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Are Fiscal Adjustments Bad for Investment?

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by

Christoph A. Schaltegger
University of Lucerne, University of St. Gallen, CREMA

and

Martin Weder
University of Lucerne

Abstract

The current debt crisis in many OECD countries calls for adequate strategies in budget consolidation. To regain fiscal solvency many governments base their fiscal adjustments at least partly on spending cuts. A common political claim is that spending cuts rely too much on investment thereby undermining future long-term growth perspectives. We study the effect of fiscal adjustments on economic growth, consumption and investment for a panel of 20 OECD countries during the 1970-2008 period. Our results support the idea of expansionary consolidations in the case of sizeable adjustments and through spending cuts. The effect is primarily a result of increased consumption rather than investment. While fiscal adjustments also boost private investment, this tends to be offset by a corresponding reduction in government investment. Fiscal consolidations therefore hardly affect total investment.

JEL-Classification: E61, E63, H61

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Corresponding Author: Christoph A. Schaltegger
University of Lucerne
Winkelriedstrasse 14
CH-6000 Lucerne 7
Switzerland
christoph.schaltegger@unilu.ch

1. Introduction

The macroeconomic effects of fiscal adjustments have received much attention during the recent debt crisis. While there are some who are skeptical about the contractive effects of spending cuts and tax increases on aggregate demand, others argue that under certain circumstances, strict consolidations may boost private demand to an extent that overcompensates the loss in public demand. Among the first, Giavazzi and Pagano (1990) study two major fiscal contractions in Denmark (1983-1986) and in Ireland (1987-1989) that were associated with surprising immediate non-Keynesian expansionary economic effects. If consumers are persuaded that the proposed consolidation strategy will lead to sustained smaller government spending, and hence a reduction of the expected tax burden, they perceive an increase in their permanent income which affects private consumption decisions. In addition, the reduction of the cost of public debt service reduces real interest rates which, in turn has a positive effect on private investment (Ardagna, 2009; Schaltegger and Weder, 2010). In this context, credibility of the consolidation strategy is decisive. Credibility can be achieved by sizeable and sustained fiscal adjustments as they signal a true policy change whereas only small adjustments fail to persuade consumers anticipating their consumption to a higher level of income. Ardagna (2004) provides empirical evidence on this "expectation view" causing expansionary consolidations.

The initial conditions of fiscal consolidations are also of importance: non-Keynesian effects more often occur in highly indebted countries and countries with rapidly growing indebtedness (Giavazzi, Jappelli and Pagano, 2000). One recent example might be Ireland. Still faced with declining real estate prices and an ailing banking system, GDP in Ireland has contracted by more than 14% since the beginning of the crisis. The public deficit of 14.3 percent of GDP was the highest among all OECD countries in 2009 and debt is projected to reach 83 percent this year after 29 percent in 2007. Decisive measures by the government were announced in spring of 2009. In the first quarter of 2010, Ireland recorded the highest quarter on quarter GDP growth rate of all EU-27 countries at 2.7 percent (OECD, 2010).

In addition, the effect of the composition of the consolidation program has been analyzed. Among the first, Alesina, Perotti and Tavares (1998) show that expansionary fiscal adjustments are more likely if they rely primarily on spending cuts rather than tax increases (the labor market view or composition view). Especially successful seem to be spending cuts on government wages and transfers to households (Alesina and Ardagna, 1998). The argument is that wage moderation by the government serves as a signal to wage claims in the private sec-

tor which stimulates employment, capital accumulation and economic growth (Ardagna, 2007).

Some authors argue that successful consolidations are caused by a devaluation of the currency. Lambertini and Tavares (2005) show that monetary and exchange rate policies are important for the success of major fiscal adjustments: if a fiscal adjustment episode is preceded by an exchange rate depreciation in the two years before the enactment, the probability of success is significantly higher.

While some authors like van Aarle and Garretsen (2003) or Afonso (2006, 2010) devote their research on expansionary fiscal adjustment on the question of the relation between consolidation and private consumption spending, the effect of fiscal adjustments on private investment is much less elaborated.[1] However, a common political claim is that spending cuts rely too much on investment thereby undermining future long-term growth perspectives. Therefore, we concentrate on the question: Are fiscal adjustments bad for investment?

Our paper follows Ardagna (2004), van Aarle and Garretsen (2003) or Afonso (2006, 2010) and evaluates the impact of fiscal adjustments on growth, consumption and investment. We distinguish between effects on consumption as well as on public and private investment.[2] Our results support the idea of expansionary consolidations in the case of sizeable fiscal adjustments and through spending cuts. The effect is primarily the result of increased consumption rather than increased investment. While consolidations boost private investment, this does not outweigh the reduction in government investment. Total investment is hardy affected by fiscal consolidations.

The paper proceeds as follows. Section 2 provides information on the empirical method and on the data we use for our empirical analysis. In section 3 we first focus on the interpretation of descriptive findings around the episodes of fiscal adjustments followed by section 4 with the empirical analysis. Section 5 is devoted to some robustness checks whereas section 6 offers concluding remarks.

[1] An important contribution on the effect of fiscal policy on investment is Alesina, Ardagna, Perotti and Schiantarelli (2002).

[2] We also analyzed the effects of fiscal adjustments on FDI inflows and outflows, but did not find any statistically relevant influence in either direction. Instead, determinants of FDI flows include the tax level, the size and openness of the economy, political stability and political governance (i.e. accountability, corruption, red tape), economic growth and economic freedom or the quality of infrastructure – see for example the World Bank Group (2010), Chowdhury and Mavrotas (2006), Nonnemberg and Cardoso de Mendonça (2004) or Dabla-Norris, Honda, Lahreche and Verdier (2010).

2. Data and methodological issues

2.1. Data

We use annual data from the OECD's Economic Outlook database to study the effect of fiscal adjustments on economic growth, consumption and investment. Our sample includes 20 OECD countries and covers a maximum time span from 1970 to 2008. The countries in the sample are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, New Zealand, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. Data for the remaining OECD member countries, particularly those of Eastern Europe, were either incomplete or even unavailable for some variables and were thus not included in our calculations. Data on exchange rates are from the Bank for International Settlements (BIS) while bank crises are defined as in Reinhart and Rogoff (2009). Appendix A provides an overview and a description of all variables and sources used in our analysis.

2.2. Methodological issues

When assessing the effects of fiscal policy on economic activity, there are at least three methodological issues that need to be addressed. First, a critical point is the definition of fiscal adjustments. The prevailing measure in the literature is a certain threshold based on the cyclically adjusted primary balance (CAPB). Some authors analyze changes in taxes and expenditure without defining a threshold while others rely on dummy variables that define a consolidation period if the structural budget balance improves from one year to the other. Depending on the definition used, the number and selected years of fiscal adjustments may differ substantially. Our method to identify episodes of budget consolidation draws from previous works by Alesina and Perotti (1997), von Hagen, Hughes-Hallett and Strauch (2001), Ardagna (2004), Mierau, Jong-A-Pin and de Haan (2007) and others. Episodes are selected on the basis of large and substantial changes of the CAPB expressed as a percentage of GDP. Using the CAPB measure has the advantage that business cycle fluctuations such as changes in inflation and real interest rates are factored in. Since this measure also excludes interest payments, this definition largely reflects changes in discretionary fiscal policy. However, the CAPB has been

criticized because it can be distorted by asset prices, extraordinary expenditure or windfall gains.[3]

Definition of fiscal adjustments

- A period of fiscal adjustment is a time span in which the cyclically adjusted primary balance (CAPB) improves by at least 1.5 percent of GDP in each year or by at least 1.2 percent of GDP in two consecutive years.
- A period of fiscal adjustment is successful if gross financial liabilities as a percentage of GDP are reduced by at least 5 percentage points in the three years following the adjustment.

This definition of fiscal adjustments is relatively strict compared with the existing literature since it is the purpose of our analysis to focus on large and substantial changes in fiscal policy. Small adjustments and those that are carried out over a prolonged period are thus excluded. In order to avoid arbitrariness in our definition and to check for the robustness of our results, we also ran calculations with alternative measures such as the primary deficit unadjusted for the business cycle or a dummy variable taking the value of 1 if the CAPB improved in a particular year.

Second, a potential problem is the existence of reverse causality or endogeneity. In our estimation functions we use the growth of real GDP, consumption per capita and investment per capita as our dependent variable while the fiscal adjustment period constitutes one of many explanatory variables. We thus assume that fiscal policy affects economic activity. Regression results only show correlations and whether those are statistically significant, but they do not provide an answer to the question of causality. One could argue that there is a causal relationship in the opposite direction, meaning that economic activity has a substantial effect on fiscal policy. To make sure our results are not biased, we need to test for endogeneity and apply an appropriate estimation technique (see section 5.1).

Third, by using annual data we are unable to define precisely when a change in fiscal policy was announced and implemented. By letting the data define our fiscal adjustments, we neglect the exact date the decision was made and could thus be confronted with statistical artifacts. By using a relatively high threshold for the definition of fiscal adjustments, we increase the

[3] See for example Girouard and Price (2004), Koen and van den Noord (2005) or the OECD (2007).

probability that the consolidation periods defined actually reflect policy changes. Furthermore, even if we knew the date a fiscal adjustment strategy was enacted by the corresponding parliament, we could still be confronted with an implementation lag or ripple effects. In line with the existing literature, we therefore also look at the three years that preceded the adjustments and the three years that followed.

3. Descriptive findings

Table 1 summarizes all episodes of fiscal adjustments over the past four decades using the definition of the cyclically adjusted primary balance. With the exception of France and Germany, all countries in our sample experienced at least one year of budget consolidation as determined by an improvement in the cyclically adjusted primary balance. Countries like Greece, Portugal, Italy and Sweden even experienced eight or more years of fiscal adjustments. Overall, 62 fiscal adjustments took place between 1970 and 2008, covering a total of 88 periods.

The fiscal adjustments defined are in line with the existing literature and include the well known examples of Denmark and Ireland in the 1980's as well as Canada and Sweden in the 1990's. However, as table 2 shows, only about one third of all adjustments (19 out of 60) were successful and led to lower debt levels. If we use a different definition of a fiscal adjustment and consider a budget consolidation to have been successful if debt levels were at least unchanged three years after the adjustment took place, this share increases to 47 percent. Over time, fiscal adjustments have become more likely to be successful. In the 1970's only 14 percent of all adjustments led to lower debt levels. This share rose to a third in the 1980's and over 50 percent during the last twenty years. More details about the distribution of adjustments over time, their size and duration are provided in the appendix G.

Table 3 shows that in line with the empirical literature, countries with successful adjustments faced higher interest rates, higher debt and higher expenditure before and during budget consolidation. The size of the adjustment as expressed by the change in the cyclically adjusted primary balance was very similar, however. The major difference was in the composition of the adjustment. During successful adjustments, expenditure was cut by 1.5 percent of GDP during each year of consolidation. In unsuccessful cases, expenditure was cut by only 0.2 percent while tax revenue increased by sharply by 1.5 percent of GDP. Adjustments cannot generally be described as contractionary as the average real GDP growth rate was almost 2.4 percent. The unweighted average between 1970 and 2008 for all 20 countries observed is 2.8

percent. Countries with successful fiscal adjustments even experienced a small growth premium during those periods – both when compared with the G7 states or all 20 OECD countries. This is surprising given the fact these countries were also confronted with appreciating exchange rates.

Table 1: Episodes of fiscal adjustments (as defined by the cyclically adjusted primary balance)

Country	Adjustments	Periods	Successful	Year(s)
Australia	1	2	2	1986-87
Austria	3	4	0	1984, 1996-97, 2001
Belgium	5	5	2	1977, 1982, 1984, 1987, 1993
Canada	3	6	3	1981, 1986-87, 1995-97
Denmark	2	6	6	1983-86, 2004-05
Finland	6	6	1	1981, 1984, 1988, 1994, 1998, 2000
France	0	0	0	-
Germany	0	0	0	-
Greece	4	8	5	1986-87, 1991-94, 1996, 2005
Ireland	2	5	3	1983-84, 1986-1988
Italy	6	8	0	1976-77, 1982-83, 1991, 1993, 1995, 2006
Japan	1	1	0	1984
Netherlands	4	4	2	1972, 1983, 1991, 1993
New Zealand	5	6	5	1987, 1989, 1993-94, 2000, 2002
Portugal	5	8	0	1982-1984, 1986, 1992, 1995, 2006-07
Spain	2	2	0	1987, 1992
Sweden	6	9	4	1976, 1981, 1983-84, 1986-87, 1996-97, 2000
Switzerland	1	1	0	2000
United Kingdom	3	6	4	1980, 1982, 1995-1998
United States	1	1	0	1976
Total	**60**	**88**	**37**	

Table 2: Episodes of successful fiscal adjustments (as defined by the cyclically adjusted primary balance)

Country	Successful	Year(s)
Australia	2	1986-87
Belgium	2	1987, 1993
Canada	3	1995-97
Denmark	6	1983-86, 2004-05
Finland	1	1998
Greece	5	1991-94, 2005
Ireland	3	1986-1988
Netherlands	2	1972, 1993
New Zealand	5	1987, 1993-94, 2000, 2002
Sweden	4	1986-87, 1996-97
United Kingdom	4	1995-98
Total	**37**	

Table 3: Episodes of fiscal adjustments: Characteristics

	Adjustment	Successful	Failed
No. of observations	88	37	51
Real GDP Growth	2.38	2.79	2.08
Real GDP Growth vs. OECD	-0.28	0.02	-0.50
Real GDP Growth vs. G7	-0.21	0.26	-0.56
Δ Consumption (% of GDP)	0.87	1.45	0.62
Δ Investment (% of GDP)	-0.20	-0.44	0.04
Δ Private Investment (% of GDP)	0.18	0.11	0.27
Δ Public Investment (% of GDP)	-0.37	-0.55	-0.24
CAPB (% of GDP)	0.84	1.86	0.10
Δ CAPB (% of GDP)	2.21	2.17	2.23
Tax Revenue (% of GDP)	37.65	38.64	36.92
Δ Tax Revenue (% of GDP)	1.25	0.95	1.47
Expenditure (% of GDP)	48.79	49.43	48.32
Δ Expenditure (% of GDP)	-0.73	-1.51	-0.17
Real interest rate (10 year bond)	4.31	5.07	3.78
Δ Real interest rate (10 year bond)	-0.001	-0.84	0.58
Gross Debt (% of GDP)	71.75	77.09	67.88
Δ Gross Debt (% of GDP)	1.27	0.61	1.75
Exchange Rate (2005 = 100)	96.85	94.01	98.91
Δ Exchange Rate (2005 = 100)	0.32	1.16	-0.28

Private consumption as a share of GDP increased by 0.87 percent of GDP during fiscal adjustments while investment dropped by 0.2 percent. Differentiating between private and public investment reveals that the strong decline in government fixed capital formation (-0.4 percent) offsets the rise in private investment. The development of public investment during fiscal adjustments is striking. Overall, public investment has witnessed a steep decline since the 1970's, dropping by more than 40 percent from over 4.3 percent of GDP in 1971/72 to 2.5 percent in 2005 (see figure 5 in Appendix G). The average decline over the entire sample is 0.04 percent of GDP per year, but more than nine times larger at 0.37 percent during fiscal adjustments. The decline of public investment as a share of GDP was particularly strong during successful adjustments (-0.55 percent versus -0.24 percent during failed budget consolidations). Knowing that the economy grew by almost 2.8 percent in adjustment periods, the increasing share of consumption and private investment as a percentage of GDP indicates that growth of investment and consumption was even higher which can be interpreted as evidence for non-Keynesian effects.

Figure 1 plots the development of GDP growth, consumption and investment before, during and after fiscal adjustments. Periods of fiscal adjustments are labeled as T, no matter how many years they lasted. The three years before the adjustments are T-3, T-2 and T-1 while the

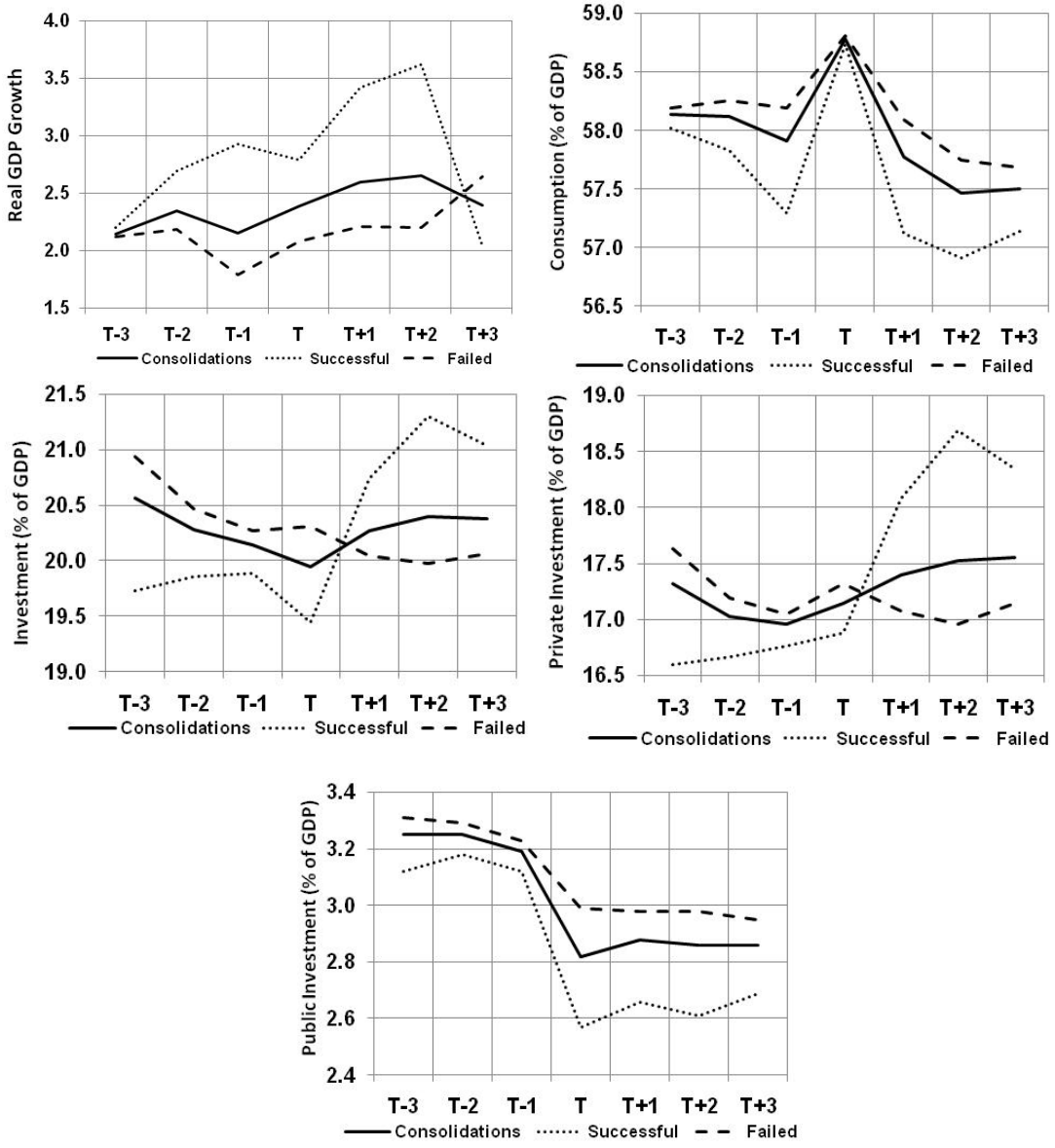
three years afterwards are labeled T+1, T+2 and T+3 respectively. Real GDP growth is slightly lower than the historical average – not only during, but also before and after fiscal adjustments. However, growth picks up from 2.4 to 2.6 and 2.7 percent in the two years after budget consolidation took place. Unlike predicted by Keynesian theory, growth increases during periods of fiscal adjustment from 2.2 percent in the previous year to 2.4 percent. Successful adjustments are associated with accelerating growth rates that peak at 3.7 percent two years after the budget consolidation took place. Although growth rates even increase after failed adjustments, they remain below the historical average through all periods observed.

The main non-government components of GDP, private consumption and private investment, increase as a share of GDP if an austerity program is implemented. The share of consumption improves by 0.9 percent of GDP, while private investment rises 0.2 percent. Net exports (not shown) also improve by 0.3 percent of GDP. Total investment diminishes by 0.2 percent though as the rise in private investment is more than offset by a strong decline in government investment (-0.4 percent). Interestingly, the share of consumption decreases after a fiscal adjustment took place. This effect is particularly strong for successful adjustments. Consumption then remains at below pre-crisis levels. Investment recovers after budget measures by the government were taken and almost reaches pre-crisis levels after three years. Overall, the share of private investment remains higher than before the fiscal adjustments took place. Public investment, however, stays subdued. Thus it appears that with every budget crisis the government faces, public investment is slashed disproportionately and is then not brought back to previous levels. Repeatedly cutting expenditure where political opposition is small also means that governments will gradually run out of simple options when faced with a large budget deficit.

Austerity measures that led to lower debt levels were followed by an immediate boost in private investment. Its share of GDP increases by almost 2 percentage points from 16.8 to 18.7 percent and remains elevated even three years later. Failed adjustments on the other hand only experienced a temporary rise in private investment, followed by a decline in the two years afterwards. As the government announces and starts implementing budget cuts, firms might view this behavior as an encouraging sign and increase investment. However, if uncertainty about the government's willingness to cut the deficit persists or budgetary measures are diluted, firms might quickly become reluctant to invest more. Figure 6 in Appendix G depicts

how government revenue, expenditure and gross debt developed before, during and after fiscal adjustments.

Figure 1: Real GDP growth, consumption and investment during fiscal adjustments



4. Empirical analysis

In this section, we describe our method used for the empirical analysis, discuss the choice of the variables of interest, investigate the time-series properties of the variables and present the main results. Since our objective is to study the effect of fiscal adjustments on economic growth, consumption and investment, the corresponding growth rate is chosen as the depen-

dent variable. Economic growth refers to annual real GDP growth while real growth of consumption and investment per capita are also examined.

4.1. Empirical specification

Although the subject of our empirical work is similar to what has been done by Giavazzi and Pagano (1996), van Aarle and Garretsen (2003), Afonso (2006, 2010) and others, we differ methodologically. In addition to estimating consumption, we also look at GDP growth as well as public and private investment. We also use a broader set of fiscal adjustment variables. Previous work primarily focused on the lagged level of government consumption and taxes as well as changes in taxes and expenditure. We expand the analysis by also controlling for other economic and fiscal variables as well as by using a more detailed composition of fiscal adjustments.

We estimate the following linear equation for an unbalanced panel of 20 countries covering the period from 1970 to 2008 while using country as well as year dummies:

$$g_{i,t} = \alpha_{i,t} + \beta_1 g_{i,t-1} + \beta_2 GDP_{i,t} + \beta_3 GDP_{i,t-1} + \beta_4 OECD_{i,t} + \beta_5 MONETARY_{i,t} + \beta_6 INTEREST_{i,t} + \beta_7 EXPENDITURE_{i,t} + \beta_8 TAX_{i,t} + \beta_9 EXCHANGE_{i,t} + \beta_{10} CRISIS_{i,t} + \beta_{11} OPEN_{i,t} + \beta_{12\Delta} DEBT_{i,t} + \beta_{13} POPULATION_{i,t} + \beta_{14} ADJUSTMENT_{i,t} + \varepsilon_{i,t} \quad (1)$$

where g is the growth rate of GDP, consumption or investment, measured as the change in the logarithm of real per capita values, for t = 39 years and i = 20 OECD countries. The constant is labeled as α, the corresponding coefficients of the explanatory variables are $\beta_1, \beta_2, \ldots, \beta_{14}$. The error term is ε_t. The first part of the equation is identical to Giavazzi and Pagano (1996), van Aarle and Garretsen (2003) and Afonso (2006, 2010). For example, the growth rate of per capita consumption is a function of consumption in the previous period ($g_{i,t-1}$) as well as growth of real GDP in the current and the previous period ($GDP_{i,t}$, $GDP_{i,t-1}$). We also include the growth rate of real GDP of the 20 OECD countries included in our sample ($OECD_{i,t}$).[4] This control variable is important to test for potential external effects between countries. Fiscal adjustments in a given country might be more likely and more likely to be successful if the most important trade partners experience high growth rates and do not implement a tight fis-

[4] Giavazzi and Pagano (1996) include the growth of world income instead of OECD income. We tried to estimate both versions, but had to drop the variable "world income" because of multicollinearity. We thus used the variable OECD income as in van Aarle and Garretsen (2003) or Afonso (2006), but used the average of the 20 countries in our sample instead of the average from all OECD member countries.

cal policy at the same time. Other economic and policy variables included in the analysis are the short-term interest rate set by the central bank (MONETARY), the real interest rate as measured by the yield of the 10-year government bond adjusted for the consumer price index (INTEREST), total government expenditure and tax revenue as a share of GDP (EXPENDITURE, TAX), effective exchange rates adjusted by relative consumer prices and weighted by trade volume (EXCHANGE), a dummy variable D_t where $D_t = 0$ in normal times and $D_t = 1$ if the country was hit by a banking crisis (CRISIS), the sum of exports and imports as a share of GDP to describe the openness of markets (OPEN), the change in total public debt as a share of GDP (ΔDEBT) and the rate of population growth in percent (POPULATION). Our variable of interest is labeled as ADJUSTMENT and includes eight different definitions of fiscal adjustment. While Giavazzi and Pagano (1996), van Aarle and Garretsen (2003) as well Afonso (2006) use a dummy variable $D_t = 1$ for fiscal policy variables during adjustments and a term $1 - D_t$ for normal times, we only look at adjustment periods and use all observations as a reference group.[5] The adjustment variables are defined as follows.

4.2. Specification of fiscal adjustment variables

- (1) **Fiscal adjustment * debt:** This variable is a dummy for episodes in which a fiscal adjustment took place multiplied by total public debt in order to check whether the effect of a budget consolidation on growth also depends on the extent of government indebtedness as stated for example by Perotti (1999).
- (2) **Fiscal adjustment * exchange**: An interaction term of the consolidation variable (1) multiplied with the real exchange rate evaluates the impact of the exchange rate movements during a period of consolidation for economic growth, consumption and investment. Hjelm (2002) or Lambertini and Tavares (2005) argue that successful adjustments are preceded by exchange rate depreciations.
- (3) **Successful adjustment / failed adjustment**: Two dummy variables that distinguish whether the adjustment was successful as defined above (section 2.2.) or failed to lead to lower debt levels.
- (4) Δ **Primary deficit:** Measures the change in the primary balance as a percentage of GDP.

[5] However, we also calculated regressions with a term $1 - D_t$ for normal times. The results are displayed in Appendix E, Table 12.

- (5) Δ **Primary deficit * adjustment**: Refers to the change in the primary balance in a given consolidation year measured as a percentage of GDP. This variable thus reflects the size of the adjustment.
- (6) **Share of expenditure cuts**: Indicates to what degree improvements of the CAPB during fiscal adjustments can be attributed to measures taken on the expenditure side of the budget. If an austerity program is based entirely on expenditure cuts, the corresponding value is 1. It is zero if the improvement of the CAPB was brought forth by a tax increase. The mean for all adjustments in our sample is close to 0.4.
- (7) **Expenditure based adjustment / Revenue based adjustment**: Two dummy variables that define the adjustments from (1) more precisely. They indicate whether more than 50% of the improvement of the CAPB can be attributed to measures on either the expenditure or the revenue side. For all 88 fiscal adjustment periods observed, one of the two dummies thus equals one.
- (8) **Expenditure based * Δ deficit / Revenue based * Δ deficit**: These two variables use the dummy variables specified in (7) and are multiplied by the change in the CAPB. For example, if an adjustment was primarily based on expenditure cuts and led to an improvement of the CAPB of 1.5 percent of GDP, the corresponding value is 1.5.

All variables, their description and sources are indicated in Appendix A. The respective descriptive statistics are summarized in Appendix B. Finally, the correlation coefficients are presented in Appendix F. Fiscal indicators always refer to the general government and are expressed as a share of GDP.

4.3. Time series properties

The stationarity properties of our relevant series were calculated by using the Fisher test (see Appendix C). Since we do not have complete data for all countries and variables dating back to 1970, we are estimating an unbalanced panel and can thus not rely on standard unit root tests for panel data. Instead, we used the Fisher test which is designed specifically for unbalanced panels and is provided in STATA. The null hypothesis states that the variable is non-stationary. The results show that for real GDP growth and private consumption per capita the existence of a unit root can be rejected at all levels. Total, private and public investment per capita are all non-stationary. When using first differences, however, the null hypothesis is clearly rejected for all dependent variables used in our estimations. With the exception of monetary policy, the effective exchange rate and openness variable, the null hypothesis is also

rejected for the explanatory variables. Non-stationarity for the real interest rate and government expenditure can be rejected at the 5% significance level.

4.4. Fiscal adjustments and real GDP growth

To estimate the influence of fiscal adjustments on real GDP growth, we use a model with fixed-effects (country and year effects) and real GDP growth as our dependent variable. Basic control and fiscal adjustment variables are chosen as outlined in section 4.1 and 4.2 above. Depending on the fiscal adjustment variable used, the number of observations varies between 599 and 627. Results are summarized in Table 4.

According to the results reported in Table 4, there is no evidence that fiscal adjustments have a negative effect on real GDP growth even if they are large or primarily based on cuts in expenditure. On the contrary, there is some weak evidence in favor of non-Keynesian effects. In equation (4), the more substantial the improvement in the primary balance, the higher real GDP growth will be. An improvement in the primary balance of 1 percent of GDP adds 0.18 percentage points to GDP growth. This effect remains robust when we only look at fiscal adjustments episodes as in equation (5). The interaction term is not significant, indicating that the effect of an improvement in the primary balance is not different than during normal times. The coefficient of the conditional fiscal adjustment variable is negative. The total effect of the improvement in the primary balance thus depends on the size of the adjustment. Above a threshold of around 1.5 percent of GDP, the total effect is positive.

Equation (6) shows that GDP growth is enhanced if the fiscal adjustment is largely based on expenditure cuts. Simply differentiating between expenditure based and revenue based consolidations by a dummy as in equation (7) does not confirm this picture, however. In equation (8), the fiscal adjustment variables do not have a significant effect on GDP growth. As in equation (5), the positive effect on growth originates from the improvement in the primary balance, but not from the fiscal adjustment. According to equations (1) and (2), the level of public debt or changes in the exchange rate during fiscal adjustments do not have an effect on GDP growth.

Table 4: Effect of fiscal adjustments on real GDP growth[6]

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP $_{t-1}$	0.22*** (5.78)	0.22*** (5.81)	0.22*** (5.85)	0.18*** (4.86)	0.22*** (5.85)	0.21*** (5.57)	0.21*** (5.54)	0.18*** (4.74)
Δ GDP OECD	0.82*** (9.41)	0.82*** (9.48)	0.82*** (9.47)	0.62*** (6.98)	0.82*** (9.47)	0.72*** (8.48)	0.72*** (8.46)	0.62*** (6.94)
Monetary policy	-0.14*** (-5.07)	-0.14*** (-5.09)	-0.14*** (-5.16)	-0.16*** (-5.75)	-0.14*** (-5.16)	-0.15*** (-5.59)	-0.15*** (-5.66)	-0.15*** (-5.53)
Real interest rate	0.22*** (6.43)	0.22*** (6.43)	0.22*** (6.44)	0.25*** (7.47)	0.22*** (6.44)	0.23*** (7.07)	0.23*** (7.06)	0.25*** (7.40)
Expenditure	-0.04* (-1.86)	-0.04** (-2.12)	-0.04** (-2.12)	-0.06*** (-3.01)	-0.04** (-2.12)	-0.06*** (-2.76)	-0.06*** (-2.76)	-0.06*** (-2.96)
Tax revenue	-0.12*** (-3.64)	-0.12*** (-3.69)	-0.12*** (-3.72)	-0.12*** (-3.83)	-0.12*** (-3.72)	-0.11*** (-3.57)	-0.11*** (-3.59)	-0.12*** (-3.80)
Exchange rate	-0.01* (-1.90)	-0.01* (-1.80)	-0.01* (-1.90)	-0.01 (-1.64)	-0.01* (-1.90)	-0.01** (-2.09)	-0.01** (-2.08)	-0.01 (-1.64)
Banking crisis	-0.61*** (-2.89)	-0.62*** (-2.96)	-0.62*** (-2.98)	-0.58*** (-2.86)	-0.62*** (-2.98)	-0.59*** (-2.93)	-0.60*** (-2.99)	-0.59*** (-2.90)
Openness	0.03*** (3.24)	0.03*** (3.27)	0.03*** (3.24)	0.03*** (3.31)	0.03*** (3.24)	0.03*** (3.24)	0.03*** (3.33)	0.03*** (3.27)
Δ Gross debt	-0.08*** (-4.70)	-0.08*** (-4.75)	-0.08*** (-4.73)	-0.07*** (-4.21)	-0.08*** (-4.73)	-0.08*** (-4.84)	-0.08*** (-4.74)	-0.07*** (-4.19)
Population growth	0.38* (1.86)	0.38** (1.99)	0.37** (1.98)	0.31 (1.70)	0.37** (1.98)	0.23 (1.25)	0.23 (1.23)	0.31* (1.67)
Fiscal adjustment	0.46 (1.00)	0.20 (0.14)			-0.41* (-1.90)			
Adj. * Debt	-0.004 (-0.67)							
Public Debt	0.00 (0.08)							
Adj.* Exchange		-0.00 (-0.02)						
Successful Adj.			0.03 (0.10)					
Failed Adjustment			0.28 (1.25)					
Δ Primary deficit				0.18*** (4.92)	0.23*** (4.80)			0.19*** (4.38)
Δ Primary * Adj.					0.05 (0.56)			
Share Δ Exp.						0.50* (1.90)		
Expenditure based							0.32 (1.51)	-0.24 (-0.45)
Revenue based							0.22 (0.96)	-0.06 (-0.13)
Exp.based*ΔDeficit								0.10 (0.45)
Rev.based*ΔDeficit								-0.05 (-0.25)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	627	627	627	599	599	611	611	599
R2	0.616	0.616	0.616	0.646	0.616	0.635	0.634	0.646
F-statistic	18.29	18.68	18.71	20.64	18.71	20.12	19.63	18.92
Joint significance	0.46	1.58			9.39***			4.97***

t-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As expected, real GDP growth is significantly affected by GDP in the previous year as well as growth in other OECD countries. High levels of government expenditure and tax revenue are

[6] Note: The OECD Economic Outlook database does not provide complete data for all fiscal indicators and for all countries since 1970. Hence, the number of observations varies depending on the fiscal variable or fiscal adjustment strategy variable used.

associated with lower growth rates. Central banks have a significant influence on GDP as well as higher short-term interest rates lead to lower growth rates thereby confirming the counter-cyclical effect of monetary policy. In all equations estimated, OECD countries have higher growth rates the higher the share of exports and imports as a percentage of GDP. Appreciating exchange rates lower GDP growth, although the quantitative effect is small. The existence of a banking crisis on the other hand significantly lowers GDP growth by approximately 0.6 percentage points. An increase in public debt of 10 percent of GDP has a strong negative effect on growth: GDP growth is reduced by 0.8 percentage points.

4.5. Fiscal adjustments and consumption per capita

In a next step, we estimate the influence of fiscal adjustments on the largest component of GDP: private consumption. Overall, private consumption accounts for almost 60 percent of GDP. In some cases it is even higher than 70 percent such as in the United States or Greece. The model remains the same as in section 4.4 with the exception of the added variables GDP per capita and growth in GDP per capita. As table 5 shows, there is further evidence for non-Keynesian effects. The results are also in line with the results from the literature (i.e. Giavazzi and Pagano (1996), van Aarle and Garretsen (2003) or Afonso (2006)).

As before, the level of public debt and changes in the exchange rate do not have a significant influence on consumption per capita. On the other hand, successful adjustments are associated with higher consumption per capita. Failed adjustments lead to lower growth rates, but this effect is insignificant. Equation (4) shows the expected Keynesian effect on consumption if fiscal policy is tightening, that is, if the primary balance is improving. This effect holds when we only look at fiscal adjustment episodes as in equation (5). The corresponding coefficient is negative and significant at the 10% level. However, the interaction term is positive and also significant. Since the coefficient is twice as large, this indicates that fiscal adjustments are associated with higher growth rates in consumption per capita. This is particularly the case for large adjustments. There is further evidence that expenditure based adjustments lead to higher growth rates in consumption per capita as equations (7) and (8) show. Equation (8) also shows that revenue based adjustments have a statistically significant and negative effect on consumption per capita despite the fact that the coefficient of the interaction term is positive and significant.

Table 5: Effect of fiscal adjustments on real consumption per capita[7]

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Consumption $_{t-1}$	-0.15***	-0.15***	-0.15***	-0.16***	-0.16***	-0.15***	-0.15***	-0.15***
	(-7.69)	(-8.03)	(-8.14)	(-7.93)	(-7.99)	(-7.90)	(-7.86)	(-7.96)
Δ GDP per capita	0.65***	0.65***	0.65***	0.65***	0.66***	0.64***	0.64***	0.65***
	(17.75)	(17.74)	(17.90)	(16.28)	(16.36)	(16.68)	(16.72)	(16.27)
GDP per capita $_{t-1}$	0.13***	0.14***	0.14***	0.14***	0.14***	0.13***	0.13***	0.14***
	(7.53)	(7.96)	(8.08)	(7.86)	(7.86)	(7.77)	(7.76)	(7.81)
Δ GDP OECD	-0.002**	-0.002**	-0.002**	-0.002*	-0.002*	-0.002**	-0.002**	-0.001
	(-2.27)	(-2.30)	(-2.31)	(-1.86)	(-1.76)	(-2.48)	(-2.48)	(-1.62)
Monetary policy	-0.0004	-0.0004*	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003
	(-1.62)	(-1.69)	(-1.35)	(-0.96)	(-1.29)	(-1.21)	(-1.05)	(-1.09)
Real interest rate	0.001***	0.001***	0.001***	0.001**	0.001**	0.001***	0.001***	0.001***
	(3.12)	(3.29)	(3.24)	(2.43)	(2.53)	(3.11)	(3.09)	(2.62)
Expenditure	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002	0.0002	0.0002
	(0.92)	(0.83)	(0.94)	(1.32)	(1.06)	(0.89)	(0.92)	(0.95)
Tax revenue	-.0008**	-.0007**	-.0007**	-.001***	-0.001***	-0.001***	-0.001**	-.001***
	(-2.56)	(-2.46)	(-2.45)	(-2.76)	(-2.78)	(-2.62)	(-2.59)	(-2.65)
Exchange rate	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-.0001
	(-1.52)	(-1.37)	(-1.48)	(-1.51)	(-1.48)	(-1.24)	(-1.18)	(-1.35)
Banking crisis	-0.0009	-0.0008	-0.0005	-0.001	-0.001	-0.0006	-0.0007	-0.001
	(-0.50)	(-0.45)	(-0.27)	(-0.74)	(-0.64)	(-0.33)	(-0.38)	(-0.56)
Openness	-.001***	-.001***	-.001***	-.001***	-.001***	-0.001***	-0.001***	-.001***
	(-5.36)	(-5.51)	(-5.47)	(-5.48)	(-5.58)	(-5.48)	(-5.48)	(-5.53)
Δ Gross debt	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
	(-1.19)	(-1.15)	(-1.20)	(-1.23)	(-1.31)	(-1.16)	(-1.17)	(-1.50)
Population growth	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001
	(-1.11)	(-1.11)	(-1.03)	(-0.84)	(-0.54)	(-0.60)	(-0.61)	(-0.60)
Fiscal adjustment	-0.004	0.015			0.002			
	(0.97)	(1.22)			(0.84)			
Adj. * Debt	0.0001							
	(1.28)							
Public Debt	-0.000							
	(-0.57)							
Adj. * Exchange		-0.0001						
		(-1.16)						
Successful Adj.			0.006***					
			(2.64)					
Failed Adjustment			-0.003					
			(-1.55)					
Δ Primary deficit				-0.00	-0.0008*			-0.001
				(-0.27)	(-1.78)			(-1.61)
Δ Primary * Adj.					0.0015*			
					(1.69)			
Share Δ Exp.						0.004		
						(1.51)		
Expenditure based							0.004*	-0.005
							(1.92)	(-0.94)
Revenue based							-0.001	-0.01**
							(-0.47)	(-2.43)
Exp.based*ΔDeficit								0.004**
								(2.12)
Rev.based*ΔDeficit								0.005***
								(2.85)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	627	627	627	599	599	611	611	599
R2	0.636	0.635	0.641	0.628	0.632	0.631	0.632	0.639
F-statistic	19.01	19.40	19.86	18.22	17.81	18.90	18.59	17.54
Joint significance	0.70	1.45			2.36*			3.26***

t-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[7] Note: The OECD Economic Outlook database does not provide complete data for all fiscal indicators and for all countries since 1970. Hence, the number of observations varies depending on the fiscal variable or fiscal adjustment strategy variable used.

Some of the control variables lose their significance when compared to our previous estimates with GDP growth as our dependent variable. This is the case for monetary policy, the exchange rate, the dummy variable $D_t = 1$ if the country observed is in a banking crisis and the change in total public debt. Government expenditure has its traditional Keynesian effect on consumption, but is not significant. A high tax level on the other hand is associated with significantly lower growth rates of real consumption per capita. All variables from the basic consumption function (lagged consumption, growth in GDP per capita, lagged GDP per capita and GDP growth of OECD countries) are also highly significant in all models estimated.

4.6. Fiscal adjustments and investment per capita

Given the general trend towards ever lower shares of public investment as a percentage of GDP and the importance of investment for economic growth, it is relevant to know how fiscal adjustments affect investment. Investment accounts for about 20 percent of GDP of which more than four fifths are spent by the private sector (see Figure 5; Appendix G). We distinguish between total, private and public investment. The results are summarized in tables 6-8.

As with GDP growth and consumption per capita, fiscal adjustments do not seem to harm investment in all specifications estimated (table 6). Instead, coefficients are positive and even significant in some calculations. As before, equation (4) shows that there is a significant positive relationship between the improvement of the primary balance and per capita investment.

Unlike with GDP growth and consumption, tax increases during fiscal adjustments appear to stimulate investment as equation (7) shows. While this result would be puzzling in normal times, it is further evidence of non-Keynesian effects in times of fiscal crisis. Afonso (2006, 2010) argues that non-Keynesian effects may be associated with tax increases at high levels of government indebtedness. If the public perceives the consolidation program as a serious attempt by the government to reduce borrowing requirements, then there could be an induced wealth effect, potentially increasing consumption and investment. This argument is based upon the “expectational view of fiscal policy” put forth by Blanchard (1990), Sutherland (1997) and others. If the government is able to reduce the structural deficit, risk premiums and real interest rates will be reduced, leading to a crowding-in of private investment. Cuts in expenditure on the other hand do not appear to have an effect on total investment per capita.

Table 6: Effect of fiscal adjustments on total investment per capita[8]

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Investment $_{t-1}$	-0.12***	-0.12***	-0.12***	-0.11***	-0.11***	-0.11***	-0.11***	-0.11***
	(-7.31)	(-7.10)	(-7.14)	(-6.35)	(-6.32)	(-6.89)	(-6.92)	(-6.39)
Δ GDP per capita	2.18***	2.19***	2.19***	2.15***	2.13***	2.23***	2.22***	2.15***
	(21.82)	(21.92)	(21.92)	(19.82)	(19.53)	(21.17)	(21.12)	(19.76)
GDP per capita $_{t-1}$	0.14***	0.13***	0.13***	0.14***	0.13***	0.14***	0.14***	0.14***
	(4.89)	(4.82)	(4.83)	(4.35)	(4.26)	(4.52)	(4.50)	(4.30)
Δ GDP OECD	-0.007***	-0.007***	-0.007***	-.007***	-.007***	-.007***	-.007***	-.007***
	(-2.98)	(-3.16)	(-3.16)	(-3.07)	(-3.11)	(-3.00)	(-3.07)	(-3.05)
Monetary policy	-0.0009	-0.0008	-0.001	-0.0007	-0.0007	-0.0006	-0.0008	-0.001
	(-1.33)	(-1.18)	(-1.13)	(-1.03)	(-1.03)	(-0.89)	(-1.19)	(-1.23)
Real interest rate	-0.002***	-0.002**	-0.002**	-0.002**	-0.002*	-.002***	-0.002**	-0.002*
	(-2.80)	(-2.58)	(-2.60)	(-1.97)	(-1.82)	(-2.61)	(-2.48)	(-1.91)
Expenditure	-0.002***	-0.002***	-0.002***	-.002***	-.002***	-.002***	-.002***	-.002***
	(-2.96)	(-4.07)	(-4.06)	(-3.76)	(-3.64)	(-3.97)	(-4.02)	(-3.78)
Tax revenue	0.002***	0.002***	0.002***	0.002**	0.002**	0.002***	0.002***	0.002**
	(2.60)	(2.71)	(2.71)	(2.34)	(2.13)	(2.96)	(2.77)	(2.26)
Exchange rate	0.0004***	0.0005***	0.0005***	0.0004**	0.0005***	0.0004**	0.0004**	0.0004**
	(2.87)	(2.85)	(2.87)	(2.59)	(2.74)	(2.30)	(2.36)	(2.49)
Banking crisis	-0.017***	-0.016***	-0.016***	-.016***	-0.016***	-.016***	-.016***	-.016***
	(-3.33)	(-3.17)	(-3.15)	(-3.12)	(-3.11)	(-3.18)	(-3.12)	(-3.17)
Openness	-0.0005**	-0.0004**	-0.0004**	-.0004**	-.0004*	-.0005**	-.0005**	-.0004*
	(-2.12)	(-2.03)	(-2.03)	(-1.98)	(-1.77)	(-2.16)	(-2.09)	(-1.94)
Δ Gross debt	-0.0005	-0.0005	-0.0005	-0.0004	-0.0004	-0.0004	-0.0004	-0.00
	(-1.24)	(-1.16)	(-1.16)	(-0.82)	(-0.94)	(-0.99)	(-0.91)	(-0.70)
Population growth	0.007	0.01**	0.01**	0.009*	0.008	0.009*	0.009*	0.009*
	(1.48)	(2.04)	(2.07)	(1.80)	(1.65)	(1.73)	(1.84)	(1.81)
Fiscal adjustment	0.002	0.01			-0.0095*			
	(0.26)	(0.40)			(-1.75)			
Adj. * Debt	0.000							
	(0.25)							
Public Debt	-0.0002							
	(-1.61)							
Adj. * Exchange		-0.00						
		(-0.25)						
Successful Adj.			0.007					
			(1.06)					
Failed Adjustment			0.004					
			(0.72)					
Δ Primary deficit				0.003***	0.004***			0.003***
				(3.27)	(3.21)			(2.73)
Δ Primary * Adj.					0.002			
					(0.99)			
Share Δ Exp.						0.0007		
						(0.10)		
Expenditure based							0.002	-0.01
							(0.40)	(-0.95)
Revenue based							0.011**	0.01
							(2.00)	(1.09)
Exp.based*ΔDeficit								0.005
								(0.75)
Rev.based*ΔDeficit								-0.004
								(-0.78)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	627	627	627	599	599	611	611	599
R2	0.735	0.734	0.734	0.736	0.737	0.730	0.732	0.737
F-statistic	30.22	30.68	30.69	30.10	29.04	29.95	29.59	27.79
Joint significance	1.34	3.07**			4.60***			2.62**

t-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[8] Note: The OECD Economic Outlook database does not provide complete data for all fiscal indicators and for all countries since 1970. Hence, the number of observations varies depending on the fiscal variable or fiscal adjustment strategy variable used.

Table 7: Effect of fiscal adjustments on private investment per capita[9]

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Investment $_{t-1}$	-0.14***	-0.15***	-0.15***	-0.13***	-0.13***	-0.14***	-0.14***	-0.13***
	(-8.01)	(-8.12)	(-8.19)	(-7.01)	(-7.03)	(-7.81)	(-7.96)	(-7.08)
Δ GDP per capita	2.34***	2.34***	2.34***	2.23***	2.20***	2.36***	2.34***	2.24***
	(19.72)	(19.70)	(19.71)	(17.60)	(17.32)	(18.81)	(18.84)	(17.58)
GDP per capita $_{t-1}$	0.14***	0.13***	0.14***	0.13***	0.13***	0.14***	0.14***	0.13***
	(4.33)	(4.28)	(4.31)	(3.81)	(3.66)	(3.93)	(3.93)	(3.82)
Δ GDP OECD	-0.004	-0.004	-0.004	-0.004	-0.004	-0.003	-0.004	-0.004
	(-1.48)	(-1.39)	(-1.39)	(-1.46)	(-1.49)	(-1.25)	(-1.34)	(-1.56)
Monetary policy	-0.001	-0.001*	-0.001	-0.001	-0.001	-0.0009	-0.001	-0.001
	(-1.52)	(-1.71)	(-1.56)	(-1.35)	(-1.47)	(-1.10)	(-1.54)	(-1.48)
Real interest rate	-.004***	-.004***	-.004***	-.003***	-.003***	-0.004***	-.004***	-0.003***
	(-3.67)	(-3.75)	(-3.79)	(-3.03)	(-2.77)	(-3.64)	(-3.54)	(-2.90)
Expenditure	-.002***	-.002***	-.002***	-0.001**	-.001**	-0.002***	-.002***	-0.001**
	(-3.07)	(-2.98)	(-2.96)	(-2.21)	(-2.17)	(-2.87)	(-2.96)	(-2.27)
Tax revenue	0.002**	0.002***	0.002***	0.002**	0.002*	0.003***	0.002***	0.002*
	(2.60)	(2.63)	(2.62)	(2.01)	(1.70)	(2.88)	(2.65)	(1.89)
Exchange rate	0.001***	0.001***	.001***	.0007***	0.0007***	0.0006***	0.0007***	0.0007***
	(3.66)	(3.69)	(3.67)	(3.42)	(3.68)	(3.11)	(3.25)	(3.40)
Banking crisis	-0.02***	-0.03***	-0.02***	-0.03***	-0.03***	-0.02***	-0.02***	-0.03***
	(-4.06)	(-4.17)	(-4.11)	(-4.21)	(-4.16)	(-4.07)	(-4.07)	(-4.25)
Openness	-0.0004	-0.0004	-0.0004	-0.0004	-.0003	-0.0005*	-0.0004*	-0.0004
	(-1.63)	(-1.64)	(-1.64)	(-1.44)	(-1.18)	(-1.84)	(-1.69)	(-1.44)
Δ Gross debt	-0.0007	-0.0007	-0.0007	-0.0006	-0.0007	-0.0007	-0.0006	-0.0005
	(-1.41)	(-1.46)	(-1.46)	(-1.14)	(-1.36)	(-1.39)	(-1.21)	(-1.06)
Population growth	0.006	0.004	0.005	0.002	0.002	0.004	0.004	0.003
	(1.08)	(0.79)	(0.85)	(0.41)	(0.31)	(0.60)	(0.74)	(0.51)
Fiscal adjustment	0.009	0.04			-0.015**			
	(0.66)	(1.12)			(-2.35)			
Adj. * Debt	0.0001							
	(0.57)							
Public Debt	0.0001							
	(0.83)							
Adj. * Exchange		-0.0003						
		(-0.73)						
Successful Adj.			0.02***					
			(2.85)					
Failed Adjustment			0.01*					
			(1.83)					
Δ Primary deficit				0.006***	0.006***			0.005***
				(5.34)	(4.55)			(3.98)
Δ Primary * Adj.					0.006**			
					(2.19)			
Share Δ Exp.						0.02**		
						(2.35)		
Expenditure based							0.015**	-0.001
							(2.42)	(-0.18)
Revenue based							0.021***	0.019
							(3.17)	(1.22)
Exp.based*ΔDeficit								0.003
								(0.44)
Rev.based*ΔDeficit								-0.004
								(-0.69)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	627	627	627	599	599	611	611	599
R2	0.712	0.712	0.711	0.719	0.722	0.705	0.710	0.720
F-statistic	26.92	27.47	27.50	27.61	26.90	26.42	26.45	25.51
Joint significance	0.52	5.14***			11.84***			6.17***

t-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[9] Note: The OECD Economic Outlook database does not provide complete data for all fiscal indicators and for all countries since 1970. Hence, the number of observations varies depending on the fiscal variable or fiscal adjustment strategy variable used.

Table 8: Effect of fiscal adjustments on government investment per capita[10]

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Investment $_{t-1}$	-0.13***	-0.11***	-0.11***	-0.11***	-0.11***	-0.11***	-0.12***	-0.12***
	(-6.58)	(-5.39)	(-5.38)	(-5.55)	(-5.60)	(-5.57)	(-5.69)	(-5.73)
Δ GDP per capita	1.23***	1.28***	1.28***	1.63***	1.66***	1.41***	1.40***	1.60***
	(4.03)	(4.13)	(4.13)	(4.77)	(4.85)	(4.32)	(4.29)	(4.70)
GDP per capita $_{t-1}$	0.29***	0.29***	0.29***	0.33***	0.35***	0.33***	0.35***	0.33***
	(3.83)	(3.70)	(3.71)	(3.60)	(3.79)	(3.69)	(3.84)	(3.56)
Δ GDP OECD	-0.016**	-.020***	-0.02***	-0.02**	-0.02**	-0.02***	-0.02**	-0.02**
	(-2.27)	(-2.84)	(-2.84)	(-2.22)	(-2.28)	(-2.64)	(-2.58)	(-2.22)
Monetary policy	0.0009	0.003	0.002	0.001	0.002	0.001	0.001	0.001
	(0.41)	(1.27)	(1.15)	(0.52)	(0.82)	(0.31)	(0.64)	(0.38)
Real interest rate	0.0009	0.002	0.002	0.001	0.001	0.002	0.002	0.001
	(0.34)	(0.78)	(0.80)	(0.51)	(0.27)	(0.66)	(0.64)	(0.36)
Expenditure	-0.001	-.005***	-.005***	-.006***	-.006***	-.005***	-.005***	-.006***
	(-0.56)	(-3.33)	(-3.38)	(-3.64)	(-3.46)	(-3.31)	(-3.31)	(-3.56)
Tax revenue	0.0009	0.001	0.001	0.002	0.003	0.001	0.002	0.002
	(0.35)	(0.58)	(0.60)	(0.87)	(1.07)	(0.55)	(0.71)	(0.95)
Exchange rate	-0.0008	-0.001	-0.0006	-0.001*	-0.001**	-0.0009	-0.0009*	-0.001**
	(-1.59)	(-1.38)	(-1.28)	(-1.83)	(-2.03)	(-1.58)	(-1.72)	(-2.05)
Banking crisis	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02
	(1.16)	(1.62)	(1.56)	(1.56)	(1.45)	(1.37)	(1.46)	(1.42)
Openness	-.002***	-.0016**	-0.002**	-.002***	-.002***	-.0016**	-0.002**	-.002***
	(-2.66)	(-2.46)	(-2.47)	(-2.67)	(-2.78)	(-2.31)	(-2.57)	(-2.65)
Δ Gross debt	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001
	(0.67)	(0.83)	(0.83)	(0.76)	(0.95)	(1.12)	(0.89)	(0.91)
Population growth	0.009	0.03**	0.03**	0.03**	0.03*	0.03*	0.03*	0.03*
	(0.60)	(2.30)	(2.25)	(2.12)	(1.96)	(1.82)	(1.77)	(1.93)
Fiscal adjustment	-0.05	-0.14			0.015			
	(-1.60)	(-1.39)			(0.90)			
Adj. * Debt	-0.000							
	(-0.08)							
Public Debt	-.002***							
	(-4.34)							
Adj. * Exchange		0.001						
		(0.82)						
Successful Adj.			-0.07***					
			(-3.64)					
Failed Adjustment			-0.05***					
			(-3.12)					
Δ Primary deficit				-0.01***	-0.01***			-0.01***
				(-4.75)	(-2.84)			(-2.75)
Δ Primary * Adj.					-0.02**			
					(-2.58)			
Share Δ Exp.						-0.11***		
						(-5.30)		
Expenditure based							-0.08***	-0.10**
							(-4.76)	(-2.28)
Revenue based							-0.05***	0.003
							(-2.72)	(0.07)
Exp.based*ΔDeficit								0.017
								(0.91)
Rev.based*ΔDeficit								-0.012
								(-0.72)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	627	627	627	599	599	611	611	599
R2	0.265	0.240	0.240	0.254	0.263	0.254	0.254	0.272
F-statistic	3.93	3.52	3.52	3.68	3.70	3.77	3.68	3.71
Joint significance	13.56***	7.44***			9.92***			7.23***

t-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[10] Note: The OECD Economic Outlook database does not provide complete data for all fiscal indicators and for all countries since 1970. Hence, the number of observations varies depending on the fiscal variable or fiscal adjustment strategy variable used.

Tables 7 and 8 provide further information as to why this appears to be the case as private and public investment are taken as the dependent variable. Across most specifications described in section 4.2, fiscal adjustments significantly boost private investment, independent of their size, success and composition. Given the vast array of different fiscal adjustment strategies used over the last 40 years, this result is remarkable. If this were to hold for consumption as well, we would expect non-Keynesian effects during fiscal adjustments across the board. Table 8 shows why this is not the case. Depending on the fiscal adjustment variable used, the positive effect on private investment is largely or even entirely offset by a corresponding decline in public investment. For example, equation (5) in both tables shows that the effect of an improvement in the primary balance of 1 percent of GDP is 0.006 for private investment and more than three times larger (-0.02) for public investment. Equation (6) uses the share of expenditure measures as a percentage of the improvement of the CAPB. Here again, the effect on public investment is about five times larger than it is on private investment (0.02 and -0.11 respectively). If the share of private and public investment as a percentage of GDP were equal, the effect on total investment would be strongly Keynesian.

Equation (2) assesses the role of the exchange rate in constituting non-Keynesian effects as has been discussed by Hjelm (2002) or Lambertini and Tavares (2005)[11]. While the constitutive variables are not significant in both equations, the result of the joint significance test indicates that the total effect differs from zero, that is, the null hypothesis can be rejected. Equation (3) shows that private investment increases even if the consolidation program eventually failed to reduce gross debt in the following three years. The effect of a successful fiscal adjustment is twice as large as a failed one though. Successful as well as failed adjustments negatively affect government investment. The coefficient of successful adjustments is slightly larger. The logical explanation for this finding is that expenditure cuts are more extensive during successful adjustments as outlined in chapter 3 and this is particularly the case for expenditure on public investment.

5. Discussion

The results obtained suggest that there is some weak evidence in favor of non-Keynesian effects for GDP growth, consumption as well as investment. We did not find any indication that fiscal adjustments have a contracting effect on the economy. In this section, we extend the

[11] These authors argue that the probability of a successful consolidation is increased by preceded exchange rate depreciations. However, they do not assess the impact of consolidations on macroeconomic outcomes.

analysis by using an IV model to test for problems with endogeneity. We also perform robustness checks to test the validity of our results.

5.1. Endogeneity and instrumental variables

As mentioned above, one potential problem of our estimated equation (1) is the existence of reverse causality or endogeneity. It is plausible to assume that economic activity has a substantial effect on fiscal policy. In this case, there would either be a circular relationship between economic activity and fiscal policy or a causal relationship that runs in the opposite direction. If one or more of our explanatory variables are correlated with the error term, the estimated coefficients are biased. We used a fixed-effects model in which time independent effects are imposed for each country. This partially reduces the potential problem of endogeneity as comparisons with an IV model show. When simply estimating an IV model with the instruments described below and without using fixed effects, the null hypothesis of the Wu-Hausman Test is usually rejected, although only at the 5% or 10% level in some cases. The null hypothesis states that the regressor is exogenous. However, if we include fixed effects, the corresponding Davidson-McKinnon test shows that the null hypothesis can no longer be rejected. The F-Statistic was between 0.001 and 2.108 with the p-value constantly above 0.100, meaning that the null hypothesis could not be rejected for all specification estimated. A rejection of the null hypothesis would have indicated that endogeneity is a problem and that instrumental variables techniques are required. Although the results did not show any need for instruments, we additionally used a model with two instruments to check for the robustness of our results.

IV models enable consistent estimates when the explanatory variables are correlated with the error term. We use the unemployment rate, the lagged total public deficit and a lagged election dummy as instruments for our fiscal adjustment variables. The unemployment rate is added because it is a proxy not only for the functioning of the labor market, but of government regulation and structural problems as well. The variable was not statistically significant if included in our first specification on real GDP growth. The total deficit is an important fiscal indicator and it can be debated whether this variable should have explanatory power in the original regression. By using the lagged deficit, we acknowledge that present fiscal policy is strongly influenced by fiscal policy of the past. In addition, the election dummy measures whether a parliamentary election took place in the past year. The idea behind this variable is the claim that “new brooms sweep cleaner”. In other words, if a government is faced with a

high and unsustainable deficit, political parties might present a strategy for budget consolidation during their campaign. If they end up winning the election, they are able to implement a fiscal adjustment quickly because of high public support. One current example is the United Kingdom, where the coalition program of the Conservative Party and Liberal Democrats includes a promise to reduce the deficit and to rapidly introduce an emergency budget. The budget consolidation program that was presented shortly afterwards is substantial and unprecedented. Its measures make up for than 100 billion £ and are largely expenditure based. The defeated Labour Party on the other hand had refused to cut expenditure in fear that it would threaten to cut off the fragile economic recovery.

Table 9 shows the results of our estimates for fiscal adjustments on private investment. Specifications for real GDP growth and total investment are provided in tables 10 and 11 in the appendix. First stage results and tests for the three instruments are presented in Appendix D. The analysis is limited to four specifications concerning the size and the composition of fiscal adjustments. The IV estimates are similar to our previous results. Fiscal adjustments generally boost private investment (equation 1). Equations (2) and (3) show that a substantial improvement in the primary balance is associated with higher growth rates in investment per capita. Equation (3) shows that this effect remains robust when we only look at fiscal adjustment episodes. The IV-estimate in equation (3) states that the boost in private investment was brought forth by large improvements in the primary balance during budget consolidation. The positive effect of a general improvement in the primary balance in normal times could not be confirmed. As before, tax increases during fiscal adjustments increase private investment (equation 4). The qualitative nature of the coefficients of explanatory variables is also identical.

The results for the first stage regressions and the corresponding tests for our instruments show that our model is neither underidentified nor overidentified. With one exception, the coefficient of the lagged deficit is always significant at the 1% level. The coefficient of the election dummy is positive and significant in one specification, providing some limited evidence that a new government might provide the necessary reforms to stimulate growth and dare to increase taxes. The unemployment rate was found to negatively affect private investment as expected, but the coefficient was only significant in two specifications. Anderson's canonical correlation test showed relatively low LM-statistics in some cases, however. In two cases, an underidentification could not only be rejected at the 10% level. Overidentification as calculated by the Sargan test could not be ruled out in equation (3).

Table 9: Fiscal Adjustment Strategies: Comparison of IV and OLS model regressions

Variables	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
Investment $_{t-1}$	-0.14*** (-8.21)	-0.15*** (-8.17)	-0.14*** (-7.69)	-0.13*** (-7.01)	-0.16*** (-3.97)	-0.13*** (-7.03)	-0.16*** (-7.02)	-0.14*** (-7.96)
Δ GDP per capita	2.34*** (19.58)	2.34*** (19.71)	2.33*** (18.48)	2.23*** (17.60)	1.87*** (6.33)	2.20*** (17.32)	2.34*** (16.69)	2.34*** (18.84)
GDP per capita $_{t-1}$	0.13*** (4.04)	0.13*** (4.27)	0.14*** (4.16)	0.13*** (3.81)	0.05 (0.62)	0.13*** (3.66)	0.13*** (3.31)	0.14*** (3.93)
Δ GDP OECD	-0.03 (-0.39)	-0.004 (-1.39)	-0.03 (-0.40)	-0.004 (-1.46)	0.09 (0.52)	-0.004 (-1.49)	-0.02 (-0.28)	-0.004 (-1.34)
Monetary policy	-0.002* (-1.84)	-0.001 (-1.64)	-0.001 (-1.14)	-0.001 (-1.35)	-0.005** (-2.20)	-0.001 (-1.47)	-0.003* (-1.86)	-0.001 (-1.54)
Real interest rate	-0.004*** (-3.35)	-0.004*** (-3.76)	-0.004*** (-3.58)	-.003*** (-3.03)	0.001 (0.48)	-0.003*** (-2.77)	-0.004*** (-3.18)	-0.004*** (-3.54)
Gov. expenditure	-0.002*** (-3.01)	-0.002*** (-2.97)	-0.002*** (-2.48)	-0.001** (-2.21)	-0.003** (-2.04)	-0.001** (-2.17)	-0.002*** (-2.99)	-0.002*** (-2.96)
Tax revenue	0.002** (2.31)	0.002** (2.60)	0.002** (2.58)	0.002** (2.01)	-0.002 (-0.90)	0.002* (1.76)	0.002** (2.24)	0.002*** (2.65)
Exchange rate	0.001*** (3.64)	0.0007*** (3.62)	0.0006*** (3.25)	.0007*** (3.42)	0.002*** (2.97)	0.0007*** (3.68)	0.001*** (2.60)	0.0007*** (3.25)
Banking crisis	-0.02*** (-4.22)	-0.02*** (-4.15)	-0.03*** (-4.51)	-0.03*** (-4.21)	-0.01 (-1.13)	-0.03*** (-4.16)	-0.02*** (-3.69)	-0.02*** (-4.07)
Openness	-0.0004* (-1.63)	-0.0004* (-1.66)	-0.0004 (-1.68)	-0.0004 (-1.44)	0.000 (0.44)	-0.0003 (-1.18)	-0.0003 (-1.10)	-0.0004* (-1.69)
Δ Gross debt	-0.0007 (-1.38)	-0.0007 (-1.44)	-0.0007 (-1.34)	-0.0006 (-1.14)	-0.002** (-1.97)	-0.0007 (-1.38)	-0.0003 (-0.44)	-0.0006 (-1.21)
Population growth	0.005 (0.90)	0.005 (0.84)	0.002 (0.35)	0.002 (0.41)	0.01 (0.94)	0.002 (0.31)	0.005 (0.83)	0.004 (0.74)
Fiscal adjustment	0.03** (2.13)	0.02*** (3.12)			-0.17*** (-2.82)	-0.015** (-2.35)		
Δ Primary deficit			0.002 (1.51)	0.006*** (5.34)	-0.006 (-1.04)	0.006*** (4.55)		
Δ Primary * Adj.					0.13*** (2.74)	0.006** (2.19)		
Exp. based Adj.							-0.03 (-0.61)	0.015** (2.42)
Rev. based Adj.							0.08* (1.76)	0.021*** (3.17)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	627	627	599	599	599	599	611	611
F-statistic	26.48	28.04	26.54	27.61	5.63	26.90	20.74	26.45
	IV (2SLS)	**OLS**	**IV (2SLS)**	**OLS**	**IV (2SLS)**	**OLS**	**IV (2SLS)**	**OLS**

Dependent variable: Private investment per capita
Instrumented variable: fiscal adjustment variable
Instruments: Unemployment rate, lagged deficit, lagged election dummy
*** p<0.01, ** p<0.05, * p<0.1

Tables 10 and 11 in Appendix E show the corresponding IV estimates with GDP growth and total investment as the dependent variable. Our previous results regarding GDP growth are confirmed: Large improvements in the primary balance reflecting a tightening fiscal policy and adjustments that are primarily based on expenditure cuts lead to higher GDP growth. Large adjustments also boost consumption as well as total investment. While expenditure cuts

stimulate private consumption during fiscal adjustments, there is some evidence that tax increases might increase investment.

5.2. Alternative models

In this section, we use a reduced form of our consumption and investment functions by relying on the same models as Giavazzi and Pagano (1996), van Aarle and Garretsen (2003), or Afonso (2006). For this purpose, we drop all our previous control variables that were not part of the basic consumption or investment function. The fiscal adjustment variables included are the change in real per capita tax revenue and government consumption as well as their lagged levels for $D_t = 1$ during adjustment periods as defined in section 2.2 above. The other periods $1 - D_t$ refer to "normal" fiscal times. Results are summarized in table 12 in the Appendix. Equations labeled (a) refer to consumption per capita while equations labeled (b) are the corresponding estimates with total investment per capita as the dependent variable.

Our previous results still hold – even though the picture is not clear cut. There is some weak evidence in favor of non-Keynesian effects during fiscal adjustments. In equation (1b), the coefficients suggest that a tax increase during fiscal adjustment significantly boost investment. Changes in government consumption did not affect private consumption or investment. In all specifications, an increase in government consumption during normal times shows a classical Keynesian effect on consumption. However, an increase in government consumption also significantly reduces investment at the same time. Tax increases negatively affect consumption in normal times, although the coefficient was not significant in all specifications. Equations (3) and (4) limit the sample to episodes where government debt was above the historical average across all periods and countries of 60 percent of GDP. The results obtained in equation (3a) and (4a) show that in times of high government indebtedness, reductions in government consumption significantly increase private consumption per capita. As before, in all specifications there is no indication that fiscal adjustment would negatively and significantly affect consumption or investment.

6. Conclusions

In this paper we studied the effect of fiscal adjustments on economic growth, consumption and investment for a panel of 20 OECD countries during the 1970-2008 period. Using different fiscal adjustment variables to control for the vast array of consolidation strategies used by different governments over time, we find evidence that fiscal tightening might have an expan-

sionary effect on economic growth in the case of sizeable adjustments and through spending cuts. The effect is primarily a result of increased consumption rather than increased investment. While consolidations boost private investment, this does not outweigh the reduction in government investment. Overall, there is only weak evidence for non-Keynesian effects of fiscal adjustments on total investment. However, whether a budget consolidation exhibits positive effects on economic activity depends not only on the size and the composition of the adjustment, but also on economic, political and fiscal circumstances.

There is weak evidence that fiscal adjustments are more likely to be expansionary if government debt levels are high because decisive measures signal a break with the past thereby encouraging consumer and investor confidence. On the other hand, the exchange rate did not exhibit a significant role for the impact of consolidations on growth, consumption or investment. There is some evidence that a new government is more determined to address the issue of fiscal sustainability because of public support. Finally, fiscal adjustments are easier to carry out and less likely to be contractionary if the world economy is in full swing because "a rising tide lifts all boats". Current conditions with historically high public debt levels in some industrialized countries and uncertainty and fears about the development of the world economy at the same time thus express ambiguous expectations about non-Keynesian effects of fiscal adjustments. More specific analysis about the external effects of fiscal policy in surrounding countries might thus provide further insight into the existence of such factors of influence.

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Appendix A: Data and Sources

Variable	*Description*	*Sources*
Real GDP Growth	Annual growth in real gross domestic product in percent	OECD Economic Outlook
GDP per capita	Logarithm of real gross domestic product per capita	OECD Economic Outlook
GDP OECD	Annual growth of real gross domestic product in percent (average of 20 countries included in sample)	OECD Economic Outlook
Consumption	Change in the logarithm of real consumption per capita	OECD Economic Outlook
Investment	Change in the logarithm of total real investment per capita	OECD Economic Outlook, Kamps (2004)
Private investment	Change in the logarithm of private real investment per capita (private fixed capital formation)	OECD Economic Outlook, Kamps (2004)
Public investment	Change in the logarithm of government real investment per capita (government fixed capital formation)	OECD Economic Outlook, Kamps (2004)
Monetary policy	Nominal short-term interest rates (3 month interest rate) set by central banks in percent	OECD Economic Outlook
Real interest rate	Yield on long-term government bonds (10 year) minus inflation as measured by the consumer price index in percent	OECD Economic Outlook
Tax revenue	Total general government tax receipts as a percentage of Nominal GDP	OECD Economic Outlook
Expenditure	Total general government expenditure as a percentage of GDP	OECD Economic Outlook
Exchange rate	Index of real effective exchange rate adjusted by relative consumer prices and weighted by trade volume (2005 = 100)	Bank for International Settlements (BIS)
Banking crisis	Dummy variable, taking the value of 1 if the country was facing a national banking crisis in a given year	Reinhart und Rogoff (2009)
Openness	Sum of exports and imports as a share of GDP	OECD Economic Outlook
Population growth	Annual growth of population in percent	OECD Economic Outlook
Δ Gross Debt	Change in total government gross debt compared to previous year in percent of GDP	OECD Economic Outlook

Appendix B: Descriptive Statistics

Variable	*Mean*	*Std. Dev.*	*Minimum*	*Maximum*
Real GDP growth	2.767	2.291	-7.30	11.49
GDP per capita	3.445	1.348	1.578	8.387
GDP OECD	2.835	1.412	-0.438	6.390
Consumption	2.897	1.304	1.167	7.833
Δ Consumption	0.020	0.021	-0.086	0.116
Investment	1.893	1.387	0.197	7.042
Δ Investment	0.020	0.063	-0.412	0.211
Private Investment	1.717	1.361	0.067	6.839
Δ Private Investment	0.022	0.072	-0.424	0.215
Public Investment	-0.065	1.491	-2.303	5.822
Δ Public Investment	0.009	0.107	-0.943	1.020
Monetary policy	7.802	4.718	0.029	24.900
Real interest rate	2.787	3.467	-19.146	11.185
Tax revenue	34.598	7.780	15.921	52.228
Government expenditure	43.655	9.369	19.300	70.900
Exchange rate	99.171	13.433	59.116	155.517
Openness	62.189	31.591	11.25	184.31
Population growth	0.598	0.550	-2.06	4.48
Δ Gross debt	0.792	4.635	-15.500	22.300
Banking crisis	0.086	0.280	0.000	1.000
Fiscal Adjustment	0.113	0.317	0.000	1.000
Adjustment * Debt	8.591	25.180	0.000	140.800
Adjustment * Exchange	10.654	30.667	0.000	152.287
Successful adjustment	0.046	0.210	0.000	1.000
Failed adjustment	0.064	0.244	0.000	1.000
Δ Primary deficit	-0.031	1.714	-8.980	7.290
Share of expenditure cuts	0.047	0.183	0.000	1.000
Expenditure based adjustment	0.063	0.243	0.000	1.000
Revenue based adjustment	0.063	0.243	0.000	1.000
Expenditure based * Δ Deficit	0.138	0.562	0.000	4.800
Revenue based * Δ Deficit	0.142	0.583	0.000	5.620

Appendix C: Test for stationarity

	Fisher Test for unbalanced panels	
	H0: Unit root, non-stationarity	
Variable	Chi2	Prob > Chi2
Real GDP Growth	231.054***	0.000
Consumption	77.798***	0.000
Δ Consumption	356.446***	0.000
Investment	17.393	0.999
Δ Investment	221.199***	0.000
Private Investment	6.479	1.000
Δ Private Investment	309.747***	0.000
Public Investment	29.659	0.885
Δ Public Investment	479.778***	0.000
Δ GDP Per Capita	221.164***	0.000
GDP OECD	93.108***	0.000
Monetary Policy	31.980	0.813
Real Interest Rate	60.966**	0.018
Tax Revenue (% of GDP)	66.702***	0.005
Expenditure (% of GDP)	58.399**	0.030
Exchange rate	46.983	0.208
Openness	21.844	0.991
Population growth	126.935***	0.000
Δ Debt	197.172***	0.000

Appendix D: Results for first stage regressions and tests for IV regressions

Variables	**(1a)**	**(2a)**	**(3a)**	**(4a)**	**(4a)**
First stage regressions					
Lagged deficit	-0.07*** (-9.64)	-0.03*** (-6.08)	0.03 (1.45)	-0.03*** (-5.27)	-0.03*** (-5.32)
Lagged election dummy	0.02 (0.84)	-0.02 (-1.35)	0.006 (0.11)	0.06*** (2.69)	-0.02 (-1.09)
Unemployment rate	-0.02** (-2.04)	-0.01 (-1.33)	-0.04** (-2.11)	-0.01 (-0.85)	-0.01 (-0.89)
Shea partial R2	0.148	0.067	0.015	0.024	0.020
F-statistic	31.72	12.85	2.64	12.07	9.72
p-value	0.000	0.000	0.049	0.000	0.000
Anderson's CC test	88.616	39.387	8.596	6.534	6.534
p-value	0.000	0.000	0.035	0.038	0.038
Sargan statistic	23.014	24.101	0.387	17.163	17.163
Sargan p-value	0.000	0.000	0.824	0.000	0.000
	IV (2SLS)	**IV (2SLS)**	**IV (2SLS)**	**IV (2SLS) Rev_based**	**IV (2SLS) Exp_based**

Instrumented variable: Fiscal adjustment
t-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix E: Additional estimates

Table 10: Fiscal Adjustment Strategies: Comparison of IV and OLS model regressions

Variables	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
GDP $_{t-1}$	0.17*** (4.65)	0.18*** (4.86)	0.23*** (5.13)	0.21*** (5.57)	0.22*** (5.23)	0.21*** (5.54)	0.17*** (4.73)	0.17*** (4.63)
Δ GDP OECD	0.40 (0.15)	0.62*** (6.98)	2.33 (0.69)	0.72*** (8.48)	1.50 (0.47)	0.72*** (8.46)	0.68 (0.25)	0.61*** (6.87)
Monetary policy	-0.16*** (-5.94)	-0.16*** (-5.75)	-0.12*** (-3.63)	-0.15*** (-5.59)	-0.17*** (-3.23)	-0.15*** (-5.66)	-0.14*** (-4.58)	-0.15*** (-5.57)
Real interest rate	0.26*** (7.86)	0.25*** (7.47)	0.28*** (6.67)	0.23*** (7.07)	0.28*** (7.04)	0.23*** (7.06)	0.24*** (6.21)	0.25*** (7.52)
Government expenditure	-0.06*** (-3.06)	-0.06*** (-3.01)	-0.05** (-2.09)	-0.06*** (-2.76)	-0.05** (-2.22)	-0.06*** (-2.76)	-0.06*** (-2.70)	-0.06*** (-2.87)
Tax revenue	-0.13*** (-4.30)	-0.12*** (-3.83)	-0.16*** (-3.96)	-0.11*** (-3.57)	-0.17*** (-4.41)	-0.11*** (-3.59)	-0.11*** (-3.26)	-0.13*** (-3.95)
Exchange rate	-0.007 (-1.21)	-0.01 (-1.64)	-0.001 (-0.16)	-0.01** (-2.09)	-0.002 (-0.28)	-0.01** (-2.08)	-0.01* (-1.71)	-0.01 (-1.51)
Banking crisis	-0.53*** (-2.72)	-0.58*** (-2.86)	-0.27 (-1.03)	-0.59*** (-2.93)	-0.39 (-1.63)	-0.60*** (-2.99)	-0.62*** (-3.04)	-0.58*** (-2.87)
Openness	0.03** (3.39)	0.03*** (3.31)	0.02* (1.82)	0.03*** (3.24)	0.03*** (2.69)	0.03*** (3.33)	0.03*** (3.34)	0.03*** (3.49)
Δ Gross debt	-0.07*** (-4.03)	-0.07*** (-4.21)	-0.09*** (-4.34)	-0.08*** (-4.84)	-0.07*** (-3.40)	-0.08*** (-4.74)	-0.07*** (-3.73)	-0.07*** (-4.28)
Population growth	0.37** (2.08)	0.31 (1.70)	0.55** (2.31)	0.23 (1.25)	0.50** (2.22)	0.23 (1.23)	0.26 (1.46)	0.28 (1.50)
Δ Primary deficit	0.29*** (6.11)	0.18*** (4.92)					0.27*** (3.58)	0.23*** (4.80)
Share Δ Exp.			5.32*** (4.69)	0.50* (1.90)				
Exp. based Adj.					3.10** (2.04)	0.32 (1.51)		
Rev. based Adj.					2.48 (1.57)	0.22 (0.96)		
Δ Primary deficit * Adj.							-0.39 (-0.64)	0.05 (0.56)
Fiscal Adjustment							0.11 (0.15)	-0.41* (-1.90)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	599	599	611	611	611	611	599	599
F-statistic	20.45	20.64	12.75	20.12	13.96	19.63	19.17	19.95
	IV (2SLS)	**OLS**	**IV (2SLS)**	**OLS**	**IV (2SLS)**	**OLS**	**IV (2SLS)**	**OLS**

Dependent variable: Real GDP growth
Instruments: Lagged deficit, lagged election dummy, unemployment rate
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Fiscal Adjustment Strategies: Comparison of IV and OLS model regressions

Variables	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
Investment $_{t-1}$	-0.11*** (-6.91)	-0.11*** (-6.35)	-0.11*** (-6.99)	-0.11*** (-6.89)	-0.13*** (-6.09)	-0.11*** (-6.92)	-0.14*** (-3.59)	-0.11*** (-6.32)
Δ GDP per capita	2.22*** (20.67)	2.15*** (19.82)	2.22*** (21.06)	2.23*** (21.17)	2.23*** (18.04)	2.22*** (21.12)	1.83*** (6.93)	2.13*** (19.53)
GDP per capita $_{t-1}$	0.14*** (4.70)	0.14*** (4.35)	0.14*** (4.73)	0.14*** (4.52)	0.13*** (3.56)	0.14*** (4.50)	0.07 (1.01)	0.13*** (4.26)
Δ GDP OECD	-0.008 (-0.13)	-0.007*** (-3.07)	-0.007 (-0.10)	-0.007*** (-3.00)	-0.006 (-0.08)	-0.007*** (-3.07)	0.10 (0.64)	-0.007*** (-3.11)
Monetary policy	-0.0006 (-0.88)	-0.0007 (-1.03)	-0.0006 (-0.86)	-0.0006 (-0.89)	-0.002* (-1.79)	-0.0008 (-1.19)	-0.004** (-2.04)	-0.0007 (-1.03)
Real interest rate	-0.002** (-2.42)	-0.002** (-1.97)	-0.002** (-2.35)	-0.002*** (-2.61)	-0.002** (-2.24)	-0.002** (-2.48)	0.002 (0.89)	-0.002* (-1.82)
Government expenditure	-0.002*** (-4.02)	-0.002*** (-3.76)	-0.002** (-4.13)	-0.002*** (-3.97)	-0.002*** (-3.78)	-0.002*** (-4.02)	-0.003*** (-2.62)	-0.002*** (-3.64)
Tax revenue	0.002*** (2.85)	0.002** (2.34)	0.002*** (2.77)	0.002*** (2.96)	0.002** (2.29)	0.002*** (2.77)	-0.002 (-0.77)	0.002** (2.13)
Exchange rate	0.0004** (2.39)	0.0004** (2.59)	0.0004** (2.44)	0.0004** (2.30)	0.0003 (1.51)	0.0004** (2.36)	0.001** (2.57)	0.0005*** (2.75)
Banking crisis	-0.02*** (-3.37)	-0.016*** (-3.12)	-.0016*** (-3.11)	-0.016*** (-3.18)	-0.016*** (-2.66)	-0.016*** (-3.12)	-0.007 (-0.58)	-0.016*** (-3.11)
Openness	-0.0005** (-2.21)	-0.0004** (-1.98)	-0.0005** (2.29)	-0.0005** (-2.16)	-0.0003 (-1.24)	-0.0005** (-2.09)	0.000 (0.18)	-0.0004* (-1.73)
Δ Gross debt	-0.0004 (-0.97)	-0.0004 (-0.82)	-0.0005 (-1.10)	-0.0004 (-0.99)	-0.00 (-0.04)	-0.0004 (-0.91)	-0.002* (-1.77)	-0.0004 (-0.94)
Population growth	0.01* (1.79)	0.009* (1.80)	0.009* (1.86)	0.009* (1.73)	0.01* (1.68)	0.009* (1.84)	0.02 (1.53)	0.008 (1.65)
Δ Primary deficit	0.0004 (0.35)	0.003*** (3.27)					-0.007 (-1.42)	0.004*** (3.21)
Share Δ Exp.			0.012 (0.48)	0.001 (0.10)				
Exp. based Adj.					-0.05 (-1.18)	0.002 (0.40)		
Rev. based Adj.					0.07* (1.70)	0.011** (2.00)		
Δ Primary deficit * Adj.							0.12*** (2.67)	0.002 (0.99)
Fiscal Adjustment							-0.15*** (-2.74)	-0.01* (-1.75)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	599	599	611	611	611	611	599	599
F-statistic	29.45	30.10	29.79	29.95	20.76	29.59	5.69	29.04
	IV (2SLS)	**OLS**	**IV (2SLS)**	**OLS**	**IV (2SLS)**	**OLS**	**IV (2SLS)**	**OLS**

Dependent variable: Total investment per capita
Instruments: Unemployment rate, lagged deficit, lagged election dummy
*** p<0.01, ** p<0.05, * p<0.1

Table 12: Effect of fiscal adjustments on real consumption and investment per capita

Variables	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
Dependent variable t-1	-0.11*** (-7.37)	-0.07*** (-4.75)	-0.11*** (-6.63)	-0.08*** (-4.91)	-0.18*** (-5.53)	-0.09*** (-3.26)	-0.24*** (-6.50)	-0.11*** (-3.84)
Δ GDP per capita	0.60*** (17.60)	1.92*** (21.30)	0.67*** (18.54)	1.97*** (20.43)	0.56*** (10.98)	1.86*** (14.46)	0.61*** (9.84)	2.28*** (13.93)
GDP per capita t-1	0.09*** (6.64)	0.05* (1.81)	0.11*** (6.03)	0.09*** (2.97)	0.10*** (4.47)	0.04 (0.80)	0.20*** (5.76)	0.03 (0.47)
D_t * Δ log(tax)	-0.01 (-0.13)	0.28** (2.34)	-0.02 (-1.12)	-0.05 (-0.84)	-0.01 (-0.20)	-0.03 (-0.32)	-0.02 (-0.68)	-0.08 (-0.94)
D_t * log(tax $_{t-1}$)	-0.02 (-1.54)	0.05* (1.71)	0.01 (0.48)	0.04 (1.52)	-0.02 (-1.27)	0.04 (1.08)	-0.01 (-0.64)	0.03 (0.76)
D_t * Δ log(govc)	-0.09 (-1.37)	0.18 (1.03)	-0.09 (-1.58)	0.23 (1.46)	-0.17* (-1.85)	0.08 (0.34)	-0.17* (-1.87)	0.10 (0.41)
D_t * log(govc $_{t-1}$)	0.01 (0.86)	-0.03 (-1.07)	-0.01 (-1.02)	-0.04 (-1.38)	0.03** (2.25)	-0.01 (-0.32)	0.01 (0.51)	-0.05 (-1.09)
$(1 - D_t)$ * Δ log(tax)	-0.03* (-1.83)	0.34*** (6.81)	-0.02 (-1.18)	0.29*** (5.83)	-0.04 (-1.35)	0.27*** (3.48)	-0.06* (-1.78)	0.16* (1.83)
$(1 - D_t)$ * log(tax $_{t-1}$)	-0.02** (-2.05)	0.08*** (3.35)	0.00 (0.09)	0.04 (1.62)	-0.02* (-1.79)	0.07* (1.87)	-0.02 (-1.27)	0.04 (1.06)
$(1 - D_t)$ * Δ log(govc)	0.14*** (5.74)	-0.19*** (-2.95)	0.10*** (4.00)	-0.16** (-2.46)	0.12*** (3.56)	-0.22** (-2.58)	0.10** (2.49)	-0.22** (-2.00)
$(1 - D_t)$ * log(govc $_{t-1}$)	0.01 (1.04)	-0.07*** (-2.86)	-0.01 (-0.85)	-0.04 (-1.62)	0.04*** (2.97)	-0.04 (-1.33)	0.02 (1.07)	-0.06 (-1.47)
Δ Real interest rate							-0.00 (-0.48)	-0.005*** (-2.81)
Real interest rate $_{t-1}$							0.00** (2.41)	-0.004** (-2.51)
Δ Gross debt			0.00 (1.62)	-0.001** (-2.60)			-0.00* (-1.91)	-0.0001 (-0.22)
Gross debt $_{t-1}$			0.00 (1.08)	-0.0001** (-1.98)			0.00*** (3.02)	-0.0001 (-0.72)
Δ Exchange rate							0.00 (0.93)	0.002*** (3.45)
Exchange rate $_{t-1}$							0.00*** (3.10)	0.001** (2.20)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trend Dummy	No	No	No	No	No	No	No	No
No. of observations	757	757	679	679	379	379	317	317
R2	0.552	0.672	0.592	0.703	0.584	0.690	0.700	0.760
F-statistic	17.66	29.39	18.07	29.43	9.33	14.80	10.83	14.70

Dependent variable: Consumption (a) and investment (b)
t-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix F: Correlations

Correlation coefficients (20 countries, 1970-2008)

	Investment	Real GDP growth	GDP OECD	Monetary policy	Real interest rate	Tax revenue	Expenditure	Exchange rate	Banking crisis	Openness	Population growth	Δ Gross debt
Investment	1.000											
Real GDP growth	**0.735**	1.000										
GDP OECD	**0.458**	**0.585**	1.000									
Monetary policy	-0.191	-0.125	-0.208	1.000								
Real interest rate	0.106	0.058	0.010	0.184	1.000							
Tax revenue	-0.008	-0.138	0.006	-0.098	0.273	1.000						
Expenditure	-0.142	-0.263	-0.122	0.088	**0.379**	**0.874**	1.000					
Exchange rate	-0.075	-0.145	0.014	-0.027	0.014	0.165	0.112	1.000				
Banking crisis	-0.235	-0.204	-0.100	0.192	0.165	-0.026	0.087	0.125	1.000			
Openness	0.062	0.106	0.018	-0.198	0.037	**0.448**	**0.353**	-0.195	0.214	1.000		
Population growth	0.020	0.177	-0.020	-0.044	-0.161	**-0.322**	**-0.403**	-0.030	0.025	-0.086	1.000	
Δ Gross debt	**-0.418**	**-0.422**	**-0.371**	0.181	0.141	-0.122	0.147	0.117	0.238	-0.240	-0.149	1.000

Appendix G: Descriptive statistics

Figure 2: Episodes of fiscal adjustments and average gross debt

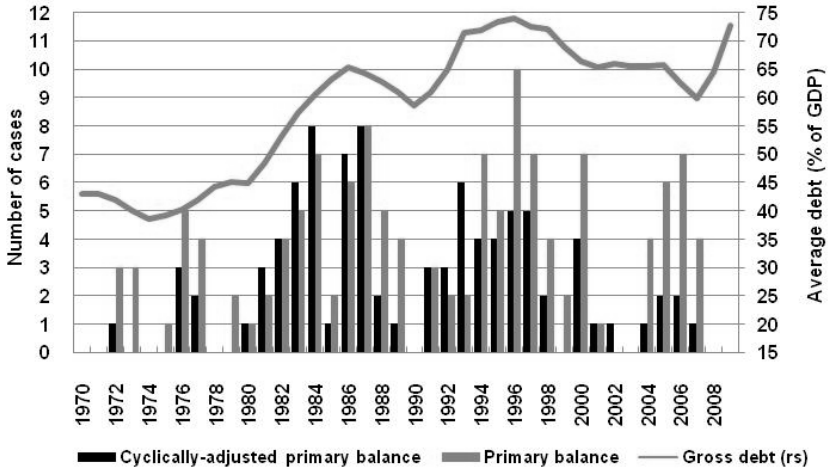

Figure 3: Episodes of fiscal adjustments: Success and size of adjustment (% of GDP)

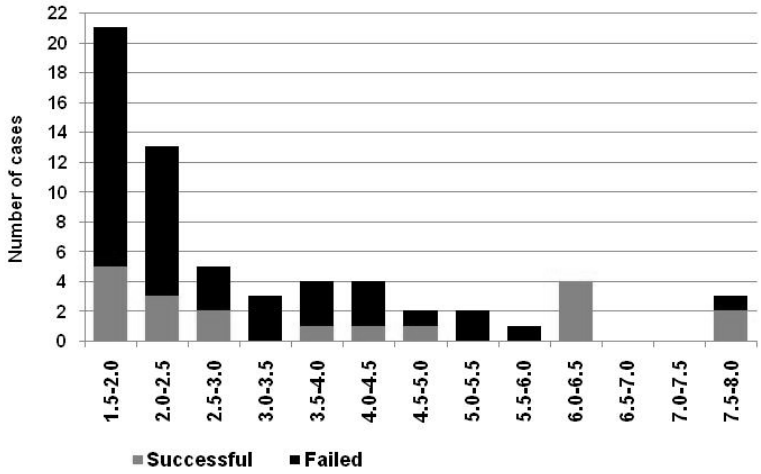

Figure 4: Episodes of fiscal adjustments: Success and duration (number of years)

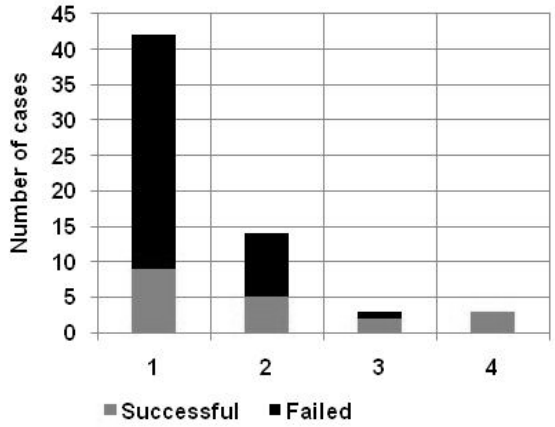

Figure 5: Decline of public investment as a share of GDP (1970-2008)

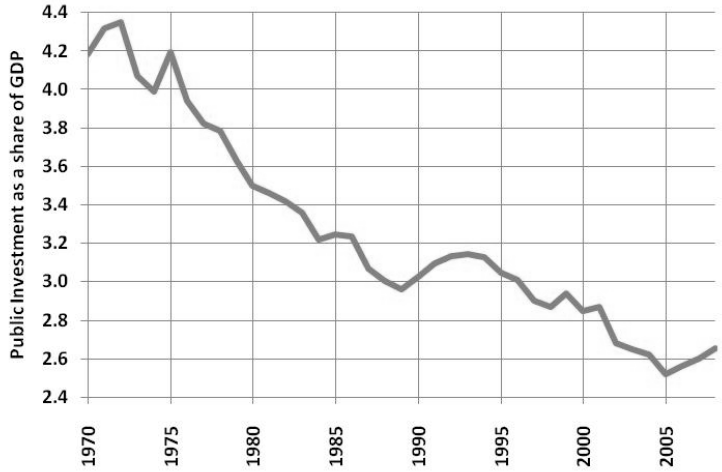

Figure 6: Government revenue, expenditure and gross debt before, during and after adjustments