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Nicholas E. Karavitis

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BANK OF GREECE
Economic Analysis and Research Department – Special Studies Division
21, E. Venizelos Avenue
GR-102 50 Athens
Tel: +30210-320 3610
Fax: +30210-320 2432

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FISCAL ADJUSTMENT AND DEBT SUSTAINABILITY: GREECE 2010-2016 AND BEYOND

Nicholas E. Karavitis
Panteion University

ABSTRACT

This paper reviews the fiscal developments that led Greece from a successful convergence process and the adoption of the Euro to an unprecedented prolonged recession. Analysis of all fiscal aggregates reveals the policies behind the sovereign crisis, both on the expenditure and the revenue side. We employ a simple macrostatic model to identify the impact of fiscal policies on the economy through the fiscal multipliers, especially during the adjustment programmes. We attempt to explore the extent to which fiscal adjustment may have been self-defeating by developing *ex post* adjustment scenarios. Following this, we turn to testing debt sustainability in the long run in an interest rate sensitive environment. This is done based on a set of several varying assumptions regarding growth, fiscal performance and debt reprofiling. Analysis of the resulting scenarios points out the risks surrounding debt sustainability and draws the broad lines of future fiscal policies.

JEL classification: E62, H62, H63, H68

Keywords: Greek Crisis, Fiscal Adjustment, Fiscal Multipliers, Debt Sustainability.

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Correspondence:
Nicholas E. Karavitis
Panteion University
136, Syggrou ave
Athens, 17671
email: n.kar@panteion.gr

Preface

> *"Civilized people must, I believe, satisfy the following criteria: […] 3) They respect other people's property, and therefore pay their debts."*
> Anton Chekhov, A Life in Letters (From a letter to Nikolay Chekhov, March 1886)

Following the international financial crisis of 2007-2008, Greece entered a prolonged period of deep recession in 2009 along with other European countries. The transmission mechanism, however, was much different. While the banking sector was not badly exposed to international risks, the state had embarked on a spending spree that rendered public finances unsustainable; the domestic financial institutions, highly exposed to government securities, collapsed, due not to imported but to domestic toxic products. The pathogenies of the Greek economy and especially those of the public sector surfaced in full force and threatened the Euro and the cohesion of the Eurozone. Financial assistance to the country was accompanied by adjustment programmes for the recovery of the Greek economy. These were designed to address both various sectoral structural inefficiencies and the issue of fiscal consolidation.

The persisting economic distress and the continuing struggle to bring the economy back on the growth track has led politicians, analysts and voters not only to blame fiscal adjustment as the source of all evil but, taking the notion one step further, to form the opinion that once fiscal discipline is relaxed everything will fall back in place nicely and the economy will recover. In this context we attempt to examine the truth of such beliefs and establish whether something went wrong with fiscal consolidation, how much was it responsible for the recession, what are the lessons that can be learned and in the light of all these how is the future foreshadowed.

In the first section we review the recent fiscal history of Greece distinguishing between three periods: the convergence, the euro and the crisis periods. In this context we examine the macroeconomic fiscal aggregates that led the fiscal developments and we analyze the role of the snowball effect in shaping the public debt ratio. We then turn to an appraisal of the effectiveness of the fiscal adjustment programmes during the crisis and we compare the volume of measures planned and

taken to the adjustment that was planned and actually achieved in the context of the policy mix between expenditure and revenues.

In the second section we build a simple macrostatic model in order to estimate the fiscal multipliers for the major fiscal instruments and from there we infer the impact of the fiscal developments on the GDP. Subsequently, in a series of simulations we attempt to answer three "what if" questions regarding fiscal adjustment in relation to the strength of the fiscal effort, the speed of adjustment and the policy mix.

In the third section we run a number of different scenarios regarding the sustainability of the public debt from 2020 and over the next decades. In particular, we employ a high growth and a low growth scenario, combined with three assumptions on the debt structure and three different levels of primary surpluses. The modelling is interest rate sensitive and we base our conclusions on the size and trend of the public debt ratio and the gross financing needs, as well as the net deficit restrictions. We close the study with the policy options and implications that emerge from our analysis.

1. An account of Greek fiscal performance

In this section we attempt to present in some detail the trends of the main macroeconomic aggregates that relate to fiscal policy, establish the fiscal causes of the crisis and analyze the consequences and effectiveness of fiscal policies. Starting with public debt as the main indicator of the sovereign crisis we backtrack to the constituent parts of the primary deficit and the dynamics behind the growth of the public debt ratio. The data used were extracted from the Eurostat database (unless otherwise stated) and refer to the 1995-2016 period for which there are available macroeconomic data conforming to ESA2010.

1.1. The main fiscal macroeconomic aggregates

The recent fiscal history of Greece can be summarily described by the evolution of its public debt[1]. As can be seen in Figure 1[2], as well as Appendix 1, the Gen-

[1] Public debt is the General Government Debt (GGD) as defined by Eurostat for the purpose of the Excessive Deficit Procedure (EDP), i.e. end-year, nominal and consolidated. For a detailed description see (Eurostat, 2016).

eral Government Debt (GGD) rose steadily in absolute terms since 1994. However, in GDP terms its growth had been quite modest up to 2007 thanks to a rising nominal GDP. In 2008 and 2009 rising deficits and falling income growth rates triggered a spectacular increase, both in absolute and relative terms. Despite two debt write-off operations in the beginning of the current decade, the debt ratio shot up to a new plateau of 180%.

As can be seen in Figure 2, despite the continuous positive changes in absolute values, the change in the public debt ratio fluctuated around 0% for a number of years, due to favourable GDP conditions. As from 2008 we notice a sharp increase both in absolute and relative terms temporarily checked in 2012 only to reach the new high plateau thereof. Later we shall go into greater detail about the dynamics of the public debt ratio but at this point we shall attempt to unfold the factors that shaped the public debt by going backwards to analyze its constituent parts.

The change in the public debt consists of the net deficit[3] and various stock-flow adjustments (S-FA) that affect the debt but do not appear in the deficit[4], in accordance with the established national accounting legislation and practices. As can be seen in Figure 3, Greece had been in a high deficit of 9.7% when it started its convergence effort.

There followed a period of fiscal adjustment with the deficit falling to 4% in 2000, only to regain momentum until the electoral-Olympic Games year of 2004, when it reached 8.8%. After a brief two-year period of some fiscal adjustment the electoral cycle struck again with the deficit rising first to 6.7% in 2007 and then to a spectacular 15.1% in 2009. The international financial crisis had already crept in and the Greek sovereign crisis had just begun. The implementation of consecutive fiscal adjustment programmes has eliminated the deficit to date.

[2] In this and the following graphs, bars show absolute values (in € million, unless stated otherwise) and lines indicate ratios to GDP.

[3] The definition of the net deficit (-B9 in national accounting terms) follows the definition of Eurostat for EDP and not that of the Adjustment Programme (unless stated otherwise). See Appendix 2 for details.

[4] Stock-flow adjustments include variations of the debt owing to exchange rate variations, various financial transactions, including privatization operations, changes in intragovernmental debt and other changes in assets and liabilities.

The net deficit also includes interest payments on top of the primary deficit. Interest payments on the public debt (defined as D41 in national accounts) have followed an impressive downward trend, as can be seen in Figure 4. It is evident that interest payments, as a percentage of GDP, were drastically reduced between 1995 and 2008 due to the reduction of the effective interest rate by 700 bps (the dotted line). Their temporary rise in 2009-2011 owed to the abrupt increase of the public debt. Subsequently, the drastic reduction of interest rates on the debt by the new holders (institutions and states) of the Greek public debt led to a further reduction of the interest payments to GDP ratio. In the context of the adjustment programmes a further decrease from 4.9% in 2009 to 1.8% in 2016 took place. This is ⅔ of the Eurozone[5] average borrowing rate of 2.7%.

Having seen that interest payments have moved on a more or less favourable trend vis-à-vis the deficit and the debt, it is time to turn to the primary deficit. In Figure 5, we observe a distinct fiscal effort during the convergence period with the continuous formation of primary surpluses in the region of 1% to 3% of GDP.

Closure of that period signaled the return to primary deficits which progressively reached 4% on 2004, the electoral-Olympic Games year. By 2007 the deficit was halved to 2.2%, but then again exploded to 5.4% in 2008 and 10.1% in 2009. Since the adjustment programmes came into force in 2010, primary deficits were checked and effectively[6] turned to surpluses in 2012. In 2016 the primary surplus stood at 3.8% of GDP compared to 0.7% for the Eurozone. The overall adjustment at the primary level since 2009 amounts to almost 14% of GDP.

Next we proceed to the breakdown of the primary deficit. The latter is formed by non-interest spending and tax and non-tax revenues. Non-interest expenditure, as a percentage of GDP has presented an upward trend since 1995.

As can be seen in Figure 6, spending to date has increased by 10 percentage units. After reaching a peak of 49% in 2009 and following seven years of fiscal adjustment, even if we do not take into account spending related to the crisis (the dot-

[5] Referring to the current Euro Area of 19 countries.

[6] This is shown by the dotted line in Figure 6, where the crisis related component of the primary balance has been removed. This component comprises spending for the support of financial institutions, revenues from the Agreement on Net Financial Assets (ANFAs) and profits from the Securities Market Programme (SMPs).

ted line), primary expenditure still stood at 45.7% in 2016, which, however, is the Eurozone average. Yet, we have to take into account the fact that in absolute values, primary spending was reduced by some €36 bn., down by 31% compared to 2009.

Total revenues, on the other hand, present a different pattern. Figure 7 shows that revenues demonstrated significant growth of almost six percentage units of GDP, from 36.3% to 42.4%, between 1995 and 2000. Following a downward trend in the aftermath of the convergence process the ratio finally landed at 38.9% in 2009. Next, the adjustment programmes led revenues in 2016 to an unprecedented 49.7%, substantially higher than the 46.3% of the Eurozone average and in spite of the decrease in absolute terms, due to the denominator effect.

Having examined the top-level aggregates, the overall picture that emerges is that while primary spending has presented a quite uniform upward trend, revenues increase drastically in periods of alert, such as the convergence period and the sovereign crisis, but tend to be slack otherwise. Therefore, it is time to turn to the components of expenditure and revenues in order to try understand this behaviour.

1.2. Revenue trends

We keep the breakdown of revenues at an elementary level, examining direct taxes, consisting of taxes on income and wealth and social security contributions, indirect taxes, comprising VAT, excise taxes, property taxes *etc* and, finally, non-tax revenues comprising everything else. Tax revenues form the bulk of total revenues, averaging 72% over the period against 87% for the Eurozone.

1.2.1. Direct taxes

Direct taxes include various distinct taxations, such as various income taxes and social security contributions into which we will take a closer look later. In 1995 revenues from direct taxes stood at 16.9% of GDP (Figure 8), lagging almost ten percentage units behind the Eurozone average. Reaching a peak of 21.3% in 2000, the ratio stabilized close to that level until 2009. The adjustment programmes, however, brought about a further increase to 24.5% in 2016, which, however, is still away from the Eurozone average by a substantial 3.5 pp. Yet the increase in tax rates has been

substantial, as can be seen in Appendix 3, where indicatively the average tax rate for the households rose from 12.8% to 16.9% (up by 31.9%) and for the non-financial corporate sector from 23.1% (in 2008) to 34.5% (up by 49.4%).

Income and wealth taxation (classified as D5 in national accounts) has been has been traditionally quite weak in Greece. As can be seen in Figure 9, during the convergence period a serious effort was undertaken that raised the GDP ratio from 6.6% to 9.8%, which, however lagged about 2.5 pp behind the Eurozone average.

Moreover, after 2000, the particular tax policy was relaxed and from 2001 to 2009 the ratio fell to an average of 8.3%. The implementation of the adjustment programmes brought income taxes to a level close to or above 10% along with the shrinking of the tax base.

The two main sources of income taxation are personal and corporate taxes (D51A and D51B, respectively, in national accounts). The former include taxes of small businesses, as well, and for many decades had been characterized by their low yield. As can be seen in Figure 10, personal income tax revenues stood just above 3% of GDP in 1995 and 1996. Within three years they rose by almost 50% to reach a peak of 4.5% in 1999. This was less than half of the Eurozone average and remained rather stable throughout the years until 2011.

After a temporary decline in 2010, there followed a spectacular increase to 6.9% in 2012 only to fall again to 5.4% in 2015[7]. The divergence from the Eurozone still remains, albeit a little smaller, since for the latter its share of household taxation rose from 8.2% in 1995 to 9.3% in 2015. Even if we compare with countries like Italy, Portugal and Spain, Greece lags by some 7% of GDP from the former and 2% from the latter.

As far as corporate taxation goes, the pattern in Figure 11 is quite telling. In 1995 corporate profits contributed 2.2% of GDP in taxes and stood at the Eurozone average. The European trend of increased corporate tax revenues in the late 1990's was more than followed by Greece which almost doubled the share to 4% in 2000, only to fall back to 2.1% in 2009. A significant drop of about 26% in corporate profits

[7] There are no available data for 2016.

led to an all-time low of 1.1% in 2012 which was gradually restored to 2.2% in 2015, close to the Eurozone average of 2.5%, by raising the tax rates.

The other major pillar of direct taxation is the contributions to the social security system (D61). For many decades the Greek social security system has been under the direct threat of ageing population and structural inefficiencies[8]. Enter the crisis and unemployment aggravated the situation with accentuated revenue stringency and imposing spending requirements.

In Figure 12 we notice how the social security system had almost tripled its revenues in absolute terms within fourteen years (1995-2008) and lost a quarter of this increase to the crisis. However, due to the denominator effect and the reforms brought about by the adjustment programmes, the GDP ratio continued climbing to reach 14.2% in 2016, up almost four percentage points since 1995. This compares comfortably to Eurozone's average of 15.3% despite the severe crisis.

As can be seen in Appendix 3, the average social security contributions tax burden per employee is estimated to have risen by 26.2% since 2009. Between 2009 and 2016 the average growth rates were −2.5% for the social security revenues and −5.6% for the labour income (a differential of 3.1%), while from 1995 to 2009 social security revenues had been increasing at an average annual rate of 7.4% against an average annual change of 6.0% for labour incomes (a differential of 1.4 pp, less than half of the next period).

1.2.2. Indirect taxes

Indirect taxes (D2) have traditionally been a stronghold for the public coffer[9]. After reaching a peak of 13.1% in 2000 (Figure 13), the ratio gradually declined to 11.7% by 2009. During the adjustment programmes, however, the more or less smooth until then trend shot up to 17.1%, almost matching the absolute level of revenues of pre-crisis 2008. This figure is 4 percentage units higher than the 13.1% of

[8] See European Commission (2015b) and Tinios (2016).

[9] Indirect taxes cover a wide range of economic activity and include the Value Added Tax, property taxes, duties and compensatory amounts on imports, excise and consumption taxes, stamp taxes, taxes on financial transactions, insurance premiums and gambling profits, taxes on entertainment and other services, turnover taxes and a plethora of other taxes.

the Eurozone. Below we examine some of the main components of indirect taxation and we first turn to VAT receipts.

As we observe in Figure 14, VAT revenues have moved over the years within a range of 1.5% of GDP. These fluctuations were not necessarily in line with changes in VAT rates.

In particular, it is worth noting that with no change in VAT rates Greece almost doubled its revenues between 1995 and 2002, while the households' final consumption (the main component of the tax base) increased by only 52%. Thus, the revenues share grew from 5.8% to 7.3%, exceeding the Eurozone average of 6.5%. There followed a contraction but revenues recovered in 2005 after an increase of the rates. In 2009 revenues plummeted both in absolute and relative terms, to recover temporarily in 2010 after another increase of the rates. A succession of further increases led revenues to 7.3% in 2015, half a percentage point higher than the Eurozone average, as a consequence of Greece having the highest rates (with the exception of Finland). Yet, Greece presents the fourth highest VAT gap in the Eurozone[10].

Excise and consumption taxes are an important part of indirect taxes. These taxes are in their best part structured on a per unit basis and, therefore, the ratio exhibited a downward (upward) trend as long as the volume of consumption and adjustment of the tax rates were slower (faster) than the growth of nominal GDP. As a result, the share of revenues declined from 4.1% in 1995 to 2.2% in 2008 (see Figure 15). During the recession and the fall of nominal GDP the ratio recovered and stabilized just below 4%, which is almost double the Eurozone average due to its high statutory rates[11].

Other indirect taxes include a variety of taxes, but most notably taxes on real estate and pollution, which form the bulk of revenues for this category. As can be seen in Figure 16, these taxes have fluctuated widely over the year, accounting for less than 4% of GDP, until 2013. In the process, however, two major reforms took place with the full remodeling of pollution and real estate taxes. As a result, reve-

[10] See Poniatowski et al. (2016).

[11] Greece is in the group of high-rate countries, especially for unleaded petrol and cigarettes which form the bulk of such revenues. For more details see European Commission (2013)

nues shot up both in absolute and relative terms and in 2015 stood at 4.9% of GDP compared to 4.2% of the Eurozone average.

1.2.3. Non-tax revenues

Non-tax revenues include a diversity of accounts such as current and capital transfers from the European Union to the government and property income, as well as market output, output for own final use and payments for non-market output; to these one should add revenues from the ANFA and the SMP[12]. Non-tax revenues have traditionally moved between 6% and 8% of GDP (see Figure 17), with the exception of 2002, when receipts from the European Union showed a temporary glitch. Since 2011 this group of revenues has stabilized at just over 8%, reaching a peak of 11% in 2013, owing to increased receipts from the European Union, the ANFA and the SMP. Compared to the Eurozone average of 5.2% in 2016, Greece exhibits a ratio almost 3pp higher, owing to high receipts from the European Union, both current transfers (2pp) and investment grants (1.4pp), although other sources of non-tax revenues seem to fall slightly behind (especially property income at −0.3pp).

1.3. Primary expenditure trends

As seen earlier, primary spending in the public sector rose over the years form 35.3% to 45.7% of GDP (not including crisis related expenditure). The most prominent components of primary public spending include the wage bill, intermediate consumption, social transfers and investment. Of course, there are several other items, mostly current and capital transfers (see Appendix 2). An important element of spending related to the crisis has been the support to the financial sector, which is examined separately.

1.3.1. The wage bill

The wage bill reached its peak in 2009, increasing 2.9 times in absolute terms (Figure 18). In the meanwhile, nominal GDP grew by 2.3 times, resulting in an increase of the wage bill share from 10.2% to 13.1%. Subsequently and during the implementation of the adjustment programmes the ratio was checked and subsided to 12.3% in 2016, which is still higher by 2.1 pp relative to 1995.

[12] ANFA: Agreement on Net Financial Assets. SMP: Securities Markets Programme.

Comparing these ratios to the respective European ones, one will discover that Greece stood slightly below the Eurozone average during the convergence period, increasing its expenditure in the process and exceeding the Eurozone average by 2.2pp in 2009. A difference of this magnitude was maintained until 2016. Comparing Greece to Portugal, a country of similar size and features, it is worth noticing that Portugal stood higher until 2005 but then significantly reduced its share from 14.5% in 2005 to 11.3% in 2016.

Since the wage bill is the composite effect of employment in the public sector and the wage rate (including taxes and social security contributions), it would be worth analyzing its constituent parts. National accounts data reveal that the wage bill has suffered a reduction of 30.4% since 2009. On the other hand, estimates based on data compiled by the Greek authorities[13] indicate a significant reduction in public sector employment[14], reaching 27.1% between 2009 and 2016. Other studies[15] report a somewhat lower reduction (25.2%). Whichever the case maybe, this creates some confusion since it implies that the average compensation per employee was reduced by a mere 4.6% over this period[16], which is true but rather misleading. These issues are dealt with in more detail in Appendix 4. There it is shown that the average compensation per employee (in essence, unit labour costs for General Government) has not really declined, although civil servants suffered losses of income, albeit lower than those of the private sector. The reduction of the average income in the public sector is effectively the result of the tax wedge. On the other hand, the decrease of the general government wage bill owes mainly to the contraction of employment, although the net savings to the budget are rather low since a good part of salaries were replaced by pensions.

1.3.2. Intermediate consumption

Intermediate consumption climbed smoothly from 5.3% of GDP in 1995 to 6.7% in 2009, was reduced during the crisis and finally stabilized near 5% (Figure 19), close to the Eurozone average of 5.2% (2016).

[13] See Υπουργείο Διοικητικής Ανασυγκρότησης (2017).
[14] Including employees financed through EU programmes etc.
[15] See Κοινωνικό Πολύκεντρο (2017).
[16] 7% in the case of a 25.2% downsizing.

1.3.3. Public investment

Public investment has moved rather erratically over the period examined but it steadily ranks high in the Eurozone with the exception of 2011 and 2012 when it was below the Eurozone average. Starting at €4.4 bn. and 4.2% of GDP in 1995 (Figure 20), it reached a peak of €12 bn. and 6.7% in 2003, only to subside temporarily to 4.7% in 2005, in the aftermath of the Olympic Games. After recovering for a number of years it stood at 4.9% in 2011 and has remained in that neighbourhood since. In 2016 public investment stood at 4.7%, significantly higher than the Eurozone average (2.6%) or countries like Portugal (1.5%), Italy (2.1%) and Spain (2%). This has happened despite the effective disappearance of public investment financed by national resources.

1.3.4. Social transfers

Social transfers are by far the most sizeable item of public spending, taking up almost half of primary public expenditure. The best part of social transfers go to pensions of all sorts. Between 1995 and 2009, social transfers expanded 3.6 times (€35.3 bn.) in absolute terms, from 13% to 20.6% of GDP (see Figure 21), with the slope of the ratio becoming steeper after 2004. Between 2009 and 2013 social transfers were cut by €10.3 bn. These cuts caused the GDP share, which had continued growing to 23.2%, to finally settle at 21.4%. Since then it returned to an upward slope to reach 22.3% in 2016.

During the period under consideration, Greece converged on the Eurozone at a fast pace and within twenty-odd years bridged a gap of almost 8 percentage points of GDP. One should bear in mind, however, that it took Greece only half a century to turn its age pyramid to an age "vase"[17], while in 2013, after a first round of pensions reforms, it still exhibited the highest dependency ratio in Europe[18] and a replacement ratio very close to the Eurozone average. The above signify that the fiscal pressure will persist in the future and substantial policy changes, mainly vis-à-vis eligibil-

[17] See Καραβίτης (2011), p.10.
[18] See European Commission (2015b), p.40.

ity criteria and replacement ratios, are or should be in the pipeline over the next decades, as the Ageing Report of the Commission clearly indicates.

Given the fast growth of social transfers, we carried out a simple benchmarking exercise, shown in Figure 22. Assuming that the "natural" growth of pensions could be the product of the change of CPI (*inf*) times the change of the population over 55 years of age (*pop*), i.e.

$$benchmark = (1+inf)\cdot(1+pop)-1,$$

we compare this to the actual growth rate of pensions[19] and the emerging pattern is quite informative: for the years until the adjustment programmes, the actual growth rate exceeded the benchmark, which means that the growth of the number of the beneficiaries and/or the size of benefits outmatched the combined growth of the relevant age group and the CPI, respectively.

In other words, the system had been quite generous in its eligibility criteria and/or replacement ratios until 2009. After that and until 2014, the above analysis indicates large sub-benchmark cuts (not necessarily suffered by the same people who had earlier benefited), while the last 3 years are more or less in line with the benchmark. More specifically, it is estimated that the average gross income from pensions was reduced by 10.3% between 2009 and 2016, while in net terms the reduction stood at 15.6%[20]. Moreover, the data reveal that the average cuts of pensions were effectively concluded by 2013, while about ⅓ of the reduction in average pension was due to the increase of the tax burden (social contributions and income tax).

[19] Pensions extracted from the ESSPROS data base and refer to old age and survivors pensions (cash periodic payments, excluding lump-sum payments). The data cover the 2001-2015 period, since in 2001 there was a break in the series. For 2016 we used estimates based on the growth rates indicated by the "Helios" database.

[20] Nominal cuts were selective and much heavier for higher pensions. This explains the fact that our figures appear lower than it is widely believed. For example, in 2010 the number of monthly pensions was limited to 12. This would signify a reduction of 14%, which, however, was much lower having been partially replaced by a pension supplement of up to €800. Other pension cuts addressed special groups (such as pensioners below 55 or 60 years of age, supplementary pensions, or pensions over a threshold) which usually form small proportion of the total expenditure on pensions. Across-the-board measures, such as the increase of the health insurance premium by 50%, from 4% to 6%, correspond to a decrease of the average pension by a little more than 2%. Taking into account the bulk of pensions/pensioners are in the lower end, then the average pension income is also low and in our calculations escapes many of the imposed reductions.

1.3.5. Other expenditure

Other expenditure includes many lesser items[21] and it has normally been fluctuating around 3% of GDP. The respective ratio for the Eurozone has been quite higher in almost all the components, especially current transfers (D7). In 2016 the ratio stood at 5%, while for Greece it was 3%. In the years of the crisis Greece presented high capital transfers due to the support to domestic financial institutions, which is represented by the distance between the compact and the dotted line in Figure 23.

1.4. Revenue and expenditure overview

We showed earlier that Greece's public revenues' share of GDP in 2016 was higher than the Eurozone average. In fact, only Finland, Belgium, Austria and France presented higher shares. A similar picture is given by tax revenues, where the country is ranked fifth from the top in the Euro Area (Italy is added to the three countries mentioned earlier).

As we can see in Figure 24, in 2010 Greece actually picked up the convergence process where she left it back in 2000, only this time amidst a deep recession, with the tax revenues to GDP ratio rising due to the fall of the denominator rather than the increase of the nominator.

Another important aspect of the tax revenues relates to the tax-mix and Greece's dependency on indirect taxes. As can be seen in Figure 25, in 2016 the share of direct tax revenues had in fact increased relative to 1995. This owed mainly to the increased share of income taxation.

However, the reduction of the share of indirect taxes from 42.1% in 1995 to 41.1% is only part of the story. The dependency on indirect taxation is still regarded to be high, or in any case, higher than the Eurozone average. As we can see in Table 1, Greece was close to the Eurozone average in the first two periods, whereas the adjustment process relied heavily on indirect taxation. Its share of GDP was raised by 2.5% of GDP, or 1.8pp higher than the Eurozone average.

[21] Namely subsidies on products and production, taxes paid by the government, current transfers such as international cooperation, capital transfers and investment grants.

On the other hand, the increases of the GDP share for income taxes and social security contributions were less pronounced (1.6 pp and 1.3pp, respectively). What is important in this context is that over the years Greece has been closing the gap from the Eurozone average in direct taxation but still lags 4.1pp of GDP, while presenting a high share of indirect taxes.

To recapitulate, it seems that in 2016 Greece in relation to the Eurozone reached a level of tax revenues that could be regarded as a benchmark. If we arbitrarily set this benchmark, this would mean that Greece should proceed with a restructuring rather than a further increase of its tax revenues.

More specifically, restructuring would imply:

(a) a significant reduction of the indirect tax revenues share of GDP, which would require a lowering of rates for various taxes (VAT, real estate tax, excise taxes *et al*) and

(b) an increase of the direct tax revenues share of GDP, which would require a broadening of the tax base and a downward restructuring of tax rates. The required increase in revenues is roughly balanced between income taxation and social security contributions.

In Table 2 we can see that the share of total expenditure (TE*, the asterisk denoting “net of support to financial institutions”) has caught up and exceeded the Eurozone average in the last period, the difference owing to interest payments (despite a significant cut in the second period).

The primary expenditure share of GDP has been rising steadily in Greece since 1995, reaching the Eurozone average. Social transfers (D62+D632) led this trend with a spectacular rise of 8.6pp between the periods, followed by an increase of 2.2pp in the wage bill. On the other hand, intermediate consumption and investment have subsided (especially the latter) in the last period, while miscellaneous expenditure (OTH*) remained almost stable.

In 2016, Greece was placed above the Eurozone average in spite of the decisive decline of interest payments, which, however, stood at 3.2% compared to 2.2% of

the Eurozone. Primary spending (banks support excluded) was very close to the Eurozone average in 2016 (Figure 26).

This was due primarily to social transfers and secondarily the wage bill. During the adjustment programmes, primary spending has stabilized at a plateau of about 46% of GDP, with almost half of it going to social transfers. Unless there is a significant growth of nominal GDP, the social transfers system will continue exerting pressure on the relative size of the public sector.

From the above we deduce that Greece seems not to have much room for expenditure cuts, with the possible exception of the wage bill of the public sector, except if the country is to follow a different model for the public sector, departing from "Eurozone average"-driven policies and proceeding to a smaller public sector (which will signify lower financing needs). In either case, however, restructuring of government expenditure with a view to boost its effectiveness is not precluded.

As we can see in Figure 27, Greece belongs to the group of countries with the size of the public sector lying above the Eurozone average. At the same time Greece presents the highest primary surplus. Therefore, the policy question that we may pose is the following: if Greece were to continue to more or less maintain its current level of public expenditure what would this imply for taxation, given a target for the primary balance? And how would it differ if Greece were to move to a lower level of spending?

1.5. The fiscal adjustment process (2010-2016)

Having unfolded the main points of the Greek fiscal history, let us now focus on the factors that shaped the debt ratio over the examined period. The dynamics of public debt are thoroughly dealt with in the existing literature and we will set out with the components of a discreet change of the debt ratio.

Based on the well known relationship $\Delta b = \frac{i-y}{1+y} b_{t-1} + \pi_t + f_t$, where the change in the debt ratio (Δb) is the sum of the snowball effect (SE)[22] , the primary deficit (π_t)

[22] That is, the composite impact of the interest rate (i), nominal growth rate (y) and debt ratio of the previous period (b_{t-1}). See Καραβίτης (2008).

and the stock-flow adjustments (f_t), we calculated their size for the periods under examination, shown in Table 3.

During the six years of the convergence period, the debt ratio increased by 7.8% of GDP (an average of 1.3% per year). In the nine years of the post-convergence period it grew by 23.1% (2.6% per year), but during the seven years of the adjustment period it grew by 52.3% (7.5% per year) despite the massive PSI. If we analyze the components of the change of Δb, we see that in the first period the debt ratio was relieved by primary surpluses totaling 11.3% of GDP. On the other hand, S-FA added 3.1%, while an adverse SE added another 16.1%. The latter was the net outcome of a relief of 35.3% due to nominal GDP growth (16.1% owing to inflation and 19.2% to real growth) and a burden of 51.4% from interest. Therefore, in the first period, primary surpluses and nominal growth came just a little short to outmatch the pressure from interest payments on debt.

In the second period, the snowball effect was favourable (−6% resulting from −51% from nominal growth and 45% from interest), but primary deficits were quite taxing adding 27.3% (3% per year) to the debt ratio. In the third period, the pressure from primary deficits seems to persist, but 18.4% out of 19.3% is primary deficit due to crisis related transactions and, therefore, the “true” addition comes down to only 0.9%. However, the recession brought about an unfavourable snowball effect of 81.3% (48.2% from nominal growth-chiefly real growth and 33.1% from interest). The PSI amounted to a colossal 66% of GDP but the overall impact of S-FA for the whole period was limited to just −48.3%, proving inadequate to check the huge snowball effect.

Since we are discussing period averages, we should notice that the adjustment path was not uniform throughout the third period. In particular (and besides the PSI), it is important to notice that that the snowball effect was significantly reduced during the last three years (see Figure 28). The overall 81.3% is distributed by 80% in the first four years and 20% in the last three.

It should be also mentioned that in the last three years, the contribution of the interest payments component is significant but even more so is that of the nominal GDP growth. More specifically, while in the first four years the GDP growth and in-

terest components of the snowball effect burdened the debt ratio by 43.4% and 22.3%, respectively, during the last three years these loads were reduced to 4.8% and 10.8%.

1.6. Fiscal Adjustment Effectiveness and Policy Mix

In terms of fiscal policy it is important that we examine the policy mix during the adjustment period, i.e. how net and primary balances were formed. To this end, we first employ Table 3, where B9 and PB9 indicate the net and primary balances, respectively, CR is the net effect of the crisis related transactions on the balances and * designates that the effect of CR has been removed.

Table 4 shows that the overall adjustment of the net deficit (-B9*) amounted to €37 bn., or 15.7% of GDP, which turned an extremely high deficit to a surplus. This adjustment is split between interest (€6.3 bn., or 1.8% of GDP) and the primary deficit (€30.7 bn., or 13.9%), i.e. 88% of the improvement owed to the primary balance and 12% to lower interest payments. In this sense, Greece did manage to successfully reverse the ominous fiscal situation she faced at the outset of the crisis.

From Table 5 (where TR and TPE indicate total revenue and total primary expenditure, respectively; other symbols as in Table 4), we observe that the public sector spent €36.1 bn. less but also raised €5.4 bn. less in revenues. In GDP terms, however, the revenues ratio accounted for 10.6pp of the 13.9% correction of the primary deficit. On the other hand, expenditure contributed only 3.3pp. This means that ¾ of the adjustment of the primary balance was made from the side of the revenues. Moreover, we can see that $^{5}/_{6}$ of the adjustment took place in the first four years of the adjustment programmes, both on the revenues and the expenditure sides, although in 2016 adjustment seems to have picked up pace. This is a clear indication of fiscal fatigue after the first years.

Table 6 shows that, in absolute terms, only revenues from indirect taxes (D2) were actually increased during the period in question, while revenues from direct taxes (DIR), as well as non-tax revenues (NT*) were reduced by some €7.5 bn. However, in GDP terms, all categories of revenues increased. Tax revenues (TAX) added 8.9pp to their share of GDP, while non-tax revenues only 1.6 pp. That is, about 85%

of the adjustment of revenues was due to tax revenues which on average account for 82% of total revenues. Moreover, we can infer that since revenues accounted for ¾ of the primary balance adjustment, as we saw earlier, fiscal policy relied by ⅔ on taxation to reduce the primary deficit. This fiscal effort was shared 40-60 between direct taxes (whereas the split was equal between income and wealth taxes, on the one hand, and social security contributions, on the other) and indirect taxes. At this point, it should be stressed that while for indirect taxes there seems to be a smoother time path, for all other tax and-non tax revenues the best part or all of the increase of the ratios seems to have taken place in the first four years.

During the period in question, primary expenditure (excluding support for the financial institutions) was reduced by €36.1 bn. (-31%), as shown in Table 7. A little more than half of this reduction was covered by wages and social transfers. However, it was investment and intermediate consumption that suffered the highest cuts (51% and 48%, respectively). The wage bill was trimmed by 30%, other expenditure by 37% and social transfers by 20%.

In terms of GDP shares we have a somewhat different pattern; the GDP ratios for all items were reduced except for social transfers, which increased by 1.7 pp. Therefore, the wage bill, intermediate consumption, investment and other expenditure had to cover a distance of 5pp (=3.3pp+1.7pp). Investment and consumption carried about ¾ of this load and wages and other expenditure 15.6% and 10% respectively.

In conclusion, while primary expenditure was responsible for just ¼ of the overall primary balance adjustment, this took place mainly through cuts in consumption and investment, with wages contributing a mere 5.6% of the adjustment (although they take up 28% of TPE*), while social transfers kept a pressure on the public debt ratio.

The actual fiscal adjustment that took place between 2010 and 2016 was the result of a continual series of measures. The fiscal measures foreseen in the Adjustment Programmes are at the epicenter of the political debate, not just because of their sheer volume but of their questionable effectiveness. The controversy has two facets: one that addresses the fiscal yield of measures planned and another that in-

volves the debate on multipliers and their feedback to the efficiency of fiscal policy. In this section we shall deal with the first one, leaving the second issue for the next section.

A fiscal measure goes through the phases of planning, implementation and execution. Therefore, the risks lie in the first two stages, only to be revealed in the third. First there is the question of efficient planning, i.e. whether the appropriate volume of measures has been planned with an efficient policy mix, which will result in the desired fiscal target with minimum effort. Next, the issue of moving from planning to implementation arises; politics and governance may affect the process so that what the legislature and the executive bring into force deviates from what has left the drawing table. Finally, successful execution itself relies on effective governance[23] and whether the response of the subjects of the measures matches their anticipated behaviour. Therefore, one should distinguish between fiscal measures planned and taken, on the one hand, and measures taken and realized, on the other. The first Adjustment Programme for 2010-2014 is a very good example of how things may go wrong.

The First Adjustment Programme envisaged a fiscal adjustment of €33.9 bn. (14.2% of GDP) at the primary balance level (excluding crisis related transactions). In terms of GDP shares, this adjustment would be distributed almost evenly between revenues and expenditure. As shown in Table 8, measures planned to this end[24] amounted to €41.7 bn. (18.1%). The final outcome, however, shows that the overall adjustment in the 2010-2014 five-year period was significantly lower than planned and stood at €24.4 bn., or 10.4% of GDP; moreover, in GDP terms, ¾ of it originated from the revenue side. As for the measures actually taken, it is quite a task to quantify the exact realization of most of the measures. The usual procedure followed by the European Commission is to compare outcomes to a baseline (no-policy-change) scenario. We followed this method here for the expenditure side (after corrections for a base effect due to revisions of the base year data), although for revenues we followed a different approach in the same vein. In particular, baseline annual reve-

[23] These issues preexisted the fiscal crisis and may have contributed to it. See Kaplanoglou et al. (2011)
[24] These include 2010 measures that were taken prior to the Programme.

nues were estimated based on the assumption that the "normal" long-run income elasticity of tax revenues stands at 1.1 and that of non-tax revenues at 0.8.

What follows is that measures of €65.2 bn. (34.1% of GDP) were taken during this period to achieve an adjustment of €24.4 bn. (10.4%)[25]. This effectiveness loss of about 60% of the measures stems exclusively from the revenue side and was not foreseen in the original Programme. This whole exercise reveals that from a fiscal yield point of view, revenue-side measures are not as effective as expenditure-side measures, at least until the denominator effect sets in. Indeed, measures taken on the revenue side were twice higher than those initially planned (22% for expenditure measures) and although the adjustment they brought about was €28 bn. lower, in GDP terms adjustment was 0.5% higher. In a nutshell, the original Programme intended revenue-side measures of 8% for an adjustment of 7% and finally we had measures of 19.4% for an adjustment of 7.7%. For expenditure, we ended up with measures of 14.7% for an adjustment of just 2.6%, against planned measures of 10.1% for a 7.2% adjustment. It is also apparent that the initial mix of measures drifted away from taxes and was reversed from 45/55 of the original plan to 55/45. Moreover, the overall actual realized adjustment slipped from a planned 14.2% to 10.4% and ¾ of it was brought about by revenues instead of 50% of the initial plan.

2. The fiscal multipliers

2.1. Some general remarks

Much of the political debate regarding the Greek adjustment programmes revolves around the required degree of fiscal discipline so that debt sustainability is not undermined by excessive induced recession. An aspect of the multipliers debate is that they tend to reduce the effectiveness of fiscal measures, a fact that the Commission readily admitted at the outset of the programmes[26]. Politicians despise fiscal measures and seek to minimize their extent; the more the leakages the measures

[25] These figures may be compared to the Commission's estimates (appearing in the AMECO database) where measures for the 2010-2014 period amount to €62.4 bn., quite close to our estimate of €65.2).The mix, however, is different since on the expenditure side we have €-33.7 bn. (higher than our estimate of €-28.5 bn.) and on the revenue side we have €28.7 bn. (lower than our estimate of €36.6 bn.)

[26] See European Commission (Directorate-General for Economic and Financial Affairs) (2010), *p.18*.

are subject to, the more unwilling they are to implement measures. It is therefore apparent that not only fiscal policy recommendations, but their effective implementation as well, will depend heavily on the size of the fiscal multipliers involved.

The fiscal multiplier shows the response of the economy, usually in terms of growth, to changes in the fiscal state of things. It is not as simple as it might seem to correctly interpret the fiscal multiplier, since changes in the fiscal magnitudes may arise both from policy-induced fiscal shifts, as well as automatic fiscal responses to changes in the economy[27]. That is to say, a fiscal variable may both act, being an instrument of current policy, and react, being the outcome of structural features of the economy (i.e. of policies past and behaviours of the economic agents). Simultaneity, however, creates serious statistical problems and estimates of the multipliers may become quite unreliable.

This dichotomy has its roots back to the different approaches followed by Keynesian thinking and its successors, on the one hand, whereas fiscal variables are used as instruments to affect economic activity (even the automatic stabilizers are policy instruments put at work via mechanisms established in the past) and the classical-Wagnerian suggestions, on the other, that fiscal magnitudes are determined by changes in the level of economic activity. To put it in more technical terms, modern approaches tend to deal with multiplier effects, while the simplified Wagnerian approach tends to emphasize the income elasticities of fiscal variables[28].

Given the scope of this study, we tend to focus on the policy dimensions of the fiscal variables and regard them mainly as policy instruments rather than demand-formed variables. Therefore, public expenditure may have been the result of long-run demand (social transfers is a very obvious case) but in the context of this work we feel that the policy content of the fiscal variables is more relevant, in the sense that especially during the years of crisis they were explicitly treated as instruments.

[27] For a thorough discussion of the various issues on multipliers see Marglin et al. (2013).

[28] Wagner's law of state activity (and not public expenditure, as is often hastily interpreted) was stated in very broad terms. However, the Wagnerian approach cannot be dismissed lightheartedly and has to be put in its right perspective. Wagner referred to the (very) long-term demand generated for publicly provided goods and services and the need for extending the regulatory role of government in the course of economic and social development. Moreover, the Wagnerian approach deals mainly with the expenditure side of public finances and underplays the significance of public revenues, which are simply regarded as a means of financing expenditure in a more or less Ricardian environment. For an extensive critical review see Karavitis (1986).

On the other hand, tax variables may be policy instruments, but by nature respond automatically to economic activity, since the latter forms the tax bases. Hence, tax variables will be treated as endogenous.

Simultaneity, however, may create serious statistical problems and render the estimates of the multipliers unreliable[29]. There are many different ways that have been proposed to estimate various forms of fiscal multipliers, usually associated with specific theoretical frameworks, and not only does each method present its pros and cons , but it also seems to introduce bias towards larger or smaller multipliers[30]. In general, there is no consensus in the literature regarding the size of the multipliers, with estimates ranging from 0 to considerably higher than 1. Moreover, more recent evidence points to the possibility that multipliers not only are they higher during recessions, as suggested by Auerbach et al. (2012) and Canzoneri et al. (2011) among others, but according to Crichton et al. (2014), their size depends on whether public spending moves pro− or anti− cyclically (i.e. whether or not fiscal consolidation takes place during a recession). There is also growing evidence that during a recession the process of fiscal adjustment may in fact cause the debt ratio to deteriorate, at least in the short term[31].

2.2. Concepts of multipliers

Since we have analyzed in the previous section the adjustment period in terms of changes of the GDP ratios of the fiscal variables, it is convenient to define multipliers in the same vein. If $\pi=\frac{dY}{dX}$ is the usual impact multiplier of some fiscal variable (X) on GDP (Y), then we may define

$$m = \frac{\frac{dY}{Y}}{d\left(\frac{X}{Y}\right)} \qquad (1)$$

[29] See Karavitis (1987)

[30] For analyses of the methods of estimation, reviews of the types of multipliers and comparison of their size see among others Spilimbergo et al. (2009), Boussard et al. (2012), Riera-Crichton et al. (2016), Batini et al. (2014), Thomas Warmedinger (2015) and Kilponen et al. (2015).

[31] Indicatively, see Gechert et al. (2015), Born et al. (2015), Eyraud et al. (2013) and Boussard et al. (2012).

Therefore, m-type multipliers show the absolute change in the growth rate of GDP due to a change of the ratio of the fiscal variable to GDP[32]. Given that our definition of the π-multiplier refers to the final outcome of the process and involves absolute changes, results may not be as informative. The m-multiplier may give a clearer description of developments. For example, in the Laffer-curve case, where an increase of the tax rate leads to a reduction of revenues through the contraction of the tax base, the (negative) tax multiplier will imply an increase of GDP ($\Delta Y=\pi\cdot\Delta X$, with both left-hand side terms being negative), which is not straightforward to interpret. On the other hand, the m-multiplier will incorporate the contraction of the tax base in the d(X/Y) term and most likely will reveal a negative contribution to the overall GDP growth rate, $dY/Y= m\cdot d(X/Y)$, since under normal circumstances m is negative and d(X/Y) is likely to be positive[33].

Since the estimation of π-type multipliers is more usual, we can work out the relationship linking the two types of multipliers, as follows:

First, we take the differential of (X/Y)

$$d\left(\frac{X}{Y}\right) = \left(\frac{dX}{Y}\right) - \left(\frac{X}{Y}\right)\left(\frac{dY}{Y}\right) \qquad (2)$$

Next we divide the GDP growth rate (dY/Y) by d(X/Y) to obtain:

$$m = \frac{\frac{dY}{Y}}{d\left(\frac{X}{Y}\right)} = \frac{1}{\frac{dX}{dY} - \frac{X}{Y}} \Rightarrow m = \frac{1}{\frac{1}{\pi} - \frac{X}{Y}} \qquad (3)$$

Thus, we arrive at the m-type multiplier which can be computed indirectly, once the π-type multiplier is known[34].

[32] This, in fact, is the inverse semi-elasticity of the fiscal variable ratio.

[33] From (3) we can see that in order to have $d\left(\frac{X}{Y}\right)>0$, we must simply have that $\left(\frac{dX}{X}\right) > \left(\frac{dY}{Y}\right)$, i.e. the rate of change of the fiscal instrument must be higher than that of GDP.

[34] Calculations based on the quotient rule $d\left(\frac{x}{y}\right)=\frac{ydx-xdy}{y^2}$. However, in discrete time we have $\Delta\left(\frac{x}{y}\right)=\frac{y\Delta x-x\Delta y}{y(y-\Delta y)}$. Therefore, in discrete time the m-multiplier in (3) must be adjusted by multiplying with $\left(1-\frac{\Delta y}{y}\right)$. This is particularly relevant in our case, since GDP has recorded a highly negative growth rate over the period of the crisis.

2.3. The model

In order to estimate the magnitude of the multipliers, we built a simple macro-static model with no monetary sector. All variables are in nominal terms, therefore inflation does not enter the model explicitly. Let us start with the typical national accounting identities:

$$Y \equiv C^P + I^P + G + I^G + X - M \quad (4a)$$

$$\equiv W^P + W^G + P + IC^P + IC^G + T^I - S, \quad (4b)$$

where (national accounting codes ESA2010 in parentheses for each sector)

Y : Gross Domestic Product (B1GQ)

C^P : private final consumption (P3_S14_S15)

I^P : private investment (P5)

G : government final consumption (P3_S13)[35], whereas $G \equiv C^G + W^G$

C^G : government consumption, other than compensation of employees[33]

W^G: government compensation of employees (D1_S13)

I^G : government investment (OP5ANP)

X : exports (P6)

M : imports (P7)

W^P : private sector compensation of employees (D1)

P : profits, defined as net operating surplus and mixed income (B2A3N)

IC^P, IC^G: Consumption of Fixed Capital (P51C) of the private and the public sector, respectively.

T^I : Indirect taxes (D2)

S: Subsidies (D3)

[35] Government final consumption (P3) is the sum of compensation of employees (D1) +intermediate consumption (P2) +consumption of fixed capital (P51C)+other taxes on production (D29 payable)–other subsidies on production (D39 receivable)–output for own final use (P12)–payments for the other non-market output (P131)+social transfers in kind via market producers (D6311+D63121+D63131) (items of zero value, such as the general government net operating surplus, are omitted).

Next we proceed to the identification of the private consumption function, as follows:

$$C^P = C_0^P + c\cdot(W^P+W^G+P+ST-T^D-T^S)+\Delta CR^C \quad (5),$$

According to the above specification, nominal private consumption is a function of factor incomes and monetary social transfers, ST (D62), net of income taxes T^D (D5) and social security contributions T^S (D61). To the above we add ΔCR^C, which is the change in consumer credit and is assumed to feed private consumption in its entirety (therefore, credit financing is effectively netted out of private consumption).

Next we assume that income taxes are applied on factor incomes and state transfers[36], net of social contributions ($T^{S)}$):

$$T^D = T_0^D + t^D\cdot(W^P+W^G+P+ST-T^S) \quad (6)$$

Similarly, we have[37]

$$T^S = T_0^S + t^S\cdot(W^P+W^G+P) \quad (7)$$

Nominal investment is modelled very simply as a function of profits (P) and the change in business credit and housing loans (ΔCR^B)[38]. It is rather apparent that this is an approach based on the entrepreneurial rather than the macroeconomic perspective. Hence, we have

$$I^P = I_0^P + i_1\cdot P + i_2\cdot\Delta CR^B \quad (8)$$

Then we express profit as a simple function of private sector economic activity, as follows:

$$P = P_0 + p\cdot(Y-W^G-C^G-I^G) \quad (9).$$

[36] To keep things simple, it is assumed that all factor incomes are taxed at a uniform marginal rate t^D. Of course, this is a rather heroic assumption.

[37] It is assumed that social security contributions are applied on factor incomes but not social benefits. This may not be entirely true, since pensions carry some heath insurance contributions, which, however, amount to a relatively small sum. Furthermore, P includes corporate profits on which social security contributions are not levied. Definition of the social security contributions (and income taxes) function could have been defined much more accurately if only data of net operating surplus and net mixed income with their corresponding tax yields were available at a sectoral level.

[38] ΔC^B is defined as the change in the annual sum of loans extended to the private non-financial sector plus residential loans. The residential construction industry has traditionally been a strong force of growth with many spill-over effects between subsectors as suggested by Μανιάτης et al. (2015)

In the profit function, I^P is part of Y and, therefore, we may argue that implicitly we follow the neo-classical view of a two-way causality pattern between investment and profits[39].

Next, we assume that the private sector nominal wage bill is a function of the private sector economic activity, such that

$$W^P = W_0^P + w\cdot(Y - W^G - C^G - I^G) \quad (10).$$

The external sector is described by a simple demand function for imports,

$$M = M_0 + m\cdot Y \quad (11).$$

Obtain the reduced form of the GDP function as follows: first substitute (9) and (10) into (6) and (7); then place the outcome in (5) along with (6) and (7) to get a reduced form consumption function and, in parallel, substitute (9) into (8) for a new investment function; finally, combine these and (11) with (4a). Rearrange to arrive at:

$$Y\cdot[1-c\cdot(w+p)\cdot(1-t^D)\cdot(1-t^S) - i_1\cdot p + m] = Y_0 + [1+c\cdot(1-t^D)\cdot(1-t^S)\cdot(1-w-p) - i_1\cdot p]\cdot W^G$$

$$+[1-c\cdot(1-t^D)\cdot(1-t^S)\cdot(w+p) - i_1\cdot p]\cdot(C^G + I^G) + c\cdot(1-t^D)\cdot ST + \Delta CR^C + i_2\cdot\Delta CR^B + X \quad (12a),$$

$$\text{where } Y_0 = C_0^P + I_0^P + i_1\cdot P_0 + c\cdot(1-t^D)\cdot(1-t^S)\cdot(W_0^P + P_0) - c[T_0^D - (1-t^D)\cdot T_0^S] - M_0 \quad (12b).$$

In this way we are able to differentiate between the public sector wage bill and the other items of public consumption and investment. This is rather important in policy terms, given that (a) each component of public consumption carries different political weight, (b) investment, consumption of fixed capital, intermediate consumption and other items of non-wage final consumption share more common features and compete more strongly among them, rather than with the wage bill and (c) the wage bill amounts to about 50% of the sum of non-transfer payments and, therefore, it is not productive not to investigate the possibility of a different impact on GDP.

This particular reduced form of the GDP function (12a) yields the following multipliers:

[39] For an informative discussion on the issue see Stubelj (2014).

$$\pi_{W^G} = \frac{1 + c\cdot\left(1- t^D\right)\cdot\left(1- t^S\right)\cdot(1-w-p) - i_1\cdot p}{1-c\cdot\left(1- t^D\right)\cdot\left(1- t^S\right)\cdot(w+p) - i_1\cdot p + m} \quad (13),$$

$$\pi_{C^G}=\pi_{I^G}= \frac{1-c\cdot\left(1-t^D\right)\cdot\left(1-t^S\right)\cdot(w+p) - i_1\cdot p}{1-c\cdot\left(1- t^D\right)\cdot\left(1- t^S\right)\cdot(w+p) - i_1\cdot p + m} \quad (14)$$

and

$$\pi_{ST} = \frac{c\cdot(1-t^D)}{1-c\cdot\left(1- t^D\right)\cdot\left(1- t^S\right)\cdot(w+p) - i_1\cdot p + m} \quad (15)$$

Turning to the tax multipliers, a problem that emerges is that indirect taxation enters the model only through identity (4b). This particular identity allows us then to rewrite our consumption function as

$$C^P = C_0^P + c\cdot(Y-T^I+S+ST-T^D-T^S)+\Delta CR^C \quad (16),$$

where $W^P+W^G+P = Y-IC^P-IC^G -T^I+S$.

If we define the indirect-tax function as

$$T^I = T_0^I + t^I\cdot(C^P+I^P) \quad (17),$$

we may then obtain the multipliers for T^D, T^S and T^I by following the procedure below:

a) for π_{T^D}: Substitute (7) and (17) into (16) to obtain a new reduced form of the consumption function that contains only Y, T^D and the exogenous variables. Substitute the new consumption function along with (8) and (11) into identity (4a) to reach a reduced form of Y. Finally, solve for Y.

b) for π_{T^S}: Substitute (6) and (17) into (16) to obtain a new reduced form of the consumption function that contains only Y, T^S and the exogenous variables. Substitute the new consumption function along with (8) and (11) into identity (4a) to reach a reduced form of Y. Finally, solve for Y.

b) for π_{T^I}: Substitute (6) and (7) into (16) to obtain a new reduced form of the consumption function that contains only Y, T^I and the exogenous variables. Substitute the new consumption function along with (8) and (11) into identity (4a) to reach a reduced form of Y. Finally, solve for Y.

The resulting multipliers are:

$$\pi_{T^D} = \frac{c}{1-c\cdot(1-t^D)\cdot(1-t^S)-i_1\cdot p+m} \quad (15),$$

$$\pi_{T^S} = \frac{c\cdot(1-t^D)}{1-c\cdot(1-t^D)\cdot(1-t^I)-i_1\cdot p+m} \quad (16)$$

and

$$\pi_{T^I} = \frac{c\cdot(1-t^D)\cdot(1-t^S)}{1-c\cdot(1-t^D)\cdot(1-t^S)-i_1\cdot p+m} \quad (17)$$

Proceeding to the estimation of the fiscal multipliers, a model was built consisting of equations (1) to (8) and the reduced form of the GDP function. Exploring the possibility that the multipliers may have changed during the crisis, parameters c, t^D, t^S and t^I take the general form of *x·(1+d*DUM)*, where *x* is the initial parameter which may have changed its magnitude by a factor of *(1+d)* during the 2010-2016 period, as imposed by a dummy variable *DUM* which takes the value 1 for this period. Some of the constants of the model were dropped after an initial run.

2.4. Estimates of the fiscal multipliers

The first thing that is noticed in the results found in Appendix 6 is the high marginal propensity to consume. It stands at 0.85 (estimate for parameter CP1) and during the Programme years it has reached 0.95 [CP1·(1+CP01·DUM)=0.851*(1+0.115·1)= 0.949], practically unity. In fact, all parameters for investment and taxation were also significantly affected; the marginal propensity for investment declined from 0.38 to 0.32, while the marginal tax rates increased. Therefore, on the one hand we have a high marginal propensity to consume that leads us to expect large multipliers and on the other we have increased leakages from taxation pushing to the opposite direction.

In Table 9 we show the resulting impact fiscal multipliers with their main feature being that, in general, they are close to or higher than one. Spending multipliers for the wage bill and social transfers stand at 1.4[40], while for government consump-

[40] Their identical size is purely coincidental.

tion and investment stand much lower at 0.3[41]. The resulting weighted average multiplier for expenditure stands at 1.2. This may not be too far off the estimates used by the IMF and the Commission or found elsewhere, as in Kilponen et al. (2015), Monokroussos et al. (2013). However, what is interesting is that tax multipliers not only are they sizeable compared to those found in mainstream literature, but they are higher than the spending multipliers, as suggested by Romer et al. (2010) or Hondroyiannis et al. (2015). The average tax multiplier stands at −1.4, with the income tax multiplier being marginally higher than that of social security and quite larger than that of indirect taxation. This has a serious policy implication, since there are voices, such as Monokroussos et al. (2013) and Rannenberg (2015), arguing that fiscal consolidation should have relied more on tax increases rather than expenditure cuts, contrary to warnings such as by Romer et al. (2010). Moreover, we notice that the multipliers are higher during the recession albeit not spectacularly so. This seems to support arguments such as those found in Thomas Warmedinger (2015), Canzoneri et al. (2011) and Riera-Crichton et al. (2017).

2.5. Implications of the multipliers

The first conclusion is that, as shown in Table 10, the main fiscal instruments stood responsible for about 40% of the nominal GDP losses since 2009, the other 60% coming from other macroeconomic variables and the structural features of the economy (dynamic effects may, of course, change this impression to the extent that the relative sizes of the multipliers differ). Therefore, fiscal adjustment was only in part responsible for the recession whose largest part has to be explained by other factors. In rate terms (using the m-multipliers), the highest impact was that of indirect taxes, followed by social transfers, direct taxes and social security contributions. In absolute terms (using the π-multipliers), wages and social transfers by far presented the highest effects. In general, it seems that in rate terms all of the recession owes to the change in the relative tax burden, since the negative impact of the re-

[41] An explanation for public investment could be that the impact multiplier may be weak but the cumulative multiplier will grow larger as the overall effect on the economy manifests itself in the future. For public consumption it is more difficult to explain its relatively low impact on the economy; its similar to public investment specificities and composition (e.g. the fact that it includes payments in kind and consumption of fixed capital) may account for it.

duction in wages and public consumption and investment is counterbalanced by the effect of the increased social transfers.

Next, we explored the implications of the estimated multipliers and undertook an exercise in the form of a series of simulations. We attempted to answer three basic "what if" questions, namely what would have happened if the size of the adjustment, the time profile of its implementation and the policy mix had been different. The results, shown analytically in Appendix 7, indicate that a much smaller adjustment by itself would not have done much good since it would not bring about the desirable fiscal consolidation and the public debt ratio would have continued to rise, thus undermining any accounting gains for the GDP. On the other hand, however, a faster adjustment could contribute to a significant reduction of the debt ratio by as much as 19% of GDP despite its fast increase during the first years. Also, a different policy mix, with a 50/50 split between revenues and expenditure (instead of 76/24, which was the actual split), could have contributed another 7% of reduction.

Such exercises, of course, useful as they may be, have to do more with accounting mechanics rather than real life fiscal policies and politics. Having this in mind, we cannot but infer that certain policies that are implied by the arithmetics of our simulations would be quite hard to implement. For example, a 50/50 split of the policy mix would require double the cuts in public spending and it is quite doubtful that any government would be willing to proceed so, despite the fact that tax increases would have been much milder. We should not forget that individual measures tend to be more or less selective and do not necessarily address the same interest groups. There are forces that require that consolidation efforts should be as balanced as possible regardless of the fact that the imbalances were not generated in a symmetric way. Pressure groups and their power are quite important in this context; if they have the power to gain benefits, they are just as strong to resist their abolishment, let alone if it is out of proportion compared to other groups.

In this sense we ran a "politically feasible" alternative scenario, whereas the fiscal adjustment is limited to 60% of the actual one. Not only that, but as we assume that all consolidation takes place within the first three years (2010-2012), it is worth noticing that the 7% adjustment of the scenario (compared to the actual 11.8%) is

even lower than the actual adjustment that took place in the first three years of the Programme (7.7%). Moreover, the policy mix is different: only 40% of the adjustment comes from taxation but the remaining 60% for public expenditure is applied to a higher GDP base thus resulting to lower spending cuts in absolute values. Furthermore, although the extra spending cuts (as GDP ratios) are allocated by more than 60% to social transfers, in absolute terms we have €2.7 bn. smaller reductions. The rearrangement of taxes foresees that income taxes and social contributions present a minimum increase in ratio terms (just 0.3 pp) and indirect taxes increase their GDP share by 2.5 pp, resulting in a decrease of €1.7 bn. and €2.2 bn. respectively, if compared to the actual figures. In all, primary spending and taxation stand at €5.7 bn. higher and €3.9 bn. lower, respectively.

The final outcome is that in 2016 the fiscal sector, although at a lower debt level of 175.1%, still runs a small primary deficit of 1.3% instead of a large surplus of 3.9%, while GDP stands 11% higher than the actual figure. This kind of development may have provided enough breathing space for the economy and time enough (the 2013-2016 period) for the fiscal consolidation to sink in and prepare for the second stage of adjustment in the post-Programme period. This is said having in mind that the multiplier effects explain about 40% of the overall GDP reduction, the other 60% having to do with structural and financial issues of the economy that apparently were inadequately addressed during the adjustment period.

3. Debt sustainability analysis

Debt sustainability is the core fiscal objective for the Greek economy. The definition of debt sustainability can be a very simple one that emanates from common sense: “A debt is sustainable as long as one can service it” (i.e. pay interest and principal out of one’s earned income or loans). This is quite straightforward, but simple things are the hardest to realize. In market-access countries (or potential market-access, as in the case of Greece) the willingness, hence conditions, of markets to finance an economy does not depend on her economic and political performance alone, but on the international willingness to finance and the availability of funds, as

well. Therefore, we must correct our initial approach to sustainability to "A debt is sustainable as long as the lenders believe one can service it". This is very close to the views expressed by Bohn (2005). Moreover, it means that judgement on the sustainability of a country's debt, especially in the long-run, can be made only on the basis of many *ceteris paribus* assumptions.

The two prevailing approaches in the context of this review are those of the European Commission and the IMF, which follow similar general directions. However, before dealing with them it should be stressed that this approach is being hit hard at its foundations; a growing number of polemists of the theology of the Excessive Deficit Procedure definitions argue that sustainability analysis is based on the wrong definition of debt. They argue that the European concept of Gross Nominal Debt should be replaced by Net Present Value Debt, which is substantially more realistic and abides to international accounting standards[42]. Despite possible merits of these proposals, institutional and market agencies so far seem reluctant to make a switch[43]. They follow the original guidelines, which will be also used in this analysis.

From a technical point of view, the IMF has adopted a risk-based approach with four main considerations to be weighed in order to judge the sustainability of the public debt of an advanced economy[44]: 1) whether debt can be stabilized at 60% or less with debt servicing not exceeding 15% and, at the same time, preserving growth, even under stressful circumstances, 2) whether the previous proposal is supported by realistic primary balances, 3) whether macroeconomic assumptions are realistic and d) whether debt composition does not hinder market access. This seems to be quite an exhausting shopping list, although the benchmarks set are open to criticism as much as the Maastricht criteria.

Moreover, according to Guzman (2016), the definition of the IMF not only has it failed in practice, but it is poor in its conception since it puts too much weight on fiscal adjustment rather than overall macroeconomic policy. Unfortunately, Guzman's useful insight does not lead to a useful suggestion, being just as arbitrary and

[42] For a thorough presentation of these views, see Kazarian (2015), a champion of the movement, and Most Important Reform (2017).
[43] However, the IMF does not preclude the use of net debt as a complementary measure. See IMF (2013), p.9. See, also, EU (European Union) (2012), p.189.
[44] See IMF (2013).

vague as IMF's, since it refers to an intertemporal budget constraint (possibly of infinite time horizon) of equal present values of expenditure and revenues. This brings us to the definition of the European Commission, whereas debt sustainability is analyzed within the framework of overall fiscal sustainability. More specifically, the European Commission works out seven scenarios for debt formation, supported by several other scenarios that are combined with three main composite indices of debt sustainability, S0, S1 and S2, that refer to the short, medium and long-term, respectively[45].

Nevertheless, in the present study we follow the mainstream and our debt sustainability analysis (DSA) deals with the level and trend of the public debt ratio, as well as the Gross Financing Needs (GFN) ratio, keeping in mind the restrictions imposed by the Stability and Growth Pact. The DSA carried out in this context is Excel-based and its methodology is as follows:

- First, we calculate the GFN, which are broken down to "old" and "new": the "old" GFN are those coming from debt of 2016 and before and are spread from 2017 to 2059. The "new" GFN refer to those formed after 2017 by the annual primary balances, rolling over old debt and other operations which are described later. Then we examine the trend of the resulting GFN and whether they fall within the 15% to 20% band.
- The second step is to combine the interest payments and the primary balances included in the GFN to obtain the annual net balances and check them against the -3% benchmark of the SGP.
- Finally, the net balance of the previous step is added together with the financial operations mentioned in the first step to the existing stock of debt in order to calculate the current stock of the general government consolidated debt (intragovernmental debt is assumed to remain stable at €14 bn. throughout the examined period).

The scenarios that were developed include three cases whereas debt is not rescheduled at all and debt is reprofiled either within the existing maturity period or an extended maturity to 2080. There are also three different scenarios for long-run

[45] See European Commission (2017).

primary balances which we used, namely of those of 0.5%, 1% and 1.5% of GDP. As for the macroeconomic assumptions go, we use two scenarios of high or low real growth and inflation. As can be seen in Figure 29, real growth and inflation do not exceed 3.2% and 1.8% (in 2022) respectively, while in the long run they stand at 1.5% and 1.3%. On the other hand, the low growth scenarios assume rates of 1% and 0.8%.

With nominal growth ranging between 1.8% and 2.8%, it is understood that the scenarios used are quite moderate in their expectations and very close or below the projections used by the European Commission and the IMF[46]. As far as primary balances go, we assume that (in ESA 2010 terms) 2017 will present a primary surplus of 2.5% of GDP, which will go up to 3% in 2019, and then will fall to 2.5% in 2020. After that, three scenarios are examined, where the primary surplus will take values of 0.5%, 1 and 1.5%.

Past debt obligations

Given the standing volume of public debt, €405 bn. in total must be paid out after 2016 until 2060 for debt servicing, arising from the financial assistance during the Adjustment Programmes and the restructuring of the Greek debt (see Appendix 5:). This amount is composed (a) by €80 bn. owed to the ECB, the IMF, the EIB and private investors (€66 bn. capital repayment and €14 bn. interest payments) and (b) €325 bn. owed to the EFSF/ESM and EU countries (€232 bn. capital and €93 bn. interest).

The time profile of this debt servicing presents an irregular pattern with troughs and peaks (red section of Figure 30), with spikes appearing especially in the first years of the expected return to market. Rescheduling payments to the second group of lenders, so that a smooth back-loaded scheme emerges, could prove beneficial to the sustainability of the debt, as will be shown later. Rescheduling for the first group is not regarded as feasible.

As can be seen in Figure 30, restructuring the *second group* of loans will not have a smoothening impact on the *total* servicing before 2020. This is due mainly to

[46] See European Commission (2016) and IMF (2017). The IMF projects long-term nominal growth at 2.7%, while the Commission's estimates are a little higher than 3% after 2030.

the high repayments of capital due to the ECB (€5.8 bn.) and private investors (€4 bn.) in 2019. On the other hand, it is assumed that no payments of capital will be made before 2021 to the second group of lenders. In addition, should such a restructuring take place, it is estimated that the average interest rate should marginally drop by 0.15% in order to keep the nominal interest burden unchanged for the whole period. A second approach would be to extend the second group of loans into 2080[47]. This would bring about extra debt relief, as will be seen later. Smoothening of the overall debt servicing through the extension of debt repayment to the second group of lenders would require a grace period for capital until 2031 (while interest payments are fully met[48]).

Such a schedule is shown in Figure 31, where capital repayment is kept to a minimum until 2031 (since it is made to the first group only). This may seem as front-loading the schedule during the first period of market financing, but it should be noticed that debt servicing is significantly lower compared to the first scenario, while the profile of debt servicing is clearly back-loaded starting from a very low base in 2025. This more or less accommodates for the increasing pressure of replacing the loans of the second group by market loans, which are expected to bear higher interest rates. Interest rates in this case are assumed to remain at the level we assumed for simple reprofiling[49].

New debt obligations

Total GFN are the combined result of past borrowing, as examined earlier, and new gross borrowing, which is determined by the primary balance of the general government, as well as requirements to refinance expiring loans, payments of interest on new debt and various other transactions. For the latter we have assumed that between 2017 and 2019 €6 bn. of past cash obligations (arrears) will be cleared, repo transactions will be reduced and €3.5 bn. will be switched to bonds in 2018 and

[47] In the DSA that follows the time horizon is 2060 and 2080 in the case of extended rescheduling. For simplicity's sake, however, we present results up to 2060 since trends have clearly manifested by then and are not reversed after that point.

[48] A grace period for interest would alleviate GFN, but would not affect the net deficit (which is measured on an accrual basis). The grace period would effectively increase future payments to the extent that interest is capitalized and/or interest rate terms are worse.

[49] It is understood that this may be a highly controversial political issue and would, therefore, require to devise an acceptable solution for financing fixed (low) interest rates (see IMF (2016), *p7.)*.

2019, while €8 bn. will be absorbed to finance the stability of the banking system. Moreover, a cash buffer of €6 bn. will be have been built up by 2019 (around 3% of GDP), which will then gradually decrease to 1.5% of GDP in the long run, while privatization proceeds will sum up to €5 bn. by 2026. Finally, ANFA and SMP gains are not taken into account, treated as a buffer for possible downside deviations. It is also assumed that rescheduled debt will bear an interest rate of 1.35% after 2020.

Regarding the GFN, we assume that new GFN, including replacement of existing bonds, are financed by market bond issues that are split evenly in 3-, 5- and 10-year maturities. Short-term borrowing (TBs) is assumed to remain constant at €15 bn. throughout the period (thus diminishing in GDP terms and correspondingly affecting the consolidated GGD through intragovernmental debt). The 2018 average market interest rates for bonds are assumed to average at 5.4%, changing thereof in response to changes in the debt to GDP ratio[50]; indicatively, the range of interest rates for the high growth scenarios are shown in Figure 32, whereas a range of debt reduction between 38% and 96% of GDP is associated with a reduction of the average nominal interest rate ranging from of 1.5% to 2.8%.

In Figure 33 we present eighteen scenarios for the period 2020-2060. They combine **(1)** three cases of "old" debt structure, namely a) unchanged= "basic"-red lines, b) reprofiled="restructured"-amber lines and c) extended reprofiling="extended"-green lines with **(2)** two regimes of long-run nominal growth: (a) 1.8% ("low"-dotted lines) and (b) 2.8% ("high"-compact lines) and **(3)** three cases of long-run primary surpluses (0.5%, 1% and 1.5%).

Thus, in nine graphs we compare the net deficit, the gross financing needs (GFN) and the general government debt (GGD) for these scenarios. The unstructured debt case is used as the benchmark (basic) scenario. What becomes immediately apparent is that the public debt is clearly unsustainable in all cases of low growth (dotted lines), with net deficit, GFN and debt shooting up exponentially; in fact, addition-

[50] The algorithm used is $\Delta i=(i_0/\psi)\Delta b_{-1}$, where Δi is the change of the interest rate, Δb_{-1} is the change of the debt ratio in the previous period and ψ is a constant that takes the value of 1.35 if Δb_{-1} is negative and 0.85 if it is positive. Thus, we have assumed myopic financial markets and an asymmetric effect with the interest rate rising faster than it falls. For example, with the initial interest rate at 5%, a fall of 1% of the debt ratio will cause a change of (-1%x5%/1,35=) −3.7 bps, while an equivalent increase of the debt ratio will lead to a change of (1%x5%/1,35=) +5.9 bps. The IMF projections assume a change of ±4 bps for every ±1% change of the debt ratio.

al analysis shows that primary surpluses of at least 2% would be required, depending on the debt restructuring options. A possible exception seems to appear in the case of a primary surplus of 1.5% with extensive reprofiling of the debt (south-east corner of Figure 33). However, we can quickly dismiss it since debt remains at the high level of 140% and then gets on an upward trend (170% in 2080), while the net deficit and GFN are far from being anywhere close to the respective specified bounds.

In the higher nominal growth scenarios it is evident that public debt is viable at surpluses of 1% or 1.5%, although rescheduling will be required in the first case. Here, a possible exception dwells in the south-west corner with 0.5% primary surplus and extensive reprofiling, where debt seems to decrease below 120% on a downward trend. However, the net deficit is dangerously close to the 3% threshold and GFN stand close to 18% (and stabilize at about 18.5% by 2080). This is a rather precarious situation, with the economy being more vulnerable to international developments and unforeseen factors. Moving eastwards, the difference between the 1% and 1.5% scenarios lies in the speed of debt reduction, where the annual difference of 0.5% in primary surpluses signifies a debt reduction which is higher by some 20% to 25% of GDP across the various scenarios. With reprofiling taking place, the debt ratio moves between below 100% and just higher than 60%, depending on the extension of reprofiling.

From the above analysis it turns out that the prime factor for debt sustainability is the long-run growth rate, where this small gap of 1pp between the high and low nominal growth scenarios makes a world of a difference, being the key element for sustainability. At this point, it should be mentioned that a full scale model should take explicitly into account not only the impact of fiscal policy on real growth but on inflation, as well, which is just as important to debt reduction.

Next to nominal growth we have the primary surplus, whereas an extra half of a percentage point in the long run lowers the debt ratio by some 25% of GDP or more. In general, debt can be sustainable when primary surpluses of at least 1% are realized. At the same time, the net deficit remains comfortably between 1% and 2% (for 1% surplus; much lower for 1.5%) and the GFN ratio moves either within or below the 15%-20% band, in both cases being on a downward trend until 2080.

Finally, debt reprofiling may benefit the debt ratio by at least 20%. We have analogous impacts on the GFN and the net deficit. As shown in Figure 34, in the case of 1% primary surpluses extensive debt reprofiling may benefit the reduction of the debt ratio up to 25% of GDP through the snowball effect in high growth conditions. In low growth conditions debt restructuring may be beneficial but the snowball effect gets so adverse that there is no point in dealing with it.

To recapitulate, public debt is not sustainable under the present circumstances, yet it can be turned into such under the right circumstances and the appropriate policies. It seems that fiscal discipline must prevail in the long run although fiscal policy may not be so restrictive. Much depends on the GDP growth rate to which the analysis shows high sensitivity. Having seen in the previous section that the fiscal multipliers have affected GDP by 40%, the rest depending on structural and financial policies, it is only logical to assume that efforts should concentrate not only on safeguarding fiscal prudence but on restoring the productive capacity of the economy and activating the mechanisms that will contribute to sustainable growth, as well.

4. Conclusions

In the preceding analysis we reached a number of conclusions regarding fiscal consolidation during the crisis that help us identify several policy options for the future. In particular we highlight the following points:

- The fiscal crisis was the result of a substantial swell of primary spending which was not met by tax revenues.
- After seven years of adjustment programmes, in 2016 Greece still presented an oversized public sector relative to the Eurozone average (especially on the revenue side; see Figure 35), which, however, was mostly the result of the denominator effect[51].

[51] Even if we take the cyclically adjusted figures as provided by the AMECO database, we see that in 2016 primary spending in Greece was 1% of trend GDP lower than the Eurozone average, while in 2009 it was 6.3% higher (-3.4% and 3.3%, respectively, based on potential GDP). On the other hand revenues stood 4% higher in 2016 and were -5.3% lower in 2009 (3.8% and -5.5%, respectively, based on potential GDP).

- Overall fiscal measures for the 2010-2016 period amounted to €65.9 bn. or 33.6% of GDP[52]. The respective fiscal adjustment was €35.9 bn. or 14% of GDP. Therefore, the measures applied had a poor yield of 55%. At the relative to GDP level, performance was even poorer at 42% due to the denominator effect. Restricting the analysis to the crucial 2010-2014 period shows that the effectiveness of the adjustment process[53] was 33.6% (close to our estimate of 30.2%). Effectiveness of revenues measures stood at 58% (39.7% according to our estimates), while for primary spending stood at 14.1% (17.7%).
- Fiscal adjustment cut primary spending by some €36 bn. relative to 2009 and brought it roughly back to its 2005 level albeit in a non-symmetric way.
    - Social transfers still gained about €7 bn. (relative to 2005) which were met by equivalent cuts in non-wage spending (consumption and investment).
    - For a long period until 2010 the growth rate of spending on pensions was significantly sur-benchmark (Figure 22) and was brought back in line in 2016.
    - Pensions suffered losses of 15.6% on average (about ⅓ of them due to the increase of the tax burden).
    - The public sector wage bill was reduced by €9.4 bn. but the net gain to the budget was limited to €5.9 bn. due to leakages coming from pensions and taxation.
    - ¾ of the gains from the reduction of the government net wage bill owed to employment reduction and ¼ to the reduction of net salaries.
    - The average net salary in the private sector was reduced by 21% compared to 15% for the public sector and remained lower than the latter.
    - Employment in the private sector shank by 13% compared to 30% in the public sector, the difference being that a good part of private sector redundancies led to unemployment, while those of the public sector to retirement.

[52] Commission's estimates in the AMECO database.
[53] In terms of GDP ratios.

- The Unit Labour Cost has remained higher for the government sector relative to the private sector. During the crisis the private sector ULC decreased by 21% against 1% for the public sector.

- On the revenue side, despite measures of at least €31 bn. according to the official estimates (probably more if we take into account our estimates in section 1.6), revenues shrank by €5 bn. from 2009 to 2916. This indicates not only a serious problem in forecasting the tax-base effect, but probably a misestimation of the actual collection rates of taxes, as well.
  - Tax revenues on consumption in 2016 remained practically the same relative to 2006 despite the substantial increase of the implicit tax rate from 17.4% (15.6% fro 2009) to 20%.
  - Income taxes and social security contributions paid by households shrank by €6.7 bn. (about €1.7 and €5 bn., respectively) despite the increase of the sectoral tax rate by 25.3%. The respective "hybrid" SITRs rose by 46.2% and 37.8%.
- Thus, fiscal adjustment was not symmetric to the imbalances that caused the need for it. It did not take place by reversing the trends but by raising taxation much more than cutting down on spending. Thus, ¾ of a tremendous fiscal adjustment of 14% of GDP at the primary level was achieved from the revenue side. Yet, it should be mentioned that primary spending shrank by 31%, i.e. more than the GDP (−26%).
- This reveals a strong dilemma for fiscal policy: given that about half of primary spending goes to social transfers (while primary spending stands rather close to Eurozone average), how politically feasible would it be to further check spending in order to relieve taxation? Given that pensions and the public wage bill clearly address fewer persons than direct or indirect taxation, further spending cuts would have to be much higher to counterbalance any tax cuts. Even more so since pensions (and public sector wages to a lesser extent) are already little taxed and no serious benefits would accrue to them form tax cuts.

- It seems that the answer to this dilemma lies in the denominator effect. Whatever reductions in the GDP ratios of spending and taxes have to come from raising the denominator faster than the nominator, so that spending cuts do not involve reductions in absolute nominal terms and lower tax rates do not cause tax revenues to shrink further. An indication for the above policy option is given by the "politically feasible" alternative scenario in Section 2.5, where it is shown that the fiscal adjustment was undermined by its own severity and prolongation along with a non-optimal policy mix.
- Fiscal adjustment, however, has not been the root of all evil since it stands responsible for about 40% of the GDP losses. This shows that economic policies should not be one-dimensional, exhausting their scope in fiscal arithmetic. Moreover, in growth rate terms taxation seems to be the sole responsible for these losses.
- Fiscal multipliers have been estimated and found higher than unity[54], with π-type tax multipliers (the usual impact multipliers) being higher than spending multipliers (-1.4 compared to 1.2, on aggregate). Also, the fiscal multipliers were found to be lower before the recession and the fiscal adjustment, which means that as the economy recovers, fiscal policy will help to a lesser degree than the 40% mentioned above in boosting growth. Therefore, all other policies will become even more important.
- Having in mind the aforementioned high tax burden relative to the Eurozone average, the rise of the tax rates during fiscal consolidation and the high tax multipliers, it seems only logical that reducing taxation should take priority over increasing spending in the process of the recovery of the economy. After this has been achieved, then expenditure may rise (in absolute terms) at a pace slower than the GDP growth rate. Until, then, however, whichever fiscal result is required should be first addressed by not allowing expenditure to rise fast.
- As a consequence of all these, any serious effort for recovery should equally concentrate on restoring the productive capacity of the economy as much as

[54] With the exception of public investment and non-wage consumption which, however, possibly increase given time.

on obtaining maximum gains from relaxing (but not neglecting) fiscal discipline. For the latter this should involve changing the policy mix which will not go without political challenges.

- Finally, according to our sustainability scenarios the Greek public debt may be rendered sustainable in the long run. This will require extensive reprofiling (for EFSF/ESM and bilateral country loans), with no debt relief à la 2012, which proves to be quite beneficial (up to 20% of GDP). This approach has also a good chance to avoid cross-fire from the discussion on the degree of political union in the Eurozone.
    - Still, reprofiling is not an easy issue to tackle as it would involve debt aggregation, smoothening of future payments and co-ordination and fine tuning of interest rates.
    - Moreover, the whole debt sustainability exercise is quite sensitive to the growth rate of the economy. Our *ceteris paribus* analysis shows that for a 2.8% long-run nominal growth rate, a primary surplus of at least 1% of GDP is required in order to keep the net deficit, the Gross Financing Needs and the public debt ratio in check. On the other hand no low growth scenario results in a sustainable public debt, reprofiling or not.
    - The difference between 1% and 1.5% primary surplus may benefit the debt ratio by up to 25% and this is clearly the object of a political choice.

References

Καραβίτης, Ν. (2011) **Συντάξεις: Πέρα Από Τον Πρώτο Πυλώνα**. ΙΟΒΕ, Αθήνα.

Καραβίτης, Ν. (2008) **Δημόσιο Έλλειμα Και Χρέος**. Διόνικος, Αθήνα.

Κοινωνικό Πολύκεντρο (2017) **Απασχόληση, Αμοιβές, Θεσμικές Παρεμβάσεις Στο Δημόσιο Τομέα Στο Πλαίσιο Περιοριστικών Πολιτικών**. ΑΔΕΔΥ,

Μανιάτης, Γ. Παύλου, Γ. (2015) **Η Σημασία Ανάπτυξης, Τα Εμπόδια Και Το Μέλλον Του Κλάδου Των Κατασκευών**. ΙΟΒΕ, Αθήνα.

Υπουργείο Διοικητικής Ανασυγκρότησης (2017)

Auerbach, A.J. Gorodnichenko, Y. (2012) **Fiscal Multiplier In Recession And Expansion**, NBER working paper. University of Chicago Press, . doi:10.3386/w17447

Batini, N. Eyraud, L. Forni, L. Weber, A. (2014) **Fiscal Multipliers: Size, Determinants, And Use In Macroeconomic Projections**, Technical Notes and Manuals 14/04. IMF, . doi:10.5089/9781498382458.005

Bohn, H. (2005) **The Sustainability Of Fiscal Policy In The United States**, CESIFO Working Paper. CESifo,

Born, B. Müller, G.J. Pfeifer, J. (2015) **Does Austerity Pay Off?**, CEPR Discussion Papers. ADEMU,

Boussard, J. Castro, F. De Salto, M. (2012) **Fiscal Multipliers And Public Debt Dynamics In Consolidations**, EC Economic Papers, European Economy. European Commission (Directorate-General for Economic and Financial Affairs), . doi:10.2765/26914

Canzoneri, M. Dellas, H. (2011) '*Fiscal Multipliers In Recessions*'. Economic Journal 126, 1–16

EU (European Union) (2012) **Fiscal Sustainability Report**. Luxembourg. doi:10.2765/19669

European Commission (2017) **Debt Sustainability Monitor-2016**, European Economy, Institutional Papers 047

European Commission (2016) **Compliance Report: The Third Economic Adjustment Programme For Greece (First Review June 2016)**

European Commission (2015a) **Taxation Trends In The European Union**

European Commission (2015b) **The 2015 Ageing Report**, European Economy series. Luxembourg: Publications Office of the European Union, . doi:10.2765/76255

European Commission (2013) **Excise Duty Tables**, Exercice Duty Table. Brussels.

European Commission (2012) **Quarterly Report On The Euro Area**

European Commission (Directorate-General for Economic and Financial Affairs) (2010) **The Economic Adjustment Programme For Greece**, Occasional Papers

61

European Commission Directorate-General for Economic and Financial Affairs (2013) **The Second Economic Adjustment Programme For Greece**, Occasional Papers 192

Eyraud, L. Weber, A. (2013) **The Challenge Of Debt Reduction During Fiscal Consolidation**, (IMF Working Paper No. 67). IMF, . doi:10.5089/9781475553864.001

Forelle, C. Minczeski, P. Bentley, E. (2015) "*Greece's Debt Due*". Wall Street Journal, https://graphics.wsj.com/greece-debt-timeline/

Gechert, S. Hallett, A.H. (2015) **Fiscal Multipliers In Downturs And The Effects Of Eurozone Consolidation**, Centre for Economic Policy Research, Policy Insight

Guzman, M. (2016) **Definitional Issues In The IMF Debt Sustainability Analysis Framework- A Proposal**, Policy Brief 77. CIGI,

Hondroyiannis, G. Papaoikonomou, D. (2015) **When Does It Pay To Tax? Evidence From State-dependent Fiscal Multipliers In The Euro Area**, Economic Modelling, Working Paper. doi:10.1016/j.econmod.2014.10.031

IMF (2017) **Greece - Request For Stand-By Arrangement**

IMF (2016) **Preliminary Debt Sustainability Analysis-Updated Estimates And Further Considerations**

IMF (2013) **"Staff Guidance Note For Public Debt Sustainability Analysis In Market-Access Countries"**

IMF (2012) **Balancing Fiscal Policy Risks**, World Economic and Financial Surveys/Fiscal Monitor

Kaplanoglou, G. Rapanos, V.T. (2011) **The Greek Fiscal Crisis And The Role Of Fiscal Governance**, GreeSE Paper

Karavitis, N. (1987) '*The Causal Factors Of Government Expenditure Growth In Greece, 1950—80*'. Applied Economics 19, 789–807. doi:10.1080/00036848700000110

Karavitis, N. (1986) "*The determinants of government expenditure growth in Greece, 1950-1980*". University of Leicester,

Kazarian, P. (2015) "*Greece: Government Accounting Reform as a Pre-Condition to EU Funds*", in: Munich Seminars. CESifo and the Süddeutsche Zeitung,

Kilponen, J. Pisani, M. Schmidt, S. Corbo, V. Hledik, T. Hollmayr, J. Hurtado, S. Julio, P. Kulikov, D. Lemoine, M. Lozej, M. Lundvall, H. Maria, J.R. Micallef, B. Papageorgiou, D. Rysanek, J. Sideris, D. Thomas, C. de Walque, G. (2015) **Comparing Fiscal Multipliers Across Models And Countries In Europe**, European Central Bank, Working Paper Series: 1760, 2015, Working Paper Series. doi:10.2866/614287

Marglin, S.A. Spiegler, P. (2013) '*Unpacking The Multiplier: Making Sense Of Recent Assessments Of Fiscal Stimulus Policy*'. Social Research 80, 819–854. doi:10.1353/sor.2013.0050

Ministry of Public Administration (2016) **The Truth About The Greek Public Sector**

Monokroussos, P. Thomakos, D. (2013) '*Greek Fiscal Multipliers Revisited*'. Economy & Markets VIII

Most Important Reform (2017) http://www.mostimportantreform.info/IMF_2017_Spring_Meetings_Greece_Helpful_Facts.pdf

Poniatowski, G. Bonchosmolovskily, M. Belkindas, M. (2016) **Study And Reports On The VAT Gap In The EU-28 Member States : 2016 Final Report TAXUD / 2015 / CC /**. IHS, Institute for Advanced Studies, Vienna.

Rannenberg, S. (2015) '*The Costs Of Greece's Fiscal Consolidation*'. Vierteljahrshefte zur Wirtschaftsforschung 84, 47–59

Riera-Crichton, D. Vegh, C.A. Vuletin, G. (2017) '*Tax Policy And The Macroeconomy: Measurement, Identification, And Non-linearities*'. Ensayos sobre Política Económica 10–17

Riera-Crichton, D. Vegh, C.A. Vuletin, G. (2016) **Tax Multipliers: Pitfalls In Measurement And Identification**, Journal of Monetary Economics. doi:10.1016/j.jmoneco.2016.03.003

Romer, C.D. Romer, D.H. (2010) '*The Macroeconomic Effects Of Tax Changes: Estimates Based On A New Measure Of Fiscal Shocks*'. American Economic Review 100, 763–801. doi:10.1257/aer.100.3.763

Spilimbergo, A. Schindler, M. Symansky, S. (2009) **Fiscal Multipliers**, Staff Position Note 11. IMF,

Stubelj, I. (2014) '*Investment And Profits: Causality Analysis In Selected EU Countries*'. Managing Global Transitions 12, 395–413

Thomas Warmedinger, C.C.-W. and P.H. de C. (2015) **Fiscal Multipliers And Beyond**, European Central Bank, Occasional Papers. doi:10.7866/HPE-RPE.15.4.6

Tinios, P. (2016) **Towards A New Social Contract: Greek Pensions Halfway Through Adjustment**. Hellenic Observatory, LSE, London.

Appendix 1: Main Fiscal Aggregates (% of GDP)

Main Fiscal Aggregates (% of GDP)

Year	*D5*	*D61*	Direct Taxes	D2	Non-tax	TR	D1	P2	OP5A NP	D62_ D632	Other	TE (prima-ry)	-B9 (Primar y)	D41	-B9	S-FA	Gross Debt	Δ(Gross Debt)
1995	*6,6%*	*10,4%*	16,9%	12,3%	7,1%	**36,3%**	10,2%	5,3%	4,2%	13,0%	2,6%	**35,3%**	**-1,0%**	10,7%	**9,7%**	-3,4%	**96,3%**	**0,4%**
1996	*6,4%*	*10,4%*	16,8%	12,6%	7,6%	**36,9%**	9,6%	5,5%	4,3%	13,0%	2,3%	**34,8%**	**-2,1%**	10,3%	**8,2%**	4,2%	**100,0%**	**3,8%**
1997	*7,1%*	*10,6%*	17,7%	12,7%	7,2%	**37,6%**	10,3%	5,0%	4,5%	13,0%	2,5%	**35,4%**	**-2,3%**	8,3%	**6,1%**	1,6%	**98,6%**	**-1,4%**
1998	*8,5%*	*10,8%*	19,3%	12,4%	7,2%	**38,9%**	10,2%	5,2%	5,7%	13,3%	3,1%	**37,5%**	**-1,4%**	7,7%	**6,3%**	-5,1%	**97,7%**	**-0,9%**
1999	*8,9%*	*11,0%*	19,9%	13,0%	7,5%	**40,4%**	10,3%	5,5%	6,5%	13,8%	2,5%	**38,6%**	**-1,8%**	7,6%	**5,8%**	1,6%	**97,5%**	**-0,2%**
2000	*9,8%*	*11,6%*	21,3%	13,1%	7,9%	**42,4%**	10,5%	5,3%	5,9%	14,5%	3,3%	**39,6%**	**-2,8%**	6,9%	**4,1%**	4,1%	**103,7%**	**6,1%**
2001	*8,6%*	*11,7%*	20,2%	12,7%	7,5%	**40,5%**	10,4%	6,0%	5,9%	14,9%	2,6%	**39,7%**	**-0,8%**	6,3%	**5,5%**	4,2%	**107,1%**	**3,4%**
2002	*8,9%*	*12,6%*	21,4%	12,8%	5,5%	**39,8%**	10,9%	5,7%	6,0%	14,9%	2,7%	**40,2%**	**0,5%**	5,6%	**6,0%**	-0,9%	**104,9%**	**-2,2%**
2003	*8,1%*	*12,5%*	20,6%	12,1%	6,1%	**38,8%**	10,6%	5,9%	6,7%	15,5%	3,1%	**41,7%**	**2,9%**	4,9%	**7,8%**	-2,2%	**101,5%**	**-3,4%**
2004	*8,1%*	*12,1%*	20,2%	11,6%	7,0%	**38,8%**	11,3%	6,4%	6,2%	15,1%	3,9%	**42,8%**	**4,0%**	4,8%	**8,8%**	0,3%	**102,9%**	**1,4%**
2005	*9,0%*	*12,3%*	21,3%	11,9%	6,2%	**39,4%**	11,4%	5,9%	4,7%	16,0%	2,8%	**40,9%**	**1,5%**	4,7%	**6,2%**	1,2%	**107,4%**	**4,5%**
2006	*8,3%*	*11,9%*	20,2%	12,2%	6,8%	**39,2%**	11,0%	6,3%	4,8%	16,5%	2,1%	**40,7%**	**1,5%**	4,4%	**5,9%**	-0,6%	**103,6%**	**-3,8%**
2007	*8,3%*	*12,4%*	20,7%	12,6%	7,1%	**40,4%**	11,1%	6,7%	5,1%	17,2%	2,5%	**42,6%**	**2,2%**	4,5%	**6,7%**	-0,6%	**103,1%**	**-0,5%**
2008	*8,1%*	*12,7%*	20,8%	12,6%	7,3%	**40,7%**	11,6%	6,2%	5,7%	18,9%	3,6%	**46,0%**	**5,4%**	4,8%	**10,2%**	0,1%	**109,4%**	**6,3%**
2009	*8,5%*	*12,4%*	20,9%	11,7%	6,3%	**38,9%**	13,1%	6,7%	5,3%	20,6%	3,4%	**49,0%**	**10,1%**	5,0%	**15,1%**	0,1%	**126,7%**	**17,3%**
2010	*8,3%*	*13,1%*	21,4%	12,6%	7,3%	**41,3%**	12,4%	6,1%	3,7%	20,9%	3,4%	**46,6%**	**5,3%**	5,9%	**11,2%**	1,9%	**146,2%**	**19,5%**
2011	*9,2%*	*13,2%*	22,4%	13,5%	8,1%	**44,0%**	12,6%	4,9%	2,5%	22,9%	4,0%	**47,0%**	**3,0%**	7,3%	**10,3%**	2,1%	**172,1%**	**25,8%**
2012	*10,8%*	*13,9%*	24,7%	13,6%	8,2%	**46,5%**	12,8%	5,1%	2,6%	23,2%	6,6%	**50,3%**	**3,8%**	5,1%	**8,9%**	-35,7%	**159,6%**	**-12,5%**
2013	*10,5%*	*13,5%*	24,0%	14,1%	11,0%	**49,1%**	12,2%	4,7%	4,8%	21,4%	15,1%	**58,2%**	**9,1%**	4,0%	**13,1%**	-4,6%	**177,4%**	**17,9%**
2014	*9,8%*	*13,5%*	23,3%	15,5%	8,1%	**46,9%**	12,3%	4,9%	4,0%	21,8%	3,6%	**46,6%**	**-0,3%**	4,0%	**3,7%**	-4,1%	**179,7%**	**2,3%**
2015	*9,7%*	*13,9%*	23,6%	16,1%	8,6%	**48,3%**	12,3%	4,9%	4,7%	22,2%	6,5%	**50,6%**	**2,3%**	3,6%	**5,9%**	-10,5%	**177,4%**	**-2,3%**
2016	*10,3%*	*14,2%*	24,5%	17,1%	8,2%	**49,7%**	12,3%	4,7%	3,5%	22,3%	3,0%	**45,8%**	**-3,9%**	3,2%	**-0,7%**	2,6%	**179,0%**	**1,6%**

Appendix 2: Definitions on the formation of the net fiscal balances

REVENUES		**TR_CURR**	**Total general government current revenue**	=
		D2r	Taxes on production and imports, receivable	
	+	D39r	Other subsidies on production, receivable	
	+	D4r	Property income, receivable	
	+	D5r	Current taxes on income, wealth, etc., receivable	
	+	D61r	Net social contributions, receivable	
	+	D7r	Other current transfers, receivable	
	+	D91r	Capital taxes, receivable	
	+	P11_P12_P131	Market output, output for own final use and payments for non-market output	
PRIMARY EXPENDITURE		**TE_CURR**	**Total current expenditure**	=
		P2	Intermediate consumption	
	+	D1p	Compensation of employees, payable	
	+	D29p	Other taxes on production, payable	
	+	D31p	Subsidies on products, payable	
	+	D39p	Other subsidies on production, payable	
	+	D42_TO_D45p	Other property income, payable	
	+	D5p	Current taxes on income, wealth, etc., payable	
	+	D62p	Social benefits other than social transfers in kind, payable	
	+	D632p	Social transfers in kind purchased market production, payable	
	+	D62_D632p	Social benefits other than social transfers in kind, payable	
	+	D7p	Other current transfers, payable	
	+	D8	Adjustment for the change in pension entitlements	
		NTE_CAP	**Total net capital expenditure**	=
		D9p	Capital transfers, payable	
	+	P5	Gross capital formation	
	+	NP	Acquisitions less disposals of non-financial non-produced assets	
	-	D92_D99rec	Other capital transfers and investment grants, receivable	
FISCAL BALANCES		**B9_PRIM**	**Primary surplus (+) /primary deficit (-)**	=
		TR_CURR	Total general government revenue	
	-	TE_CURR	Total current expenditure	
	-	NTE_CAP	Total net capital expenditure	
		B9	**Net lending (+) /net borrowing (-)**	=
		B9_PRIM	Primary surplus (+) /primary deficit (-)	
	-	D41p	Interest, payable	

Appendix 3: Tax burden and implicit tax rates

Implicit tax rates (ITR) are customarily constructed to reflect the average tax burden on a specific tax base. These rates can be found in European Commission (2015a) and show that between 2009 and 2015 the rates increased significantly from 15% to 18.1% (+20.7%) for consumption and from 34.4% to 40.2% (+16.9%) for labour income. In an effort to have a more detailed depiction we proceeded to match the Commission's estimates by reconstructing the calculations as follows:

The implicit tax rate for consumption (ITR^C) was estimated on the basis of the undermentioned expression:

$$ITR^{C} = \frac{D211+D212+(D214-D214B-D214C-D214K)+D29D+D29F+D29G+D59B+D59C+D59D}{P31\_S14\_DC},$$

where

D211 : Value added type taxes
D212 : Taxes and duties on imports excluding VAT
D214 : Taxes on products except VAT and import duties
D214B : Stamp taxes
D214C : Taxes on financial and capital transactions
D214K : Export duties and monetary compensatory amounts on exports
D29D : Taxes on international transactions
D29F : Taxes on pollution
D29G : Under-compensation of VAT (flat rate system)
D59B : Poll taxes
D59C : Expenditure taxes
D59D : Payments by households for licenses
P31_S14_DC : Final consumption expenditure of households (Domestic concept)

The data and estimates are provided in Table A1[55].

As can be seen in Table A1, the ITR^{C} increased by 28.3% from 15.6% in 2009 to 20% in 2016. This development followed a long period of slow and not smooth de-escalation since 1995.

At this point we depart from the Commission's approach for implicit tax rates that focuses on the tax base and introduce the concept of the sectoral income tax rate (SITR) that shows the tax burden imposed by direct taxation on total incomes of the sector. The advantages of this approach lie in the fact that data are simpler, safer and more readily available[56] and estimates are easier to visualize since they are assigned to sectors rather than hazy tax bases. Also, ITRs being extremely useful in economic analysis, SITRs may complement them and add a social context. Herewith we provide estimates for the two most important sectors in this context, non-financial corporations (S11) and households (S14). They are based on the following formulae:

$$SITR^{S11} = \frac{D51+D59}{B4N} \text{ and } SITR^{S14} = \frac{D51+D59+D61+D91}{D11+D3+D41n+D42+D44+D45+D62+D63+D75+D92+D99+B3N},$$

where[57]

[55] Variables with zero values have been omitted.
[56] For example, separate data for the tax burden of household non-labour incomes such as social transfers and self-employment are not available.
[57] All variables are at the sectoral level.

D51 : Taxes on income
D59 : Other current taxes
B4N : Entrepreneurial income (net)
D61 : Net social contributions
D91 : Capital taxes
D11 : Wages and salaries
D3 : Subsidies
D41n : Interest received net of interest paid
D42 : Distributed income of corporations
D44 : Property income attributed to insurance policy holders
D45 : Rents
D62 : Social benefits other than social transfers in kind
D63 : Social transfers in kind
D75 : Miscellaneous current transfers
D92 : Investment grants
D99 : Other capital transfers
B3N : Mixed income (net)[58]

As can be seen in Table A2, the sectoral implicit tax rate for the non-financial corporate sector rose from 23.1% in 2008 to 28.3% in 2009 and 34.5% in 2016, up by 49.4% (relative to 2008) or 21.9% (relative to 2009).

Turning to the households sector, the data presented in Table A3 show that the SITR increased from 12.8% in 2009 to 16.9% in 2016, up by 31.9%. This followed a decrease of −13.9% between 2003 and 2009, which, in turn, had followed a rise of 37.1% between 1995 and 2003. These estimates show clearly that in periods of fiscal adjustment the tax rate for households rises significantly.

Taking this approach a little further, we can estimate "hybrid" SITRs, such as the SITRs for social contributions ($SITR^{D61\_S14}$) and income taxes[59]. The difference lies in that straightforward SITRs reflect the total (direct) tax burden on total incomes of the households, while the "hybrid" ones show the implicit tax rates relative to the tax bases they apply to. Thus we end up with Table A4 which shows that $SITR^{D61\_S14}$ has been on an upward trend since 1995 that became steeper after 2009. From 2009 to 2016 $SITR^{D61\_S14}$ grew by 37.8% from 11.8% to 16.3%. Also, $SITR^{D5\_S14}$ increased by 46.2%, from 12.3% to 18%.

[58] B3N for the household sector is not available. Therefore an estimate was used, where B3N=B3G·(B2A3N/B2A3G).
[59] D12: Employers' social contributions.

Appendix 4: Fiscal Adjustment and Public Sector Downsizing, 2010-2016

As can be seen in Table A5, employment in the public sector[60] was reduced by 262,591 persons (−27.1%) between 2009 and 2016. This was the net result of hiring, firing, decease and retirement during this period. Permanent staff numbers were decreased by 20.7%, while non-permanent by 47%[61]; the reduction was much higher (66.9%) for "normal" non-permanent staff, while "self-financed" personnel more than doubled. The reduction of permanent staff was accomplished mainly through restraining new hires, albeit not always at the pace agreed with the lenders. However, the effort to downsize the public sector coincided with changes in pension entitlements which, combined with arrangements that encouraged retirement, led many public sector employees to early retirement.

The considerable reduction of non-permanent staff obviously contributed significantly to budget savings. For permanent staff, however, the case is not as simple. Permanent staff replaced (part of) their salaries with pensions and, therefore, budget savings are not what they seem. In the same vein, the net burden of the budget should take into account those parts of salaries that return to the public coffer in the form of income tax and social contributions.

In Table A6 we present estimates of the net burden of the wage bill (D1 net), derived on the basis of the National Accounts wage bill (D1), excluding the estimated payroll of the self-financed employees. The adjusted D1 (D1 adj.) is then netted out of the respective social security contributions (D61r) and income tax payments (D5r).

[60] Public sector employment is defined as the number of persons employed by General Government agencies irrespective of the mode of financing their remuneration, since the General Government wage bill (D1) supposedly includes all such payments. Our figures include all relevant information provided in the Public Sector Human Resources Registry at Υπουργείο Διοικητικής Ανασυγκρότησης (2017). As a result the number of employees appears higher than the one that is usually used (e.g. see the differences with European Commission et al. (2013), p.38). Figures in Appendix 4: Fiscal Adjustment and Public Sector Downsizing, 2010-2016

are year-end.

[61] While permanent staff has been contracting steadily, non-permanent staff has reversed the trend after 2014.

We notice that the initial burden relief from downsizing between 2009 and 2016 has been revised upwards from €9.4 bn. (for D1) to €9.6 bn. (for D1adj.) and subsequently downwards to €8.5 bn. (for D1net) This figure should be further adjusted by taking into account the effect of net pensions of retired employees.

As shown in Table A7, the final burden of the wage bill amounted to €15 bn. (2016) compared to €21.6 bn. of the gross amount appearing in the National Accounts. Hence, we may deduce that the final budget relief from the wage bill was €9.6 bn. gross (a reduction of the gross wage bill by 31%), or €8.5 bn. net (a reduction of net wages by 41%), with the final outcome being €5.9 bn. that corresponds to a reduction of the amount having finally affected the deficit by 28.1%[62]. These figures are more or less in accord with Ministry of Public Administration (2016). The reduction of the net wage bill by 41% has been the combined effect of the reduction in employment by 30.5% and the average annual net salary by 15.1%. This may be compared to the decrease of the private sector net wage bill by 31.4%, which was the result of employment falling by 13.2% and the average net salary by 20.9%, as we show next. That is, in the public sector costs were checked by reducing employment more than earnings (with almost ⅓ of these gains, however, being neutralized by pensions), while in the private sector average earnings suffered more than employment.

In Figure A1 we have excluded employment of the "self-financed" personnel from our data and adjusted employment figures to refer to annual averages instead of year-end (so that they are more compatible with the national accounts wage bill). As we can see, employment in the public sector declined steadily since 2009 and seemed to stabilize in 2016. In fact, employment in both sectors was falling at the same pace (about −25%) until 2013. However, private sector employment started to recover after 2013, so that by 2016 the respective rates stood at −13.2% and −30.5%. Therefore, we may conclude that employment was equally reduced in proportion in both sectors until 2013; after that point it picked up in the private but not in the public sector, apparently for reasons of fiscal consolidation. What seems likely to

[62] This figure remains practically the same if we assume that given a "natural" rate of attrition of 1.2% of permanent

have happened is that while permanent public sector personnel did not seek to return to employment since they had retired, non-permanent staff (which was greatly reduced) was absorbed to some extent in the private sector.

As we showed earlier, the average salary was reduced more in the private than in the public sector. Indeed it seems that on average what happened was that the unit labour cost (ULC) was significantly reduced (-20.5%) in the private but not in the public sector (-0.8). As a result, the average ULC and take-home earnings were affected differently in the two sectors. If we standardize salaries with the 2009 (gross) compensation per employee of the public sector, then the respective indices that appear in Figure A2 show that the ULC of the private sector not only is it lower but has been reduced significantly relative to that of the public sector, which practically remained unchanged. Similarly, net earnings were reduced more in the private sector and the gap between the two sectors widened, a clear indication that during the crisis the private sector suffered higher losses of income[63].

We should take note, however, of the increase of the tax wedge[64] in the public sector which did not occur in the private sector, as shown in Table A8. There we notice that the tax wedge of 35% for the private sector in 2009 presented a temporary increase and then returned to that level in 2016, while in the public sector it remained on an upward trend, probably as the result of the relatively higher average remuneration in the public sector that leads to higher marginal tax rates.

[63] This is the situation for salaried employees. If we include the self-employed in the private sector the picture is much worse for the private sector, not only in terms of incomes but in terms of employment, as well.

[64] The tax wage is the sum of social security contributions and income tax corresponding to the salary as a ratio of the average compensation per employee. Social security contributions were computed on a per employee basis by combining information on representative rates for each year and national accounts data on imputed contributions for the public sector. These were subtracted from the gross earnings (D1) in order to apply the income tax scale in effect each year to the remaining income (including the solidarity surcharge).

Appendix 5: The Gross Financing Needs of "Old" Debt

	ECB-IMF-EIB-Private			EFSF-ESM-Bilateral			Total		
	Capital	Interest	Total	Capital	Interest	Total	Capital	Interest	Total
2017	8.106	1.861	**9.966**		3.481	**3.481**	8.106	5.342	**13.447**
2018	3.679	1.765	**5.444**		3.481	**3.481**	3.679	5.246	**8.925**
2019	11.939	1.465	**13.404**		3.481	**3.481**	11.939	4.946	**16.885**
2020	3.487	1.077	**4.565**	706	3.488	**4.195**	4.194	4.566	**8.759**
2021	2.121	958	**3.079**	2.074	3.489	**5.562**	4.195	4.447	**8.642**
2022	3.283	870	**4.153**	2.645	3.460	**6.105**	5.928	4.329	**10.258**
2023	3.177	715	**3.891**	6.670	3.452	**10.122**	9.847	4.167	**14.013**
2024	3.390	605	**3.995**	4.940	3.346	**8.286**	8.330	3.951	**12.281**
2025	1.792	549	**2.342**	4.940	3.271	**8.211**	6.732	3.820	**10.553**
2026	2.435	481	**2.916**	4.940	3.196	**8.136**	7.375	3.676	**11.052**
2027	1.470	439	**1.909**	4.940	3.121	**8.061**	6.410	3.560	**9.970**
2028	1.525	408	**1.934**	4.940	3.047	**7.987**	6.465	3.456	**9.921**
2029	1.504	378	**1.882**	4.940	2.973	**7.913**	6.444	3.351	**9.795**
2030	1.520	359	**1.879**	4.940	2.900	**7.840**	6.460	3.259	**9.719**
2031	1.368	320	**1.688**	4.940	2.825	**7.765**	6.308	3.145	**9.453**
2032	1.374	292	**1.666**	4.940	2.751	**7.691**	6.314	3.043	**9.357**
2033	1.453	264	**1.716**	4.279	2.675	**6.954**	5.731	2.939	**8.670**
2034	1.410	235	**1.646**	5.343	2.622	**7.965**	6.753	2.857	**9.611**
2035	1.444	207	**1.651**	5.456	2.540	**7.996**	6.900	2.747	**9.647**
2036	1.505	177	**1.682**	5.796	2.461	**8.257**	7.301	2.637	**9.938**
2037	1.529	147	**1.676**	6.055	2.375	**8.431**	7.584	2.522	**10.107**
2038	1.382	115	**1.497**	6.076	2.285	**8.360**	7.458	2.400	**9.857**
2039	1.337	88	**1.425**	6.093	2.194	**8.286**	7.430	2.282	**9.712**
2040	1.372	60	**1.432**	5.403	2.096	**7.500**	6.775	2.157	**8.932**
2041	1.363	33	**1.396**	4.056	2.002	**6.058**	5.419	2.035	**7.454**
2042	1.433	5	**1.438**	3.875	1.941	**5.817**	5.308	1.946	**7.254**
2043				4.727	1.888	**6.616**	4.727	1.888	**6.616**
2044				3.631	1.804	**5.435**	3.631	1.804	**5.435**
2045				5.352	1.756	**7.108**	5.352	1.756	**7.108**
2046				5.772	1.707	**7.479**	5.772	1.707	**7.479**
2047				7.042	1.631	**8.673**	7.042	1.631	**8.673**
2048				9.438	1.506	**10.944**	9.438	1.506	**10.944**
2049				7.933	1.350	**9.283**	7.933	1.350	**9.283**
2050				7.724	1.229	**8.953**	7.724	1.229	**8.953**
2051				5.761	1.128	**6.889**	5.761	1.128	**6.889**
2052				14.484	1.098	**15.582**	14.484	1.098	**15.582**
2053				20.688	975	**21.663**	20.688	975	**21.663**
2054				9.512	573	**10.085**	9.512	573	**10.085**
2055				9.464	432	**9.896**	9.464	432	**9.896**
2056				4.815	224	**5.039**	4.815	224	**5.039**
2057				1.879	118	**1.998**	1.879	118	**1.998**
2058				2.505	96	**2.601**	2.505	96	**2.601**
2059				2.358	56	**2.414**	2.358	56	**2.414**
Total	**66.399**	**13.872**	**80.270**	**232.073**	**92.527**	**324.599**	**298.471**	**106.398**	**404.870**

Source: Forelle et al. (2015)

Appendix 6: Model Estimates and Data

Estimates derived with the use of TSP5.0.

THREE STAGE LEAST SQUARES

EQUATIONS: EQCP, EQIP, EQWP, EQNPR, EQM, EQTDIR, EQTSSC, EQTIND, EQGDP
INSTRUMENTS: WG, CG, IG, X, DCRC, DCRB, DCRH, PENS, P51CP, DUM
MAXIMUM NUMBER OF ITERATIONS
ON V-COV MATRIX OF RESIDUALS= 0
MATRIX NAME: OWN
Number of observations = 22
E'PZ*E = 129.782
Standard Errors computed from quadratic form of analytic first derivatives (Gauss)
CONVERGENCE ACHIEVED AFTER 3 ITERATIONS

	Means of depedent variables	S. E. of Equations
EQCP	119.915,7	3.635,9
EQIP	27.688,2	3.961,4
EQWP	38.452,4	1.410,4
EQNPR	71.046,3	5.211,2
EQM	54.929,8	4.708,2
EQTDIR	15.599,3	1.517,2
EQTSSC	22.130,4	1.278,1
EQTIND	23.277,5	2.384,2
EQGDP	177.708,5	16.293,7

Para-meter	Estimate	S.E.	t-stat	P-value
CP0	8.843,9	2.137,9	4,137	[,000]
CP1	0,851	0,018	48,583	[,000]
CP01	0,115	0,013	8,829	[,000]
IP1	0,380	0,020	19,059	[,000]
IP01	-0,164	0,085	-1,918	[,055]
IP2	0,370	0,082	4,526	[,000]
WP0	-15.170,5	1.531,9	-9,903	[,000]
WP1	0,475	0,013	35,761	[,000]
NPR0	12.596,4	4.917,0	2,562	[,010]
NPR1	0,522	0,043	12,144	[,000]
M0	-15.819,3	4.146,7	-3,815	[,000]
M1	0,394	0,023	17,242	[,000]
TDIR1	0,107	0,003	41,289	[,000]
TDIR01	0,116	0,039	3,006	[,003]
TSSC0	-5.041,9	581,5	-8,670	[,000]
TSSC1	0,200	0,005	42,030	[,000]
TSSC01	0,124	0,017	7,511	[,000]
TIND1	0,149	0,004	41,362	[,000]
TIND01	0,142	0,038	3,773	[,000]

Gradient of objective function at the convergence	
CP0	4.60323D-17
CP1	4.36002D-12
CP01	-2.45632D-12
IP1	2.10861D-12
IP01	-1.95769D-13
IP2	5.46047D-13
WP0	-6.90656D-17
WP1	-6.76214D-12
NPR0	1.47452D-17
NPR1	1.80072D-12
M0	-2.18192D-17
M1	-3.56195D-12
TDIR1	-1.08751D-11
TDIR01	-2.12710D-13
TSSC0	8.66356D-17
TSSC1	1.38995D-11
TSSC01	3.03011D-12
TIND1	7.45673D-13
TIND01	-5.41490D-13

Corellation Matrix of the Residuals

	EQCP	EQIP	EQWP	EQNPR	EQM	EQTDIR	EQTSSC	EQTIND	EQGDP
EQCP	1,000								
EQIP	-0,562	1,000							
EQWP	0,044	0,143	1,000						
EQNPR	-0,485	0,155	0,016	1,000					
EQM	0,392	-0,011	-0,545	-0,318	1,000				
EQTDIR	0,742	-0,317	-0,274	-0,418	0,506	1,000			
EQTSSC	0,746	-0,478	-0,158	-0,675	0,462	0,728	1,000		
EQTIND	0,591	-0,666	-0,330	-0,608	0,340	0,546	0,840	1,000	
EQGDP	-0,025	-0,065	0,084	0,001	-0,157	-0,049	0,048	0,077	1,000

Covariance Matrix of Transformed (Weighted) Residuals

	EQCP	EQIP	EQWP	EQNPR	EQM	EQTDIR	EQTSSC	EQTIND	EQGDP
EQCP	2,347E+01								
EQIP	-7,113E-01	2,131E+01							
EQWP	2,403E-01	-1,713E+00	2,311E+01						
EQNPR	-1,994E+00	3,671E-01	-3,422E-01	2,025E+01					
EQM	1,222E-01	1,764E+00	3,465E-01	1,242E+00	2,056E+01				
EQTDIR	7,546E-01	3,096E-01	6,852E-01	-1,351E+00	-6,560E-01	2,189E+01			
EQTSSC	4,945E-01	2,740E-01	-6,634E-01	-3,181E+00	6,580E-01	-3,444E-01	2,114E+01		
EQTIND	-5,004E-01	-1,394E-01	-1,267E+00	-9,029E-01	1,229E+00	-1,696E-01	-3,980E-01	2,170E+01	
EQGDP	-1,769E-01	-5,972E-01	5,813E-01	4,916E-01	-6,697E-01	-4,642E-02	2,224E-01	4,595E-02	2,171E+01

Estimated Variance-Covariance of Estimated Parameters

Para-	CP0	CP1	CP01	IP1	IP01	IP2	WP0	WP1	NPR0	NPR1	M0	M1	TDIR1	TDIR01	TSSC0	TSSC1	TSSC01	TIND1	TIND01
CP0	4,570E+06																		
CP1	-3,448E+01	3,068E-04																	
CP01	4,298E+00	-8,198E-05	1,684E-04																
IP1	-4,674E+00	-1,484E-05	5,962E-05	3,971E-04															
IP01	1,514E+01	-3,954E-06	-4,863E-04	-1,226E-03	7,288E-03														
IP2	2,128E+01	-1,703E-04	4,641E-05	-1,199E-03	4,719E-03	6,665E-03													
WP0	1,647E+06	-1,254E+01	1,640E+00	8,809E-01	-4,843E+00	-4,865E+00	2,347E+06												
WP1	-1,393E+01	1,067E-04	-1,397E-05	-1,665E-06	4,858E-05	4,406E-05	-1,996E+01	1,766E-04											
NPR0	-3,175E+06	2,456E+01	-2,162E+00	-1,916E+01	7,065E+01	9,604E+01	-1,883E+06	1,590E+01	2,418E+07										
NPR1	2,669E+01	-2,286E-04	2,036E-05	1,715E-04	-5,928E-04	-8,164E-04	1,591E+01	-1,340E-04	-2,061E+02	1,850E-03									
M0	7,520E+05	-5,603E+00	-5,918E-01	6,299E+00	-2,270E+01	-2,998E+01	-3,022E+06	2,561E+01	-2,050E+06	1,746E+01	1,720E+07								
M1	-3,983E+00	4,162E-05	2,074E-06	-3,779E-05	1,169E-04	1,592E-04	1,629E+01	-1,458E-04	1,123E+01	-1,121E-04	-9,211E+01	5,228E-04							
TDIR1	7,273E-02	1,211E-05	-1,314E-05	-1,006E-05	1,718E-05	-2,393E-06	-6,982E-03	-1,569E-06	6,134E-02	-7,137E-06	1,446E-01	5,061E-06	6,685E-06						
TDIR01	-5,011E-01	-1,023E-04	3,441E-04	8,847E-05	-6,717E-04	4,286E-05	1,076E+00	-7,492E-06	2,442E+00	-1,395E-05	-5,869E+00	2,561E-05	-5,775E-05	1,482E-03					
TSSC0	4,909E+05	-3,786E+00	4,622E-01	1,162E+00	-4,373E+00	-5,535E+00	3,289E+05	-2,776E+00	-7,926E+05	6,745E+00	3,001E+05	-1,630E+00	-1,945E-02	3,649E-02	3,382E+05				
TSSC1	-3,442E+00	3,685E-05	-1,273E-05	-2,200E-05	5,684E-05	3,696E-05	-2,373E+00	1,915E-05	5,781E+00	-5,945E-05	-2,104E+00	1,614E-05	3,959E-06	-2,856E-05	-2,468E+00	2,264E-05			
TSSC01	1,002E+00	-4,804E-05	1,364E-04	7,039E-05	-5,461E-04	1,587E-05	1,260E+00	-1,041E-05	2,493E-01	9,864E-07	-1,134E+00	4,699E-06	-1,496E-05	3,944E-04	1,112E+00	-2,644E-05	2,730E-04		
TIND1	1,572E-01	1,253E-05	-1,384E-05	-3,200E-05	5,572E-05	-7,287E-06	2,702E-03	-2,954E-06	1,552E-01	-1,686E-05	-2,363E-02	5,914E-06	4,489E-06	-3,045E-05	-3,112E-02	6,551E-06	-2,480E-05	1,304E-05	
TIND01	-3,713E-01	-7,874E-05	2,721E-04	2,100E-04	-1,631E-03	8,479E-05	1,140E+00	-8,096E-06	5,040E+00	-3,456E-05	-1,977E+00	7,525E-06	-2,192E-05	5,640E-04	1,326E-01	-3,482E-05	4,886E-04	-7,268E-05	1,417E-03

Data for variables

Year	GDP	CP	CG	IP	IG	X	M	WP	WG	NPR	P51CP	P51CG	TIS	ST	TDIR	TSSC	TIND	DCRB	DCRH	DCRC	DUM
1995	104.662,0	71.162,4	18.622,7	19.083,7	4.435,5	15.097,8	23.740,1	19.934,0	10.660,4	49.685,5	11.428,5	2.919,5	10.034,1	13.590,0	6.870,4	10.835,8	12.850,0	3.404,3	601,7	583,5	0
1996	114.908,1	78.092,8	20.232,3	21.847,1	4.988,4	16.416,9	26.669,4	21.984,3	11.064,1	54.524,4	12.527,1	3.173,9	11.634,3	14.980,7	7.357,1	11.937,3	14.439,8	2.686,8	1.017,3	459,1	0
1997	126.353,9	84.284,9	22.343,6	22.636,0	5.718,9	20.497,5	29.127,0	24.116,7	13.071,3	59.170,2	13.602,6	3.401,4	12.991,7	16.404,4	9.023,4	13.353,3	16.057,5	2.867,0	1.122,3	476,5	0
1998	129.057,2	86.470,9	22.582,0	25.184,0	7.306,8	21.031,9	33.518,4	25.411,9	13.181,6	59.919,8	14.131,9	3.507,1	12.904,9	17.225,5	10.987,1	13.982,1	15.938,7	4.841,9	1.237,2	837,2	0
1999	139.945,0	93.393,6	25.161,9	24.639,5	9.156,8	26.947,9	39.354,7	28.232,6	14.383,8	62.462,1	15.677,6	3.873,4	15.315,5	19.352,3	12.417,2	15.457,0	18.132,7	2.951,2	1.790,1	950,8	0
2000	142.976,0	95.642,0	26.106,7	28.503,7	8.420,8	33.911,6	49.608,8	28.936,5	15.077,3	62.229,7	16.582,4	4.104,6	16.045,5	20.769,1	13.985,1	16.539,0	18.680,9	6.986,2	2.407,5	1.527,6	0
2001	152.193,9	100.685,7	28.483,0	30.184,6	8.916,0	34.683,1	50.758,5	31.004,2	15.902,0	65.660,3	17.898,0	4.413,0	17.316,4	22.623,0	13.079,0	17.732,0	19.383,0	6.985,7	4.380,3	2.341,5	0
2002	163.460,8	108.122,3	31.430,0	30.670,1	9.786,0	32.876,6	49.424,2	36.275,1	17.773,0	67.061,0	19.394,0	4.777,0	18.180,7	24.403,0	14.481,0	20.520,0	21.001,0	3.767,8	5.572,5	1.903,4	0
2003	178.904,8	115.871,8	33.918,0	37.076,0	11.899,0	33.177,2	53.037,2	40.472,5	18.989,0	74.844,3	20.728,0	5.152,0	18.719,0	27.662,0	14.476,0	22.301,0	21.680,0	6.363,3	5.553,4	2.630,2	0
2004	193.715,8	124.015,2	37.108,0	37.086,0	11.938,0	40.114,9	56.546,3	42.247,9	21.890,0	82.628,8	21.852,0	5.615,0	19.482,1	29.257,0	15.618,0	23.440,0	22.444,0	6.945,0	7.274,1	4.644,2	0
2005	199.242,3	131.812,3	39.889,0	34.675,1	9.356,0	42.463,0	58.953,1	45.570,7	22.700,0	81.885,0	22.672,0	5.892,0	20.522,6	31.968,0	17.878,0	24.537,0	23.632,0	8.582,7	11.367,6	4.771,3	0
2006	217.861,5	139.855,9	43.911,0	46.425,9	10.549,0	46.130,0	69.010,3	49.078,1	23.988,0	89.725,2	24.760,0	6.399,0	23.911,2	35.966,0	18.009,0	25.891,0	26.688,0	10.767,0	11.725,2	4.771,5	0
2007	232.694,6	150.861,2	47.750,0	51.299,6	11.833,0	52.403,5	81.452,7	52.663,9	25.777,0	94.751,8	26.741,0	6.820,0	25.940,9	39.996,0	19.199,0	28.892,0	29.241,0	16.580,7	12.218,3	5.345,8	0
2008	241.990,4	163.005,1	50.177,0	45.427,0	13.888,0	56.532,8	87.039,5	54.901,4	28.046,0	95.457,9	29.020,0	7.344,0	27.221,1	45.718,0	19.640,0	30.641,0	30.413,0	21.971,2	8.336,6	4.492,6	0
2009	237.534,2	161.805,0	55.400,0	31.021,8	12.537,0	45.089,2	68.318,8	53.814,5	31.060,0	90.683,0	29.860,0	7.822,0	24.294,7	48.928,0	20.292,0	29.344,0	27.826,0	784,3	2.858,7	-390,7	0
2010	226.031,5	156.716,6	50.275,0	30.081,4	8.453,0	49.957,9	69.452,4	54.064,4	28.066,0	80.616,5	29.935,0	7.978,0	25.371,6	47.328,0	18.682,0	29.700,0	28.454,0	-8.402,2	-52,0	-963,4	1
2011	207.028,9	144.819,6	44.962,0	26.082,0	5.189,0	52.865,7	66.889,4	47.157,4	26.102,0	73.180,4	29.481,0	7.456,0	23.652,1	47.489,0	19.102,0	27.272,0	27.971,0	-3.469,5	-2.113,4	-2.095,9	1
2012	191.203,8	133.606,9	41.625,0	19.561,1	4.919,0	54.844,9	63.353,1	41.582,1	24.498,0	66.511,9	29.913,0	7.114,0	21.584,8	44.347,0	20.680,0	26.621,0	25.944,0	-12.286,8	-3.759,1	-2.748,5	1
2013	180.654,3	127.804,0	36.973,0	12.330,8	8.627,0	54.834,8	59.915,3	37.659,4	22.056,0	65.108,2	28.006,0	6.967,0	20.857,7	38.660,0	18.934,0	24.455,0	25.453,0	-4.147,9	-3.579,6	-1.854,0	1
2014	178.656,5	125.457,5	36.213,0	14.155,8	7.124,0	57.836,5	62.130,3	37.290,5	21.906,0	64.015,4	25.234,0	6.795,0	23.415,6	38.876,0	17.361,0	24.088,0	27.624,0	-1.412,2	-1.646,1	-2.150,1	1
2015	176.312,0	122.978,0	35.931,0	9.026,9	8.285,0	55.930,8	55.839,7	36.790,5	21.600,0	62.942,6	24.079,0	6.770,0	24.129,9	39.020,0	17.095,0	24.422,0	28.253,0	-6.056,7	-1.815,0	-723,3	1
2016	174.199,3	121.681,4	35.294,0	12.141,3	6.341,0	53.058,9	54.317,3	36.764,0	21.620,0	59.953,8	23.334,0	6.749,0	25.778,5	39.394,0	18.018,0	24.908,0	29.999,0	-1.639,6	-6.195,9	-858,4	1

Appendix 7: The Impact of the Multipliers and Their Significance

In this section we present data and estimates that attempt to answer three basic "what if" questions in the light of the estimated multipliers. In particular, it is interesting to know whether (a) the fiscal intensity of the programmes was at the "right" level, (b) the fiscal policy mix should have been different and (c) the time distribution of the fiscal effort was proper. Before we address these questions, let us see in some detail the effect of the fiscal multipliers for the 2010-2016 period.

With the use of the π-multipliers presented earlier in Table 9 we proceeded to the estimation of the impact of the 2010-2016 fiscal adjustment on the GDP, excluding non-tax revenues and "other" expenditure (which includes crisis related transactions, among other things). As can be seen in Table A9, an overall adjustment of €28.7 bn. brought about on impact a €24 bn. reduction of GDP. This is 39% of the overall nominal GDP losses of €61.6 bn. during the period (implying an overall fiscal multiplier of -0.84) and shows that fiscal developments may have been a major factor but certainly they cannot explain but a fraction of the GDP decrease; loss of private incomes, structural inefficiencies, liquidity constraints, private savings and bank deposits diminution, investment cancellation are but a few factors that may readily come to mind. This reduction of GDP is equivalent to 10.1% of the overall 26% losses since 2009.

What is awkward with these figures is that they show that taxation actually contributed to increasing the GDP. This, of course, is the outcome of the induced decrease due the shrinking of the tax base and does not reflect the effect of the increase of the relative tax burden. To take account of this we employ the information given in Table A9 to estimate the m-multipliers, $m=\left(1-\frac{\Delta Y}{Y}\right)\cdot\left(\frac{1}{\frac{1}{\pi}+\frac{X}{Y}}\right)$, and extract the results shown in Table A10.

The impact of the 11.8% of GDP fiscal adjustment on the GDP growth rate stands at-10.3%, i.e. 39.6% of the overall GDP decrease rate, implying an overall fiscal multiplier of -0.87 (corresponding to €24.4 bn.), very close to our previous estimates. However, in terms of GDP growth rate, we now see that taxation is the sole

responsible factor, since the downward pressure from wages (-1.3%) and consumption and investment (-1.2%) is balanced out by the increased share of social transfers. Last, we must take note of the fact that while the average (weighted) π-multiplier for taxation is higher than the spending multiplier, the respective aggregate m-multipliers are much closer and stand at 1.29 and -1.23. Therefore, since the two multipliers are practically the same, we gather that changes in the tax ratios affect the GDP growth rate pretty much the same as expenditure ratios.

Having examined the impact of fiscal adjustment, we now turn to our questions which we attempt to address and give straightforward answers. To this end we need to work on a *ceteris paribus* base[65] and the results are shown in Figure A3. First, we notice that the first scenario, which assumes half the fiscal adjustment (5.9% of GDP instead of 11.8%, distributed in time and between revenues and expenditure in direct proportion to the actual figures), records a lesser decrease in GDP. More specifically, the GDP ends up at €196 bn. instead of €176 bn., registering a growth rate of -17.4% instead -26% (i.e. about ⅓ better off). Revenues remain practically unchanged in absolute terms (about 5% of GDP lower in relative terms), while public spending is about €12 bn. higher (or 1.6% of GDP). However, this degree of adjustment is not adequate since public debt (GGD) remains on a steeper upward trend, reaching 192% by 2016.

In the second scenario all fiscal adjustment is assumed to take place within the first three years (2010-2012, distributed 40/40/20). The actual adjustment took place in a stop-and-go fashion, with 35% of it coming during 2013-2016. In this case, while GDP losses are more or less the same (-26.8% compared to 26%, or -€2.1 bn. more) by 2016, the debt ratio is reduced almost spectacularly by almost 19% of GDP to 160.2%, despite the fact that initially there is a short-term boost to 188% in 2011[66]. This points to the fact that while in the short run such a policy costs more both in terms of GDP and debt ratio, recovery is faster and the debt ratio can be substantially reduced even without taking into account further benefits arising from the

[65] This has to do mainly with the other factors that affect GDP, which are assumed to remain proportionally the same and other revenues and expenditures that are assumed to maintain their actual absolute values. It should be noted that in **Figure A** the fiscal aggregates are all-inclusive for better comparability.

[66] Revenue and expenditure (absolute values and GDP ratios) do not change significantly, although the time pattern of the GDP ratio of tax revenues is different; first, it goes up and then it de-escalates.

improvement of the fiscal position of the country. This scenario seems to confirm what is more or less widely held about consolidation during recessions[67], its adverse effects in the short-run and the rewards that follow in time.

The third scenario assumes that instead of an unbalanced adjustment coming 76% from revenues, a balanced path of 50/50 between taxation and spending had been followed. This would have required a further decrease of a) the gross wage bill by 0.9% of GDP (or €1.6 bn., or about 17.5% more cuts in employment and/or gross salaries), b) other government final consumption by 1.3% of GDP (or €2.2 bn., or 40% extra effort) and c) social transfers by 0.9% (or €1.3 bn., or 17% extra effort). On the other hand, direct taxes (income taxes and social contributions) would have increased **less** by 1.2% of GDP (€2 bn.), while indirect taxes would have been lower than what actually happened by 1.8% of GDP (€3.1 bn.). In other words, €5.1 bn. of more expenditure cuts would have lowered the tax burden equivalently. The end result would have been a slightly higher GDP, but more importantly a decrease of the debt ratio by 7.2%, down to 171.8% of GDP.

The above scenarios provide the following useful insight: Fiscal adjustment in Greece could have been both milder and more effective, if a front-loaded programme with a different policy mix had been implemented. Therefore, as shown in Figure A4 (legend as in Figure A3), we could have a shorter programme ending up at a marginally lower debt ratio (175.1% or −4% of GDP), but more importantly with significantly lower GDP losses (−17.7% instead of −26%, or €19.6 bn. higher GDP) and a smaller claim of the public sector on the resources of the economy, especially through taxes, all the above combined to contribute to a faster restoration of market confidence.

More specifically, in this alternative scenario fiscal adjustment is limited to 7% instead of 11.8% (40% less fiscal effort). It takes place in the first three years (split equally) with 60% of it coming from the expenditure side. However, not all individual items participate equally. As shown in Table A11, the overall adjustment from revenues amounts to 2.8% of GDP instead of 7% that actually took place. Taking into account the denominator effect, this sums up to €3.9 bn. less tax revenues split be-

[67] See, among others, European Commission (2012), *p.23,* IMF (2012)*, p.15* and Eyraud et al. (2013).

tween income taxes (€-0.9 bn.), social contributions (€-0.8 bn.) and indirect taxes (€-2.2 bn.). On the other hand, while expenditure is reduced a further 1.4% of GDP (mainly from social transfers), the denominator effect comes into play and the result is that we have €5.7 bn. less than the actual cuts. As can be seen in the upper part of Table A11, total expenditure is reduced by €27.4 bn. instead of €33.1 bn., whereas the wage bill is decreased by €1.9 bn. less, social transfer by €2.7 bn. less and other final consumption and public investment by €0.7 and €0.5 less.

In conclusion, this alternative scenario that has been drafted purely for demonstration purposes shows that a different policy mix implemented at a faster pace could have led to a milder fiscal adjustment with less income losses and a marginally better public debt ratio.

Tables and figures

Figure 1: The General Government Debt

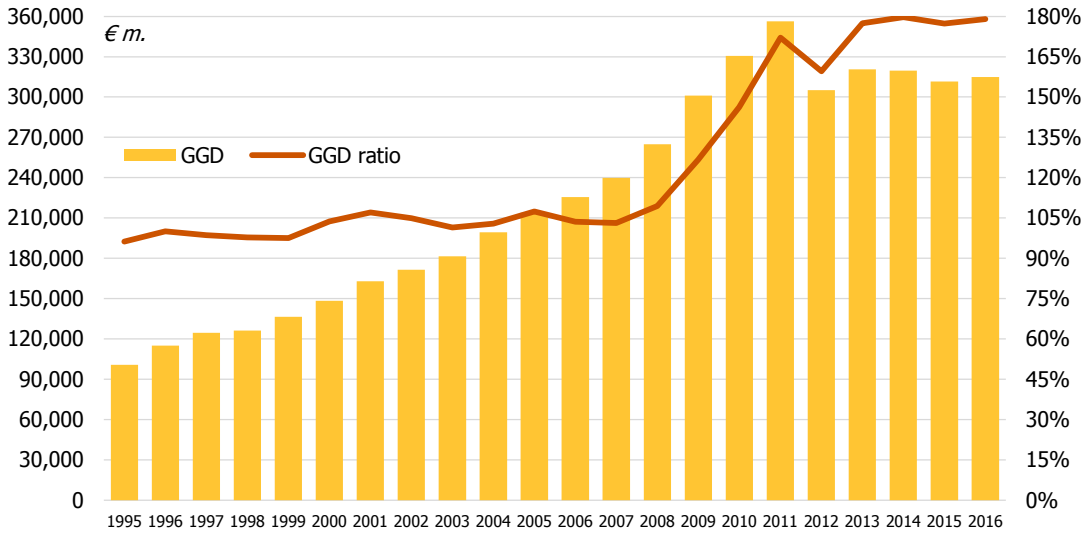

Figure 2: Change of the General Government Debt

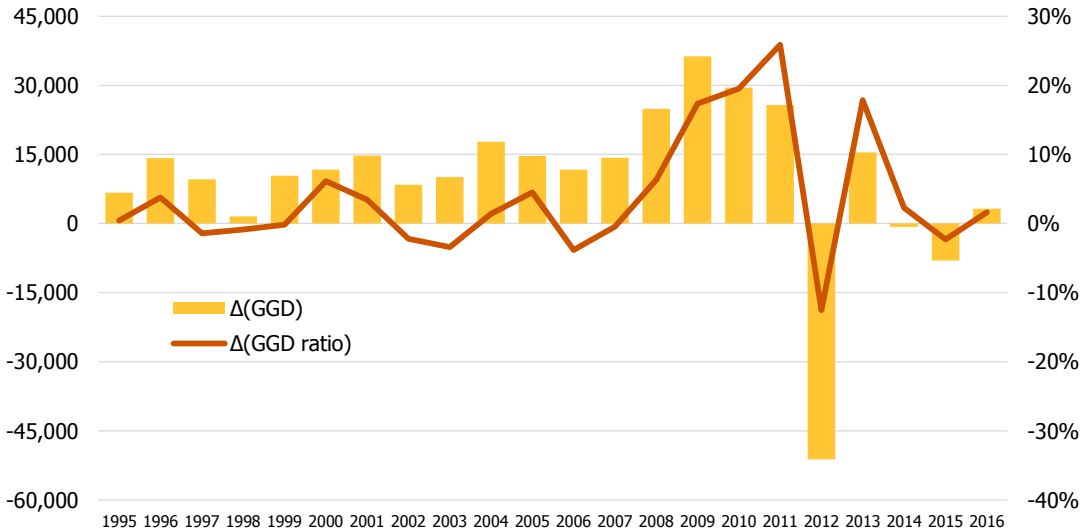

Figure 3: The Net Deficit

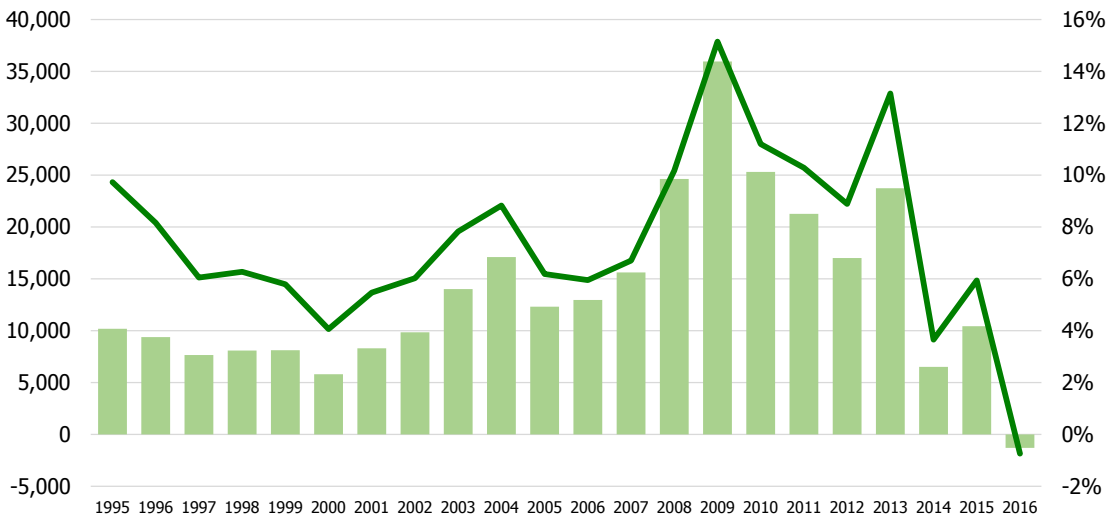

Figure 4: Interest Payments (D41)

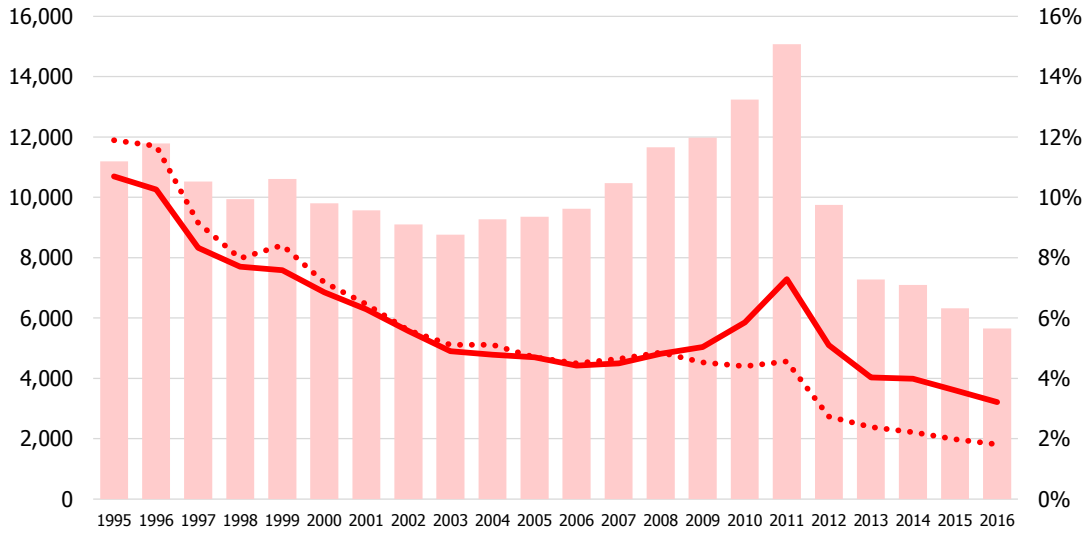

Figure 5: The Primary Deficit

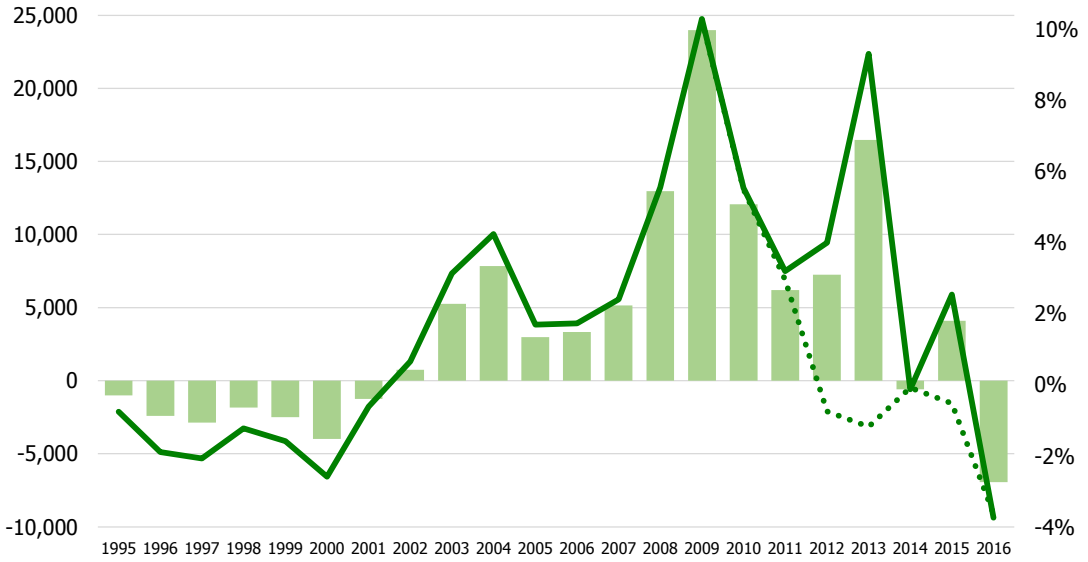

Figure 6: Primary Expenditure

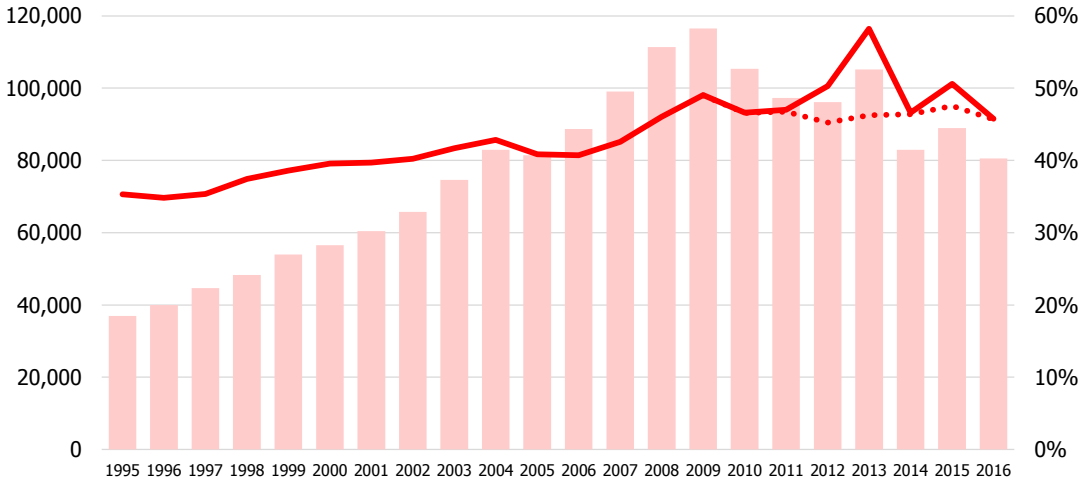

Figure 7: Total Revenues (TR)

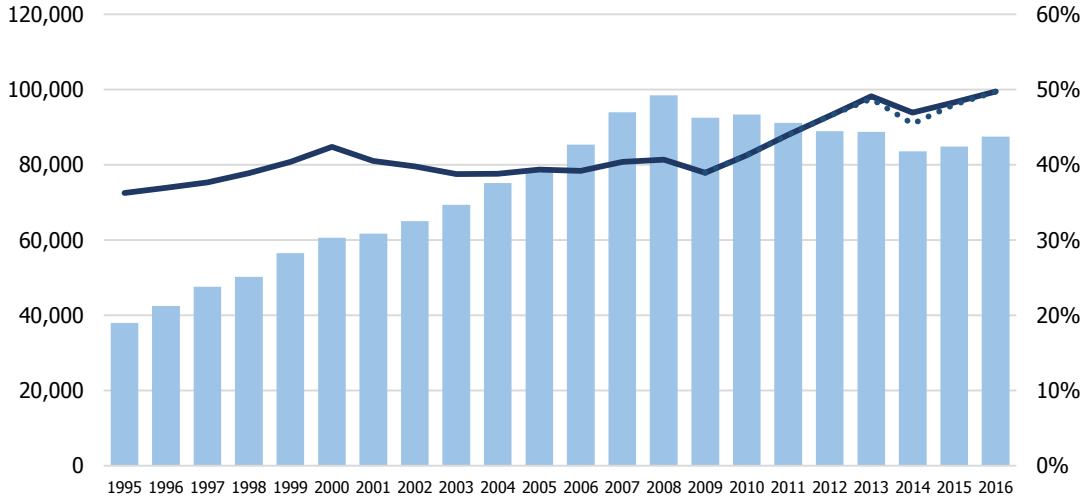

Figure 8: Direct Taxes

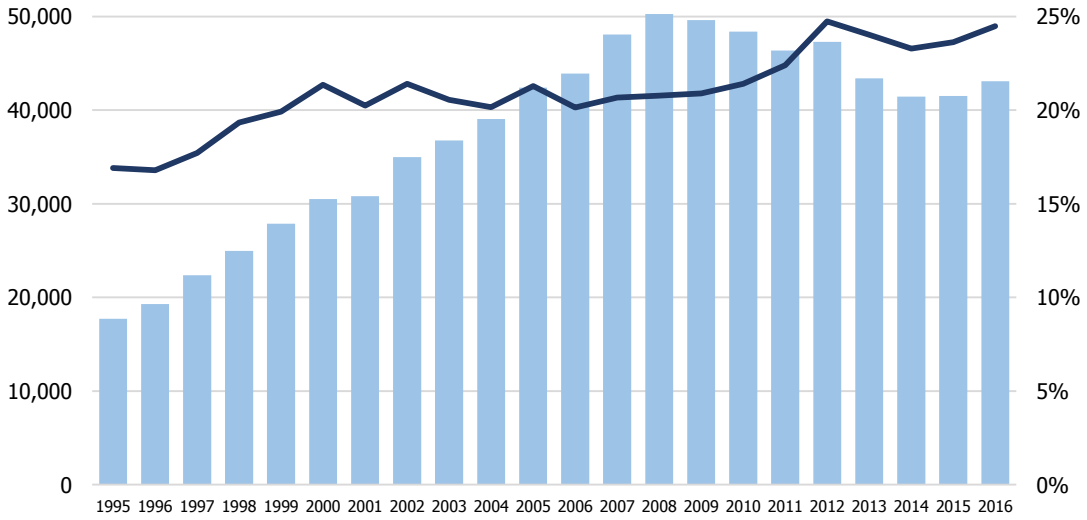

Figure 9: Income and wealth taxes (D5)

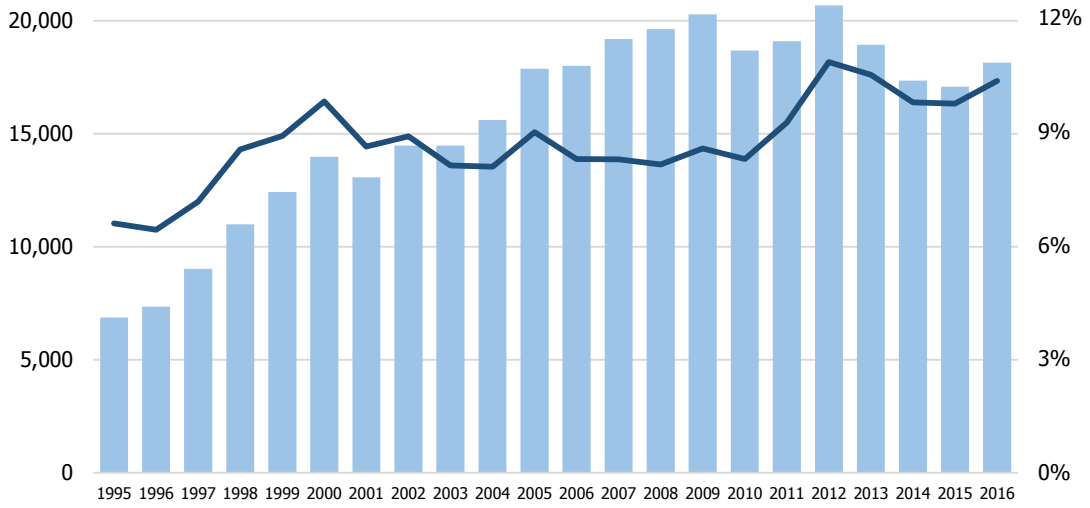

Figure 10: Personal income tax (D51A)

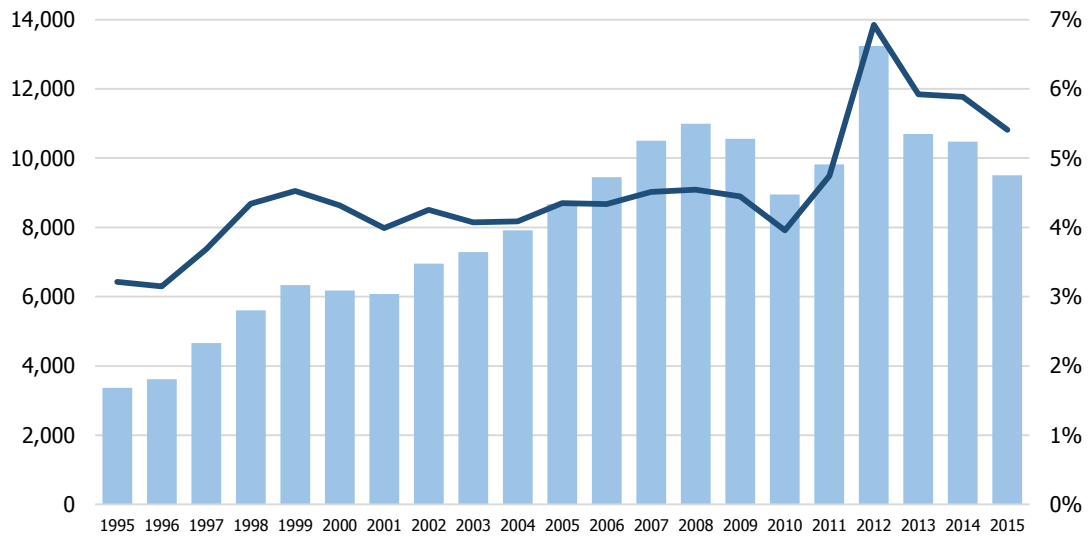

Figure 11: Corporate income tax (D51B)

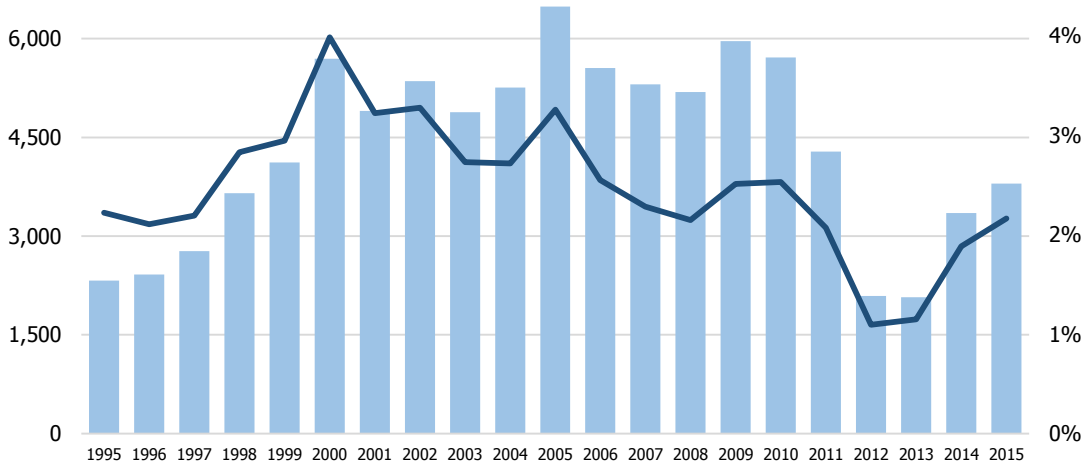

Figure 12: Social security contributions (D61)

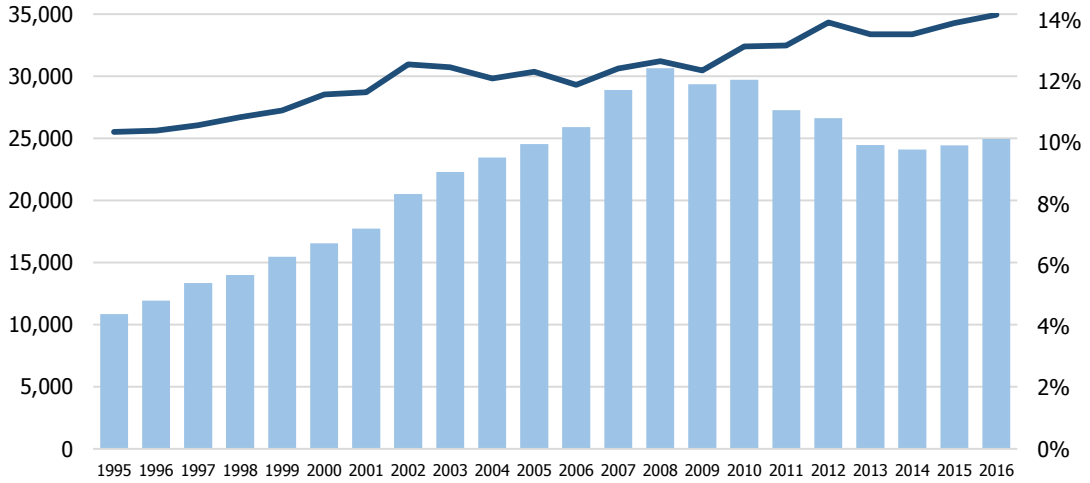

Figure 13: Indirect Taxes (D2)

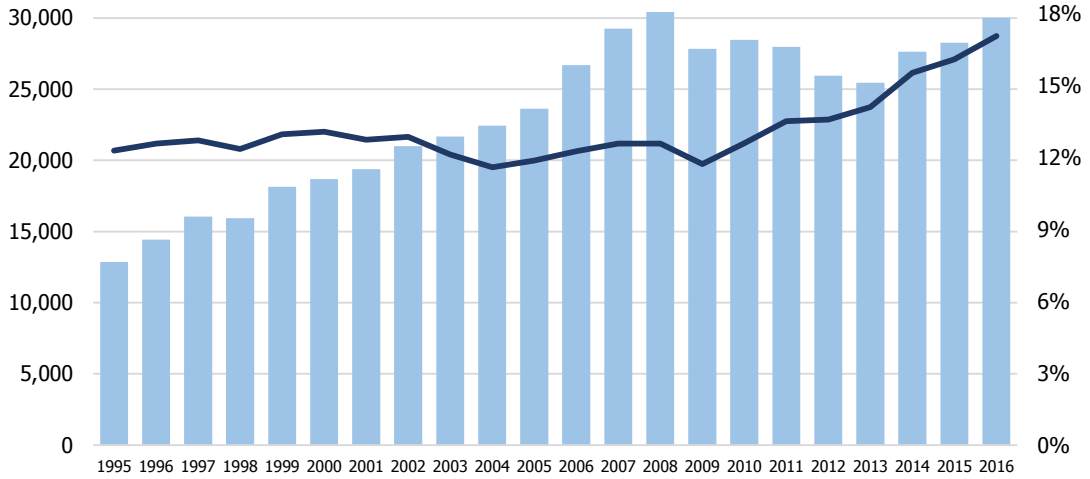

Figure 14: VAT (D211)

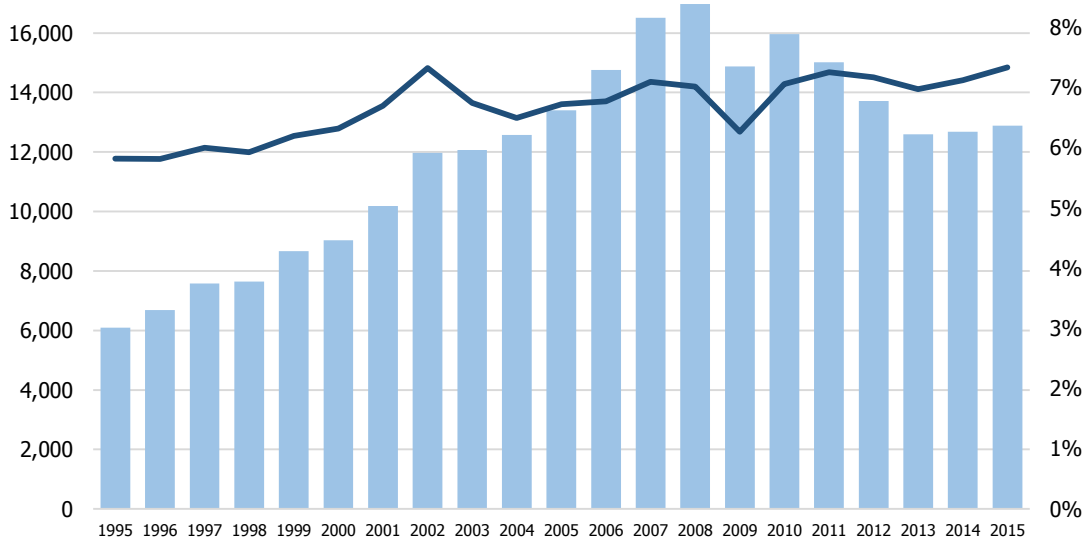

Figure 15: Excise and Consumption taxes (D214A)

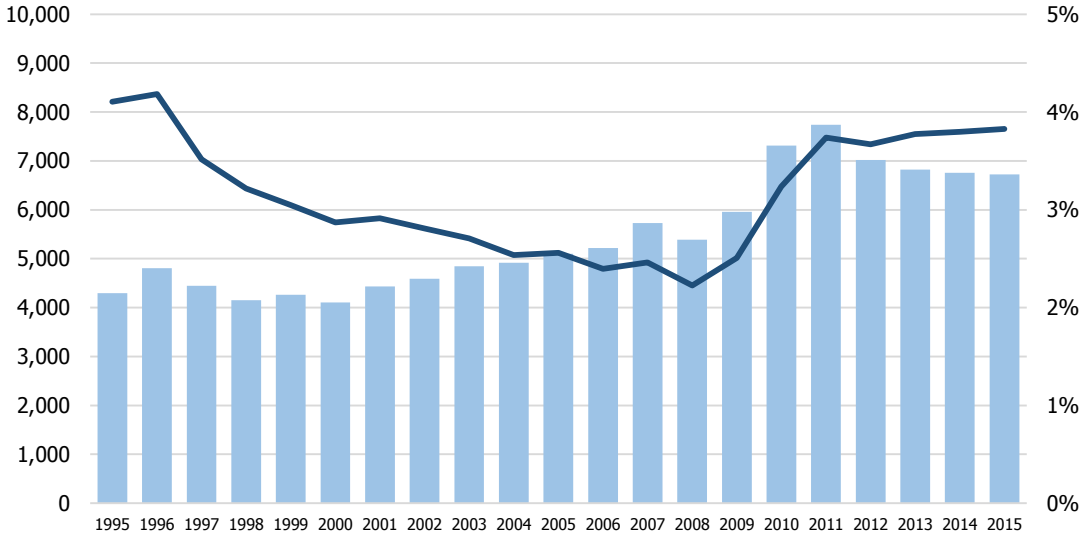

Figure 16: Other indirect taxes

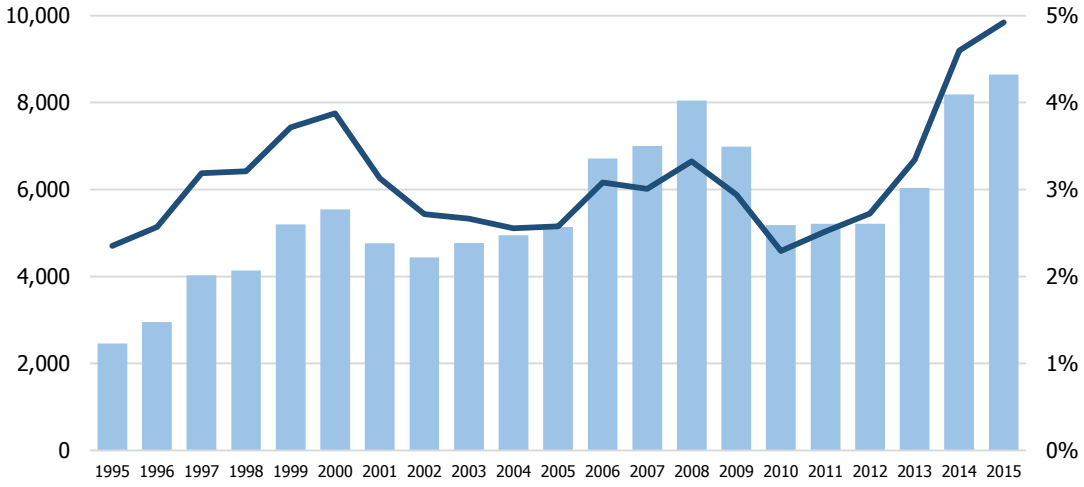

Figure 17: Non-Tax Revenues

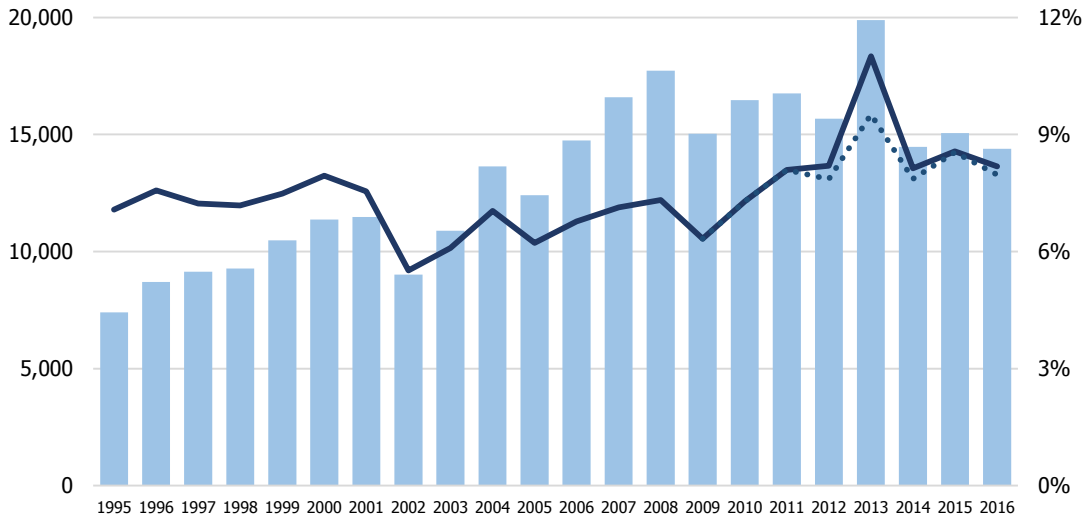

Figure 18: The Wage Bill (D1)

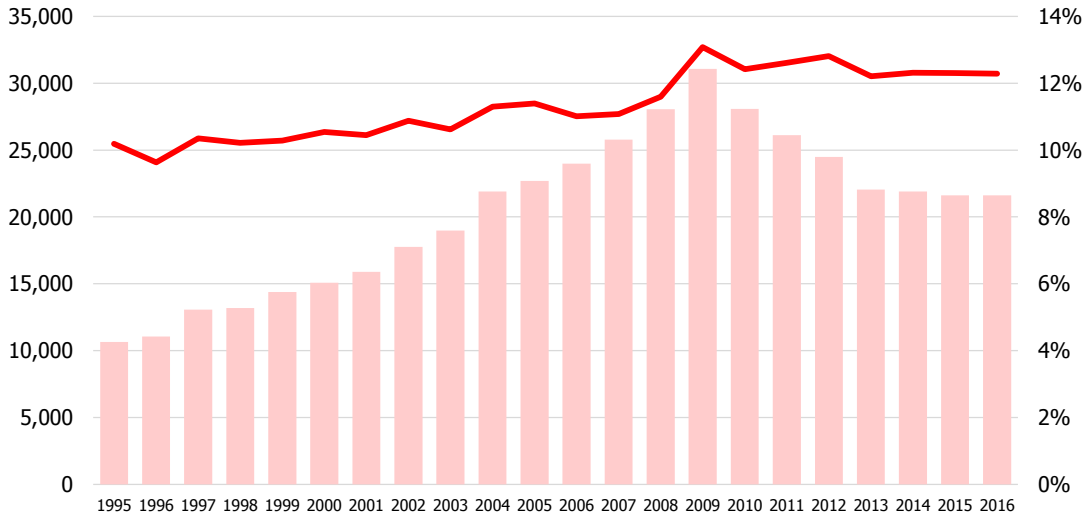

Figure 19: Intermediate Consumption (D2)

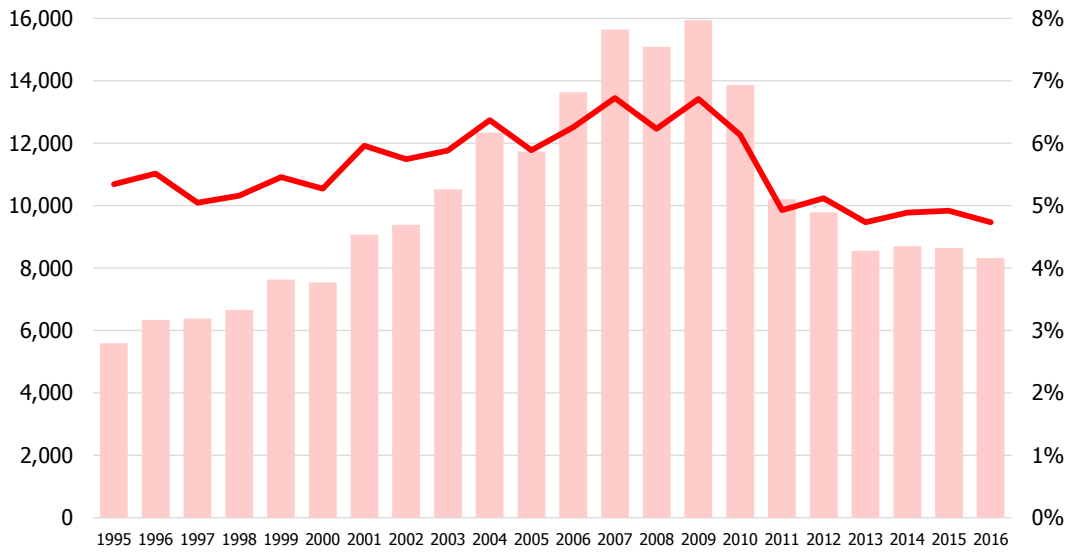

Figure 20: Public Investment (OP5ANP)

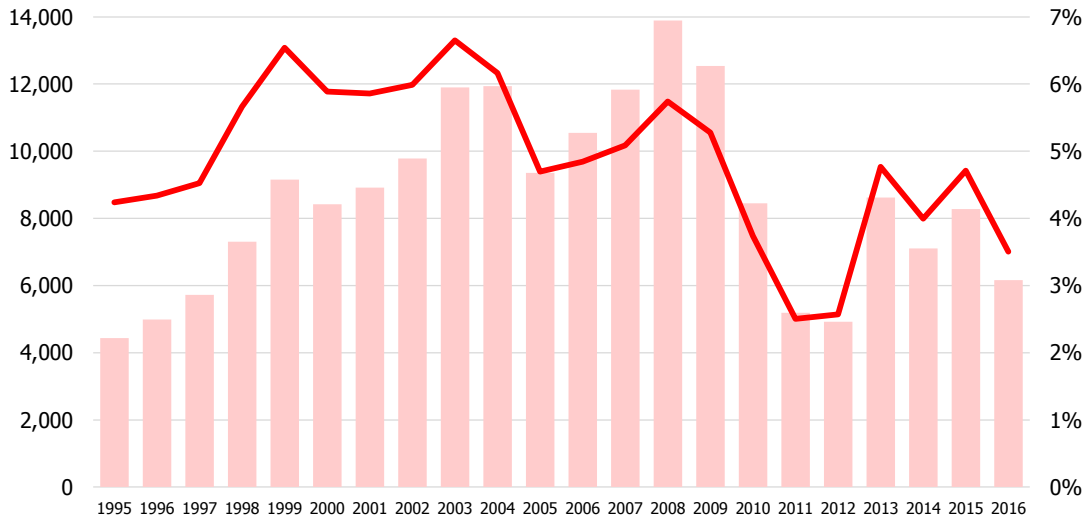

Figure 21: Social Transfers (D62+D632)

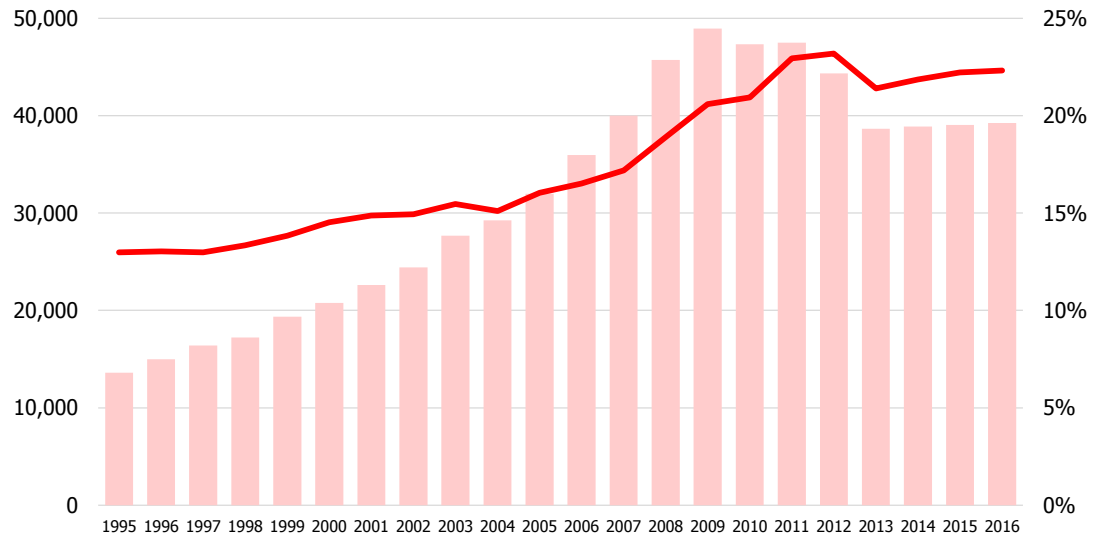

Figure 22: Growth of Social Transfers relative to a Benchmark

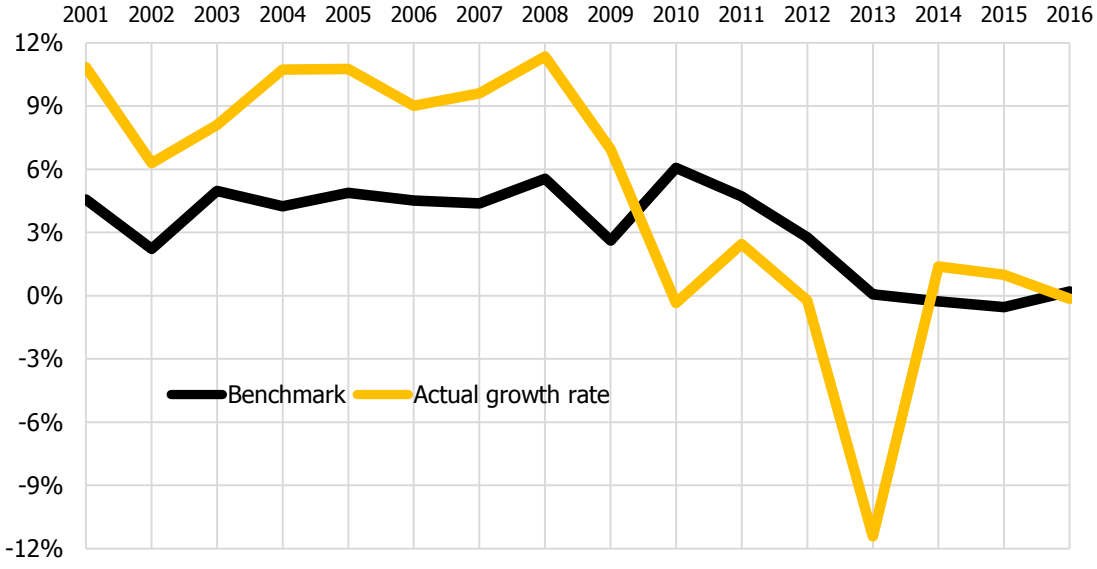

Figure 23: Other expenditure

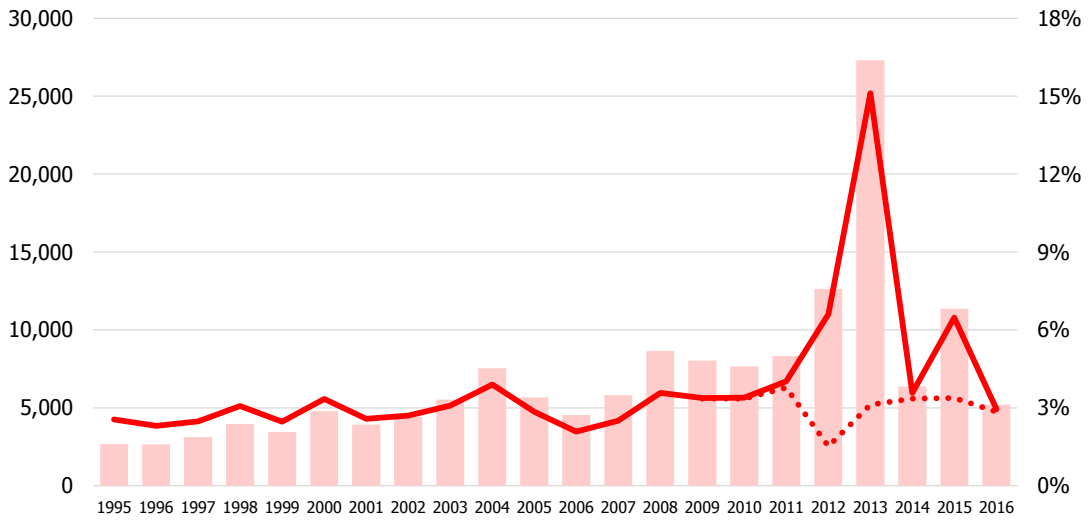

Figure 24: Tax Revenues (% of GDP) in Greece and the EA-19

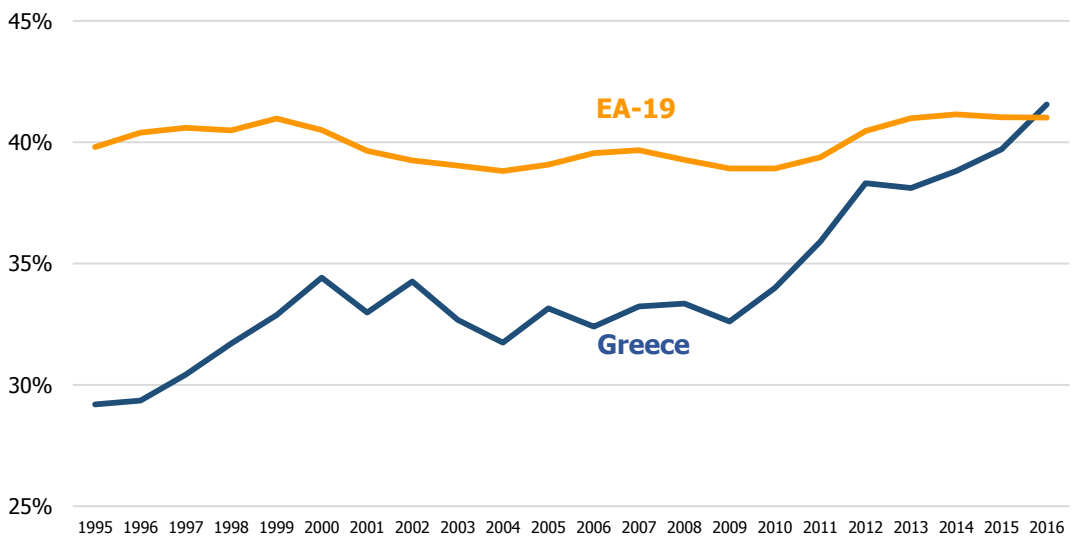

Figure 25: Structure of Tax Revenues (% of total)

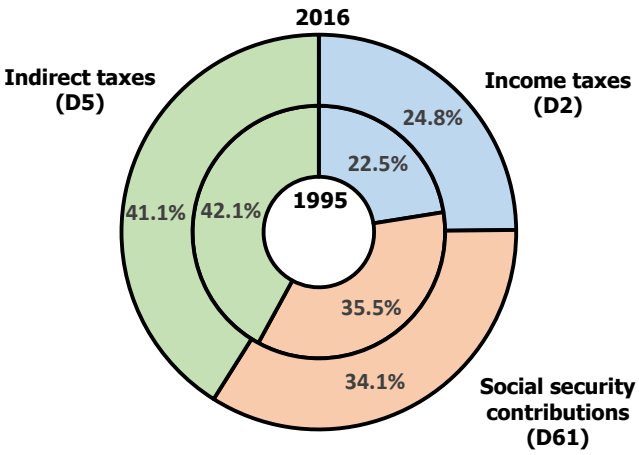

Figure 26: Primary Expenditure in Greece and the EA-19

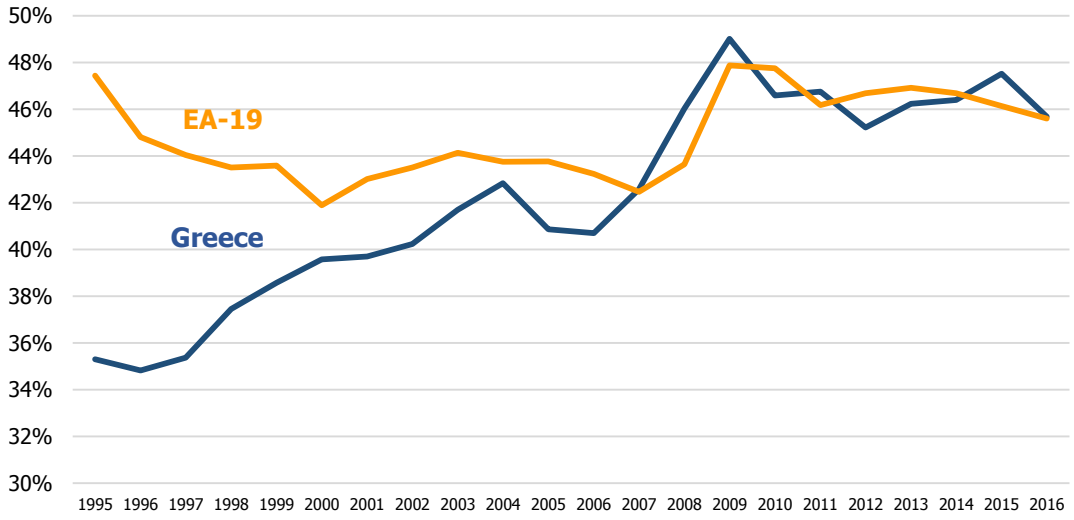

Figure 27: Size of the Public Sector (% of GDP) in Greece and the EA-19, 2016

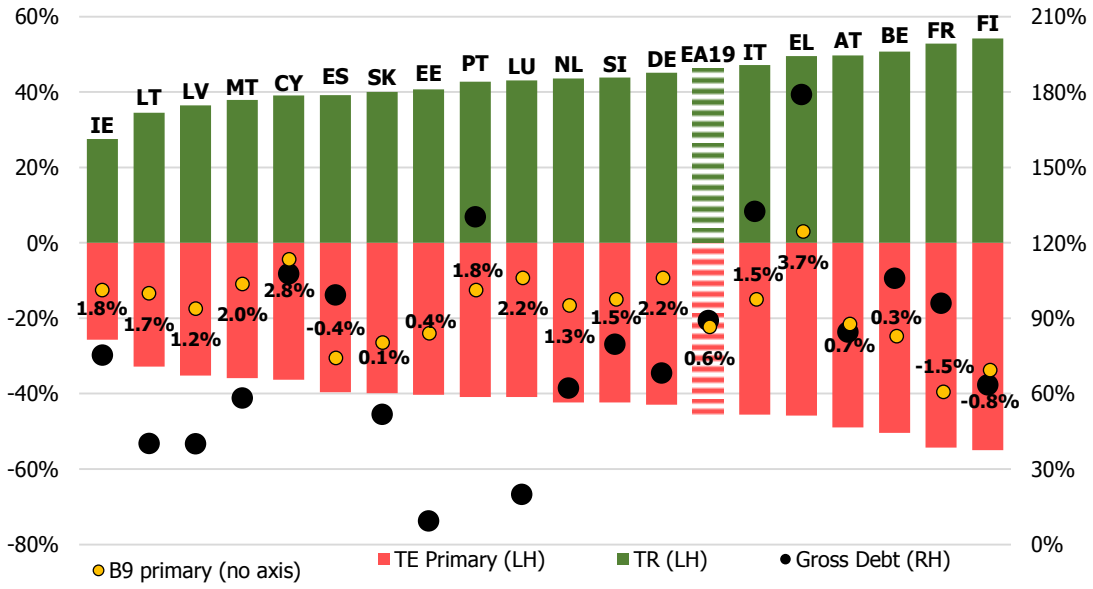

Figure 28: Factors of change of the debt ratio (2010-2016)

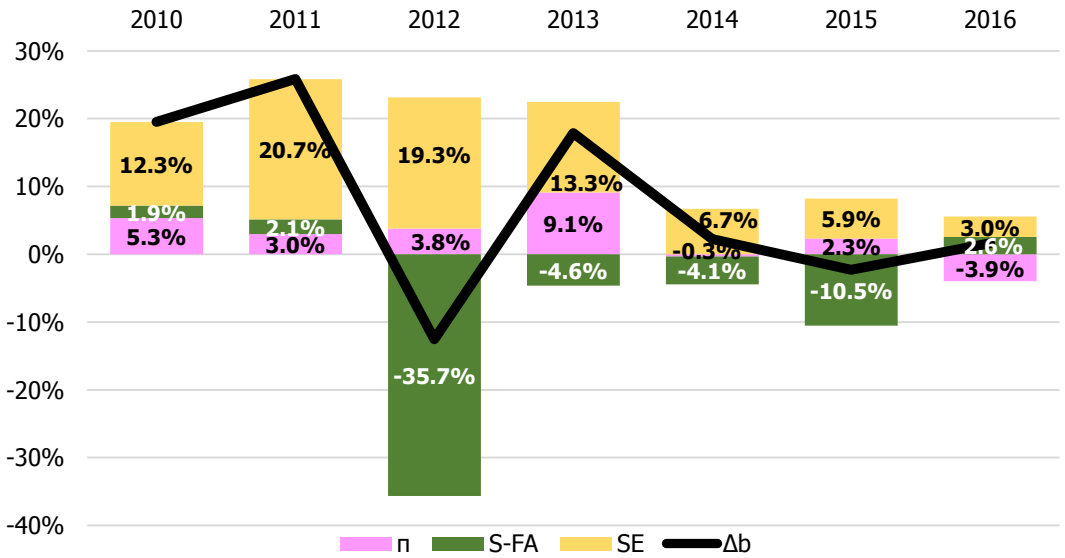

Figure 29: Macoreconomic assumptions for the DSA scenarios

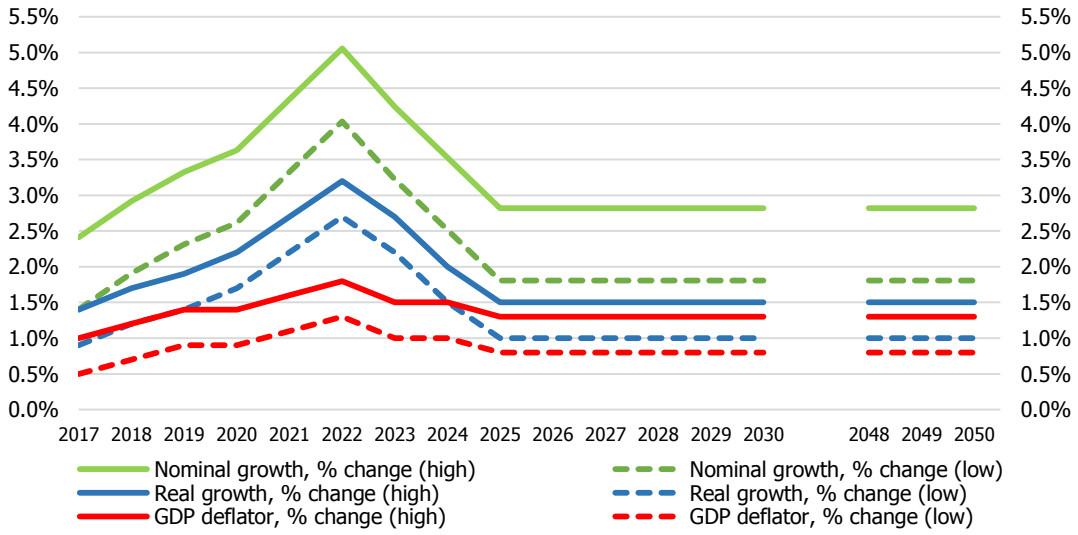

Figure 30: Reprofiling Selected Debt

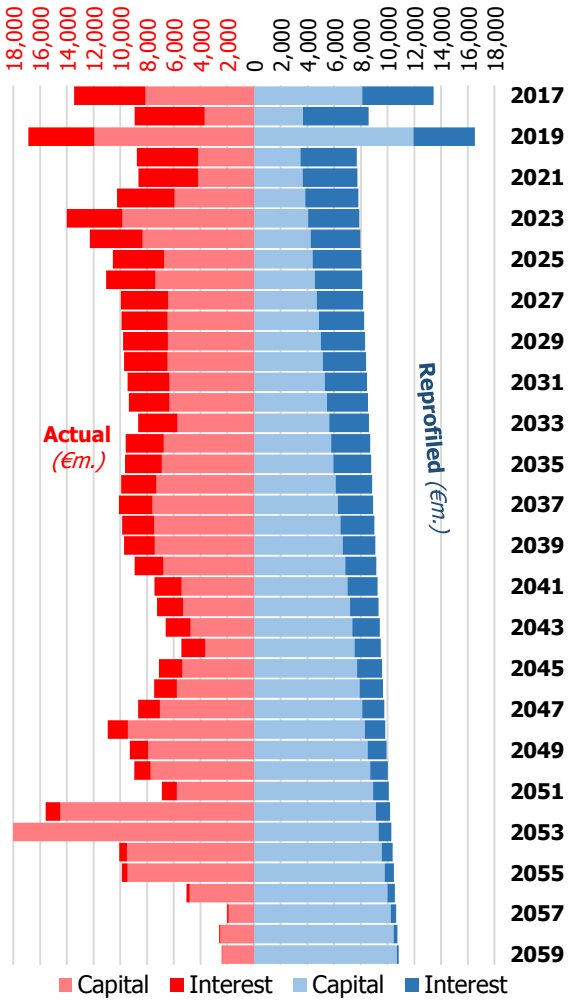

Figure 31: Extended Reprofiling of Selected Debt (€m.)

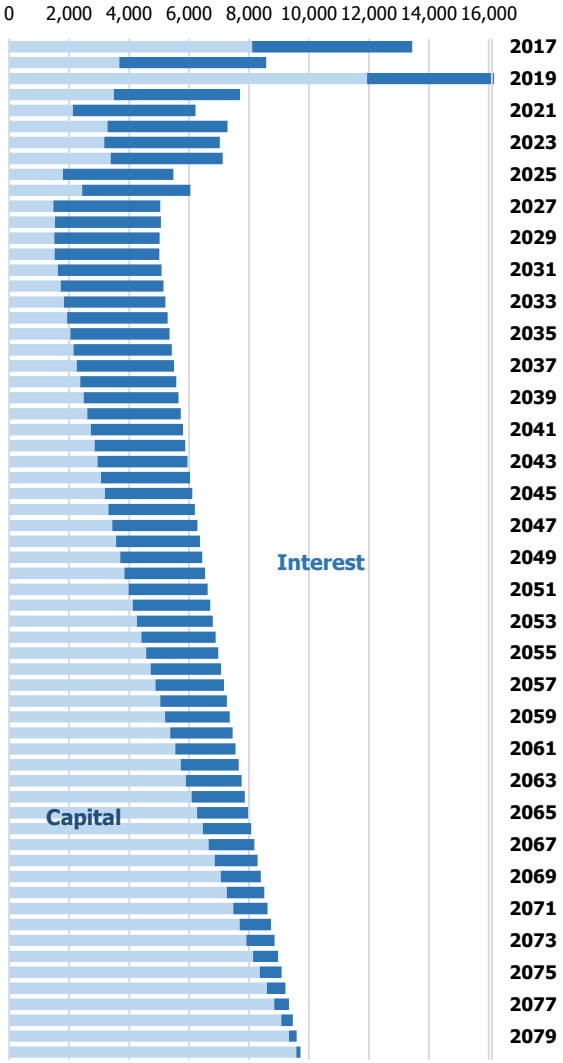

Figure 32: New Debt Issues-Avg. Nominal Interest Rate (high growth)

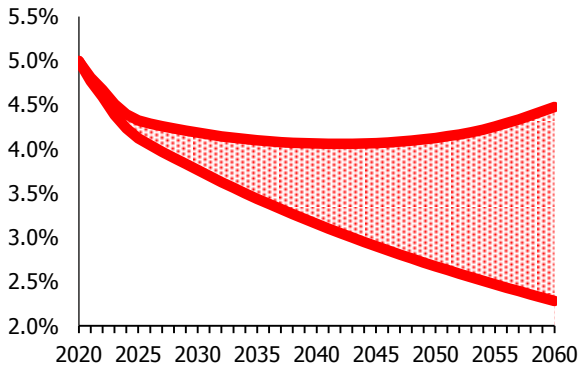

Figure 33: DSA Scenarios

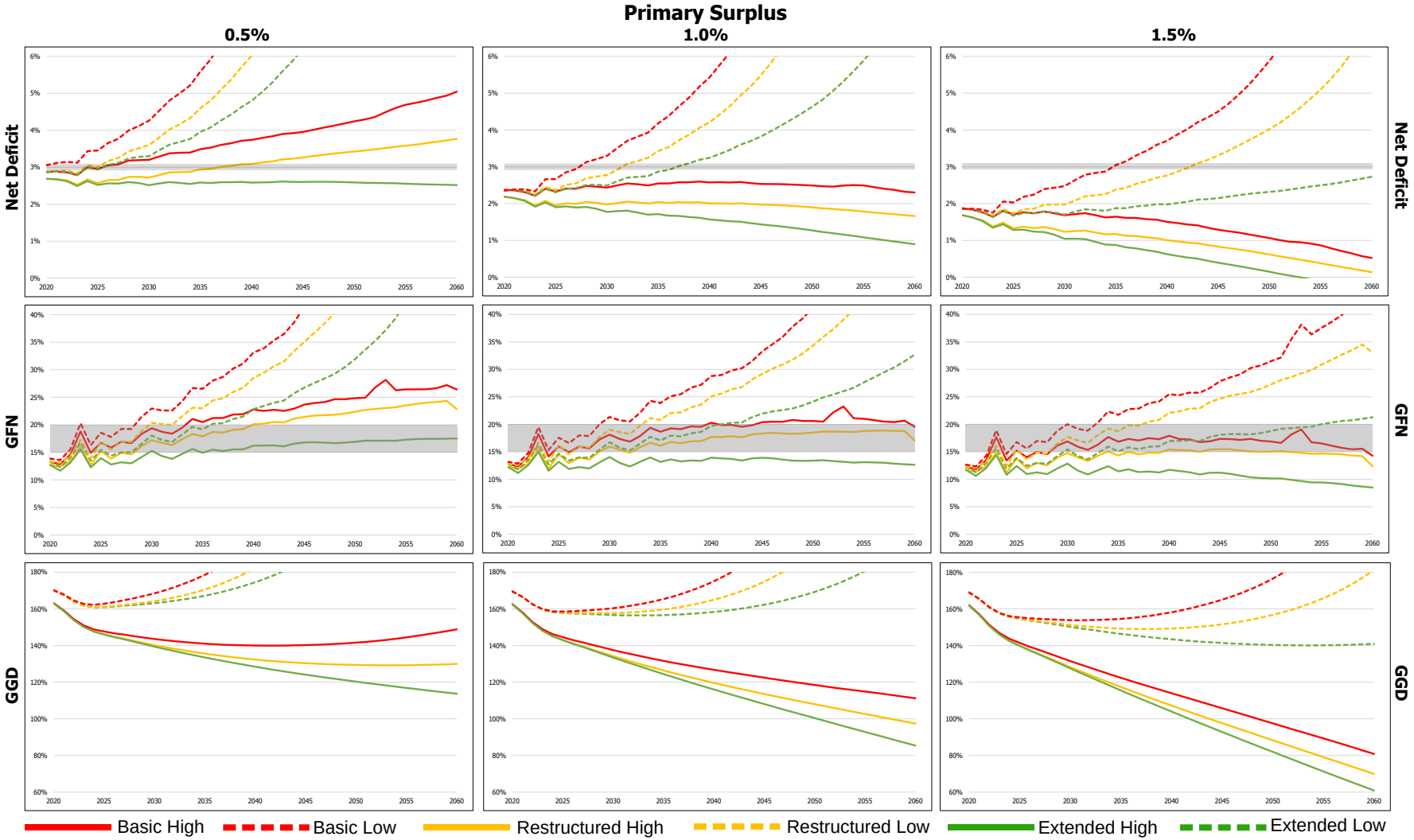

Figure 34: Debt Reprofiling and the Cumulative Snowball Effect

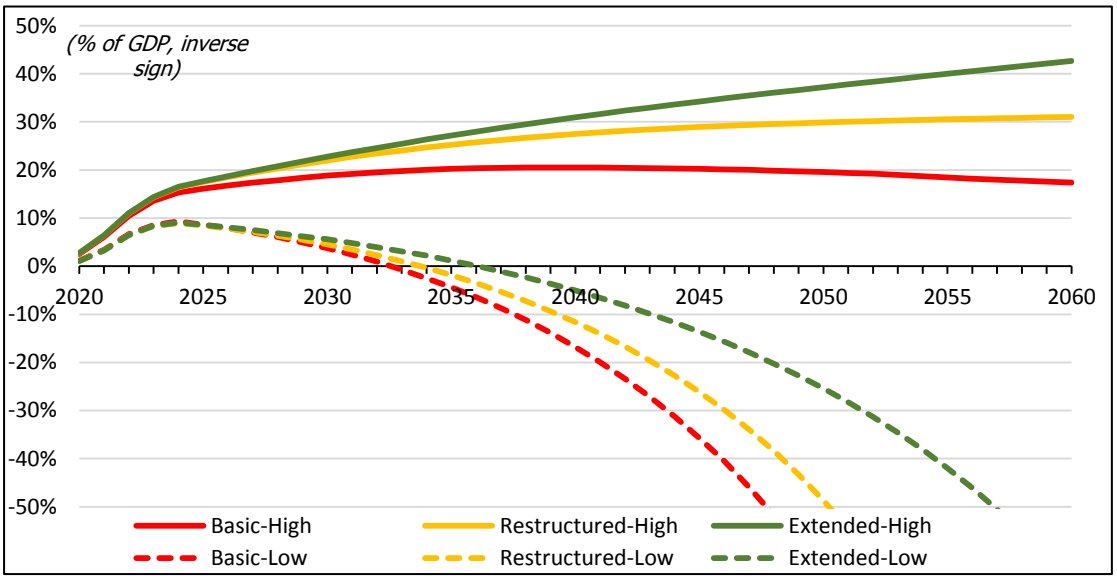

Figure 35: Primary Spending and Revenues (% of GDP) in Greece and EA19

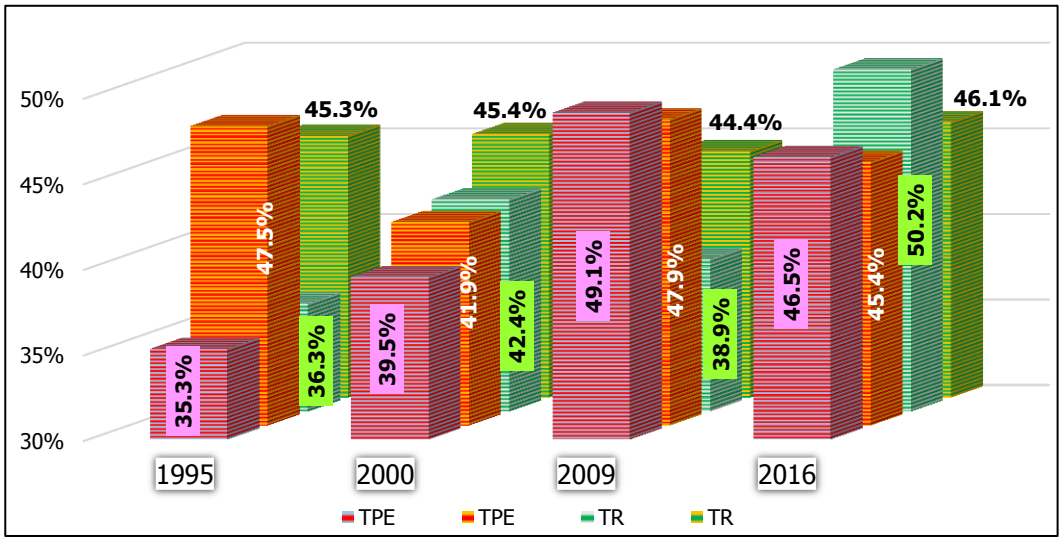

Figure A1: Salaried employment in the Private and Public Sector

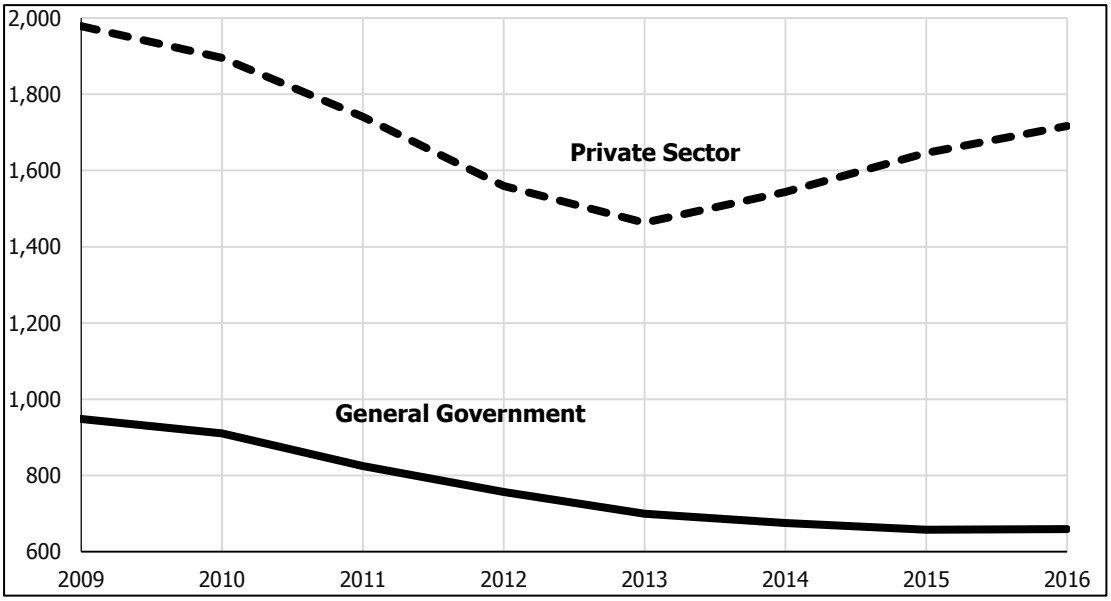

Figure A2: ULC and Take-home Earnings in the Private and Public Sector

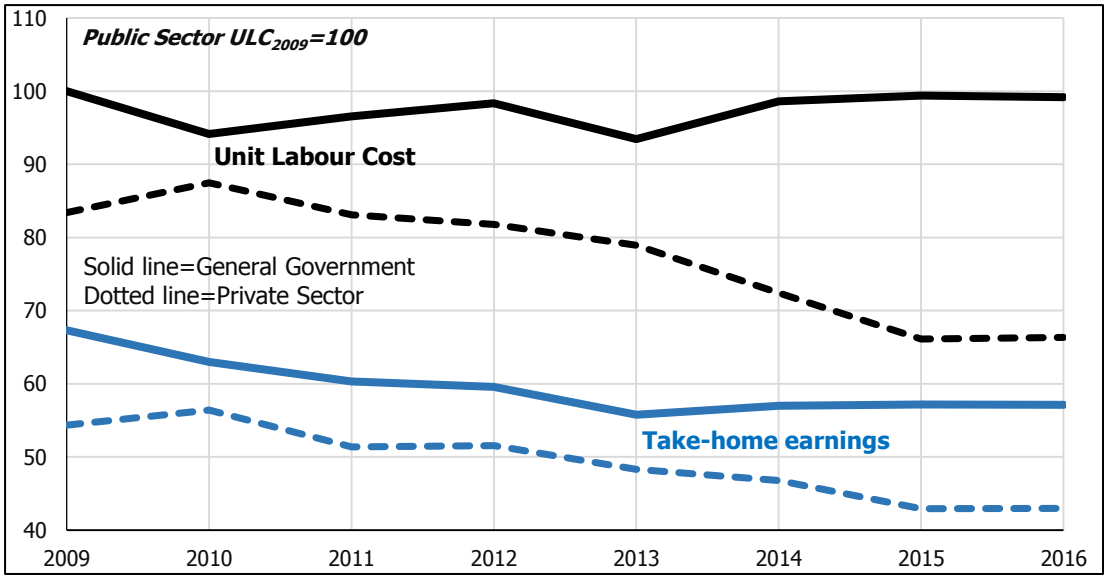

Figure A3: Alternative Fiscal Adjustment Paths, 2010-2016

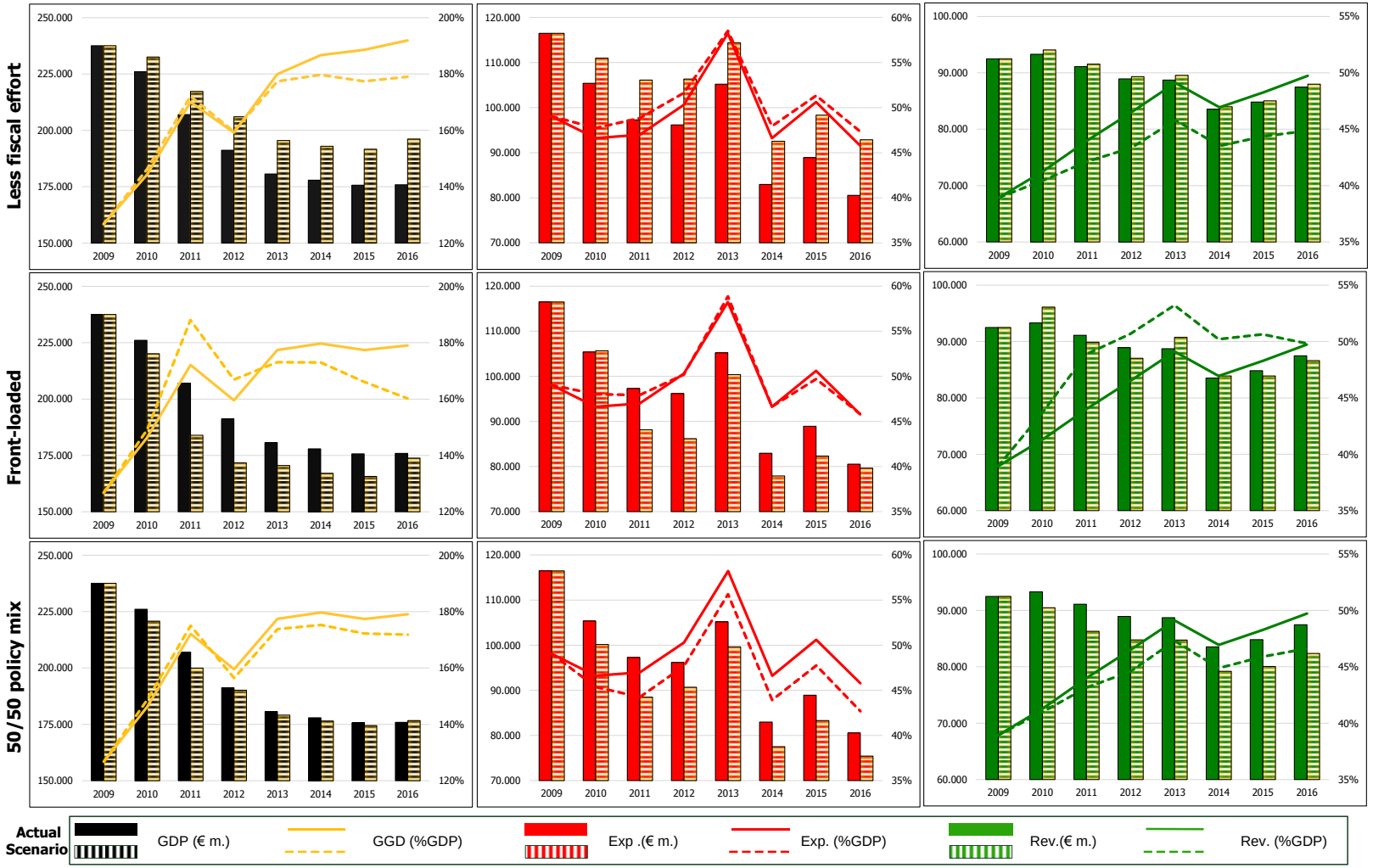

Figure A4: A combined scenario of fiscal adjustment

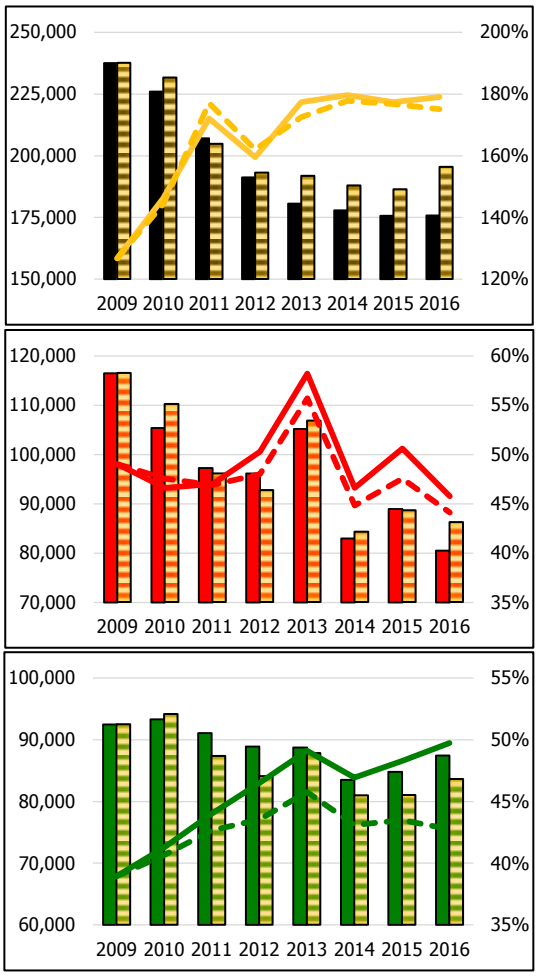

Table 1: Average Revenue Shares for EA-19 and Greece

		D5	D61	D5 +D61	D2	Tax	Non-tax	TR
EA-19	1995-2000	11.8%	15.8%	**27.6%**	12.6%	**40.2%**	5.1%	**45.3%**
	2001-2009	11.7%	14.9%	**26.6%**	12.6%	**39.2%**	5.1%	**44.3%**
	2010-2016	12.2%	15.3%	**27.5%**	12.9%	**40.4%**	5.5%	**45.9%**
Greece	1995-2000	8.1%	11.1%	**19.2%**	12.7%	**31.9%**	7.2%	**39.1%**
	2001-2009	8.3%	12.3%	**20.6%**	12.1%	**32.7%**	6.7%	**39.4%**
	2010-2016	9.8%	13.6%	**23.4%**	14.6%	**38.1%**	8.5%	**46.6%**

Table 2: Average Expenditure Shares for EA-19 and Greece

		D1	P2	OP5 ANP	D62 +D632	OTH*	TPE*	D41	TE*
EA-19	1995-2000	10,5%	4,5%	3,0%	20,8%	5,4%	44,2%	4,6%	48,8%
	2001-2009	10,3%	4,8%	3,2%	20,7%	4,9%	43,9%	3,1%	47,0%
	2010-2016	10,3%	5,3%	2,9%	22,7%	5,3%	46,6%	2,7%	49,2%
Greece	1995-2000	10,2%	5,3%	5,2%	13,5%	2,7%	36,9%	8,6%	45,4%
	2001-2009	11,3%	6,2%	5,6%	16,6%	3,0%	42,6%	5,0%	47,6%
	2010-2016	12,4%	5,1%	3,7%	22,1%	3,0%	46,3%	4,7%	51,1%

Table 3: Factors of change of the debt ratio

	π	f	SE	SE $_{-y/(1+y)}$	*SE* $_{p}$	*SE* $_{g}$	SE $_{i/(1+y)}$	Δb
1995-2000	**-11.3%**	**3.1%**	**16.1%**	-35.3%	*-16.1%*	*-19.2%*	51.4%	**7.8%**
2001-2009	**27.3%**	**1.8%**	**-6.0%**	-51.0%	*-27.8%*	*-23.2%*	45.0%	**23.1%**
2010-2016	**19.3%**	**-48.3%**	**81.3%**	48.2%	*7.5%*	*40.7%*	33.1%	**52.3%**

Table 4: Net and Primary Deficits, 2010-2016

€ m.								
	-B9	**CR**	**-B9***	**Δ(-B9*)**	**D41**	**Δ(D41)**	**-PB9***	**Δ(-PB9*)**
2009	35,966	63	35,903		11,972		23,931	
2010	25,309	89	25,220	-10,683	13,239	1,267	11,981	-11,950
2011	21,280	504	20,776	-4,444	15,076	1,837	5,700	-6,281
2012	17,000	9,074	7,926	-12,850	9,744	-5,332	-1,818	-7,518
2013	23,749	18,969	4,780	-3,146	7,276	-2,468	-2,496	-678
2014	6,516	-83	6,599	1,819	7,097	-179	-498	1,998
2015	10,427	5,381	5,046	-1,553	6,322	-775	-1,276	-778
2016	-1,288	-193	-1,096	-6,142	5,649	-673	-6,745	-5,469
Total				**-36,999**		**-6,323**		**-30,676**
% of GDP								
	-B9	**CR**	**-B9***	**Δ(-B9*)**	**D41**	**Δ(D41)**	**-PB9***	**Δ(-PB9*)**
2009	15.1%	0.0%	15.1%		5.0%		10.1%	
2010	11.2%	0.0%	11.2%	-4.0%	5.9%	0.8%	5.3%	-4.8%
2011	10.3%	0.2%	10.0%	-1.1%	7.3%	1.4%	2.8%	-2.5%
2012	8.9%	4.7%	4.1%	-5.9%	5.1%	-2.2%	-1.0%	-3.7%
2013	13.1%	10.5%	2.6%	-1.5%	4.0%	-1.1%	-1.4%	-0.4%
2014	3.7%	0.0%	3.7%	1.1%	4.0%	0.0%	-0.3%	1.1%
2015	5.9%	3.1%	2.9%	-0.8%	3.6%	-0.4%	-0.7%	-0.4%
2016	-0.7%	-0.1%	-0.6%	-3.5%	3.2%	-0.4%	-3.8%	-3.1%
Total				**-15.7%**		**-1.8%**		**-13.9%**

Table 5: Primary Deficit – Adjustment, 2010-2016

€ m.					
	Δ(-PB9*)	**TR***	**Δ(TR*)**	**TPE***	**Δ(TPE*)**
2009		92.488		116.419	
2010	-11.950	93.307	819	105.288	-11.131
2011	-6.281	91.096	-2.211	96.796	-8.492
2012	-7.518	88.269	-2.827	86.451	-10.345
2013	-678	86.020	-2.249	83.524	-2.927
2014	1.998	83.053	-2.967	82.555	-969
2015	-778	84.765	1.712	83.489	934
2016	-5.469	87.099	2.334	80.354	-3.135
Total	**-30.676**		**-5.390**		**-36.065**
% of GDP					
	Δ(-PB9*)	**TR***	**Δ(TR*)**	**TPE***	**Δ(TPE*)**
2009		38,9%		49,0%	
2010	-4,8%	41,3%	2,3%	46,6%	-2,4%
2011	-2,5%	44,0%	2,7%	46,8%	0,2%
2012	-3,7%	46,2%	2,2%	45,2%	-1,5%
2013	-0,4%	47,6%	1,5%	46,2%	1,0%
2014	1,1%	46,7%	-0,9%	46,4%	0,2%
2015	-0,4%	48,2%	1,6%	47,5%	1,1%
2016	-3,1%	49,5%	1,3%	45,7%	-1,8%
Total	**-13,9%**		**10,6%**		**-3,3%**

Table 6: Revenues – Adjustment, 2010-2016

€ m.							
	Δ(TR*)	***Δ(D5)***	***Δ(D61)***	**Δ(DIR)**	**Δ(D2)**	**Δ(TAX)**	**Δ(NT*)**
2010	**819**	*-1.610*	*356*	-1.254	628	**-626**	**1.445**
2011	**-2.211**	*420*	*-2.428*	-2.008	-483	**-2.491**	**280**
2012	**-2.827**	*1.578*	*-651*	927	-2.027	**-1.100**	**-1.727**
2013	**-2.249**	*-1.746*	*-2.166*	-3.912	-491	**-4.403**	**2.154**
2014	**-2.967**	*-1.579*	*-367*	-1.946	2.171	**225**	**-3.192**
2015	**1.712**	*-270*	*334*	64	629	**693**	**1.019**
2016	**2.334**	*1.062*	*510*	1.572	1.751	**3.323**	**-990**
Total	**-5.390**	*-2.145*	*-4.412*	-6.557	2.178	**-4.379**	**-1.011**
% of GDP							
	Δ(TR*)	***Δ(D5)***	***Δ(D61)***	**Δ(DIR)**	**Δ(D2)**	**Δ(TAX)**	**Δ(NT*)**
2010	**2,3%**	*-0,3%*	*0,8%*	0,5%	0,9%	**1,4%**	**1,0%**
2011	**2,7%**	*1,0%*	*0,0%*	1,0%	0,9%	**1,9%**	**0,8%**
2012	**2,2%**	*1,6%*	*0,7%*	2,3%	0,1%	**2,4%**	**-0,2%**
2013	**1,5%**	*-0,3%*	*-0,4%*	-0,7%	0,5%	**-0,2%**	**1,7%**
2014	**-0,9%**	*-0,7%*	*0,0%*	-0,7%	1,4%	**0,7%**	**-1,6%**
2015	**1,6%**	*0,0%*	*0,4%*	0,3%	0,6%	**0,9%**	**0,7%**
2016	**1,3%**	*0,6%*	*0,3%*	0,9%	1,0%	**1,8%**	**-0,6%**
Total	**10,6%**	*1,8%*	*1,8%*	3,6%	5,3%	**8,9%**	**1,6%**

Table 7: Primary Expenditure – Adjustment, 2010-2016

€ m.						
	Δ(TPE*)	**Δ(D1)**	**Δ(P2)**	**Δ(P5)**	**Δ(D62+ D631)**	**Δ(OTH*)**
2010	**-11.131**	-2.994	-2.069	-4.084	-1.600	-384
2011	**-8.492**	-1.964	-3.663	-3.264	161	238
2012	**-10.345**	-1.604	-418	-270	-3.142	-4.911
2013	**-2.927**	-2.442	-1.227	3.698	-5.687	2.731
2014	**-969**	-148	142	-1.508	216	329
2015	**934**	-301	-54	1.168	159	-38
2016	**-3.135**	6	-321	-2.111	210	-919
Total	**-36.065**	**-9.447**	**-7.610**	**-6.371**	**-9.683**	**-2.954**
% of GDP						
	Δ(TPE*)	**Δ(D1)**	**Δ(P2)**	**Δ(P5)**	**Δ(D62+ D631)**	**Δ(OTH*)**
2010	**-2,4%**	-0,7%	-0,6%	-1,5%	0,3%	0,0%
2011	**0,2%**	0,2%	-1,2%	-1,2%	2,0%	0,4%
2012	**-1,5%**	0,2%	0,2%	0,1%	0,3%	-2,3%
2013	**1,0%**	-0,6%	-0,4%	2,2%	-1,8%	1,6%
2014	**0,2%**	0,1%	0,2%	-0,8%	0,4%	0,2%
2015	**1,1%**	0,0%	0,0%	0,7%	0,4%	0,0%
2016	**-1,8%**	0,0%	-0,2%	-1,2%	0,1%	-0,5%
Total	**-3,3%**	**-0,8%**	**-2,0%**	**-1,8%**	**1,7%**	**-0,5%**

Table 8: First Adjustment Programme – Plan and Outcome

	Measures planned			**Adjustment planned**			**Adjustment realized**			**Measures taken**		
	TR*	PTE*	**Total**	TR*	PTE*	**Total**	TR*	PTE*	**Total**	TR*	PTE*	**Total**
	(% of GDP)											
2010	2,0%	-5,5%	**7,5%**	2,8%	-3,3%	**6,1%**	2,3%	-2,4%	**4,8%**	2,2%	-1,1%	**3,3%**
2011	3,0%	-1,1%	**4,1%**	3,0%	1,5%	**1,5%**	2,7%	0,2%	**2,5%**	2,8%	-3,6%	**6,4%**
2012	1,0%	-1,4%	**2,4%**	0,2%	-1,7%	**1,9%**	2,2%	-1,5%	**3,7%**	4,9%	-4,9%	**9,9%**
2013	0,5%	-1,6%	**2,1%**	0,2%	-2,0%	**2,3%**	1,5%	1,0%	**0,4%**	5,0%	-3,3%	**8,4%**
2014	1,5%	-0,5%	**2,0%**	0,8%	-1,6%	**2,4%**	-0,9%	0,2%	**-1,1%**	4,4%	-1,8%	**6,2%**
Total	**8,0%**	**-10,1%**	**18,1%**	**7,0%**	**-7,2%**	**14,2%**	**7,7%**	**-2,6%**	**10,4%**	**19,4%**	**-14,7%**	**34,1%**
	(€ bn.)											
2010	4,6	-12,7	17,3	3,9	-10,8	14,7	0,8	-11,1	12,0	4,9	-2,4	7,4
2011	6,7	-2,5	9,2	3,8	0,4	3,4	-2,2	-8,5	6,3	5,4	-7,5	12,9
2012	2,3	-3,2	5,5	2,4	-1,9	4,4	-2,8	-10,3	7,5	9,4	-9,5	18,9
2013	1,2	-3,8	4,9	3,3	-2,0	5,3	-2,2	-2,9	0,7	8,6	-6,0	14,6
2014	3,6	-1,2	4,8	5,1	-1,1	6,1	-3,0	-1,0	-2,0	8,2	-3,1	11,4
Total	**18,4**	**-23,3**	**41,7**	**18,5**	**-15,4**	**33,9**	**-9,4**	**-33,9**	**24,4**	**36,6**	**-28,5**	**65,2**

Note: It is reminded that the asterisk denotes that crisis related transactions are excluded.

Table 9: The Fiscal Multipliers

	Pre-crisis	***Weighted sum***	**Crisis**	**Weighted sum**
$\mathbf{W^G}$	*1,363*	*1,023*	**1,435**	**1,210**
$\mathbf{C^G}$	*0,331*		**0,323**	
$\mathbf{I^G}$	*0,331*		**0,323**	
ST	*1,290*		**1,435**	
$\mathbf{T^D}$	*-1,448*	*-1,266*	**-1,633**	**-1,408**
$\mathbf{T^S}$	*-1,384*		**-1,561**	
$\mathbf{T^I}$	*-1,035*		**-1,115**	

Table 10: Impact of the Fiscal Aggregates on GDP

% of GDP	W^G	C^G	I^G	ST	T^D	T^S	T^I	**Total**
2010	-1,1%	-0,2%	-0,5%	0,5%	0,4%	-1,1%	-0,9%	-2,8%
2011	0,3%	-0,4%	-0,4%	2,9%	-1,4%	0,0%	-0,9%	0,1%
2012	0,3%	0,1%	0,0%	0,4%	-2,3%	-1,0%	-0,1%	-2,6%
2013	-1,0%	-0,1%	0,7%	-2,6%	0,5%	0,5%	-0,5%	-2,5%
2014	0,2%	0,0%	-0,3%	0,7%	1,1%	0,0%	-1,4%	0,3%
2015	0,0%	0,0%	0,2%	0,5%	0,0%	-0,5%	-0,5%	-0,2%
2016	0,0%	-0,1%	-0,4%	0,1%	-0,9%	-0,4%	-1,0%	-2,5%
Total	**-1,3%**	**-0,6%**	**-0,6%**	**2,5%**	**-2,6%**	**-2,5%**	**-5,2%**	**-10,3%**
€ m.	W^G	C^G	I^G	ST	T^D	T^S	T^I	**Total**
2010	-4.297	-668	-1.319	-2.296	2.629	-556	-700	-7.206
2011	-2.819	-1.183	-1.054	231	-686	3.789	539	-1.183
2012	-2.302	-135	-87	-4.508	-2.577	1.016	2.261	-6.333
2013	-3.505	-396	1.194	-8.159	2.852	3.380	548	-4.086
2014	-212	46	-487	310	2.579	573	-2.421	387
2015	-432	-17	377	228	441	-521	-702	-626
2016	9	-104	-682	301	-1.734	-796	-1.953	-4.959
Total	**-13.558**	**-2.458**	**-2.058**	**-13.892**	**3.503**	**6.885**	**-2.429**	**-24.007**

Table A1: The Implicit Tax Rate on Consumption (ITRC)

	P31_S14 DC	D211	D212	D214	D214B	D29F	D59D	**Tax**	**ITR^{C}**
1995	**64.165**	6.092	69	6.004	459	0	237	**11.944**	**18,6%**
1996	**71.048**	6.681	55	6.785	536	0	271	**13.256**	**18,7%**
1997	**78.789**	7.584	99	7.444	585	0	241	**14.783**	**18,8%**
1998	**86.468**	7.646	75	7.256	592	0	254	**14.639**	**16,9%**
1999	**90.940**	8.672	79	8.181	613	0	284	**16.601**	**18,3%**
2000	**96.623**	9.036	14	8.453	596	0	286	**17.193**	**17,8%**
2001	**103.537**	10.188	23	8.209	617	0	327	**18.130**	**17,5%**
2002	**112.842**	11.972	79	8.009	534	6	461	**19.993**	**17,7%**
2003	**120.139**	12.067	79	8.515	564	32	414	**20.543**	**17,1%**
2004	**128.744**	12.578	74	8.721	590	34	496	**21.313**	**16,6%**
2005	**136.841**	13.398	83	9.009	655	39	532	**22.406**	**16,4%**
2006	**144.975**	14.755	160	10.384	682	38	568	**25.223**	**17,4%**
2007	**155.912**	16.511	154	11.148	702	17	604	**27.732**	**17,8%**
2008	**168.065**	16.978	360	10.995	866	17	734	**28.218**	**16,8%**
2009	**165.365**	14.879	347	10.194	528	17	866	**25.775**	**15,6%**
2010	**159.493**	15.958	250	10.432	432	127	830	**27.165**	**17,0%**
2011	**148.094**	15.021	286	10.301	356	99	872	**26.223**	**17,7%**
2012	**137.465**	13.713	153	9.290	340	650	978	**24.444**	**17,8%**
2013	**133.226**	12.593	180	9.340	301	1.243	783	**23.838**	**17,9%**
2014	**131.816**	12.676	107	9.287	344	1.274	771	**23.771**	**18,0%**
2015	**130.101**	12.885	205	8.975	340	1.222	804	**23.751**	**18,3%**
2016	**128.023**	14.333	190	9.393	329	1.203	811	**25.601**	**20,0%**

Table A2: SITR for S11

	Tax			**Income**	**SITR^{S11}**
	D51	D59	**Total**	**B4N**	
1995	1.905	332	**2.237**	**6.012**	**37,2%**
1996	2.033	390	**2.423**	**9.704**	**25,0%**
1997	2.592	431	**3.023**	**11.915**	**25,4%**
1998	3.095	474	**3.569**	**11.771**	**30,3%**
1999	3.402	517	**3.919**	**15.025**	**26,1%**
2000	3.966	526	**4.492**	**14.545**	**30,9%**
2001	3.570	551	**4.121**	**17.792**	**23,2%**
2002	4.352	661	**5.013**	**17.656**	**28,4%**
2003	4.064	677	**4.741**	**19.869**	**23,9%**
2004	4.529	758	**5.287**	**22.582**	**23,4%**
2005	5.279	795	**6.074**	**22.395**	**27,1%**
2006	4.894	437	**5.331**	**22.157**	**24,1%**
2007	5.536	715	**6.251**	**26.140**	**23,9%**
2008	5.307	568	**5.875**	**25.476**	**23,1%**
2009	5.586	903	**6.489**	**22.951**	**28,3%**
2010	5.603	1.092	**6.695**	**17.940**	**37,3%**
2011	3.259	1.833	**5.092**	**15.638**	**32,6%**
2012	5.276	1.978	**7.254**	**16.155**	**44,9%**
2013	3.330	2.199	**5.529**	**16.768**	**33,0%**
2014	2.898	924	**3.822**	**16.054**	**23,8%**
2015	4.052	893	**4.945**	**16.709**	**29,6%**
2016	4.405	832	**5.237**	**15.198**	**34,5%**

Table A3: SITR for S14

	Tax					Incomes													$SITR^{S14}$
	D51	D59	D61	D91	**Total**	D1	D3	D41n	D42	D44	D45	D62	D63	D75	D92	D99	B3N	**Total**	
1995	3.852	392	11.605	330	**16.179**	30.640	59	10.874	2.098	2	248	12.011	10.747	3.758	200	0	28.206	**98.843**	**16,4%**
1996	4.070	460	12.838	327	**17.695**	33.079	110	10.477	2.470	1	125	13.228	11.751	3.735	181	0	30.685	**105.842**	**16,7%**
1997	5.079	509	14.346	377	**20.311**	37.249	251	8.153	2.839	2	228	14.489	13.044	3.260	783	0	33.180	**113.478**	**17,9%**
1998	6.262	561	14.989	349	**22.161**	38.682	183	8.362	3.529	2	229	15.303	13.486	3.876	1.012	0	33.390	**118.054**	**18,8%**
1999	7.114	611	16.542	339	**24.606**	42.929	253	8.772	3.888	2	248	17.027	14.921	3.530	345	0	35.350	**127.265**	**19,3%**
2000	8.017	624	17.550	440	**26.631**	44.322	281	9.174	3.591	2	258	18.244	15.637	3.443	1.374	0	34.218	**130.544**	**20,4%**
2001	7.449	651	18.834	428	**27.362**	47.175	267	6.992	3.894	76	301	19.865	17.135	3.438	571	0	36.687	**136.401**	**20,1%**
2002	8.159	781	21.964	376	**31.280**	54.269	306	7.174	3.615	76	322	21.522	18.329	3.016	733	0	38.491	**147.853**	**21,2%**
2003	8.051	802	23.929	291	**33.073**	59.595	506	5.360	3.843	164	309	24.543	20.330	3.469	739	0	43.336	**162.194**	**20,4%**
2004	8.636	906	25.107	324	**34.973**	64.191	384	5.563	3.978	146	371	25.939	21.255	4.258	708	0	46.020	**172.813**	**20,2%**
2005	9.892	949	26.407	394	**37.642**	68.294	759	4.998	4.295	174	379	28.332	23.673	4.182	412	0	44.716	**180.214**	**20,9%**
2006	9.892	1.019	27.735	325	**38.971**	73.047	1.676	4.943	3.730	172	403	31.533	25.676	3.563	31	0	50.387	**195.161**	**20,0%**
2007	10.490	1.080	30.871	303	**42.744**	78.409	2.134	5.432	6.315	165	378	35.026	27.421	3.077	31	0	51.383	**209.771**	**20,4%**
2008	11.043	1.072	32.744	614	**45.473**	82.800	2.219	7.310	5.034	237	402	40.059	29.307	4.175	457	0	50.083	**222.083**	**20,5%**
2009	11.199	1.294	31.354	524	**44.371**	84.675	2.384	7.118	3.714	402	362	42.783	31.491	3.920	840	0	48.396	**226.085**	**19,6%**
2010	9.797	1.457	32.271	250	**43.775**	81.877	2.235	4.278	2.931	219	357	41.647	29.396	3.330	1.155	0	42.160	**209.585**	**20,9%**
2011	9.231	2.216	29.585	250	**41.282**	72.883	2.552	4.189	2.695	169	371	41.475	27.356	2.304	1.365	0	36.546	**191.905**	**21,5%**
2012	10.108	2.377	28.259	161	**40.905**	65.719	2.373	6.382	2.713	206	378	39.473	24.731	1.988	991	0	31.191	**176.145**	**23,2%**
2013	8.891	2.627	26.371	162	**38.051**	59.381	2.137	5.220	2.743	214	357	35.438	21.666	2.183	689	370	29.827	**160.225**	**23,7%**
2014	9.591	1.179	25.544	137	**36.451**	58.816	2.118	3.762	2.859	190	330	35.843	20.462	2.019	516	0	31.258	**158.173**	**23,0%**
2015	9.410	1.170	25.819	166	**36.565**	58.089	1.948	1.531	3.345	169	331	35.741	20.225	1.726	38	0	30.901	**154.044**	**23,7%**
2016	10.039	1.143	26.334	136	**37.652**	58.238	1.988	1.175	3.209	169	312	35.998	19.967	1.580	103	0	30.350	**153.089**	**24,6%**

Table A4: SITR for social contributions and income tax of S14

	D61-D12	**D1+B3N-D12**	$SITR^{D61\_S14}$	**D5**	**D1+B3N - D61**	$SITR^{D5\_S14}$
1995	5.291	52.532	**10,1%**	4.244	47.241	**9,0%**
1996	5.718	56.644	**10,1%**	4.530	50.926	**8,9%**
1997	6.538	62.621	**10,4%**	5.588	56.083	**10,0%**
1998	6.831	63.914	**10,7%**	6.823	57.083	**12,0%**
1999	7.480	69.217	**10,8%**	7.725	61.737	**12,5%**
2000	8.601	69.591	**12,4%**	8.641	60.990	**14,2%**
2001	9.154	74.182	**12,3%**	8.100	65.028	**12,5%**
2002	10.783	81.579	**13,2%**	8.940	70.796	**12,6%**
2003	11.076	90.078	**12,3%**	8.853	79.002	**11,2%**
2004	11.813	96.917	**12,2%**	9.542	85.104	**11,2%**
2005	11.708	98.311	**11,9%**	10.841	86.603	**12,5%**
2006	12.508	108.20	**11,6%**	10.911	95.699	**11,4%**
2007	13.841	112.76	**12,3%**	11.570	98.921	**11,7%**
2008	14.128	114.26	**12,4%**	12.115	100.139	**12,1%**
2009	13.606	115.32	**11,8%**	12.493	101.717	**12,3%**
2010	14.053	105.81	**13,3%**	11.254	91.766	**12,3%**
2011	12.930	92.774	**13,9%**	11.447	79.844	**14,3%**
2012	12.320	80.971	**15,2%**	12.485	68.651	**18,2%**
2013	11.484	74.321	**15,5%**	11.518	62.837	**18,3%**
2014	11.165	75.695	**14,7%**	10.770	64.530	**16,7%**
2015	11.613	74.784	**15,5%**	10.580	63.171	**16,7%**
2016	12.089	74.343	**16,3%**	11.182	62.254	**18,0%**

Table A5: GG Employment

Year	Perma-nent	Non-per-manent	Self financed	**Total**
2009	755.598	192.658	21.883	**970.139**
2010	723.723	148.341	20.532	**892.596**
2011	692.582	84.890	20.511	**797.983**
2012	672.719	67.783	24.527	**765.029**
2013	632.306	52.719	51.476	**736.501**
2014	608.791	50.573	44.946	**704.310**
2015	600.484	55.406	44.946	**700.836**
2016	598.870	63.732	44.946	**707.548**

Source: Μητρώο Ανθρωπίνου Δυναμικού Ελληνικού Δημοσίου (Public Sector Human Resources Registry)

Table A6: Burden of the Wage Bill

	D1 adj.	**D61r**	**D5r**	**D1 net**
2009	30.916	-7.280	-2.827	20.808
2010	27.930	-6.839	-2.398	18.693
2011	25.967	-6.893	-2.857	16.217
2012	24.336	-7.350	-2.248	14.737
2013	21.716	-6.631	-2.124	12.962
2014	21.611	-7.031	-2.088	12.493
2015	21.310	-7.116	-1.941	12.254
2016	21.316	-7.096	-1.943	12.277

Table A7: Wage Bill-Final Burden

	D1 net	**D62p**	**D61r**	**D5r**	**D1 final**
2009	20.808				20.808
2010	18.693	763	-58	-18	19.379
2011	16.217	1.444	-111	-70	17.480
2012	14.737	1.829	-140	-94	16.332
2013	12.962	2.385	-183	-127	15.037
2014	12.493	2.763	-212	-149	14.895
2015	12.254	2.934	-225	-158	14.805
2016	12.277	3.077	-237	-165	14.952

Table A8: Average ULC and Tax Wedge

	General Government				**Private sector**			
	ULC	**Take-home**	**Tax wedge**	**Tax wedge (% of ULC)**	**ULC**	**Take-home**	**Tax wedge**	**Tax wedge (% of ULC)**
2009	32.603	21.944	10.659	**32,7%**	27.195	17.709	9.486	**34,9%**
2010	30.687	20.538	10.149	**33,1%**	28.522	18.388	10.134	**35,5%**
2011	31.484	19.662	11.821	**37,5%**	27.085	16.739	10.346	**38,2%**
2012	32.064	19.417	12.647	**39,4%**	26.664	16.799	9.864	**37,0%**
2013	30.468	18.185	12.282	**40,3%**	25.742	15.751	9.991	**38,8%**
2014	32.150	18.585	13.566	**42,2%**	23.612	15.249	8.364	**35,4%**
2015	32.405	18.634	13.771	**42,5%**	21.551	13.987	7.565	**35,1%**
2016	32.334	18.623	13.711	**42,4%**	21.624	14.001	7.623	**35,3%**
Change	*-0,8%*	*-15,1%*	*28,6%*	**29,7%**	*-20,5%*	*-20,9%*	*-19,6%*	**1,1%**

Table A9: Fiscal Impact on GDP (2010-2016)

	π	ΔX	ΔY	ΔX	ΔY	ΔX	ΔY
W^G	**1,435**	-9.447	-13.558				
C^G	**0,323**	-7.610	-2.458	**-33.111**	**-31.966**		
I^G	**0,323**	-6.371	-2.058				
ST	**1,435**	-9.683	-13.892			**28.732**	**-24.007**
T^D	**-1,633**	-2.145	3.503				
T^S	**-1,561**	-4.412	6.885	**-4.379**	**7.959**		
T^I	**-1,115**	2.178	-2.429				

Note: "ΔX" and "ΔY" mean change of the fiscal variable and the GDP, respectively.

Table A10: m-Multipliers and Fiscal Impact (2010-2016)

	m	Δ(X/Y)	ΔY/Y	Δ(X/Y)	ΔY/Y	Δ(X/Y)	ΔY/Y
W^G	**1,666**	-0,8%	-1,3%				
C^G	**0,327**	-2,0%	-0,6%	**-2,8%**	**0,0%**		
I^G	**0,326**	-1,8%	-0,6%				
ST	**1,461**	1,7%	2,5%			**11,8%**	**-10,3%**
T^D	**-1,454**	1,8%	-2,6%				
T^S	**-1,346**	1,8%	-2,5%	**8,9%**	**-10,3%**		
T^I	**-0,976**	5,3%	-5,2%				

Note: "Δ(X/Y)" means change of the fiscal variable ratio to GDP.

Table A11: The Alternative Scenario and Policy Mix

	W^G	C^G	I^G	ST	**Exp.**	T^D	T^S	T^I	**Rev.**	**Total**
	€ m.									
Actual	-9.447	-7.610	-6.371	-9.683	**-33.111**	-2.145	-4.412	2.178	**-4.379**	**28.732**
Alternative	-7.554	-6.927	-5.915	-7.025	**-27.421**	-3.047	-5.198	-4	**-8.249**	**19.172**
Difference	*1.893*	*683*	*456*	*2.658*	***5.690***	*-902*	*-786*	*-2.182*	***-3.870***	***-9.560***
	% of GDP									
Actual	-0,8%	-2,0%	-1,8%	1,7%	**-2,8%**	1,8%	1,8%	5,3%	**8,9%**	**11,8%**
Alternative	-1,1%	-2,1%	-1,9%	0,8%	**-4,2%**	0,3%	0,0%	2,5%	**2,8%**	**7,0%**
Difference	*-0,3%*	*-0,1%*	*-0,1%*	*-0,9%*	***-1,4%***	*-1,5%*	*-1,8%*	*-2,8%*	***-6,1%***	***-4,8%***

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