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WILL WE TREAT FUTURE GENERATIONS FAIRLY? ITALIAN FISCAL POLICY THROUGH THE PRISM OF GENERATIONAL ACCOUNTING

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WILL WE TREAT FUTURE GENERATIONS FAIRLY? ITALIAN FISCAL POLICY THROUGH THE PRISM OF GENERATIONAL ACCOUNTING

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Abstract – We compute the value of the net taxes that current fiscal policies impose to future generation of Italians. Our figures show that Italian public finances are hardly sustainable. This is due to the generous treatment awarded to past and currently living generations. We discuss some policy options which could potentially restore sustainability while at the same time improving intergenerational justice. Our analysis is also meant to contribute to an assessment of Italian fiscal policy in the last decade. When confronting our findings with those of previous studies, it appears that in the last ten years neither sustainability nor fairness have improved.

Keywords: generational accounts; fiscal sustainability; inter-generational fairness
JEL Codes: H61, E62, J11

1. INTRODUCTION

Italians are often reminded that Italy's public debt, which exceeds gross domestic product, is the world's third largest. However, in a broad sense, debt-holders are not the only creditors of the Italian Treasury. Current and prospective pensioners, students, users of the Public Health service, all expect something from the Government in one form or another.

The costs of the entitlements granted by the Italian pension-centred welfare state are set to rise significantly, mainly due to the pronounced ageing of the population. Tax-payers will be then asked to finance the increasing costs of welfare programs and to service public debt. Assessing how heavy is this burden, and which generation is most likely to bear it, appears important both from a positive and from a normative point of view.

To assess long-run fiscal sustainability several forward-looking methodologies have been developed, some of which are also endorsed by national and supra-national institutions

[1] Banca d'Italia – Research Department. The views expressed in the paper are those of the authors and do not necessarily reflect those of the Banca of Italia. The authors would like to thank Maria Rosaria Marino for providing the data on gross labour income and Daniele Franco, Jagadeesh Gokhale, Lawrence Kotlikoff, Sandro Momigliano, James Sefton and participants to the 10th Banca d'Italia Public Finance Workshop (Perugia, 3-5 April) for helpful suggestions. Marzia Romanelli provided useful hints for the construction of the age-profiles and patiently listened to one of the author's loud thoughts. The usual disclaimers apply.

(see e.g. European Commission, 2006; Congressional Budget Office, 2007).[2] They go well beyond the standard debt-deficit accounting, as they take into account both implicit and explicit liabilities, and cover a long time period. However, as they are computed independently of whom is paying a tax or receiving a benefit, they cannot capture the conflict of interests between different generations and do not allow for an assessment of intergenerational equity.

Generational accounting (GA)[3] is a forward-looking method of long-term fiscal analysis which takes into account all government's liabilities, be they explicitly labelled as such or implicit in current budgetary policies.[4] On top of this, compared to other methodologies developed to assess long-run fiscal sustainability, GA is unique as it is also focuses on the inter-generational distribution of resources.

Suppose for example that current policies can be shown to be sustainable: are they also generationally fair? If, on the contrary, they are *not* sustainable (implying that they will have to be changed at some point) what generations should bear the burden of the unavoidable adjustments? While one cannot hope to settle these thorny issues once and for all, generational accounting provides indicators of inter-generational fairness which are useful to make our value-judgements more precise and economically grounded, and to improve the quality of public discussion.

The use of GA in Italy dates back to the early nineties. In particular, the paper by Franco et al. (1994) is actually the first exercise based on such methodology outside the US. Almost ten years later, Cardarelli and Sartor (2000) produced a new fully-fledged GA assessment of the Italian intergenerational balance based on 1998 data (Franco et al. base-

2 While the concept of fiscal sustainability is intuitive (quite simply: can current policies go on forever?), it has proved to be quite difficult to define theoretically (Spaventa, 1987) and to measure in practice (Balassone and Franco, 2000). The definition of sustainability that we adopt is spelled out below.

3 The methodology of generational accounting was developed by Auerbach, Gokhale and Kotlikoff (1991) and Kotlikoff (1992).

4 The assessment of public finances cannot rely only on deficit and debt figures, which are subject to changes due to accounting conventions with no real economic substance. A recent measure of the Italian government provides a good example. With the Finance Bill for 2007 the government disposed the transfer to the social security administration (INPS) of part of the severance pay provisions not allocated to pension funds by employees of firms with more than 50 workers. In respect of these receipts the public finances will bear the burden of the redemption (at retirement) of the severance pay provisions, currently re-valued at an annual rate near 3 per cent. As a result, the deficit of 2007 was lower by about 6 billion euros. Alternatively, the government could have forced workers to lend 6 billions at 3 per cent rate of return, setting the reimbursement date at the day of retirement. While the economic substance of the transaction would not change in the two cases, in the second one the operation would have been recorded as debt with no impact on the 2007 deficit. The issue of "label-free" fiscal indicators has been recently addressed in a general setting by Green and Kotlikoff (2008).

year data were those of 1990).[5] Our study (based on 2006 and 2007 data) provides an (almost) decennial update. We believe this tradition provides a unique value added: by comparing the three different waves, we can also use the Italian generational accounts to evaluate the reform process which characterised Italy over the last fifteen years[6] from a new perspective.[7]

The rest of the paper is organized as follows: in section 2 we sketch the basics of the GA methodology to give a flavour of what kind of insight it provides; section 3 shortly describes fiscal developments in Italy in the years 1990-2007 through the lenses of the previous GA studies; section 4 describes the data we used and how we constructed relative age-profiles to allocate taxes and transfers to each cohort; in section 5 we build the generational accounts for Italy and present the main results; in section 6 we use the accounts to evaluate several reform scenarios; section 7 concludes.

2. BASICS OF GENERATIONAL ACCOUNTING[8]

The cornerstone of the GA approach is provided by the inter-temporal budget constraint of the government (IBC):

$$\text{PV[gvt expenditures]} + \text{Net gvt debt} = \text{PV[gvt revenues]} \qquad (1)$$

which simply says that, as for any other agent in the economy, government's actions are constrained by the requirement that the sum of net debt and of the present value of current and future expenditures equals the present value of revenues. The IBC can in turn be equivalently rewritten as:

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5 Between Franco et al. (1994) and Cardarelli and Sartor (2000) two other GA exercises have been performed (Sartor, 1999 and Franco and Sartor, 1999), both based on 1995 budget data.

6 Major changes have been introduced in Italy since 1990. Among the most relevant there are the interventions to introduce a federalist structure of the country, and several pension reforms (1992, 1995, 1997 and 2007).

7 In the paper we discuss the main differences between our study and the previous ones and we are aware of the fact that differences in the methodology adopted do not allow for full comparability. However, we believe that the pattern of the generational imbalance as measured in the three studies still provides interesting insights.

8 This section is not technical and simply provides an overview of the indicators we use and of their theoretical underpinnings. The theory and the methodology of GA has been described and discussed in several papers. Early references are Auerbach et al. (1991) and Kotlikoff (1992). Diamond (1996) discusses some limitations of the theory. Auerbach and Kotlikoff (1999) provide a detailed and complete description of both the theory and the procedures to implement to construct the accounts. A more technical description of GA – based on Auerbach and Kotlikoff (1999) – is also contained in the appendix.

$$\begin{gathered} PV(G) + \text{net gvt debt } - PV[\text{taxes - transfers}]_{\text{current generations}} \\ = \\ PV[\text{taxes-transfers}]_{\text{future generations}} \end{gathered} \qquad (2)$$

where PV[taxes - transfers]$_{\text{generation } t}$ represents the present value of net taxes – viz. the generational account – of the generation born in *t* and PV(G) collects those expenditures excluded from the accounts. Indeed, with the exception of government outlays on health care and education, which are treated as transfer payments, in general we do not impute to any particular generation the value of the government's purchases of goods and services because in most cases it is not clear how to attribute the benefits of such purchases (defence and infrastructure are obvious examples). Alternatively, as it is done in some studies, one could allocate in the generational accounts also this item, distributing it equally on a per capita basis. Typically, while the value of the accounts obviously changes, the main messages of the paper do not. For completeness, we report in the paper the results obtained in both cases.

The generational accounts that we construct can be used to provide summary indicators of the sustainability of current fiscal policies (in the paper, we include in the definition of current policies also future changes in the rules which have already been legislated[9]). In particular, we compute the *inter-temporal budget gap* (ITG), which is defined as the gap between the right- and the left-hand side of equation (2) under current policies. Current policies can be said to be sustainable if and only if the ITG is less or equal than zero.[10]

To move from sustainability to considerations of intergenerational fairness, we compute the GS indicator (Gokhale and Smetters, 2003). It differs from the ITG because all government expenditures are allocated in the generational accounts and the generational accounts of future generations are set to zero (instead of being calculated on the basis of current policies):

$$GS = \text{Net gvt debt } - PV[\text{taxes - transfers}]_{\text{current generations}} \qquad (3)$$

GS represents the amount of the fiscal imbalance (both in terms of explicit and implicit debt) that past and current generations can be held responsible for.[11]

9 For example, we include under current policies the effects on pension expenditure of future changes in the rules for benefit calculations and for eligibility, which have been approved in the nineties, but are subject to a lengthy phase-in.

10 We also compute the generational balance gap (GBG), which is the same of the IBG, except that we assume that future generations pay the same amount as a current newborn would pay under current policy. If future changes in the rules are already embedded in current laws, the GBG will be different than the ITG. In the case of Italy, even if past pension reforms envisaged a lengthy phase-in, the legislated changes will be fully in place when the current and future newborn will be retiring. Therefore the ITG and IGG do not differ.

11 The ITG can also be written as ITG = GS - PV[Taxes - Transfers]$_{\text{future generations}}$.

Next, we compute the Auerbach-Gokhale-Kotlikoff (AGK) indicator. To this aim, it is first necessary to calculate the PV of the generational accounts of all future newborns if all the costs of the adjustment are borne by them. In particular, the burden is allocated across future generations in such a way that the lifetime tax-to-income ratio is kept constant across all individuals.[12] The AGK indicator is then defined as the ratio between the generational account of the first future newborn and that of the youngest living generation.

The construction of the generational accounts requires the age and sex distribution and the projections of taxes and transfers, together with projections for population and government purchases. These are presented in section 4.

We also need an initial value of government net debt and assumptions on productivity growth and discount rate. In our baseline calculations we use a real interest rate of 3 per cent - which is in line with the average cost of public debt – and a real rate of productivity growth of 1.5 per cent. Of course, since the results are sensitive to macroeconomic assumptions, we also include sensitivity analyses with regard to these parameters.

To calculate government debt we do not net out the value of the government's existing physical capital, such as highways, state-owned enterprises, Palazzo Pitti in Firenze or the Colosseo in Roma. Including such assets should have no impact on sustainability, as one should also subtract from future government revenues the flow of rents granted by the assets.

Our general rule regarding tax incidence is to assume that taxes are borne by those paying the taxes, when the taxes are paid: income taxes on income, consumption taxes on consumers, and property taxes on property owners. There is one exception, which involves corporate income taxes. In the case of small open economies, like Italy, marginal corporate income taxes are assumed to be borne by (and are therefore allocated to) labour. Therefore we impute the corporate income tax (IRES), the regional tax on productive activities and all other production taxes on the basis of the age and sex distribution of labour income.

3. 1990-2007: FISCAL IMBALANCES, FISCAL DISCIPLINE AND NEW RISKS

The use of GA in Italy dates back to the early nineties. Notwithstanding some methodological differences between our study and the previous ones, comparing the results allows to some extent an assessment of the budgetary policies of the nineties through the prism of GA.

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[12] Specifically, the generational account of a person born in t+s is set equal to that of a person born in t+s-1 times (1+g), where g is the growth rate of per capita GDP.

Franco et al. (1994) provide the first application of GA to Italy. The reference year in their study is 1990, at about the peak of the fiscal imbalance which ultimately drove Italy out of the European monetary system (1992).

With the benefit of hindsight, the authors' demographic scenario was extremely optimistic. It was assumed that by the year 2000 the total fertility rate would stabilize at 2.1, whereas it has remained exceptionally low, at around 1.3. The percentage of the male and female population over-60 in 2050 was expected to be 20.5, and 26.7 per cent, respectively, while according to the most up-to-date projections, fertility should somewhat increase in the future, up to 1.6 in the year 2050. The share of 60+ individuals should reach 40 per cent. This notwithstanding, the authors found a quite high generational imbalance. The AGK indicator pointed out that, if left alone in bearing the cost of restoring fiscal solvency, future generations were expected to pay 2.6 times more than the new-born (in a scenario with a 1.5 per cent productivity growth and a 3.0 per cent real interest rate). In particular, current newborns would have to pay 125,785 euros more than future newborns (corresponding to about 10 times the per capita GDP in 1990).[13]

The wide imbalance stemmed from a huge and growing explicit public debt, due to 25 years of unsustainable fiscal policies, a very generous pension system, which was expected to grow by around 10 percentage points of GDP over the following decades[14], and a double-digit deficit.[15]

Italian public finances had dramatically improved at the time of the second comprehensive GA study performed by Cardarelli and Sartor (2000; the authors used 1998 as the reference year).[16] The adjustment was obtained through a painful consolidation process, starting in the aftermath of the 1992 exchange rate crisis, which ended with the admission of Italy to the monetary union. By the end of the nineties, the overall deficit declined from double-digit levels to well below the 3 per cent limit set by the Maastricht Treaty. Public debt, while still above GDP, was on a descending path driven by the reduction of the cost of debt servicing.[17] The adjustment package also

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13 Current newborn had to pay 79,752 euros (6.5 times 1990 GDP per capita), future newborn had to pay 205,537 euros (16.7 times per capita GDP). In a scenario with a 1,5% growth rate and a 5.0% real interest rate, future generations were expected to pay almost 4 times more than the new-born (9.8 times per capita GDP).

14 Pension expenditure was expected to reach 25 per cent of GDP by 2050. At the time the paper was written, the pension system had not yet been reformed.

15 The net borrowing in 1990 was equal to 11.4 per cent of GDP; also the primary balance was negative (1.4 per cent of GDP).

16 From a methodological point of view, this paper improves on Franco et al. (1994) because it uses the official demographic projections made available by the National statistical institute (Istat).

17 The explicit debt in 1998 was around 115 percent of GDP, down from the peak of 121.8 in 1994. The expenditure for interest payment declined from 11.4 per cent of GDP in 1994 to 7.9 per cent in 1998 and continued to fall afterwards (Marino et. al, 2008; Franco and Rizza, 2008).

included two major pension reforms which tightened the rules for pension eligibility and for the calculation of pension.

A comparison between Cardarelli and Sartor (2000) and Franco et al. (1994) shows a sizable improvement in the generational accounts. In the former study, in a scenario with a 1.5 per cent productivity growth and a 3.0 per cent real interest rate, the difference between what the current newborn actually pay and what the future newborn would have to pay to grant that the IBC is satisfied is equal to 33.811 euros, corresponding to about 1,8 times per capita 1998 GDP.[18]

After Italy was admitted to join the European Monetary Union in 1998 (on the basis of an evaluation of 1997 budget), the goals of Italian budgetary policy gradually changed, partly reflecting the problematic legacy of the previous consolidation process (Balassone et al., 2002). The reduction of the fiscal burden and the implementation of policies to support growth became priorities in the action of the governments.

Overall, the primary surplus, at 6.6 per cent of GDP in 1997, shrunk to 1.3 in 2006. In 2005 the ratio of debt to GDP began to increase again, rising to 106.2 per cent. The structural budget balance shrunk by 4 points, as well. The deterioration of the structural primary surplus was concentrated in the years 1998-2003, amounting to 6 per cent of GDP; between 2004 and 2006, the structural balance improved by 2 p.p. of GDP (Marino et al., 2008).[19]

At a first glance, these data suggest that the 1999-2007 period was a lost decade in terms of public finances consolidation and justifies a new look to Italy's generational accounts.

We also aim to improve on Cardarelli and Sartor (2000) from a methodological point of view. While their data-sources are partly coincident with ours -albeit of course of a different vintage-[20], they could not use two important data sources that are instead available to us. First, the functional classification of General government expenditures provided by ISTAT according to the COFOG methodology, which enabled us to better allocate government's budget items to different welfare programs. Second, the aggregate

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18 With a 1,5 per cent growth rate and a 5 per cent interest rate current newborns would receive from the government 11.725 euros (corresponding to 0,6 times per capita GDP in 1998), while future newborns would have to pay 39.861 euros (2,1 times per capita GDP).

19 In Marino et al. (2008) structural figures are net of the effects of the economic cycle and temporary measures, both computed using the methodology developed within the European System of Central Banks. Changes in structural figures are also decomposed in order to distinguish the effect of discretionary measures, fiscal drag and *decoupling* between tax bases and GDP growth.

20 They use 1998 aggregate budgetary data, while we use the latest available (2007). They use the 1995 wave of the Bank of Italy Survey on Household Income and Wealth (SHIW), while we use the 2006 vintage.

projections of age-related expenditures provided by the State Accounting Office (Ragioneria Generale dello Stato, RGS).[21]

4. DATA, ASSUMPTIONS AND RELATIVE AGE PROFILES

As we remarked in the previous section, to compute generational accounts one needs five main ingredients: relative age profiles, budgetary data, budgetary and demographic projections. Assumptions concerning macroeconomic parameters are also needed: we adopt in the baseline scenario a 1.5 per cent productivity growth and a 3.0 per cent real interest rate on government debt (this is also the discount rate used to calculate the generational accounts). Such figures are in line with the RGS projection exercise as well as with the sustainability exercise performed by the European commission (European Commission, 2006).

Relative age – profiles. The distribution, by age and sex, of as many of taxes and transfers as possible allows us to apportion the total amount of each government expenditure and revenue reported in official documents to the proper cohort. For each age-cohort alive in the reference year, an age-profile basically provides the average amount of a given transfer (tax) received (paid) by an individual belonging to that cohort. We refer to appendix 2 for a more detailed description of the age-profiles and of their use.

As information on the age and sex distribution of taxes and transfers is not immediately available, an important stage of our research concerned the construction of these profiles starting from micro-data. In particular, we use the 2006 release of the Banca d'Italia's household survey of income and wealth (SHIW).[22]

The SHIW does not contain information on the amount of taxes effectively paid by the interviewees. To cope with this issue, the allocation of taxes to different age-groups has been mainly based on the age and sex distribution of the relevant tax bases. In particular, we allocated VAT using consumption levels[23]; similarly taxes on financial income have

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21 Both shortcomings are also present in two further GA studies for Italy, performed taking the 1995 national accounts as a basis: Sartor (1999) and Franco and Sartor (1999). Only the first one considers the effects of the 1995 pension reform. The use of official projections for the purposes of generational accounting is becoming common practice. See among others Cardarelli et al. (2000), Agulnik et al. (2000), and Gokhale and Smetters (2003, 2005).

22 The 2006 survey concerns a representative sample of the Italian population, consisting of 19.551 individuals (7.768 households). Among them, 13,009 earn some form of income. Details about the interviews and data collection procedures are reported in Banca d'Italia (2008).

23 In the SHIW consumption is reported at the household level. In order to compute the age-profile for the VAT, we allocated consumption to each member on the basis of personal income. The only exception concerns partners/spouses. In this case (and only to allocate consumption) we first cumulated their income and then split it equally among them. The idea behind this strategy is that husbands and wives (or partners) take the consumption decisions together and represent the main consumption-decision centre of the household.

been allocated based on the age and sex distribution of the income generated by each financial instrument, whereas the allocation of taxes on real estate income has been based on the value of the properties owned (Figure 1-3).

As long as the tax-structure is proportional to the tax-base, the age-distribution of the former will coincide with that of the latter. However, this is not true in the case of a progressive tax-structure, such as the Italian income tax (Irpef). Since Irpef is highly progressive, the allocation of the income tax based on the age and sex distribution of net income would result in a biased estimate and needs to be addressed in a different way.[24] In SHIW, households only report net income. So we re-construct data on gross labour income of the employees in the survey via a static micro-simulation model.[25] Since this model currently provides gross income only for employees, we complete the dataset by adding gross income from pension and other social transfers, which we take from Istat (2007a) where social security benefits are broken down by sex and 5-years age groups[26]. The difference between gross and net income represents our estimate of the income tax paid by each age cohort. (Figure 4). It turns out that the relative Irpef profile for women shifts upward around the age of seventy. That is the age when married women start becoming widow and getting survivors' pension from their husbands. Together with the very low labour market participation rate among women, this explains why at very old ages the profile bends upward.

The reconstructed series for gross labour income is also used to allocate social security contributions (Figure 6), as well as production and corporate income taxes (see the discussion about this issue in Section 2).

On the expenditure side, we focus on the three main categories of age-related expenditures, namely education, health care and social security. These account for two thirds of current primary expenditure and for almost all age-related expenditures in the Italian budget. Since we allocate to the generational accounts only these spending programs, all the remaining public expenditure represents the term G of equation (2) and it is not assigned to any age group.

The social security relative age-profiles for 2006 have been taken from Istat (2007a); we allocate separately old-age pensions, survivors pensions, disability allowances and other non-contributory pension transfers (Figure 7).

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24 The same problem arises also in the allocation of social security contributions. Households report net labour income, whereas contributions are calculated on gross labour income.

25 The model has been built by our colleague M.R. Marino. It takes into account all household and individual characteristics contained in the 2006 SHIW, to derive the gross labour income and the gross income tax, using SHIW net income as input. The model applied to the 2004 SHIW data was first presented in Marino and Staderini (2006). A paper based on 2006 SHIW data is forthcoming.

26 Istat provides average benefit over age conditional on receiving it. As we need pension averages conditional on being alive, we compute them using the number of receivers and the size of each age cohort.

Health expenditure is divided into four categories: pharmaceuticals, hospitals, diagnostics and general services. To allocate these items we use the 2005 survey “Multiscopo” (Istat, 2007b) on the health conditions and access to health services. Unsurprisingly, it turns out that the use of health services is mainly concentrated at the start and at the end of one’s life (figure 8).

Finally, data to allocate education expenditure (divided into pre-primary, primary, high school, university) come from the Ministry of Education.

The evolution of the old-age pension and social contribution profiles. Since the early nineties three major pension reforms have been implemented in Italy which drastically altered the age and sex distribution of the benefits.

In 1992, in the aftermath of an exchange rate crisis, the rules for pension eligibility and for the calculation of pension benefits were tightened. Post retirement indexation of benefits was linked to prices instead of wages. In 1995, a notional defined system was introduced, linking pensions to life expectancy at retirement. However, only workers entering the labour market after 1995 are fully subject to the new rules, and workers with more than 18 years of contributions as of 1995 are fully exempted.[27] Finally, as legislated in 2007, the earliest eligibility age for seniority pensions will gradually increase, starting from 2008. The 2007 law also tightened the age eligibility requirements for those workers fully subject to the 1995 reform (bringing it to 65 years for men and to 60 years for women).

All these reforms involve a lengthy phase-in, which implies that the relative age-pensions profiles are expected to shift over time. Given the quantitative importance of the old-age pension scheme and the magnitude of the reforms, the simplified assumption made above of a fixed age-profiles is not acceptable.

In order to address the transition we build an extremely stylized static micro-simulation model of retirement and pension income. In our model each individual enters the labour market at the age of 25, is never unemployed and retires as soon as the rule allows him/her to go (this last assumption seems to represent the actual behaviour quite accurately). Consistent to our macroeconomic assumptions, every year the wage for each age grows in real terms at a constant rate of 1.5 per cent. On top of this, the wage of each individual also reflects a tenure effect, calibrated to match the age-wage distribution observed in the 2006 SHIW.[28]
The relative age-pension profile for those already retired at the start of the simulation period is taken from administrative data (ISTAT, 2007a).

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[27] For a thorough analysis of the pension reforms of the nineties, see Franco (2002), and Franco and Sartor (2006).

[28] In so doing we are assuming away cohort-specific effects in the return to seniority.

The model calculates yearly pension benefits from retirement to death for all the cohorts alive in at least one year of the 2006-2050 period; then it simulates the relative age-pension profile for each year up to 2050 separately for men and women (the age-profile is assumed constant after that date). Importantly, in the model the coefficients which translate the stream of life-time social security contributions into the pension benefit at retirement are updated according to the current law, that is each three years starting from 2010. The law imposes that coefficients are updated to take into account the increases in the residual lifetime at retirement.[29]

It goes without saying that this model is far too simple to capture all the heterogeneity currently existing among both the active and the retired population. However, it seems able to summarize the main trends in the relative profiles stemming from the changing pension rules. The pension profile progressively shifts to the right due to the increase in the minimum eligibility age (Figure 8). The profile, which today looks single-peaked[30], gradually becomes bi-modal. This is caused by the coexistence, for several years, of younger pensioners whose benefits are mainly calculated according to the post-1995 rules, and older pensioners, whose benefits are mainly calculated according to the pre-1995 rules. Once these earlier cohorts leave the stage, the profile becomes single peaked-again. However, the peak is now reached soon after retirement, as younger pensioners' wages benefit from higher productivity levels, that translate into higher contributions and higher benefits.

To conclude, we also used our model to calculate relative age-profiles for pay-roll social security contributions, consistent with the model's wage dynamics and with the gradual phase-in of the legislated increases in the eligibility age.

Budgetary data and projections. Data for 2006 are consistent with (and mainly taken from) the consolidated budget of the General government (Istat, 2007c and 2008a). Figures for education and health-care are taken from the classification of public expenditure by function produced by Istat (2008b), and figures for different categories of pension expenditure come from Ministero dell'Economia e delle Finanze (2007). On the revenue side, we keep track separately of each existing tax.[31]

Turning to 2007, at the time this paper was written budgetary data were available only at an aggregate level.[32] Concerning revenues we assumed that the share of each tax has

29 The exact formula can be found in Ministero dell'Economia e delle finanze – Ragioneria Generale dello Stato (2007). Our calculation follows the methodology developed in Forni and Giordano (2001).

30 The peak is actually at around 70 years. After that age, the profile slopes downward because older pensioners typically suffer from more discontinuous careers and from the rules concerning the post-retirement indexation of benefits (which are linked to prices, not to wages).

31 In particular we used tables 17 and 18 of "Statistiche in breve". However, in February 2008 Istat released revised data for 2006. Since tables 17 and 18 had not been updated at the moment this paper was written, we imputed all revisions to a residual revenue item.

32 Istat will release the disaggregated information for 2007 revenues only in June 2008.

remained unchanged with respect to the previous year.[33] As far as expenditure is concerned, currently available data do not allow to disentangle age-related expenditure. Therefore, we relied on official projections for health-care, education and pension expenditure (see below).

Importantly, we correct the general government budget for 2006 and 2007 to take into account the impact of one-off measures.[34]
Concerning projections, in the case of age-related transfers (education, health care and social security) we use the official forecasts provided by RGS (Ministero dell'economia e delle finanze – Ragioneria Generale dello Stato, 2007), which are in turn consistent with our demographic forecasts (see below). As the exact definitions of pension, health care and education expenditures are slightly different from those adopted in the general government accounts, we apply the rate of growth projected by RGS to the corresponding 2006 items in the general government accounts.

In the case of budgetary items for which no official forecast is available, we project revenues and expenditures by using the demographic projections and the age-profiles, adjusted to account for productivity growth. In particular, we keep constant in per capita terms (after adjusting for productivity growth) the average tax/transfer by age and sex (see appendix 2).

Demographic projections. GA requires accurate long term demographic projections on a year-by-year basis and by age cohort: average net-taxes paid by a member of a given cohort are multiplied by the size of the cohort and obtain the corresponding generational account. We use the demographic projections provided by the National Statistical Office (Istat) up to the year 2050 and assume that the population structure remains constant afterwards. The Istat projections are consistent with the long-term forecast of age-related expenditures realized by RGS and used in our calculations.

5. RESULTS

Using the relative age-profiles and the projections of the demographic structure and of age-related expenditures, we are able to compute the generational accounts of currently living cohorts under the assumption that current rules – including those subject to a phase-in period –remain unchanged (Figure 11). It turns out that individuals born in 2006 can be expected to pay to the government net-taxes for 174,418 euros (approximately 7

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33 The aggregate data available only distinguish between direct and indirect taxes, social security contributions and other revenues. We keep the share of each tax constant with respect to the tax category it belongs to.

34 One-off measures are taken from Momigliano and Rizza (2007). Moreover, we exclude the revenues due to the transfer to INPS of part of the severance pay provisions (such transaction is described in footnote 3), because the expenditure-increasing effects of such measures are included in the pension projections.

times the 2006 per-capita GDP). Those born between 1955 and 2006 are all net payers to the government, while generations born before 1955 are net receivers. In fact, as of 2006, the latter already paid a large share of their lifetime taxes and social security contributions, but they still are to receive the bulk of government transfers, both monetary (pensions) and in kind (health-care services).

As already explained in the previous sections, the generational accounts of currently living cohorts are necessary to compute the size of the imbalance towards future generations, however one should not refer to them to assess intergenerational fairness between currently living cohorts. In fact, the comparison would not be homogenous as it would not take into account what these generations have already paid or received since their birth.[35] This said, figure 11 still allows us to highlight the enormous difference of treatment between younger and older generations in terms of pension transfers, as a result of the pension reforms of the nineties and their lengthy phase-in. Indeed, the present value of lifetime pension transfers for a current newborn can be expected to be around 75 per cent of that of a 40-year-old person, and half of that of a 60-years-old person.[36] The lifetime pension transfers of 30-year-old persons are equal to those of the newborns, confirming that pension reforms had a negative impact especially on the current young and on the future generations.

Sustainability. – Aggregating up the GAs of currently living generations and those of future generations calculated under the assumption of unchanged policies, it turns out that current fiscal policies are indeed not sustainable: the ITG is positive and equal to 207 per cent of 2006 GDP, or 3.0 per cent of the present value of all future GDPs.

While explicit government debt accounts for about 50% of the inter-temporal fiscal gap, the other half of the imbalance has nothing to do with officially-labelled government debt. This illustrates, once again, the point that the sole focus on debt can be highly misleading in assessing both fiscal sustainability and government's generational policy.

Another way to measure the fiscal gap is to compute what immediate and permanent change in taxes and social security contributions is necessary to close the intertemporal budget gap, under the assumption that policy remains otherwise the same (including the phase-in of reforms already implemented). Given 2006 budgetary data, a tax hike amounting to 3.2 percentage points of GDP would be required. This result is in line with

[35] This is the reason why the AGK indicator assess intergenerational imbalance by only looking at the generational accounts of current and future newborns, which are comparable.

[36] These comparisons are surely informative. In fact, the bulk of people has not yet started receiving a pension when they turn 40, therefore the comparison is quite homogenous. Also, the age of 60 represents the average retirement age in Italy; even if people started receiving pensions at earlier ages, the comparison becomes even more striking against the young.

the official assessment of the European Commission, which adopts a similar indicator (European Commission, 2006).[37]

The 3.2 per cent of GDP tax increase necessary to restore balance refers to 2006 budgetary data. In 2007 the primary balance rose by around 2 per cent of GDP and the ratio of taxes and social security contributions to GDP increased by 1.3 percentage points. As a consequence, part of the adjustment has been already made in 2007.[38]

Intergenerational fairness. – To measure the intergenerational imbalance we next compute the standard AGK indicator. It turns out that if all the burden of the adjustment was left to the future generations, the results could hardly be accepted as fair: the fiscal bill left to each future generations would be approximately 70 per cent higher then the one of the generation born in 2006 (Table 1). Future newborns would have to pay (in present value) approximately 127.000 euros more than current newborns (corresponding to 5 times the 2006 per-capita GDP).[39]

The substance of the results does not change if we allocate to the generational accounts all government expenditures and not just those age-related. In the absence of any specific allocation criterion, we use a flat age profile and therefore let this expenditure grow with demographics. Under this assumption current newborns become net receivers (each of them will receive approximately 70 per cent of 2006 per-capita GDP, 17,000 euros), while future generations would have to be net payers (3.5 times per-capita GDP, 88,000 euros) to restore sustainability.

The GS indicator, which is also calculated after fully allocating all government revenues and expenditure to the generational accounts, is 381 per cent of 2006 GDP, signalling the huge amount of explicit and implicit (in current policies) debt passed to future generations.[40]

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37 The European Commission calls it S2. In the calculations made for Italy in 2006, it amounts to 3.0 per cent of GDP. The main difference with the EC methodology is that we also project revenues based on demographic trends, whereas the EC assume constancy over GDP.

38 It must be stressed that the 2 per cent improvement of the primary balance does not translate one-to-one into a reduction of our indicator of the required tax increase. In fact, the higher primary balance in 2007 was achieved through an increase of some (not all) taxes and social security contributions and via the reduction of some expenditures as a ratio to GDP. In GA every tax might have a different effect on the imbalance based on the relative profiles and the demographic projections. Also the impact of expenditure cuts and tax increases may strongly differ. Our result refers to a permanent, immediate and proportional increase of all taxes and social security contributions. Notwithstanding this, it remains true that part of the adjustment was made.

39 In particular, current and future newborns would have to pay net-taxes corresponding to respectively 7 and 12 times 2006 per-capita GDP.

40 Correspondingly (see footnote 12), the generational accounts of all future generations are equal to GS-ITG=381 -207 = 174.

To our view, all these figures suggest that future generations should not be left alone in bearing the burden of the adjustment. Actually, we believe they provide a convincing case for currently living generations to pay for most of it.

TABLE 1 – Main findings

SCENARIO	Net lifetime taxes				Taxes and S. S. contributions increase to restore intertemporal budget balance		Assumptions
	Current Newborns	Future Generations	AGK	(Future-current) / per capita GDP	%	as a fraction of GDP	
Baseline	174,418	301,903	1.7	5.0	7.7	3.2	g = 1.5%; r = 3.0%
Full allocation	-17499	88,688	-	4.2	7.7	3.2	g = 1.5%; r = 3.0%; all budgetary items allocated to generational accounts
sensitivity to discount rate	66,567	190,947	2.9	4.9	8.8	3.7	g = 1.5%; r = 5.0%
sensitivity to growth	269,680	291,400	1.1	0.9	-3.2	-1.3	g = 2.0%; r = 3.0%
No debt	174,418	251,484	1.4	3.0	3.8	1.6	g = 1.5%; r = 3.0%; public debt = 0
No coefficient revision	158,858	325,496	2.0	6.6	11.1	4.7	g = 1.5%; r = 3.0%; no revision of the pension benefits coefficient
No ageing	262,727	213,897	0.8	-1.9	-4.2	-1.8	g = 1.5%; r = 3.0%; demographic structure constant at 2006 levels
Franco et al. (1990)	40,278	160,556	4.0	9.8			g = 1.5%; r = 5.0%
	79,752	205,537	2.6	10.2			g = 1.5%; r = 3.0%
Cardarelli and Sartor (1998)	-11725	39,861	-	2.7	5.0	2.0	g = 1.5%; r = 5.0%; full allocation to generational accounts
				1.8	3.0	1.2	g = 1.5%; r = 3.0%; full allocation to generational accounts

Sensitivity analysis. – Of course, results are sensitive to different assumptions concerning productivity growth and the interest rate. If we consider a “bad” scenario in which labour productivity still grows at the baseline 1.5 per cent but the interest rate is set at 5.0 instead of 3 per cent, the inter-temporal budget gap increases from 3.0 to 3.5 per cent of the present value of future GDPs.[41] Symmetrically, in a “good” scenario in which productivity growth is permanently one percentage point higher than in the baseline, future generations would have to pay only 10 per cent more that current newborn. In such a scenario, no increase in taxes would be needed to restore inter-temporal budget balance.

Results are not as sensitive to the initial level of debt as one would expect: even with zero net debt, the ITG is positive and equal to around 100 per cent of current GDP (or 1.5 per cent of present value future GDPs). To ensure sustainability without harming currently living generations, the GA of future newborns would have to be 40 per cent heavier than the one of current newborns, compared to the 70 per cent found in the baseline scenario. This confirms that the imbalance in Italian fiscal policy mainly reflects the pending

41 Expressing the ITG as share of present and future GDPs is advisable when considering changes in the interest rate and/or in the growth rate, as these parameters influence both the fiscal imbalance and the overall amount of resources in the economy. Using current GDP to deflate the ITG does not take this second effect into account.

demographic transition. Indeed, we calculate that if population were to experience no demographic change in the future, current fiscal policies would be sustainable.[42]

Results depend crucially on the full and timely implementation of already legislated pension reform. In particular, the actuarial coefficients used in the calculation of pension benefits should be updated every three years, to account for the increases in life expectancy. The costs of not doing so would be quite substantive, requiring an additional immediate and permanent tax increase of 1.5 percentage point of GDP.[43]

6. SOME POLICY EXERCISES

In the previous section we looked at generational accounts of currently living and future Italians to conclude that: (i) current policies are not sustainable in the long run; (ii) future generations should not be left alone in bearing the burden of consolidation. In this section we explore some policy experiments potentially able to restore long-term sustainability while at the same time increasing the degree of generational fairness.

Of course, to spread more evenly the burden of adjustment across generations one should intervene promptly, frontloading the savings needed to confront the rise in age-related expenditures and the contraction in several tax bases due to a shrinking workforce.

For example, inter-temporal budget balance could be restored by a 7.7 per cent immediate and permanent across-the-board increase of taxes and contributions. By construction, the AGK indicator would also be 1 under this scenario, implying that current and future newborns are treated equally. The GS indicator would be lower than in the baseline scenario (2.2 times current GDP against 3.8), but still high, signalling the large contribution asked to future generations in order to restore sustainability (Table 2).

Tax increases in Italy can hardly be considered a wise (let alone politically viable) policy option. In fact, taxes and social security contributions were equal to 43.3 per cent in 2007, which is the second highest level ever achieved[44] and well above the euro-area average. The gap is wider in terms of the amounts effectively paid by the taxpayers who fulfil their obligations, owing to the large size of the Italian underground economy.

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42 In this exercise we assumed that the population structure remains constant at the 2006 level. Consistently, we exclude the projections of the age-related expenditures, as those are strictly related to the demographic dynamics, and assume that they grow in line with labour productivity. We are ignoring the effect of the increase of the retirement age.

43 To build the non-updating scenario we apply the profiles which would prevail without the updating (that is, they only take into account the increase in the retirement age) to aggregate expenditure projections provided by RGS for the non-updating case (since for this scenario RGS does not provide data for each future year, we constructed an interpolated series).

44 The highest level ever achieved was 43.7 per cent in 1997, the year relevant for the admission to EMU.

As repeatedly recognised by many analysts and by the Italian governments themselves, the crucial challenge of Italy's public finances consists in simultaneously consolidating public finances and reducing the fiscal burden on the economy. To achieve these objectives it is necessary to curb primary current expenditure, which over the last ten years has grown at an average real rate of between 2 and 2.5 per cent per year. Our analysis suggests that restraining the growth of current primary expenditure has also the potential to balance the gap between the net taxes paid by newborns and future generations.

In particular, we show that a 15 per cent cut of all non-age related expenditures would make fiscal policy sustainable (and consequently the AGK indicator equal to 1).[45] The GS indicator decreases from 3.8 to 2.3 times the current GDP.[46]

We also consider a reform made up of: (1) and immediate 10 per cent cut in non age-related primary expenditure[47], while keeping their growth rate constant afterwards; (2) a 10 per cent reduction in old-age and survival pensions in all the future years. This two-pronged strategy would make fiscal policy sustainable and the GS indicator equal to 2.1 times current GDP.

TABLE 2 – Policy exercises

POLICY EXERCISE	ITG		GS indicator (1)	**Description**
	In per cent of current GDP	*In percent of PV of future GDPs*	*In per cent of current GDP*	
Baseline	207	3,0	380	g = 1.5%; r = 3.0%
Tax hike	-	-	220	A 7.7 per cent increase of all taxes and S.S. contributions.
Expenditure cuts (1)	-	-	240	A 5 per cent reduction of non age-related expenditure for 3 years
Expenditure cuts (2)	-	-	210	Immediate 10 per cent cut of non age-related expenditure plus 10 per cent cut of old-age and survivors pensions
Switch from S.S. contributions to VAT	169	2,4	330	10 points reduction of contribution rates and 12 points increase of VAT rate

(1) the GS indicator is defined and discussed in section 2.

45 In GDP terms, the cut is slightly below 3 percentage points. Non-age related primary expenditures account for about 40 per cent of total primary expenditures and is approximately equal to 17 per cent of GDP.

46 Correspondingly (see footnote 12), the accounts of all future generations increase from 1.74 to 2.3 times the current GDP.

47 That is, we excluded social security health care and education expenditures. The remaining components amount to approximately 200 billions euros (14 per cent of GDP).

Finally, we experimented the effects of a switch of revenues from social security contributions to VAT. This reform clearly improves the generational accounts of currently living young and middle-age generations as compared to the old-age ones. Indeed, while social security contributions are only paid by middle-age working people, the VAT is paid by old-age retirees as well. In particular, we assumed a 10 per cent cut of the contribution rates (from 33 to 23 per cent). At the same time, we also implement a 12 percentage points increase of the VAT rate, from 18 to 30[48], keeping the overall primary balance unchanged. As a result, the ITG improves (form 207 to 169 per cent of GDP). Most importantly, fairness between generations clearly improves, with the GS indicator going from 3.8 to 3.3 times of GDP.

7. CONCLUSIONS

We documented that Italian public sector redistribute resources from middle-age individuals to the old and the very young. This is a characteristic of every modern welfare state, which can be understood as an insurance scheme which smoothes resources along the individuals' life-cycle. However, these systems are vulnerable to adverse demographic developments. This is particularly true in Italy, where pensions absorb a large part of social transfers, and population ageing is particularly pronounced.

We show that current policies are not sustainable in the long run. The amount of net public liabilities implicit in current entitlements is about of the same size of "official" public debt; the two together amount to almost 200% of GDP. Those figures are in line with other exercises, as those performed at the EU level (European Commission, 2006).[49]

As current policies are unsustainable, they will have to be changed, sooner or later. However, not all reform paths are equal. We show that: (1) the observed fiscal imbalance is mainly due to the generous treatment awarded to past and currently leaving generations

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48 We are assuming that the VAT rate is always 18 per cent, even though for some goods it may vary. We focus only on VAT revenues from domestic transactions and leave unchanged the VAT rate on import, as an increase of the latter might induce substitution effects and a reduction of the exchanges.

49 Our figures are based on official expenditure projections which might be somewhat underestimated. Some risk elements are common to other European countries. First, the increase in age-related expenditures is likely to be higher than expected. For example, in the past, longevity increases have been consistently underestimated. Second, official projections do not factor in the effects of technological improvements health care expenditure, nor the effects of changes in household composition and organization on the demand for formal long-term care. Moreover, some risk elements are specific of the Italian context: in particular, as the European commission remarks, "current pension arrangements might come under pressure at some points if the projected decrease in the benefit ratio were to fully materialize". For example, the first actuarial update of the rule for the calculation of pension benefits, due to be implemented in 2005, was repeatedly postponed (it is now scheduled in 2010).

of Italians; (2) if currently living generations were exempted from the costs of the adjustment, the future ones should have to bear a very heavy fiscal burden.

We believe that both findings give weight to the opinion that current generations should share at least part, if not most, of the costs of the fiscal retrenchment. This in turn calls for prompt actions. In the last section of the paper we sketch some policy options which could potentially restore sustainability while at the same time improving intergenerational fairness.

Our exercise is also meant to contribute to an assessment of Italian fiscal policy over the last two decades. In the period between the first two studies (1990-1998), long-term sustainability and intergenerational fairness had dramatically improved, as a result of the consolidation effort which first helped Italy to recover from the crisis of the early nineties and then allowed it to join the monetary union. When confronting our new figures with the calculations of Cardarelli and Sartor (2000), we find that Italy has improved neither its long term budgetary position, nor intergenerational fairness. While explicit public debt declined by some 10 percentage points of GDP in the 1998-2007 period, the burden of implicit public debt has increased, mainly due to a worse demographic scenario; on top of this, the primary balance is lower (3.1 percentage points of GDP instead of 5.1 p.p. in 1998).[50] Future generations will be asked to pay much more than current newborns to cover for an imbalance predominantly attributable to past and current generations.

Overall, it appears that precious time was lost. As population ageing is looming larger, inaction will likely require a more abrupt adjustment, while its costs will have to be concentrated on fewer cohorts.

50 The decrease in the structural primary balance is about [1.5] percentage points of GDP.

APPENDIX 1: THE METHODOLOGY OF GENERATIONAL ACCOUNTING

The methodology of generational accounting is accurately described, among others, by Auerbach and Kotlikoff (1999). In this section we provide a short summary, while we encourage the interested reader to go through the original paper.

Let us start by defining the generational accounts as the present value of net taxes that, under current policy, individuals of different age cohorts are expected to pay over their remaining lifetimes. By net taxes we mean the difference between total taxes and contributions paid to the government and total transfers received from the government. Transfers include both explicit monetary transfers (pension benefits, unemployment benefits, etc.) and transfers in kind (health care service, public education, etc.). Formally, the generational account at time t of the cohort born at time k is given by:

$$N_{t,k} = \sum_{s=\kappa}^{k+D} T_{s,k} P_{s,k} (1+r)^{-(s-\kappa)} \qquad \text{(A1.1)}$$

where

$N_{t,k}$ = Generational account at time *t* of the generation born in year k

$T_{s,k}$ = Average net tax payment made in year *s* by a member of the cohort born in year *k* (conditional on he/she still being alive in k).

$P_{s,k}$ = Time *s* number of surviving members of the cohort born at time *k*.

D = maximum length of life

κ =max{t,k}

Notice that the formula applies to both currently living generations (t>k) and future generations (t<k). Consider the Government Inter-temporal Budget Constraint (IBC) re-written in terms of generational accounts:

$$\sum_{k=t-D}^{t} N_{t,k} + \sum_{k=t+1}^{\infty} \frac{N_{t,k}}{(1+r)^{k-t}} = \sum_{s=t}^{\infty} \frac{G_s}{(1+r)^{s-t}} + D_t \qquad \text{(A1.2)}$$

The first term on the left-hand side of the equation is the sum of the generational accounts of all living generations, that is the total amount of lifetime net-taxes that the government will collect from currently living cohorts. The second term is the sum of the generational accounts of all future generations (lifetime net-taxes that the government will collect from future generations). On the right hand side there is the present value of current and future government consumption (it is assumed to grow over time at the growth rate of productivity) and net financial wealth. The *inter-temporal budget gap* and *inter-generational budget gap* are defined respectively as:

$$
\begin{aligned}
IBG &= \left[\sum_{s=t}^{\infty} \frac{G_s}{(1+r)^{s-t}} + D_t - \sum_{k=t-D}^{t} N_{t,k} - \sum_{k=t+1}^{\infty} \frac{N_{t,k}}{(1+r)^{k-t}}\right] / GDP \\
IGG &= \left[\sum_{s=t}^{\infty} \frac{G_s}{(1+r)^{s-t}} + D_t - \sum_{k=t-D}^{t} N_{t,k} - \sum_{k=t+1}^{\infty} \frac{N_{t,t}}{(1+r)^{k-t}}\right] / GDP
\end{aligned}
\qquad \text{(A1.3)}
$$

In equation (A1.3) all the variables are calculated under current policies. The only difference is that in defining the inter-generational budget gap we are assuming that, apart from productivity growth, each member of all future generations pay Nt,t in net taxes; i.e., except for the growth factor, they pay the same amount as a current newborn would pay under current policy.

Finally, the Auerbach-Gokhale-Kotlikoff (AGK) indicator is calculated under the assumption that the generational account of a member of a certain future generation ($N_{t,k}/P_{k,k}$) rises with respect to the one of a member of the previous generation at the economy's rate of productivity growth. Thus, the share of labour income paid to the government as net-taxes is equal for all future generations. The IBC implies:

$$
\sum_{k=t-D}^{t} N_{t,k} + \sum_{k=t+1}^{\infty} \frac{\bar{n}(1+g)^{k-t} P_{k,k}}{(1+r)^{k-t}} = \sum_{s=t}^{\infty} \frac{G_s}{(1+r)^{s-t}} + D_t \qquad \text{(A1.4)}
$$

where g is the growth rate of productivity and $\bar{n}$ is the generational account of newborns next period (t+1). We, then, solve for $\bar{n}$.

The AGK indicator is defined as the ratio between $\bar{n}$/(1+g) and the GA of current newborns. If current policies are sustainable, its value is less than 1. Moreover, it is a meaningful measure of inter-generational fairness, because the numerator and the denominator are fully comparable (indeed, contrary to the GAs of previous generations, they both involve net taxes over an entire lifetime).

APPENDIX 2: THE CONSTRUCTION OF THE RELATIVE AGE-PROFILES

An age-profile gives the average amount of a certain transfer (tax) received (paid) by an individual of a given age-cohort alive in a given year. In more formal terms, let us assume that:

$$\frac{T_{s,k}}{\sum_{j=s-D}^{s} T_{s,j}} = \frac{T^{SHIW}{}_{s,k}}{\sum_{j=s-D}^{s} T^{SHIW}{}_{s,j}} \quad \text{for k=s-D, ..., s.} \tag{A2.1}$$

In (A2.1), D is the maximum lifespan (that we take to be 100 years). The term $T_{s,j}$ is the average amount of (say) income tax paid in year s by those born in year j. The $T_{s,j}$ are what we are looking for, as they are used to build the generational accounts (see Appendix 1). As we do not observe them directly, we reconstruct them using average income taxes taken from a micro data source, for example the Bank of Italy's SHIW. In equation A2.1 we define $T^{SHIW}{}_{s,k}$ as the average amount of income tax paid in year s by those born in year j as recorded in SHIW. So, equation A2.1 states that we assume that the relative profile we observe in the survey are equal to the unobservable ones. We define the elements of such profile as:

$$\rho_{sk} = \frac{T^{SHIW}{}_{s,k}}{\sum_{j=s-D}^{s} T^{SHIW}{}_{s,j}}$$

We then exploit the fact that

$$H_s = \sum_{j=s-D}^{s} T_{s,j} P_{s,j} \tag{A2.2}$$

where H_s is the aggregate amount of income taxes in s and $P_{s,j}$ is the number of members of the j-generation still alive in s. Indeed, substituting (A2.1) in (A2.2) one gets:

$$H_s = \sum_{j=s-D}^{s} T_{s,j} P_{s,j} = \left(\sum_{j=s-D}^{s} T_{s,j} \right) \left(\sum_{j=s-D}^{s} \rho_{s,j} P_{s,j} \right)$$

That is:

$$\sum_{j=s-D}^{s} T_{s,j} = \frac{H_s}{\sum_{j=s-D}^{s} \rho_{s,j} P_{s,j}}$$

Finally, using equation (A2.1) again, one has:

$$T_{s,k} = \rho_{s,k} \sum_{j=s-D}^{s} T_{s,j} = \frac{\rho_{s,k} H_s}{\sum_{j=s-D}^{s} \rho_{s,j} P_{s,j}}$$

For years in which we have budgetary outturns or official projections, the equation explains how one can use demographic information ($P_{s,j}$) aggregate data on tax and transfers (H_s) and the profiles ($\rho_{s,j}$) to recover the $T_{s,k}$. In the absence of official figures, we assume instead that the $T_{s,k}$ grow every year in line with productivity:

$$T_{s+1,k+1} = (1+g)T_{s,k}$$

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Figure 1 – VAT (relative to the figure of a 50 years old male)

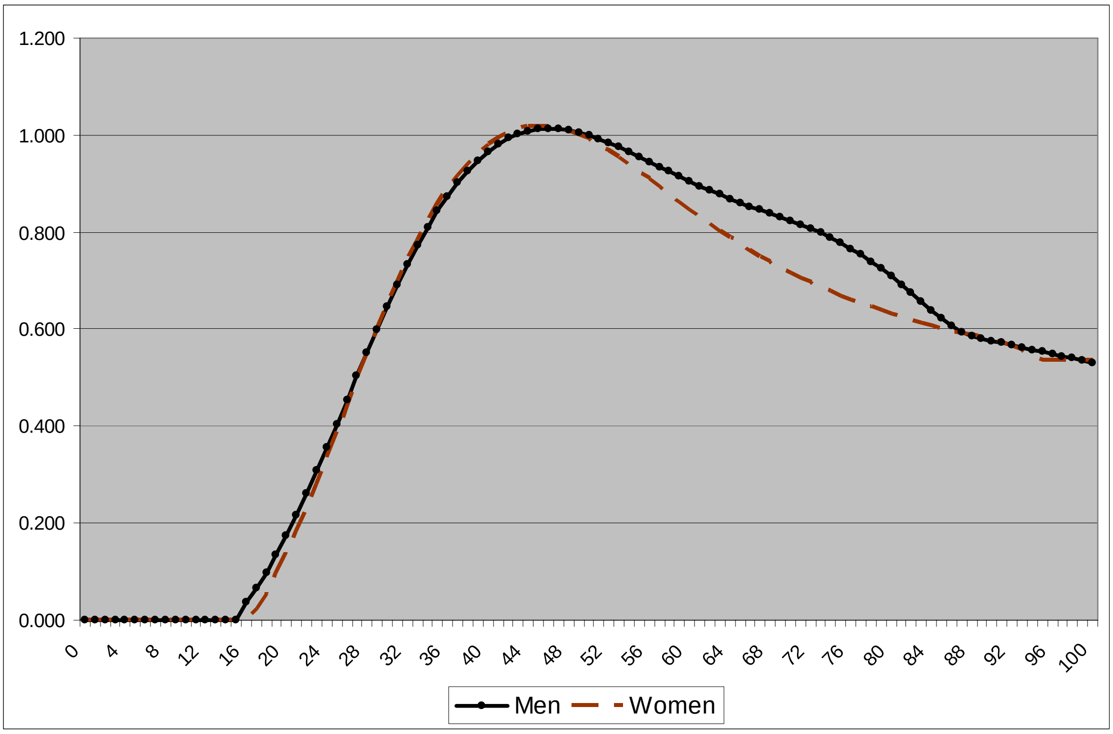


Figure 2 – Taxes on financial income – Men
(relative to the figure of a 50 years old male)

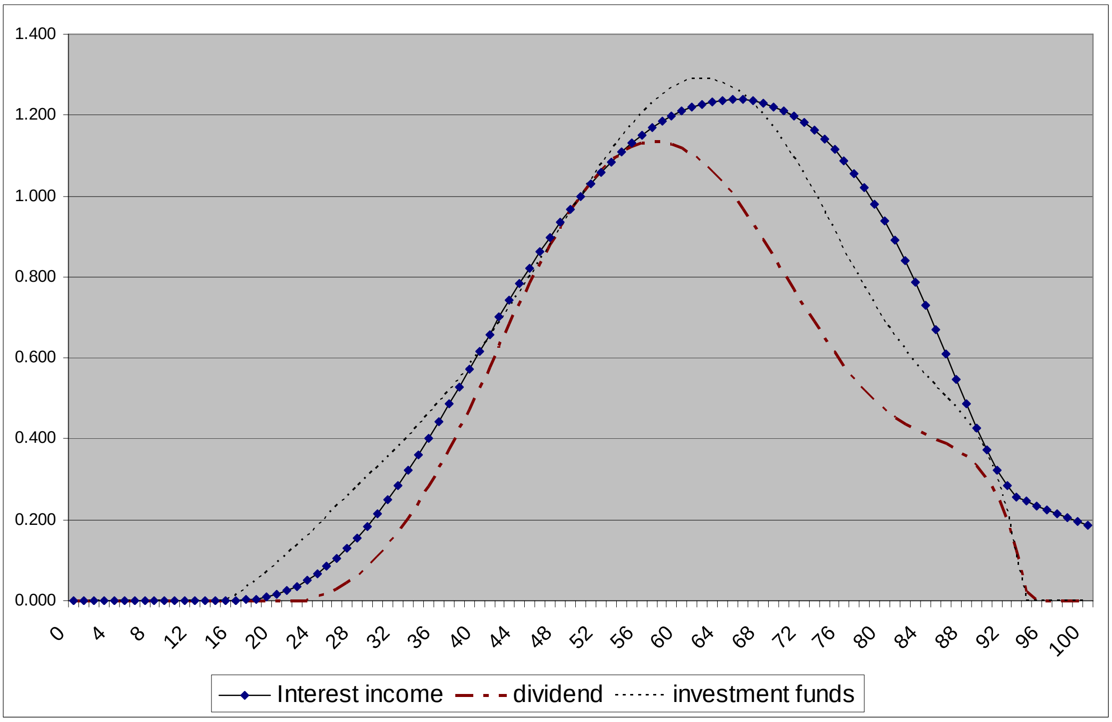


Figure 3 – Taxes on wealth – Men
(relative to the figure of a 50 years old male)

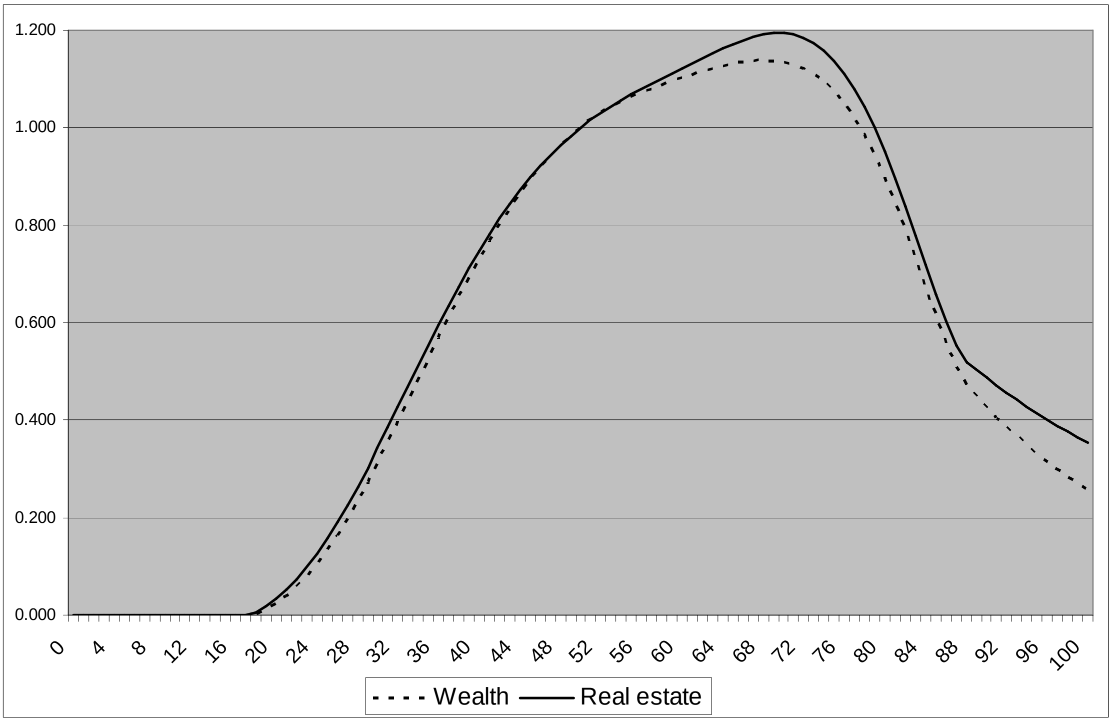


Figure 4 – Income tax (relative to the figure of a 50 years old male)

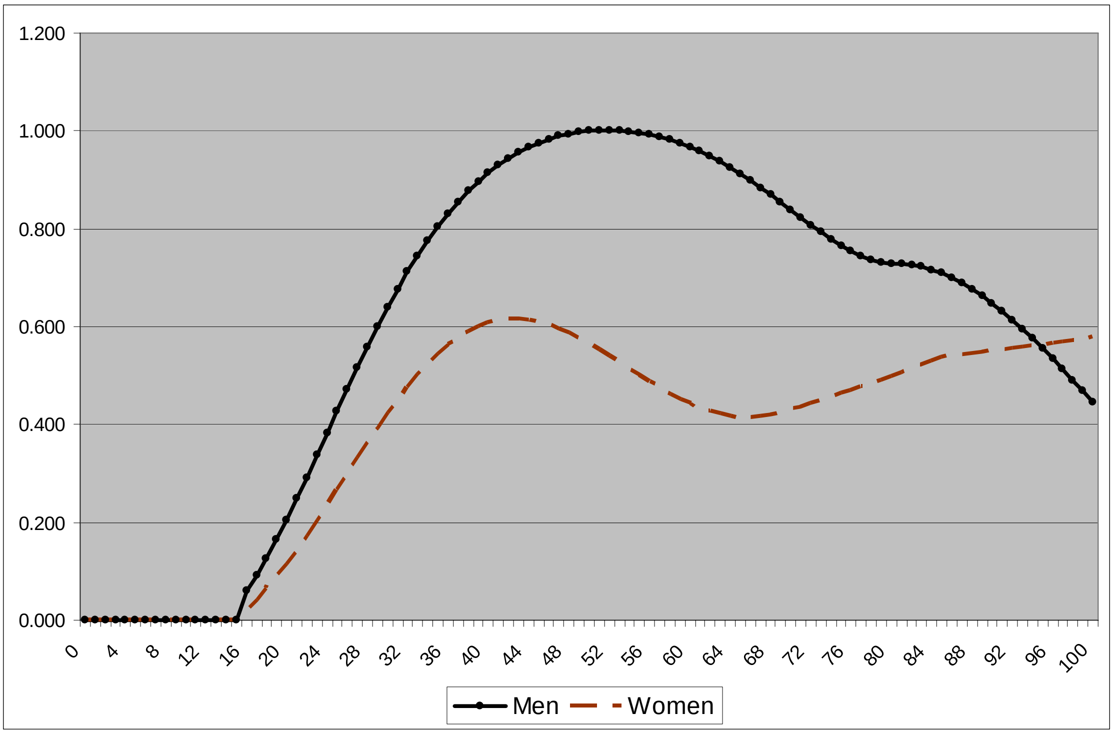


Figure 5 – Self-employed income tax (relative to figure of a 50 years old male)

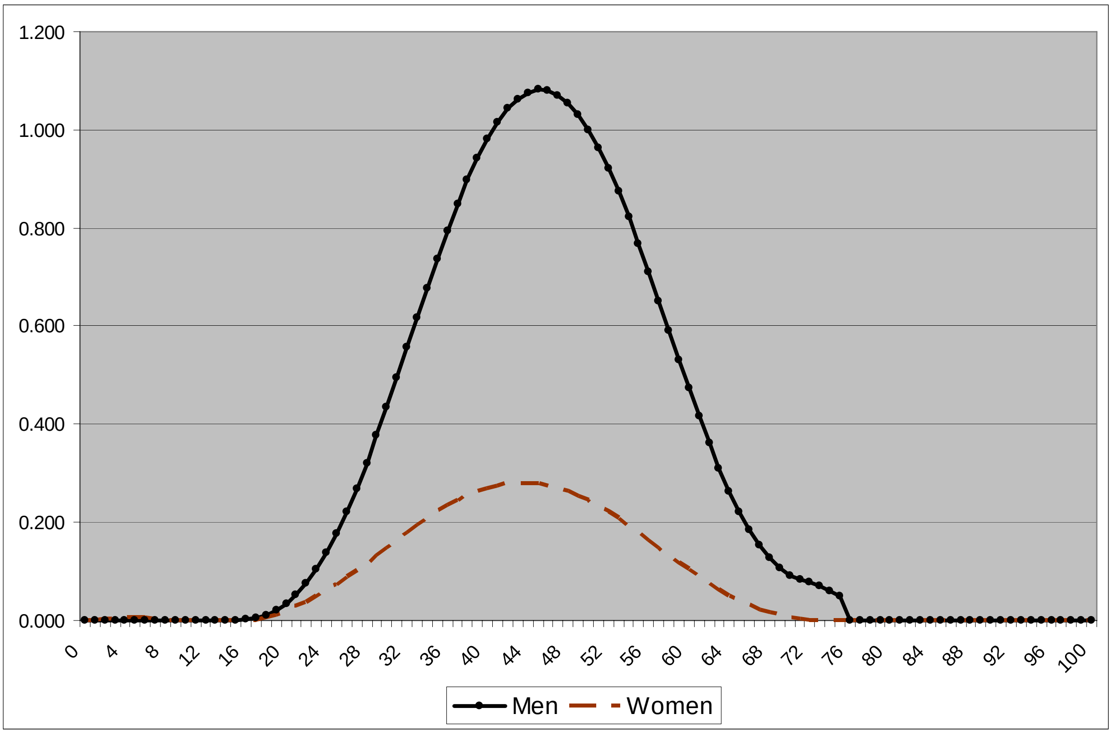


Figure 6 – Social security contributions(relative to figure of a 50 years old male)

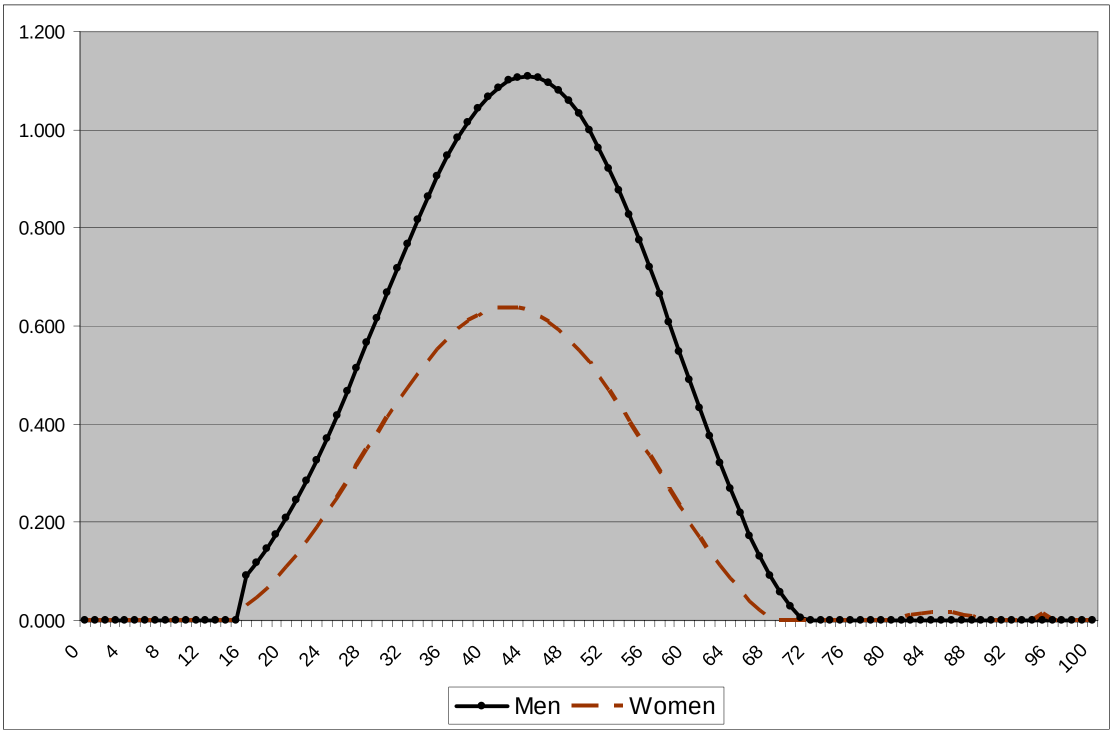


Figure 7 – Old-age pension (2006) (relative to the figure of a 60 years old male)

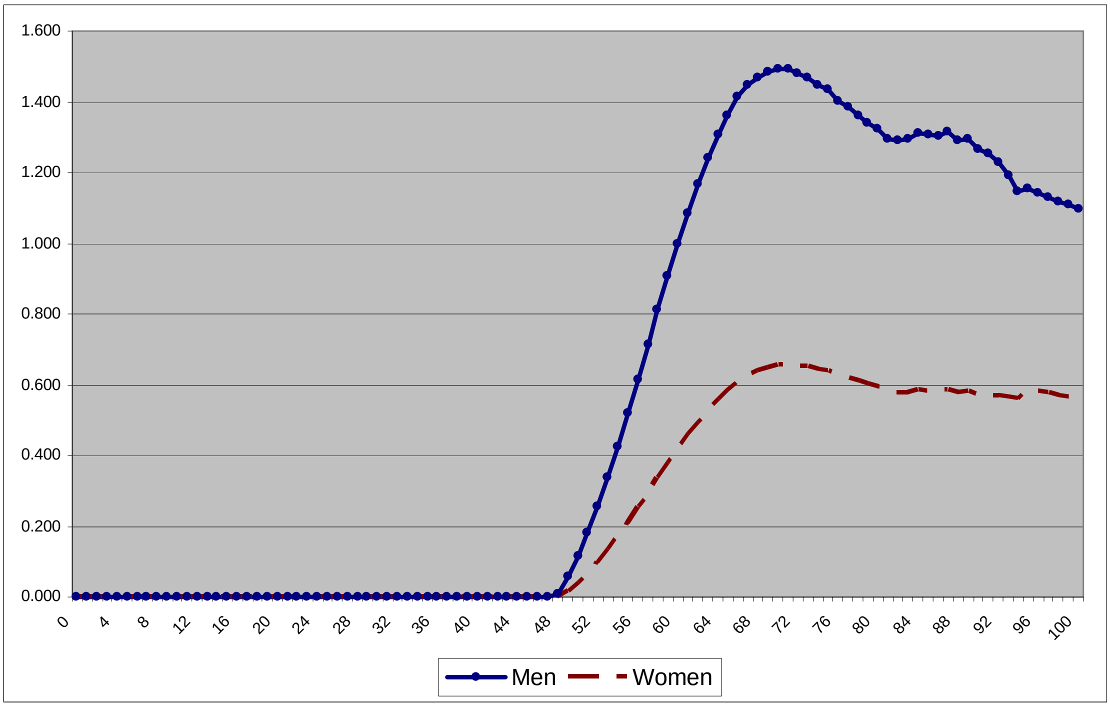


Figure 8 – Access to health-care services – Men
(relative to the figure of a 40 years old male)

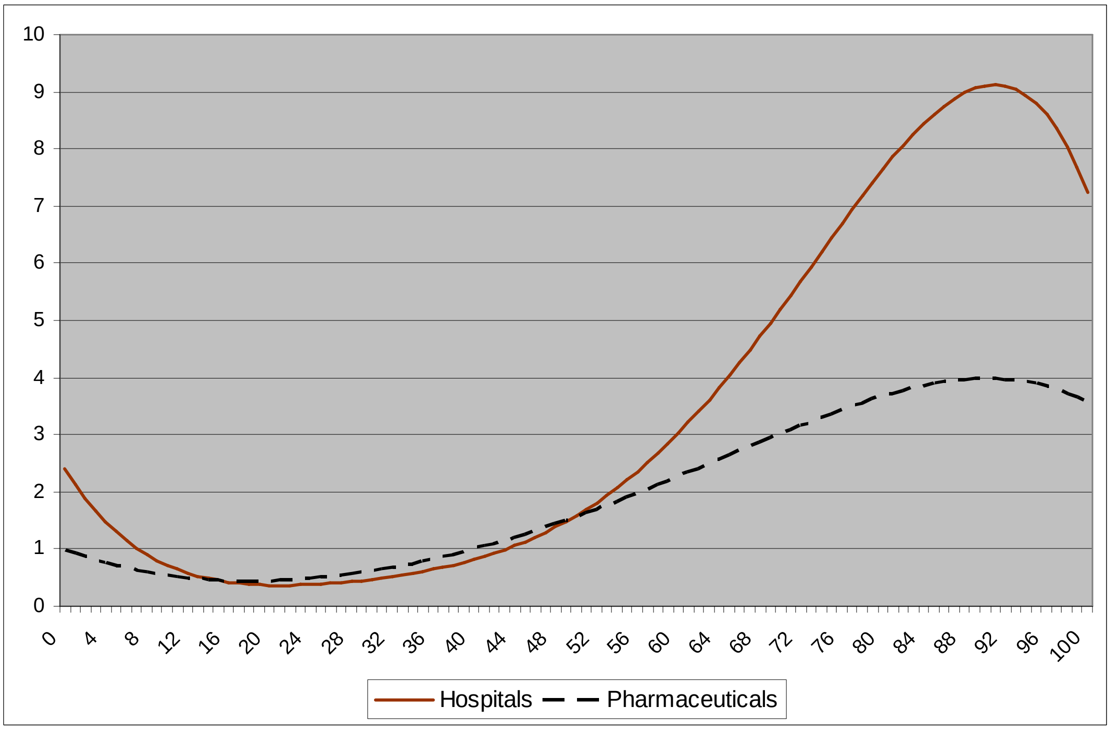


Figure 9

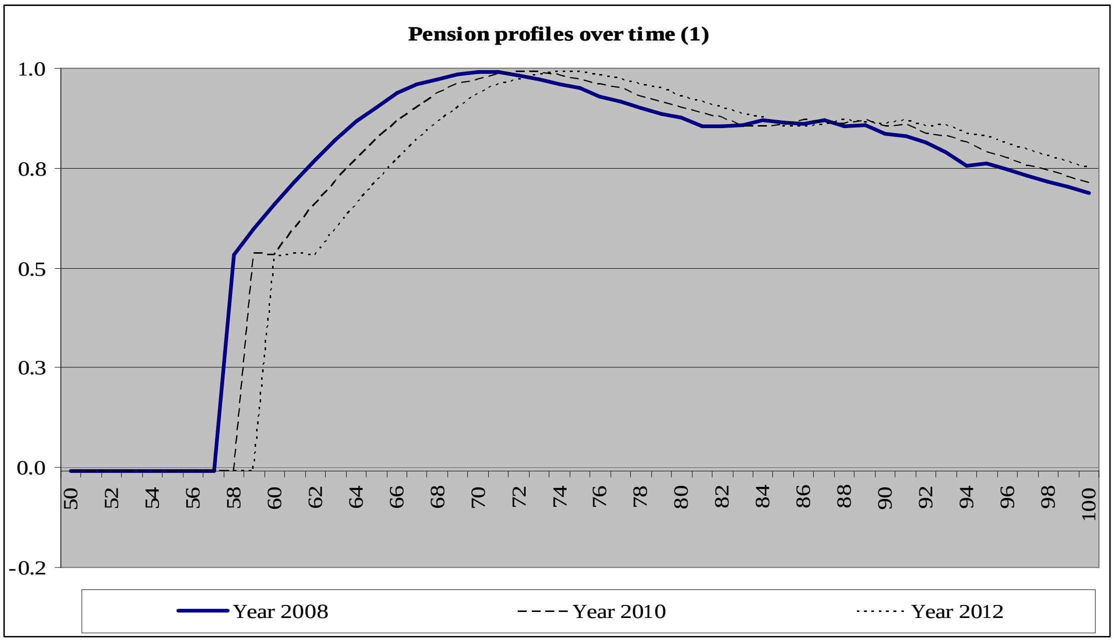


Figure 10

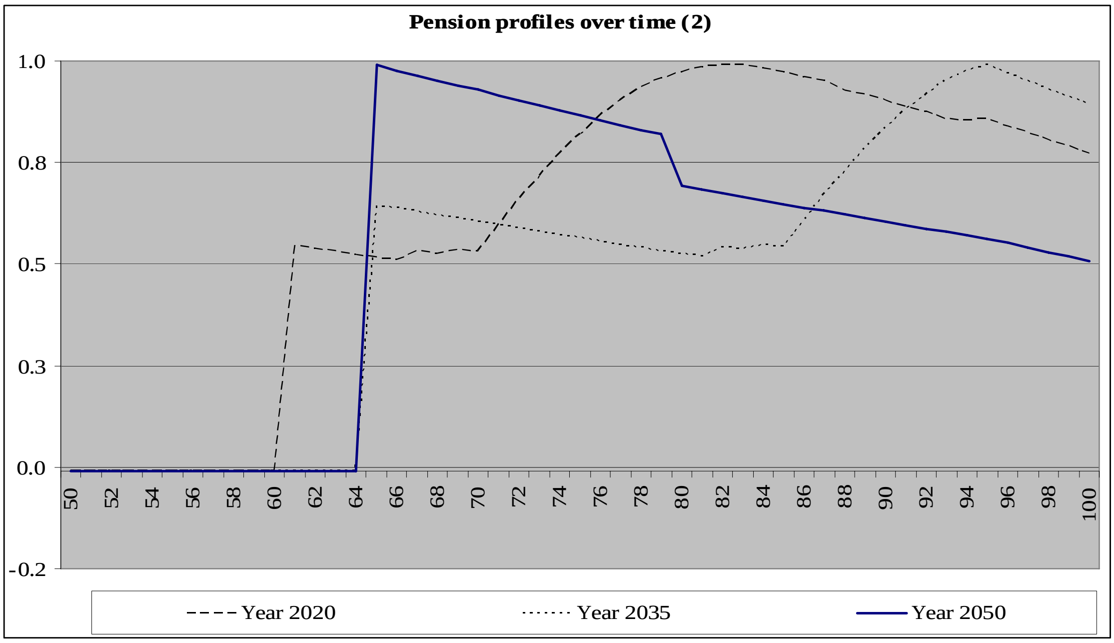
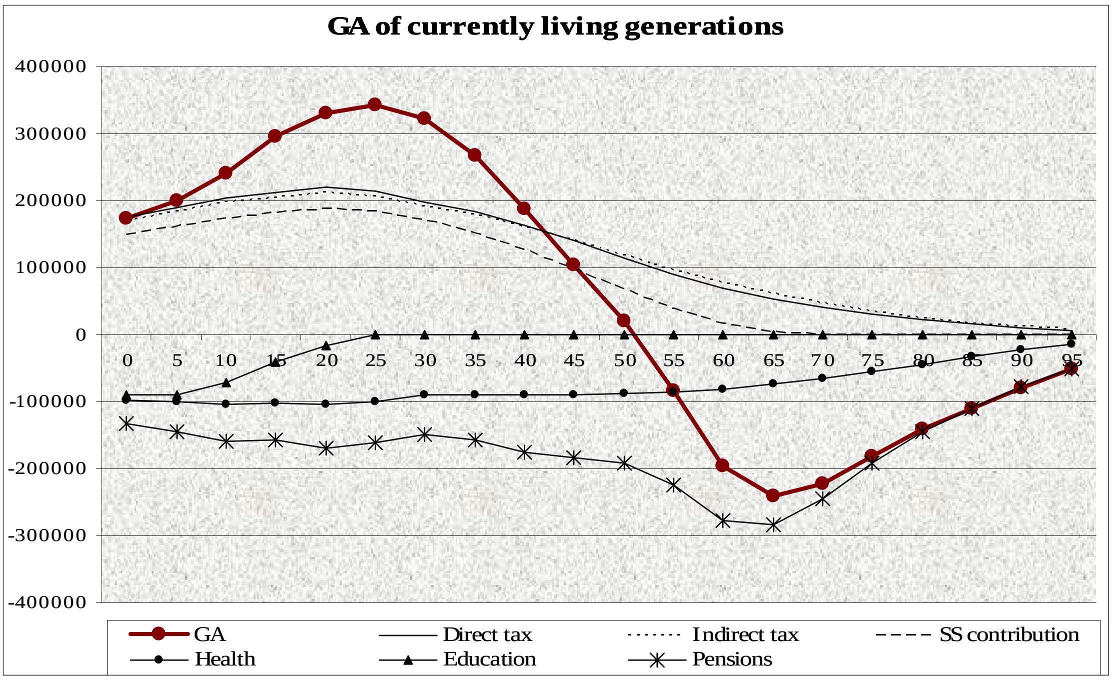


Figure 11


GA of currently living generations
400000
300000
200000
100000
0
-100000
-200000
-300000
-400000
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95
GA
Direct tax
Indirect tax
SS contribution
Health
Education
Pensions