individuals and therefore they can be directly included to their generational accounts. The same applies to a portion of the final consumption expenditures of government, while a fraction of consumption expenditures, current and capital transfers and gross capital formation cannot be directly included in the calculation of accounts. The distinction between expenditures included in the accounts and not included is mostly based on whether they are individual (or they can be directly attributed to an individual with certain socioeconomic characteristics, e.g. of a certain age) or collective.

Constructing generational accounts requires long-term fiscal, economic and population projections and detailed age-specific data on taxes, transfers and government expenditures. Most researchers have relied on sets of micro-data to calculate the age structure of taxes and transfers, while the age structure of government final consumption expenditures (some analysts have also used intermediate consumption and wages and salaries instead) is calculated in less detail. The period of projections is often beyond official government forecasts; therefore, some assumptions about long-term economic and population growth have to be made.

As expected, growth forecasts are a very important part of generational accounting, for the calculation is sensitive to different growth forecasts. For example, the differences in generational accounts in the UK are expected to disappear with growth predictions only 0.25 percentage points higher than in the base scenario (Cardarelli *et al* 1999: 5). Real growth forecasts vary in studies, but mostly are around 1 per cent (or in a range of 0.5-1.5 per cent). Due to sensitivity to growth rates, some studies also

include a sensitivity analysis – generational accounts are calculated using varying growth predictions.

Another important issue is the selection of the discount rate. Naturally, future taxes and government expenditures have to be discounted to present value in order to be able to compare them to current fiscal flows. Usually a 4–7% nominal (or 2–5% real) discount rate is used, but several studies include a calculation of generational accounts using several different discount rates in order to test the sensitivity of results to the rate used (i.e. in Ablett and Tseggai-Bocurezion, 2000; Cardarelli et al 1999). The author of this paper finds it necessary to provide sensitivity analysis to choice of discount rate. Therefore, in this study in the base scenario a 3% real discount rate is used, but additional calculations with discount rates of 2 and 4 per cent are also presented in sub-chapter 4.3.

The compilation of generational accounts and subsequent analysis of generational balance is always country-specific. Therefore, one cannot propose one unified methodology to be used universally. Next the methodology developed for Estonia is introduced in detail with the presentation of results and discussion that follows.

4. GENERATIONAL ACCOUNTING AND FISCAL SUSTAINABILITY IN ESTONIA

According to all conventional measures, government finance in Estonia seems to be on a sustainable path. Estonia has the smallest ratio of debt to GDP in the European Union (Eurostat News Release... 2010) and was able to keep the government net borrowing under the Maastricht threshold of 3% of GDP even in 2008 when the gross domestic product fell by 3.6 per cent in real value. State reserves have been accumulated over the past years, wherefore the net financial assets of the government are clearly on the positive side (Financial accounts...2010).

In the study described in the current paper, Estonian fiscal sustainability is measured using the concept of generational balance. Intergenerational balance requires not only the government to stay solvent, but to treat current and future generations equally. The first step in calculating generational accounts is to calculate the age distribution of taxes, monetary transfers and benefits from individual final consumption expenditure. The summarizing overview of the methodology is given in Figure 1 on page 23.

4.1. Data sources for generational accounting in Estonia

The age structure of taxes paid and monetary transfers received used in this paper is based on simulated taxes from the micro data set from the Household Budget Survey (HBS) from Statistics Estonia. The simulation of taxes and transfers is not part of this paper, the author had the opportunity to use a data set of taxes and transfers simulated using the micro simulation model ALAN (authors of the model are Alari Paulus and Andres Võrk). To use this data set, some additional calculations had to be made to attribute indirect taxes simulated at household level to individuals. In addition to that, all tax and transfer data in the original data set were scaled to match aggregate tax revenues and transfer expenditures presented in the administrative data.

Although the author performed calculations for the whole time series (2000–2007) available from the HBS, only the 2007 age structure was used as input data for the calculation of generational accounts. In the author's opinion, using the tax and transfer age profile of a single base year best captures the essence of generational accounting to evaluate the generational balance using the static fiscal policy and economic structure (or *ceteris paribus* principle) of the base year.

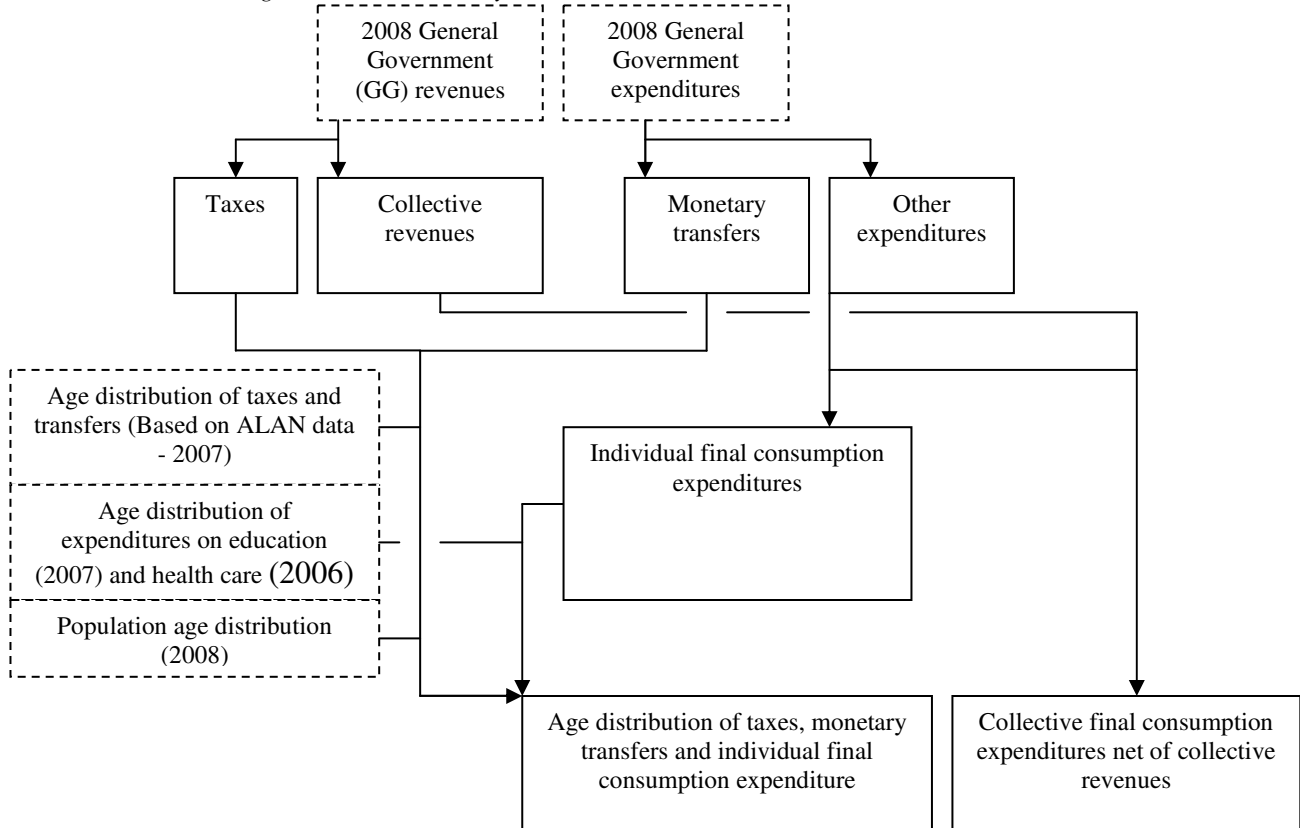


Figure 1. The calculation process of inputs and data sources for generational accounting

The age structure of taxes calculated in this paper is in line with basic economic theory. The average tax burden is highest for the middle-aged and declines towards both ends of age distribution, forming a “reverse-U” shaped pattern often indicated in relevant literature.

Table 1. Tax revenues per age group, 30–39 scaled to unity

Age group	2000	2004	2007
0-9	0	0	0
10-19	0.02	0.03	0.06
20-29	0.65	0.55	0.79
30-39	1	1	1
40-49	0.96	0.96	1.23
50-59	0.83	0.92	0.79
60-69	0.37	0.43	0.48
70-79	0.2	0.21	0.28
80-	0.14	0.15	0.19

The distribution of monetary transfers slants towards the higher end of age distribution – the elderly. This is to be considered natural given that old age pensions form the bulk of all monetary transfers. Note that when projecting future family benefits, the benefits are held constant in real terms – they are adjusted to inflation only. This is not the case for parental benefits, which are dependent on the real income of the parent receiving them prior to childbirth. These benefits are expected to grow in line with productivity. This means, that over time they will become more influential. Transfer expenditures by age group are presented in table 2, page 25.

The age structure of individuals benefiting from government final consumption expenditures is estimated using individual final consumption expenditures as stated by the European System of Accounts (ESA95). The final consumption expenditures are divided into age groups based on the Classification of Functions of Government (COFOG) statistics provided by Statistics Estonia.

Table 2. Transfer expenditures per age group, 30–39 scaled to unity

Age group	2000	2004	2007
0-9	0.02	0	0
10-19	0.07	0.05	0.05
20-29	0.5	0.63	0.42
30-39	1	1	1
40-49	0.9	0.72	0.74
50-59	1.09	1.01	0.85
60-69	3.46	2.84	2.82
70-79	3.78	3.58	3.92
80-	3.29	3.46	3.76

There are 4 large groups in COFOG that are considered to be individual consumption expenditures (meaning that these government expenditures can be distributed to certain individuals or groups of individuals). These groups are as follows.

- Health (covering COFOG groups 07.1–07.4).
- Recreational and cultural services (covering COFOG groups 08.1–08.2).
- Educational services (covering COFOG groups 09.1–09.6).
- Social protection services (covering COFOG groups 10.1–10.7).

Other groups of government final consumption expenditure are considered collective final consumption expenditure, as benefits from these expenditures cannot be directly distributed to a certain individual, but they rather fulfil the needs of all inhabitants (i.e. general public services or military defence). However, collective expenditure groups are included in the government budget constraint, meaning that they still have to be paid for by either

current or future generations. Therefore, these expenditures are expected to be spread evenly on all individuals.

For health expenditures, Estonian Health Insurance Fund data is used to derive an age profile of final consumption. The Estonian Health Insurance Fund provided the data on its 2006 expenditures according to the age and sex of the individuals receiving health services. The disability insurance transfers were deducted from this data for these are already derived from the HBS data and accounted for under the age structure of monetary transfers (which is described above). Then, the modified age structure for 2006 is used to model the health-related final consumption expenditures for the base year (2008) and its projections in the future.

Since there is no methodological basis for finding the age distribution of recreational and cultural services, these are treated as collective consumption.

The age structure of the benefits on the basis of educational services is found by combining the COFOG data on different sub-groups of Educational Services with data from the Ministry of Education and Research (MoER) on the age distribution of children in pre-school (Number of children...2009) and in different school levels. The MoER has also provided the age distribution of university students whose studies are funded from the government budget (Age distribution... 2009). Combining data on expenditures on different sub-levels of COFOG with the volume measures from the MoER yields an age structure of government final consumption expenditures on education for the base year (2008). To model the projections in the future, this age structure is held constant, but the ultimate level of expenditure depends on the demographic and growth projections (assuming that wages in education grow at the same pace as average productivity).

When constructing the age structure of final consumption expenditures on social protection services, the age structure of monetary transfers in the same COFOG group are used as a proxy. Final consumption expenditures on social protection are relatively small compared to monetary transfers.

The methodology used to derive the age structure of these individual consumption expenditures can be viewed as sufficient to quantify the benefits received by certain age groups of individuals in terms of government consumption. However, there is room for improvement, especially on expenditures on health where a more recent age structure could be used.

The summary age distribution of benefits from government individual final consumption expenditures is slanting towards younger age groups due to the large relative importance of expenditures on education. The middle-aged are less favoured by the current policy, as the elderly tend to receive more again, mostly due to an increased need for medical assistance.

Table 3. Individual final consumption expenditures per age group, 30–39 scaled to unity

Age group	2000	2004	2007
0-9	3.13	3.6	3.1
10-19	3.66	4.25	4.24
20-29	1.68	1.62	1.43
30-39	1	1	1
40-49	0.89	0.84	0.81
50-59	1.14	1.25	1.11
60-69	1.35	1.44	1.5
70-79	1.94	1.94	1.87
80-	1.97	1.94	1.66

The long-term tax revenues and government final consumption expenditures are projected to rise in line with economic growth. As for transfers, a more complex approach based on current fiscal policy assumptions is taken. Pensions in Estonia are indexed to social contribution revenues and inflation. As much as 80% of the rise in the pension index is tied to the growth of social contribution revenue and 20% to changes in the consumer price index. Since in the long run, social contributions are expected to grow in line with economic growth, in real terms the pensions are expected to grow at a pace that is 80% of the growth of the economy. Family

benefits are projected to grow in line with inflation, so in real terms they are held constant. This is an assumption of prudent fiscal policy and is in line with HBS data from 2000–2007.

For 2009–2013, the official economic forecasts provided by the Ministry of Finance are used to predict economic growth. The European Policy Committee (EPC) and European Commission joint 2009 Ageing Report forecasts for per capita growth are used to evaluate growth for 2014–2060. For the years beyond 2060, the growth rate in 2060 is used, following standard practice.

For population forecasts, the PRAXIS Centre for Policy Studies forecast model is used. In the base scenario, the Total Fertility Rate (TFR) is expected to converge to 1.86 by 2047 (as presented in Statistics Estonia official forecasts) and the mortality rate is expected to converge to the level of developed countries by that time. For the years beyond that, TFR and mortality indicators are held constant. To test the sensitivity of the results to population forecasts, two alternative scenarios are defined to explore both higher and lower fertility than in the base scenario.

In the base scenario and two alternative scenarios, the effects of migration are not taken into account. Estonia has lacked reliable data on migration-related effects on population statistics up to 2009 (when Statistics Estonia first made available the migration data). Migration flow forecasts would render it possible to evaluate the effects of migration on the generational balance. However, as the Ageing Report assures that the projected migration in- and out-flows are balanced for Estonia for 2014–2060, one would expect the effects of migration to be marginal.

4.2. Calculation process of generational accounts

In order to evaluate fiscal sustainability in terms of generational balance, first the age distribution of government individually distributable cash flows have to be used to calculate the generational accounts of currently living generations. The generational accounting framework demands that all political

agreements are to be enforced and that the fiscal policy in a chosen base year is permanent. This ensures that the effects of **current** fiscal policy on fiscal sustainability are taken into account. Any change in policy changes the underlying assumptions and demands that generational accounts be re-calculated. Comparing the generational balance of the former policy with the one calculated on the basis of new assumptions gives us the effects of policy change on the generational balance. The overview of the calculation process of intergenerational balance is given in Figure 2 on page 30.

This study was conducted in the spring of 2009, which was the focal point of the worst recession in the history of Estonia. The GDP of Estonia dropped 15 per cent in the first quarter of 2009 compared to 2008. The growth forecasts of different institutions were bleak, mainly predicting double-digit contractions for 2009 and no fast recovery. Furthermore, the variance of short and middle term growth forecasts was significant. While the official forecast of the Ministry of Finance (which is used in the current paper to calculate productivity growth for 2009–2013) reported the expected 2009 GDP contraction to be -8.5 per cent, the forecast by the Bank of Estonia (which was made public less than a month later) predicted the contraction to be over 3 percentage points larger. The economic downturn and the great deal of uncertainty about future growth combined with aspirations for Euro-zone entrance in 2011 caused severe pressure for changes in fiscal policy. Therefore, the author of this paper deviated a bit from the customary practise and made several policy expectations for 2009 and 2010 in order to capture the outcome more precisely. The expectations were based on agreements made in the first negative supplementary budget for 2009.

A second amendment to the original budget was made after the conclusion of the work presented here; therefore, those cuts are not accounted for exactly. However, the current budget deficit was expected to be kept within the limits agreed in the EDP (3% of GDP), which means that some further adjustments were written into the assumptions of this study.

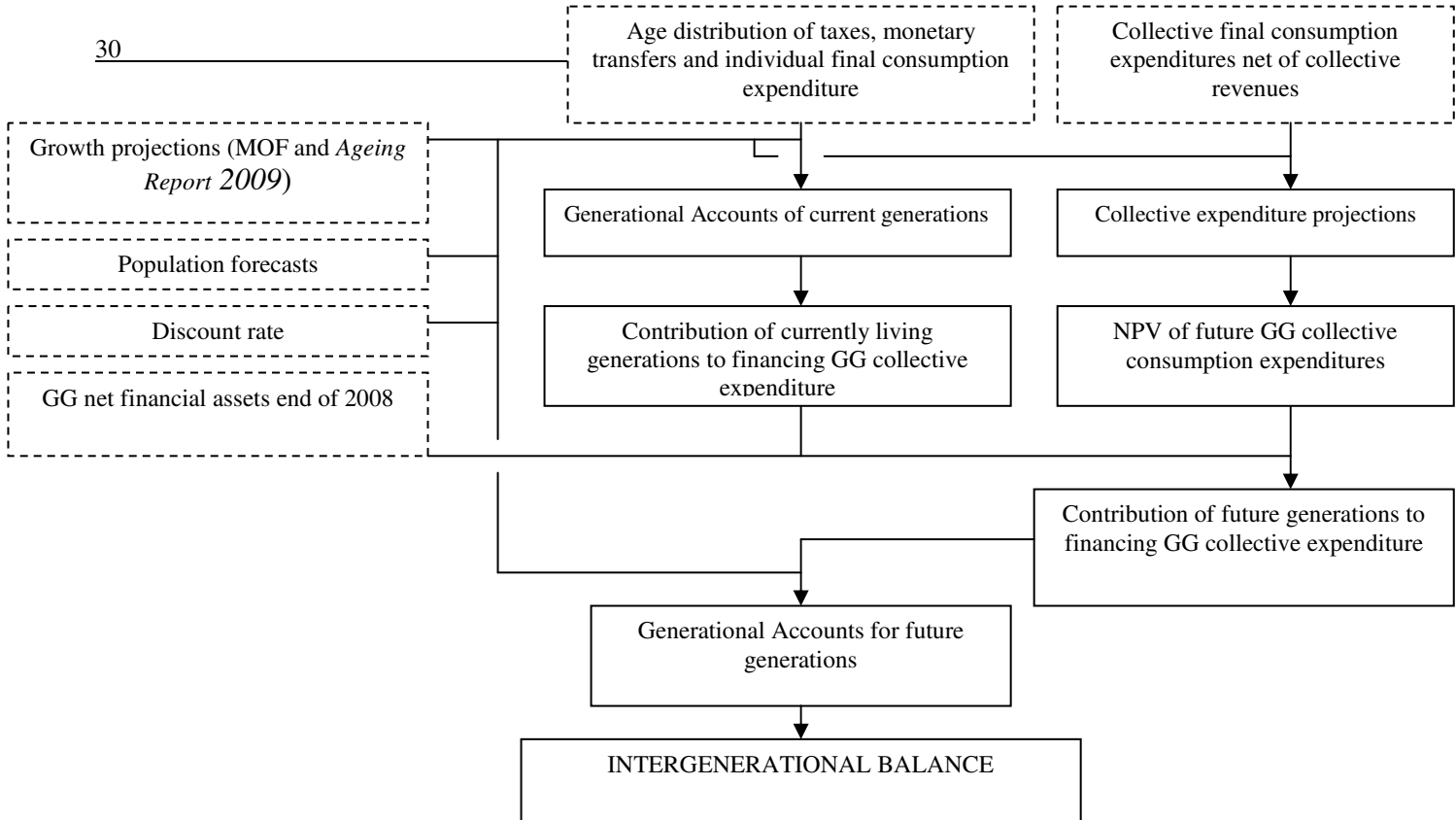


Figure 2. Calculation process of generational accounts and intergenerational balance

As the downturn proved to be of greater magnitude than in the forecasts, the required fiscal policy changes were even greater. Although the government enhanced the budget situation more than expected (with the deficit being -1.7% instead of -3.0% as in the assumptions in this paper), some of the measures taken can be considered one-offs (without a long term effect on deficit). Therefore, further policy changes may occur in 2010 to ensure fulfilment of the Maastricht criteria.⁴

Generational accounts of currently living generations in the base scenario are presented in Figure 3. Due to the forward-looking manner of generational accounting, the generational accounts of presently living generations cannot be directly compared. By looking at them, one can only conclude that the net taxes to be paid to government during an average person's remaining life reach maximum in the person's 20s and start diminishing thereafter. The net taxes turn negative at the age of around 50, which means that after that age, the net present value of all future receipts from the government is higher than the net present value of taxes paid in the remainder of the person's life. The expected net transfers from the state are highest around retirement age, when one has the longest time to receive old age pension benefits and does not have to pay income tax on salary anymore. From that moment, the values of generational accounts start to fall closer to zero each year, as the end of life approaches.

⁴ However, in the author's opinion, the net effect of changes in assumptions (recession deeper than expected) and government policy changes (larger fiscal consolidation than expected) is probably positive on generational balance. This means that the situation for future generations compared to current generations has improved compared to the results presented in this study. In order to quantify the net effects of those events, one would still have to recalculate the generational accounts.

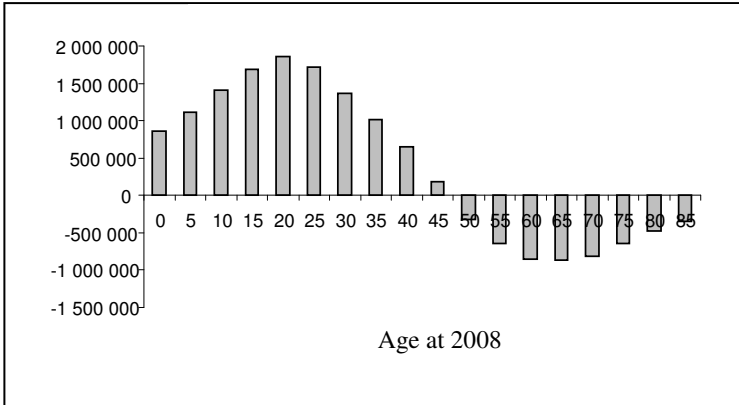


Figure 3. The generational accounts of generations alive at 2008

The results of this study show that the expected net tax burden of current newborns (generation born in 2008) does not equal the net tax burden of future generations. The future generations face on the average a 64% larger net tax burden than current generations⁵. Although this gap seems to be sizeable at first sight, it is somewhat smaller than previous studies in developed countries have indicated and can be reduced. Various methods for reducing the intergenerational imbalance are discussed in sub-chapter 4.4 of this paper.

4.3. Sensitivity analysis of the results

Growth is mainly considered to be a positive contributor to intergenerational balance. This means that the faster the growth, the smaller the difference between expected net tax burdens that current and future generations are facing *ceteris paribus* (Cardarelli *et al* 1999: 2). Therefore, there is a way to reduce generational imbalance without changing the fiscal policy – simply

⁵ However, this figure could be somewhat smaller by now since more rigorous budget consolidation than expected has been applied by the government. For further discussion see footnote 2 on page 3

by growing faster⁶. In this paper, a sensitivity analysis for growth forecasts is performed. For this purpose, 4 alternative scenarios of growth are defined in addition to the base scenario. Scenarios of *Fast Growth* and *Extra Fast Growth* are cases where *per capita* GDP growth is 0.25 and 0.5 percentage points higher than the base scenario respectively. In addition, two symmetrical scenarios of slower growth (*Slow Growth* and *Extra Slow Growth*) by 0.25 and 0.5 percentage points are also defined. The results of this sensitivity test are shown in table 4.

Table 4. Generational accounts (in thousand kroons) and generational balance (in per cent) under various growth assumptions

Age at 2008	Base scenario	Fast growth	Extra fast growth	Slow growth	Extra slow growth
A	1	2	3	4	5
0	860	995	1 144	738	627
10	1 411	1 530	1 657	1 300	1 196
20	1 862	1 939	2 020	1 787	1 716
30	1 371	1 400	1 429	1 342	1 313
40	650	641	631	657	663
50	-315	-339	-365	-292	-270
60	-849	-869	-890	-830	-812
70	-815	-824	-834	-806	-796
80	-479	-481	-484	-476	-473
future generations	1 411	1 442	1 451	1 369	1 321
generational balance	163.99%	144.88%	126.81%	185.42%	210.63%

⁶ This is also probably the main reason, why generational accounting cannot be the official tool to measure fiscal sustainability. With the outcome of the methodology being sensitive to growth it builds an incentive for the government to be overly optimistic about the growth projections in the distant future and by that make the policy pursued look more fiscally prudent.

As expected, faster growth leads to a more balanced long-term fiscal situation. One must still consider that small changes in annual growth tend to accumulate into very large differences in income levels over long periods. For example, the *Extra Fast Growth* scenario leads to a 30% higher income level by 2060 than the base scenario.

The values for generational accounts in Estonia are surprisingly insensitive to changes in population forecasts. Two additional scenarios using Total Fertility Rates (TFR) that differ from the base scenario were defined in order to evaluate the effect of demographic projections. In a positive scenario, the maximum TFR is set to 2.0. In the negative scenario the TFR is expected to remain constant at its 2008 level. In the positive scenario, the generational imbalance is reduced to 59.2% (or by 4.8 percentage points); in the negative scenario the generational imbalance is 4.7 percentage points larger (or increased to 68.6%). The mortality rate is left at the same level as in the base scenario, which means that the values of the generational accounts of currently living generations do not change.

One possible explanation of the reduced sensitivity is that the TFRs used in the base scenario and the additional scenarios are all lower than the ratio needed for the population to remain constant. This implies that although there are more children being born in the positive scenario, the population as a whole is still ageing and the higher number of children being born transforms into a higher number of pensioners in the very long run. This means that until the TFR is less than the ratio needed to keep the population constant, higher fertility is just a way to postpone fiscal problems, but not solve them.

When studying the sensitivity of generational accounts to the selection of discount rates, another detail specific to Estonia is revealed. The generational imbalance of Estonia seems to be less pronounced on lower discount rates, while in most other studies the opposite seems to be true. A possible explanation for this uncommon effect could lie in the fact that the current net financial wealth of the general government sector in Estonia is positive

(which means that the “net debt” factor in government intertemporal budget constraint is negative). In addition to this, Estonia is expected to follow a rather unique growth path due to expected convergence to the EU average.

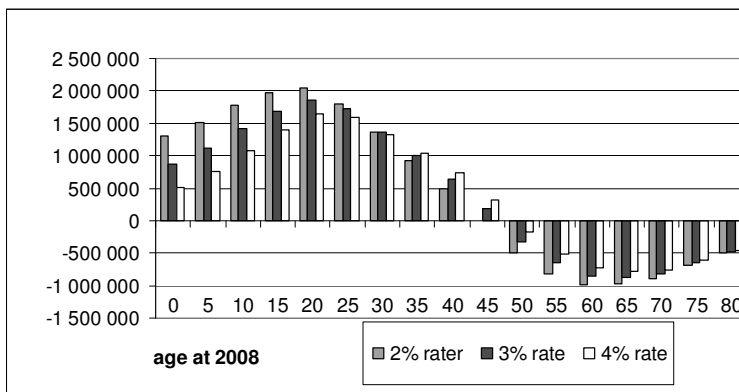


Figure 4. Generational accounts under various discount rates

The previous studies mostly use the presumption of a constant growth rate (see i.e. Auerbach *et al* 1994; Cardarelli *et al* 1999; Ablett and Tseggai-Bocurezion, 2000; Auerbach and Chun, 2006). In order to ensure comparability, the same could be applied to Estonia. However, at the same time it would mean diverging from the most likely forecast, while the aim of the study was to follow the most probable course of events.

In conclusion, the results are sensitive to growth forecasts. Since forecasts of different institutions are variable and there is considerable uncertainty about future growth, the results of the study have to be interpreted with a sense of caution. However, the sensitivity to growth forecasts is not unique to this study – several other studies have indicated this to be a common feature of generational accounting (see Cardarelli *et al* 1999; Haveman, 1994, etc).

Sensitivity to population forecasts is mild, since population is expected to diminish even under the most positive scenarios.

Therefore, a higher fertility rate only stalls the fiscal problems caused by an aging society, but does not solve them.

The sensitivity analysis for the discount rate yields an interesting phenomenon. A higher discount rate seems to broaden generational imbalance rather than diminish it. This is not in line with previous empirical studies where the opposite has been noted. One possible explanation could be the different growth paths used in this study. A variable growth rate is used to best forecast the convergence processes in the EU instead of the constant growth rates used in previous studies. Also, the fact that the government sector has positive financial assets in Estonia (which is not very common among developed countries) contributes to this effect.

4.4. Possible strategies for achieving intergenerational balance

The aim of the author of the current paper is not to propose a tailored policy measure to tackle possible inequalities, but rather to add depth to fiscal policymaking through positive analysis of the issue. In general, there are three broad strategies to reduce the intergenerational imbalance.

- First, by adding new liabilities to generations currently alive. This can be achieved by enforcing new taxes. The swifter the tax reform, the more the tax burden will lie on current generations and the less future generations will have to pay relative to them.
- Second, by diminishing the liabilities of future generations. To that end, the social care system could be reformed so that transfers from future generations to current generations would be smaller.
- Third, by cutting the collective consumption expenditures of the government. These expenditures are not a part of the generational accounts of current or future generations, but they nevertheless have to be paid for. By keeping the government intertemporal budget constraint and the

contribution of current generations fixed, reducing these expenditures will result in a smaller expected contribution by future generations.

To achieve intergenerational balance in Estonia through tax increases, the speed of the tax reform seems to be essential. If the tax increase would have taken place at the beginning of 2010, it would take a 9.0% rise in tax revenue to achieve balance⁷. It would take a 10.6% tax increase in 2020 to achieve balance and if the tax increase is postponed to 2050, the necessary hike in tax revenue would have to be 34.4 per cent.

One has to keep in mind that these effects of the tax rises on equilibrium are conditional on the age structure of taxes. As soon as the age structure changes (which is highly likely in the case of tax reforms in reality), the effects will also change. Due to the assumptions of a constant age-structure of taxes and the discarding of any behavioural effects, generational accounting is not the best tool to analyse the concrete changes in the tax system. At the same time, it provides the general appraisal of the magnitude of the necessary changes.

The dominant aspect of government fiscal activity, where intergenerational redistributions are made, is the old-age pension system. The traditional pension systems (or pay-as-you-go systems) gather social payments from generations currently working and distribute them as pension transfers to generations of retirees. In a situation where the population is ageing, in order to keep this system solvent, the government has roughly two options – whether to increase the social payments required from future generations or to lower pension payments to current generations. These choices are equivalent in the traditional sense of fiscal sustainability. They both either cut expenditures or increase revenues. Therefore, the choice is often political – the choice is made based on which one is more feasible politically. However,

⁷ Note that the VAT rate increase in July of 2009 from 18% to 20% is not accounted for in these calculations, for the study was completed in May 2009. The same applies to the excise hikes on 01.01.2010

the intergenerational balance is largely affected by this choice. If future social payments are increased, the government favours current generations over future generations. If pensions are cut, the opposite is true.

Most developed countries have solved the problem by indexing pensions using an index constructed from a combination of the rate of increase in social payments (or wage growth) and consumer price inflation. The systems in countries with decreasing and ageing populations are usually actuarially unfair in order to maintain fiscal sustainability in the traditional sense of this concept.

Table 5. Generational accounts (in thousand kroons) and generational balance (in per cent) under various pension indexing policies

Age at 2008	Indexing 39,5 - 60,5	Indexing 50 - 50	Base scenario
0	1 066	1 023	860
10	1 635	1 587	1 411
20	2 100	2 047	1 862
30	1 621	1 565	1 371
40	903	845	650
50	-85	-139	-315
60	-690	-728	-849
70	-740	-758	-815
80	-457	-462	-479
future generations	1 066	1 145	1 411
generational balance	100.00%	111.88%	163.99%

In Estonia, the system of indexing has changed constantly, with the reasons for that being mostly political rather than being based on strict economic analysis. Since 1 April 2008, an 80–20 indexing system has been used – 80 per cent of pension growth depends on the growth of social payments, and 20 per cent on the growth of

the consumer price index. The system is definitely more “generous” than the previous one when a 50–50 index was used.

The calculations in this study show that the generational accounts are sensitive to changes in indexing. Adjusting the pension indexing to a 40–60 system would bring the fiscal policy to intergenerational balance. The effects of different pension indexing systems are presented in table 5.

The third option for achieving intergenerational balance is cutting collective consumption expenditures that are not part of generational accounts, but that nevertheless have to be paid. To be exact, the cash flows in question are really net expenditures (collective consumption expenditures minus collective revenues) and their value can be modified in two ways – either by reducing the level of expenditures or increasing the level of revenues⁸. The calculations in this study show that as of May 2009, the government had to force a sustainable reduction of the net collective expenditures by about 6.3 billion kroons to achieve intergenerational balance⁹. The cut in collective net expenditures

⁸ One has to take into account that since the elaboration of this study, there has been a significant change in collective net expenditures. Due to the budget consolidation during the second half of 2009, both expenditures have been cut and revenues increased. Expenditures were cut mostly by reducing the overall payroll of government employees (by enforcing pay cuts and reductions in the number of civil servants), extra revenues consisted of higher dividend payments by public corporations and the Bank of Estonia and the sale of unnecessary fixed assets.

⁹ It can be concluded now that a cut of nearly this magnitude has also been actually implemented since the spring of 2009. Although some factors of this cut will be reversed later (i.e. the supplementary payments to the II pillar pension plan that were suspended in June 2009 will be continued in 2012 according to a preliminary plan) and some are of one-off character (i.e. sale of fixed assets, several additional dividend payments), in the mind of the author, Estonia has moved closer to a balance between current and future generations due to actions taken since the study.

could also be spread over time in order to maintain the viability of government administration.

In addition to the three policy scenarios pictured above, one could either use a combination of them all or a different approach based on other factors influencing the intergenerational distribution. For example, the sensitivity of generational accounts to productivity growth imply that any activity of the government to foster long-term growth will also make the treatment of current and future generations more equal.

5. CONCLUSIONS AND DISCUSSION

In light of the recent economic downturn, the fiscal pressure exerted by aging populations in several developed countries has received more attention. The problem is very pronounced in the European Union, where some member states have requested the help of the European Commission and the IMF in order to regain solvency. Severely austere fiscal policy is requested by the latter institutions, so that the long-term fiscal sustainability of these member states is guaranteed.

At the same time, there are no universally applicable indicators of long-term fiscal sustainability. The sustainability is often measured in current terms using budget deficit and public debt as the most convenient proxies. In theory, fiscal policy is sustainable when it does not cause excessive accumulation of government debt. This is best formalised as a claim that the ratio of government debt to GDP converge to some finite level at infinite time.

This is the broader definition of fiscal sustainability. One would expect that in a fair society, government policy would treat different generations similarly – meaning that the taxes paid and benefits received would be roughly the same for different generations. If this condition is fulfilled, the fiscal policy does not prefer current generations to future generations and in addition to being sustainable, it is also fair in the generational context.

Generational balance is therefore a narrower definition than fiscal sustainability.

The aim of this paper was to evaluate the fiscal policy of Estonia from the standpoint of generational equity. In order to evaluate the generational balance as an indicator of the fiscal sustainability of Estonia, a generational accounting model was compiled. The data used as input to this model varied widely. Micro data at the individual level was used to derive the age-distribution of taxes paid and monetary transfers received by individuals. In order to distribute all government tax income and monetary transfer expenditure to various age groups, age profiles developed from the micro-data were scaled to aggregate administrative data. Government individual final consumption expenditures were distributed to certain age groups using aggregate data on expenditures according to COFOG groups and statistics from the Estonian Health Insurance Fund and the Ministry of Education and Research.

The official growth forecasts from the Ministry of Finance and the European Commission were used to evaluate future productivity growth. Official population forecasts from Statistics Estonia had to be extended to reach the goals of this study.

The benchmark scenario revealed a 64% generational imbalance of Estonian fiscal policy, meaning that future generations would on average face a fiscal burden 64% larger than current generations. Various strategies to achieve generational balance can be constructed. A permanent and immediate tax hike that would raise tax revenue by 9% would yield an intergenerational balance. Equilibrium could also be reached by changing the indexing formula of pensions or cutting the net collective expenditures of the government (that is by reducing the collective final consumption expenditures or by raising non-tax revenues).

There are several factors that require attention when interpreting these results. First, the sensitivity analysis shows that the results are sensitive to growth forecasts. Due to the high uncertainty caused by very difficult economic conditions, the forecasts of

different institutions tend to vary considerably. Therefore, the results could be somewhat different if other growth assumptions were chosen.

Secondly, the study that is reflected in the present paper was concluded in spring 2009. Several attempts have been made by the government since then to cut expenditures and increase revenues. While some of these changes are of a one-off nature in order to keep the ratio of deficit to GDP under the Maastricht ceiling of 3%, others affect the long-term balance. At the same time the economic recession has turned out to be even more severe than forecast at the time of the study. Although these effects in part cancel each other out, the author of this paper believes the effects of the policy changes to be larger. This means that the generational imbalance is expected to be somewhat smaller than indicated in the study.

The present study is one of the first attempts to compile generational accounts for Estonia and to measure the generational balance. It aims to provide an overall evaluation of the sustainability of fiscal policy. There is room for further development, especially regarding the methodology for calculating the age structure of government final consumption expenditures developed in this study. Also, the role of government non-financial wealth and gross fixed capital formation could be studied further, as the discussion of these issues seems to be somewhat less developed in the relevant theoretical literature.

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KOKKUVÕTE

Põlvkondlik arvepidamine Eesti eelarvepoliitika jätkusuutlikkuse hindamise vahendina

Seoses vananeva elanikkonna ning väheneva sündivusega on mitmel pool arenenud riikides saanud oluliseks kõneaineks eelarvete jätkusuutlikkus. Jätkusuutlikkuse defineerimiseks eelarvepoliitika kontekstis kasutatakse enamasti riigivõla projektsiooni. Kui võlataseme suhe SKP-sse koondub pika perioodi jooksul lõplikule tasemele, on eelarvepoliitika jätkusuutlik.

Kui selle portsessi käigus tagatakse ka praeguste ja tulevaste põlvkondade võrdne kohtlemine, on eelarvepoliitika pikaajaliselt jätkusuutlik ka põlvkondadevahelise tasakaalu mõistes. Eelarvepoliitika põlvkondadevahelise ümberjaotava efekti mõõtmiseks on loodud spetsiaalne meetodiline raamistik – põlvkondlik arvepidamine.

Käesoleva töö eesmärk oli hinnata Eesti eelarvepoliitika jätkusuutlikkust põlvkondadevahelise tasakaalu mõistes, kasutades selleks põlvkondlikku arvepidamist.

Põlvkondliku arvepidamise meetodika nõuab suurt hulga sisendandmeid ning tulevikuprognose. Kõige olulisemad vajalikest andmetest on maksude, siirete ja valitsuse kulutustest saadavate hüvede jaotus vanuse järgi. Maksude ja rahaliste siirete jaotust neid maksvate või saavate vanusegruppide järgi on võimalik leida mikroandmeid kasutades. Käesolevas töös on autor leidnud maksude ja rahaliste siirete vanusjaotuse, kasutades Statistikaameti LEU andmete põhjal mikrosimulatsioonimudeliga ALAN simuleeritud andmeid. Andmed on skaleeritud administratiivandmetele, ehk on eeldatud, et mikroandmete põhjal leitud vanusstruktuur on kogu maksutulu ja siirete kulu osas representatiivne.

Valitsemissektori lõpptarbimiskulutuste osas on leitud vanusstruktuur üksnes nende kulutuste jaoks, mida võib pidada individuaalselt jaotatavateks. Individuaalselt jaotatavateks peetakse kulusid, mis kuuluvad COFOG gruppidesse 07 (tervishoid); 08 (vaba aeg, kultuur ja religioon); 09 (haridus) ja 10 (sotsiaalne kaitse). Käesolevas töös on Haridus- ja Teadusministeeriumi ja Haigekassa koostatud statistika ning LEU andmete põhjal vanusstruktuur leitud valitsemissektori lõpptarbimiskulutustele, mis kuuluvad COFOG gruppidesse 07, 09 ja 10.

Makstavad maksud inimese kohta on suurimad keskeas. Siirded on pigem kallutatud vanemate vanusegruppide kasuks, vanusegrupid alates 60. eluaastast ületavad inimese kohta saadud siirete osas eelnevaid vanusegruppe ligi kolmekordselt. Valitsuse kulutuste jaotuses on tänu hariduskulutuste suurele osakaalule pigem eelistatud nooremad vanusegrupid.

Maksude, siirete ja kulutuste vanusjaotus koos rahvastiku- ning majandusprognoosidega on aluseks põlvkondlike kontode arvutamisel. Põlvkonna või vanusekohordi põlvkondlik konto näitab kõiki konkreetse kohordi poolt tulevikus makstavaid netomakse (makse, millest on lahutatud saadavad siirded ja saadud kasu valitsemissektori individuaalsetest lõpptarbimiskulutustest) kontode koostamise aasta (baasaasta) vääringus.

Kõik ülejäänud valitsuse kulutused otseselt põlvkondlike kontode koosseisu ei kuulu. Küll aga arvestatakse nendega tulevaste põlvkondade kontode arvutamisel. Tulevaste põlvkondade panus valitsuse kulutuste eest tasumisel arvutatakse tasakaalustava kirjena, lahutades prognoositavate valitsuse tulevaste kulutuste summast kõigi baasaastal elusolevate põlvkondade põlvkondlike kontode summa.

Autori arvutatud baasstsenaariumi kohaselt jätab praegune Eesti eelarvepoliitika tulevastele põlvkondadele umbkaudu 64 protsenti suurema netomaksukoormuse kui praegustele vastsündinutele. See tähendab, et eelarvepoliitika ei ole põlvkondliku tasakaalu mõttes jätkusuutlik.

Tulemused on sarnaselt varasemates uuringutes väljatoodule tundlikud kasvuprognoside muutuste suhtes. Ebatavaline efekt tuleb välja diskontomäära mõju analüüsides – diskontomäära tõstmine pigem suurendab põlvkondadevahelist ebavõrdsust. Selline efekt võib tuleneda Eesti omapärast. Erinevalt varasemate uuringute eeldustest on autor kasutanud muutuvat kasvumäära, et paremini tuua välja võimaliku EL sisese konvergenksi mõju. Samuti võib rolli mängida Eesti negatiivne netovõlg (Eestis on valitsussektori netofinantsvara positiivse väärtusega).

Autor pakub välja kolm erinevat strateegiat põlvkondliku tasakaalu saavutamiseks. Esiteks, võiks põlvkondliku tasakaalu saavutamiseks suurendada praeguste põlvkondade kohustusi läbi maksude suurendamise. Alternatiiviks oleks vähendada tulevaste põlvkondade kohustusi, seda põhiliselt läbi pensionite indekseerimise süsteemi muutmise. Kolmas võimalus oleks põlvkondadevahelist tasakaalu saavutada läbi valitsuse põlvkondlike kontode väliste kulutuste vähendamise.