Growth Forecast Errors and Government Investment and Consumption Multipliers

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ABSTRACT

We compare government investment and consumption multipliers in developed economies during the initial years of the ongoing fiscal consolidation. We find that, in countries with high public debt, the investment multiplier is likely to be higher than what has been assumed by policy makers and higher than the consumption multiplier. This leads to the conclusion that the consolidation should be accompanied by increased public investment.

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I. Introduction

Developed economies are currently going through a fiscal consolidation. One of the main questions for them is how to design the consolidation in order to reduce the damage it will have on growth (see Lagarde (2013)). To do that, activities with lower impact on growth should be reduced more than activities with a greater impact.

It is usually considered that government investment has a greater impact on growth (i.e., multiplier) than government consumption. For instance, the "Golden Rule" of public finance states that governments should borrow only for investment, not for consumption, since investment pays for itself, through the future tax revenues generated by the new capital stock. Some economists have argued that the current fiscal consolidation should allow some support through public investment. Spilimbergo, Symansky, Blanchard, and Cottarelli (2008), when advising on the appropriate fiscal policy for the crisis, say: *"(...) spending programs, from repair and maintenance, to investment projects delayed, interrupted or rejected for lack of funding or macroeconomic considerations, can be (re)started quickly"* (p. 5). Similarly, Christina Romer argues: *"There is simply no question that the United States needs to enact a comprehensive plan for long-term deficit reduction as soon as possible. But any such plan could and should include another substantial dose of fiscal expansion in the short run—ideally one oriented toward public investment."* (Romer (2012), p. 13).

Despite these recommendations, fiscal authorities in these countries have cut investment spending more than consumption expenditure during the on-going consolidation (see Figure 1). In Greece, for instance, public investment as a percentage of Gross Domestic Product (GDP) has been cut in 2010 and 2011 by 1.5 percentage points (relative to the previous three years), while public consumption has been cut by only 1 percentage point (p.p.). In Ireland, similarly, investment has been cut by 1.5 p.p., while consumption by only 0.2 p.p.. As a matter of fact, public investment in 37 developed economies has been cut, on average, by 0.2 p.p., while public consumption has been increased by 0.1 p.p.[1] (see section III on the data sources and the selection of countries).

Figure 1 here

This paper will compare the government investment and the government consumption multiplier in the developed economies during 2011 and 2012. The approach that will be used is based on

1. If the two outliers are excluded (Bulgaria and Romania, where consumption has fallen by 9 percent of GDP), the average increase in public consumption is even higher, 0.6 percent.

investigating if there is a correlation between unexpected growth (i.e. difference between actual and forecasted GDP growth) and fiscal variables that have been known at the time of the preparations of the forecasts. This approach has a long tradition in finance and forecasting (see Timmermann and Granger (2004)) and has been introduced in the literature on fiscal multipliers recently by Blanchard and Leigh (2013). More precisely, growth forecast errors for 2011 and 2012 will be regressed on variables measuring government investment and government consumption during the previous years, 2010 and 2011. Since the forecasts should incorporate all the relevant information known at the time of their preparation, and the government consumption and investment for the previous year were known when the forecasts for the forthcoming year were prepared, the two should be uncorrelated if the right multipliers were used. If the coefficients on public consumption and investment turn out to be positive and significant, that would imply that the multipliers are higher than those that were assumed.

The analysis will distinguish between countries with high public debt and countries with not-so-high public debt, due to the conventional understanding that the fiscal multiplier may be lower, or even negative, in times of high public debt. Although there may be arguments that the multiplier may also differ between countries with high and low *private* debt, we will remain focused on the public debt, since it has attracted the greatest attention recently. Hence, in the remainder of the text, debt will be used as a synonym for public debt.

The results point out that the *consumption multipliers* have been neither higher nor lower than those assumed by the forecasters, both for the countries with high public debt and for the countries with not-so-high public debt; same for the *investment multipliers in the non-highly-indebted countries*. However, the *investment multipliers in the highly-indebted countries* seem to be substantially higher, by more than one (1.7 in the baseline regression), than those that were assumed in the forecasts. Assuming that the investment multipliers that were used in the forecasts are not lower than the consumption multipliers (a reasonable assumption, judging by Coenen, Erceg, Freedman, Furceri, Kumhof, Rene Lalonde, Linde, Mourougane, Muir, Mursula, Roberts, Roeger, de Resende, Snudden, Trabandt, and in't Veld (2012), p. 46, Table 3), these results suggest that the investment multiplier is much higher than the consumption multiplier in countries with high public debt. Assuming that similar investment multipliers were used for the highly-indebted and the not-so-highly-indebted countries, these results suggest that the investment multiplier is higher in the former than in the latter.

The finding that the *investment multiplier is higher than the consumption multiplier* reiterates

one of the basic postulates of Keynesian economics - that public investment is the best way for the government to support the economy. Several explanations can be offered for the higher investment multiplier: public investment, besides the demand effects, has also supply side effects; public investment is less likely to crowd-out private demand, than public consumption; public investment is less likely to end up in imports or savings, compared to public consumption.

The finding that the *investment multiplier is higher for the highly-indebted countries* comes as a surprise, however, since it is usually believed that high public debt reduces the multiplier, through the expectations effect (higher probability for a default in the future). We offer two explanations for this finding. First, it may happen that the highly-indebted countries have a low level of public capital (relative to the optimal level), which makes the return on public capital high (see Perotti (2004), for a similar explanation, though in the opposite direction). Indeed, the finding for the higher investment multiplier is driven by countries considered as having poor public infrastructure - Greece, Ireland and Italy. An alternative explanation is through an expectations effect, but in an opposite direction - if the public does not believe in austerity, i.e. expects the austerity to increase the public debt, instead of decreasing it (which may happen if it expects a high multiplier), the expectations effect may add up to the standard Keynesian effects. The possibility for this self-fulfilling outcome has recently been discussed by Blanchard, Mauro, and Dell'Ariccia (2013) and IMF (2013a). Support for this explanation is found in Jovanovic and Manzo (2014) and Born, Muller, and Pfeifer (2015) who find that austerity measures in the current circumstances increase sovereign risk premia/sovereign yield spreads. Similarly, Caggiano and Greco (2011), EC (2012b) and Romer (2012) find that sovereign bonds dynamics respond more to GDP growth more than reduction in fiscal deficit.

The policy implications arising from these findings are clear - the current fiscal consolidation should allow some space for support through public investment. Something similar has been argued recently by IMF (2014), Chapter 3, which has argued that now is a good time for infrastructure push.

The rest of the paper is structured as follows. Section II discusses the related literature, and section III describes the methodology and the data. Section IV presents the results. Section V discusses the findings and section VI concludes.

II. Related literature

Public investment is considered as the most effective policy instrument in Keynesian economics, because it combines the short-run support of the government consumption with the long-term supply-side benefits (see Skidelsky (2001)). This is best illustrated by the "Golden Rule" of fiscal policy, which argues that government investment can be financed by new debt, unlike government consumption, since it will pay for itself, by the tax revenues from the new capital stock[2]. Post-Keynesian economics continued this tradition (see Arestis and Sawyer (2003) and Arestis and Sawyer (2004)), but New Keynesian economics mostly ignored public investment and fiscal policy in general. According to Smith and Zoega (2009), whereas in Keynes' General Theory investment determines effective demand, in New Keynesian models investment is mostly ignored. Similarly, as stated by Woodford (1999), "nowadays the advocates of active stabilization policy almost invariably consider monetary policy, rather than fiscal policy, to be the instrument of choice" (p. 18). Only after the recent crisis have New Keynesians re-discovered fiscal policy (Auerbach and Gorodnichenko (2012a), Ilzetzki, Mendoza, and Vegh (2010), Eggertsson (2011)).

Nevertheless, there seems to be an agreement in the empirical literature that public investment is likely to have more positive growth effects than public consumption. The best illustration are the meta-regression studies of Nijkamp and Poot (2004) and Gechert (2015). The former examines the long-run growth effects of different types of government policy reported in 93 studies conducted between 1983 and 1998. It finds that the public investment is likely to have a positive effect on long-term growth, differently from public consumption, which is likely to be neutral. The study of Gechert (2015) analyses 104 papers, conducted between 1992 and 2012 (most of them after 2007), focusing on the short-run growth effects of fiscal policy. It finds that the investment multiplier is higher than the consumption multiplier by approximately 0.5.

However, it is well acknowledged in the literature that the size of the fiscal multiplier is likely to depend on the circumstances (see Gechert (2015) or Rusnak (2011)), so the notion that existing literature finds that the public investment multiplier is *usually* higher than the public consumption multiplier, does not imply that it has to be higher *during the current period of consolidation*[3]. The main reason for this is that the current economic conjuncture in developed economies is characterised

2. As Perotti (2004) states, an early, though not necessarily the earliest mention of the Golden Rule is in Musgrave (1939).

3. We take 2010 as the starting year of the fiscal consolidation. This is in accordance with Blanchard and Leigh (2013).

by high public debt, which is believed to lower the fiscal multiplier (see, for example, Auerbach and Gorodnichenko (2012a), Ilzetzki, Mendoza, and Vegh (2010), Kirchner, Cimadomo, and Hauptmeier (2010), Nickel and Tudyka (2014), and Rusnak (2011)).

No study has compared the public investment and consumption multipliers during the fiscal consolidation, yet. Several recent studies have compared the two, but they refer to the period before the start of the consolidation (Burriel, de Castro, Garrote, Gordo, Paredes, and Pérez (2010), Gemmell, Kneller, and Sanz (2011), Auerbach and Gorodnichenko (2012b), Acosta-Ormaechea and Morozumi (2013)). This is where the current study comes in. It will compare the investment and consumption multipliers in the developed countries, during the on-going fiscal consolidation. The methodology that will be used is along the lines of the tests of the efficient market hypothesis (see Timmermann and Granger (2004), for instance), and works on the premise that growth forecast errors (the difference between the realised and forecasted GDP growth) should be uncorrelated with any relevant information that was available at the time of the preparation of the forecasts, if the models that were used for preparing the forecasts are correct, because the information has been included in the forecasts. This idea has been recently applied in fiscal policy analysis by Blanchard and Leigh (2013), who investigate whether the multipliers that have been used by the IMF and other professional forecasters during the consolidation have been correct or not, by regressing the growth forecast errors on the planned fiscal consolidation. Because the planned measures have been taken into account when the forecasts have been prepared, if they are correlated with the growth forecasts errors, that would imply that the "assumed"[4] multipliers are wrong. That is what Blanchard and Leigh (2013) find - that the forecast errors are correlated with planned consolidation, i.e. that the models used by the forecasters have underestimated the multipliers, i.e. that the multipliers in the advanced countries in the current situation are likely to be high.

III. Methodology and data

The approach that is used in this paper is based on regressing the growth forecast errors in a given year on variables measuring fiscal policy during the previous year. If the multipliers that were used for producing the forecasts are correct, assuming rational expectations, the growth forecast errors should be uncorrelated with government spending from the previous year, since these data were known when

4. Since the forecasts from the models are a result of many different factors, it is not entirely correct to speak about certain values of multipliers assumed in the models. We will, nevertheless, use this word, for ease of exposition.

the forecasts were prepared. Hence, a regression of the growth forecast errors for year t on variables measuring fiscal decisions made during year $t-1$ should produce insignificant coefficients. If the coefficients turn out to be significant, that would indicate that the effect of the fiscal decisions on the growth has been either overestimated (if the coefficients are negative) or underestimated (if the coefficients are positive).

Instead of using a measure of the overall fiscal stance, we will distinguish between government consumption and government investment, in order to evaluate the proposals for supporting the economy through public spending[5]. We will also allow the multipliers to differ for countries with high public debt, given the widespread belief that the multipliers are lower, or even negative, when the public debt is high.

We opt for fiscal variables from the previous year, instead of differences between planned and actual fiscal policy as in Blanchard and Leigh (2013) for a simple reason that data on planned public consumption and investment are more problematic to find for a large number of countries. Although our fiscal variables are defined differently from Blanchard and Leigh (2013), the idea and the interpretation are similar, because what matters is that the explanatory variables were taken into account when the growth forecasts were prepared.

Therefore, our basic regression will be:

$$\begin{aligned}&\textit{Forecast Error of GDP Growth}_{t,i} = \beta_0 + \beta_1 * \textit{Government Consumption}_{t-1,i} \\ &+\beta_2 * \textit{Government Investment}_{t-1,i} + \beta_3 * \textit{Government Consumption}_{t-1,i} * \textit{High Public Debt}_{t-1,i} \\ &+\beta_4 * \textit{Government Investment}_{t-1,i} * \textit{High Public Debt}_{t-1,i} + \epsilon_{t,i}\end{aligned}$$

where the subscript t indexes the years 2011 and 2012 and i indexes the countries.

The regression is estimated using Ordinary Least Squares, because endogeneity is not a problem, because the explanatory variables are dated before the dependent variable.

The analysis will be done on a sample of *developed* countries, since it is these countries that are going through fiscal consolidation. To end up with as many observations as possible, we select the countries that the World Bank classified as high income economies in 2012 (76 countries and territories), plus Bulgaria and Romania, which are still not high income, but are EU members. Of these 78 economies, the required data on public investment, public consumption and forecasted and actual GDP growth are available for 37 countries: Australia, Austria, Barbados, Belgium, Bulgaria,

5. The third component of public spending, the public transfers, are excluded from the analysis, due to data unavailability.

Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Arab Emirates, United Kingdom, United States. As will become clear, results are almost identical when the sample is restricted to the advanced economies of the IMF, but in that case we have approximately 20% fewer observations. Since certain data is unavailable for 2012, 62 observations in total will be analysed. This may seem low, but it should be noted that similar studies work with an even lower number of observations (e.g., the baseline regression of Blanchard and Leigh (2013) is estimated on 26 observations).

The forecast errors for the GDP growth are calculated as a difference between the realised real GDP growth in year t (2011 and 2012) and the projected growth for that year at the beginning of year t. Projected GDP growth is taken from the April editions of the World Economic Outlook (WEO) in year t, i.e. 2011 and 2012 (IMF (2011) and IMF (2012)). These projections are prepared at the beginning of the year, when all the relevant data for the previous year are known, including the fiscal stimulus, but economic growth for the current year is still unknown. GDP growth and public debt is from the April 2013 edition of the WEO (IMF (2013b)).

Government consumption is defined as the difference between the government consumption in year $t-1$ (2010 and 2011) and the average government consumption for 2007-2009 (as a share of GDP). Government investment is defined analogously. We take the difference from the average for the period 2007-2009, instead of from a value for a single year (e.g. 2009), to avoid potential base effects - since GDP in 2009 in many of these countries was lower than usual, due to the recession, the share of government consumption and investment in GDP may have been higher than usual in 2009, which may overestimate the fiscal contraction in 2010 and 2011. Alternatively, we could express the fiscal variables as differences from their cyclically-adjusted or structural levels. We opt against this, due to the limitations of the cyclical adjustment procedures, nicely summarised in Guajardo, Leigh, and Pescatori (2011).

High public debt is a dummy variable which takes value of one for countries with *gross*[6] public debt above 95% of GDP in year $t-1$ (2010 and 2011). The 95% threshold is chosen after Baum, Checherita-Westphal, and Rother (2013). Five countries have debt above 95% in 2010: Belgium, Greece, Italy, Japan and US, and three more in 2011 - Iceland, Ireland and Portugal. All in all, 11

6. We take the gross debt, instead of the net, since the latter is available for fewer countries.

of the 62 observations can be classified as "high debt" episodes (Iceland and Ireland drop out due to unavailability of data on GDP growth for 2012 in the April 2013 WEO).

Data on government consumption are from the World Development Indicators (WDI) database of the World Bank. Data on government investment are calculated from Gwartney, Lawson, and Hall (2013a), who, in their Economic Freedom of the World database, provide data on government investment as a share of total investment for about 130 countries. The sources of the government investment data in this database are: Government Finance Statistics Yearbook of the IMF; WDI of the World Bank; International Finance Statistics of the IMF; World Economic Forum, Global Competitiveness Report; United Nations National Accounts; and Transition Indicators of European Bank for Reconstruction and Development (see Gwartney, Lawson, and Hall (2013b) p. 236). These values are then multiplied with the share of gross fixed capital formation in the GDP, from WDI.

IV. Results

IV.A. Main results

The results of the main (baseline) regression are presented in Table 1, column 1. All the variables in the regression are insignificant, except the cross-product of the high public debt dummy and the government investment, which is significant at the 1% level. The insignificance of the government consumption and government investment variables points out that the multipliers implied in the forecasts are unlikely to differ from the actual ones, for the countries without high public debt. The insignificance of the cross product of the government consumption with the high public debt dummy indicates that there are likely no differences between the consumption multipliers for the highly-indebted and the non-highly-indebted countries, assuming that similar multipliers were used for them in the forecasts. On the other hand, the cross-product of the high public debt dummy and the government investment is significant at the 1% level. The sum of this coefficient with the government investment coefficient gives the difference between the investment multiplier implied in the forecasts and the actual one, for the countries with high public debt. The sum is significant at the 1% level, again, indicating that the actual investment multiplier for the highly indebted countries is likely to be higher than the one used in the forecasts by around 1.7. Assuming that similar investment multipliers were used for the highly-indebted and the non-highly-indebted countries, this suggests that the investment multiplier is higher for the indebted countries. Furthermore, if the impact

of government investment on GDP was assumed not to be lower than the impact of government consumption in the indebted countries, the previous findings imply that the investment multiplier is likely to be higher than the consumption multiplier in these countries. Evidence from Coenen, Erceg, Freedman, Furceri, Kumhof, Rene Lalonde, Linde, Mourougane, Muir, Mursula, Roberts, Roeger, de Resende, Snudden, Trabandt, and in't Veld (2012) suggest that this is likely to be the case - they examine the growth effects of government consumption and investment in the main workhorse models of the leading policy institutions in the world, finding that the investment multiplier is marginally higher than the consumption multiplier.

In the next two columns of Table 1, we check whether the results change if the sample of countries is changed. In column 2, we estimate the regression for the group of countries that the World Bank classifies as high income (i.e. we exclude the EU countries which are still low income). In this way, we lose 4 observations, compared to the initial regression. In column 3, we restrict the sample to the countries that the IMF classifies as advanced, losing 8 additional observations. As can be seen, the results remain very similar - the cross product of the high public debt and the government investment is always significant at one percent, as well as its sum with the government investment, which actually increases slightly. Therefore, we continue the analysis with the initial group of countries, due to the highest number of observations in this case.

We then control for the possibility that the results are driven by certain outliers. In column 4, we estimate the equation using quantile regression, which uses the median of the variables, instead of the mean. In column 5, we estimate the equation using the robust regression technique of Andersen (2008). The variable of interest has a slightly lower coefficient in these two regressions, but remains significant (at the 5% level). In column 6, we bootstrap the standard errors in the baseline regression, due to the small sample size[7]. The variable of interest remains significant, though only at the 10% level.

Table 1 here

7. The bootstrapping exercise was done using 3000 replications. Higher number of replications gave similar results. The seed used for the simulation in Stata was 26011982, the date of birth of the author.

IV.B. Additional variables

Next, we add certain controls in the baseline regression in order to account for the possibility that there may be omitted variables correlated both with the growth forecast errors and the past fiscal decisions[8]. To begin with, fiscal decisions from the current year (t) are likely to be correlated with both growth forecast errors and fiscal policy from past year ($t-1$); with growth forecast errors because unexpected growth is likely to lead to higher revenues and hence higher spending, and with the past fiscal decisions because there is some inertia in fiscal actions. If the previous findings about the investment multiplier disappear after fiscal variables for the current year are introduced in the regression, then the previous results would be invalid. In Column 1 of Table 2 we show the results of a regression including both past and current fiscal variables. It can be seen that the variable of main interest remains significant (at the 5 percent level) and becomes even higher (approximately 3), supporting the previous findings.

We next add the trade and financial flows experienced in year t (exports, FDI and portfolio flows; see Table A1 in the appendix for a definition of these variables and the other variables from this section). Unexpected flows, caused by fiscal decision from the previous year, may bias the results. Column 2 of Table 2 shows these results. They are almost the same as the baseline. In column 3, we add the monetary policy stimulus during year $t-1$, by including the interest rate and the expansion of the M1. If both the monetary and fiscal policy are expansionary, and the forecasters have underestimated the effect of the monetary policy on growth, then the significance of the fiscal variables may be capturing the effect of the monetary policy. This does not seem to be the case, since the monetary policy variables are insignificant and the fiscal policy variables remain unchanged. In column 4, we add certain variables for the banking system - the share of capital in the total assets and the share of non-performing loans in year $t-1$. These variables are likely to be correlated with the fiscal policy, due to the bank bailouts, for instance, and if their effect on GDP growth has not been well accounted for, then the significance of the fiscal variables may be due to their omission. Again, this does not seem to be the case.

Developments in private debt may bias the results in a similar manner. Private sector deleveraging during the consolidation may be related to economic growth. The deleveraging may also be related to the fiscal decisions, because its pace has likely played a role in the design and conduct of fiscal policy.

8. By including additional controls, we also, in a certain way, control for possible errors in the forecasts regarding the effects of the other variables on the GDP.

To account for this possibility, we add two variables related to private debt - private credit growth and property prices, both measured in year t. Column 5 of Table 2 show these results. It may be seen that private credit is significant, which implies that its effect on growth has not been accounted properly. The coefficient of interest declines somewhat (the sum is now 1.2), which is likely due to private credit. Nevertheless, it remains significant at 10 percent, yielding further support to our past findings.

Next, we include a set of variables related to fiscal policy - the level of public debt, the fiscal balance and the change in taxes, all measured in year $t-1$. High debt and deficit may be correlated with the fiscal policy (lower space for support), and may affect growth, too (see, for instance, Reinhart and Rogoff (2010), Reinhart, Reinhart, and Rogoff (2012), Herndon, Ash, and Pollin (2014)). Countries where public spending was cut more are likely to have had their taxes raised. If the effect of tax hikes was not forecasted well, the observed relationship between public investment and growth forecast errors may be an artefact of the omitted tax increases. These results are presented in column 6 of Table 2. As can be seen, the results remain unchanged, again. Next, we include the current account balance - external imbalance may be related to fiscal policy (twin deficits) and may affect growth at the same time. However, the results remain stable once again (column 7).

The fiscal decisions may be endogenous with respect to the growth forecast errors through another channel - through political factors. Certain factors of political nature may lead to lower than expected GDP growth and may be correlated with the fiscal decisions from the previous year. For instance, political instability, or inability to reach agreement in the parliament, are likely to affect the size of the stimulus/consolidation, as well as its design (the allocation between consumption and investment). They may also lead to lower growth than initially expected. To control for this, we add several variables capturing certain political characteristics. We include: 1) a dummy for coalition governments - coalition governments are more difficult to reach an agreement for decisive cuts in government spending; 2) a dummy for control of all the relevant houses - if the party in power has control of all the relevant houses, it can implement problematic cuts or reforms more easily; 3) the share of seats in the parliament belonging to the government parties - the bigger the share of seats in the parliament belonging to the government parties, the more easily the government will make politically problematic decisions; 4) a dummy for left orientation of the government - parties on the left of the political spectrum may be more reluctant to cuts in government spending. These data are taken from the Database of Political Institutions 2012 of Beck, Clarke, Groff, Keefer, and Walsh (2001).

The results are presented in column 8 of Table 2. As can be seen, the variable of interest remains significant, though only at 10%.

Table 2 here

We next check whether the results hold when the IMF forecasts are replaced with forecasts from other institutions. Table 3, column 1 shows the results with forecasts from the European Commission, while column 2 shows the results when the forecasts from Consensus Economics are used.[9] The findings for the public investment remain as before. We also check if the correlation between the forecast errors and public investment is a rule rather than an exception. Column 3 of Table 3 shows the results of the baseline regression for *developing* countries, while column 4 shows the results of the regression for *developed* countries, but during "*good times*", i.e. for the period before the financial crisis (2007 and 2008). As can be seen, all the fiscal variables are insignificant in these two regressions, pointing out that the IMF forecast errors are likely to be random, normally, and that the correlation between the public investment and the growth forecast errors is present only for the developed countries, during the consolidation. Last, we replace the growth forecast errors with the GDP growth, and add the forecasted GDP growth as an additional regressor (column 5, Table 3). The forecasted GDP appears highly significant, with a coefficient of 1.16, indicating that the realised GDP is indeed correlated with the forecasts. The variable of interest retains its magnitude, but loses the significance (the p-value is 0.12), which can be attributed to its correlation with the additional regressor.

Table 3 here

In order to see if the results are driven by certain countries, we next do a simulation in which we randomly discard twelve observations (20% of the sample), and reestimate the baseline regression on the remaining 50 observations.[10] We repeat this exercise six times. The results, shown in Table 4, yield additional support to our findings.

Table 4 here

9. The spring forecasts from the European Commission are used EC (2011) and EC (2012a)), and the April editions of the Consensus Economics forecasts for G7 and Western Europe and Eastern Europe (ConsensusEconomics (2011a), ConsensusEconomics (2011b), ConsensusEconomics (2012a), ConsensusEconomics (2012b)).

10. The seed that was used for generating the random samples in Stata is 26011982.

IV.C. Bayesian Model Averaging

As an additional robustness check, we do a Bayesian Model Averaging (BMA) exercise, by which we try to see which of the discussed explanatory variables is likely to be the most robust determinant of the growth forecast errors. BMA is appropriate for situations when a large number of candidate explanatory variables exists, and the researcher does not know a priori what the correct theoretical model is. BMA addresses the problem of uncertainty regarding the correct model by considering information from all available models (i.e. combinations of the variables). Instead of selecting only one model, BMA estimates many of the potential models (sometimes even all the possible models) and then draws inferences by weighting their results. For instance, if there are 20 candidate explanatory variables, there are 2^{20} =1,048,576 possible models (i.e. there are 1,048,576 different combinations of the 20 available variables), which can often produce conflicting results. BMA estimates many (or all) of the possible model combinations using Bayesian techniques, whereby the researcher's prior information/expectations about the model parameters are combined with information from the data, to obtain the posterior parameter estimates. Then each of the estimated models is weighted by its posterior probability (a measure of the goodness of fit). Inferences are then be based on the weighted averages of the posterior means and standard errors of the candidate variables, and on the posterior inclusion probability (PIP), which can act as a measure of the significance of the variable.

A comprehensive explanation of BMA can be found in Hoeting, Madigan, Raftery, and Volinsky (1999)). Here we provide the basic technical details:

The model of interest, presented in Equation (1), can be rewritten as:

$$y = \alpha\iota_n + X\beta + \sigma\epsilon \tag{1}$$

where y stands for the change in inequality after the crisis, ι_n is an n-dimensional vector of ones (n representing the number of countries, i.e. observations), α is the intercept, X is an $n \times k$ matrix of the k candidate explanatory variables, β is a k-dimensional vector of regression coefficients, ε is the error term and σ is a scale parameter.

BMA estimates regressions of the following type:

$$y = \alpha \iota_n + X_i \beta_i + \sigma \epsilon \tag{2}$$

where X_i is a certain combination of the candidate explanatory variables, denoted as model M_i, and β_i are the respective coefficients. There are 2^k such regressions.

BMA calculates the posterior probability distribution of any parameter of interest, θ, as:

$$p(\theta|y) = \sum_{i=1}^{2^k} p(\theta|M_i, y) p(M_i|y) \tag{3}$$

where i indexes the k possible models M. Equation (4) essentially states that the posterior distribution of a parameter ($p(\theta|y)$) is the weighted sum of its posterior distribution conditional on the assumption that the model M_i is the correct model ($p(\theta|M_i, y)$), where the weights are the corresponding normalized posterior model probabilities ($p(M_i|y)$).

The normalized posterior model probabilities ($p(M_i|y)$) are obtained according to the standard Bayesian formula:

$$p(M_i|y) = \frac{p(y|M_i)\overline{p}(M_i)}{\sum_{j=1}^{2^k} p(y|M_j)\overline{p}(M_j)} \tag{4}$$

which states that the standardized posterior model probability of a model M_i is the product of the marginal likelihood of the model ($p(y|M_i)$) and the model prior ($\overline{p}(M_i)$) (i.e. the posterior model probability of a model M_i), divided by the sum of the posterior model probabilities of all the 2^k models.

The marginal likelihood ($p(y|M_i)$) is again calculated according to the standard Bayesian formula:

$$p(y|M_i) = \int p(y|\alpha, \beta_i, \sigma, M_i) p(\alpha, \sigma) p(\beta_i|\alpha, \sigma, M_i) d\alpha d\beta_i d\sigma \tag{5}$$

where $p(y|\alpha, \beta_i, \sigma, M_i)$ is the model corresponding to Equation (3), and $p(\alpha, \sigma)$ and $p(\beta_i|\alpha, \sigma, M_i)$ are priors.

The application of BMA requires: 1) the setting of priors for the model parameters ($p(\alpha, \sigma)$ and $p(\beta_i|\alpha, \sigma, M_i)$); 2) the setting of priors for the models ($\overline{p}(M_i)$); and 3) the determination of how to choose from all the available 2^k models.

For $p(\alpha, \sigma)$, as standard in the literature (see Fernandez, Ley, and Steel (2001a) and Masanjala and Papageorgiou (2008), for instance), we use an improper non-informative prior:

$$p(\alpha, \sigma) \propto \sigma^{-1}$$

For $p(\beta_i|\alpha, \sigma, M_i)$, we follow the literature, again, and set this prior as k-dimensional Normal distribution:[11]

$$p(\beta_i|\alpha, \sigma, M_i) = N_k(\beta_i|0, \sigma^2 g(X_i' X_i)^{-1}) \tag{6}$$

where N_k stands for the density function of a k-dimensional Normal distribution.

The parameter g controls the variance of the conditional distribution of the model parameters and, hence, affects the posterior model probabilities (i.e. the overall results). The choice of g can affect the results to a great extent, with high values of g giving more weight to the few best models, and low values of g spreading the weights among more models. We will therefore use several priors for the parameter g - the "benchmark prior" of Fernandez, Ley, and Steel (2001b), the unit information (UIP) prior of Kass and Wasserman (1995), the local empirical Bayes prior of Hansen and Yu (2001) and the hyperprior of Liang, Paulo, Molina, Clyde, and Berger (2008).

For $\overline{p}(M_i)$, we use the dilution prior suggested by Durlauf, Kourtellos, and Tan (2008), which is an extension of the dilution prior proposed by George (1999):

$$\overline{p}(M_i) = |R_i| \eta^{k_i} (1 - \eta)^{k - ki} \tag{7}$$

where $|R_i|$ is the determinant of the correlation matrix corresponding to model M_i, and $\eta = 1/2$. This prior penalizes models that exhibit a high degree of multicollinearity (the higher the correlation, the smaller the determinant), and is used in situations when multicollinearity may be a problem (see

11. The elements of β which do not appear in the model M_i are set to zero.

Durlauf, Kourtellos, and Tan (2008), and Feldkircher (2014)). We use this prior because three pairs of variables appeared highly collinear in our case, with correlation exceeding 0.7 (see Table A2 in the appendix). It should be noted that very similar results are obtained with other model priors.

The final thing that needs to be determined is how to choose which of the potential models to estimate. Because in our case it is technically possible to estimate all the possible models, this is what we do.

Inferences will be based on the weighted average of the posterior means of the candidate variables, and on the posterior inclusion probability (PIP). The PIP of a given variable is the sum of the posterior model probabilities of all models that include that variable. As standard in the literature, variables with a PIP higher than 0.5 will be considered significant.

The BMA results are presented in Table 5. Each column presents results obtained with one of the model coefficients prior. All the results are based on the 500 models with best fit.[12]

Table 5 here

The only two significant variables in all the estimations are the exports and the cross product of the high public debt dummy and the government investment. Therefore, it can be said that the results of the BMA analysis confirm the previous findings, that the government investment is likely to be a significant determinant for the explanation of the growth forecast error in the indebted countries.

V. Further discussion

Two main messages should be taken from this analysis. The first one is that public investment is likely to have a bigger impact on GDP in the countries with high public debt, than public consumption. Our study is not the only recent study to suggest that the investment multiplier is likely to be higher than the consumption multiplier - Burriel, de Castro, Garrote, Gordo, Paredes, and Pérez (2010), Gemmell, Kneller, and Sanz (2011), Auerbach and Gorodnichenko (2012b) and Acosta-Ormaechea and Morozumi (2013) find the same. Our study is, however, the first study that finds this for the period of fiscal consolidation (i.e. after 2010). The higher investment multiplier is by no means a

12. The BMA analysis has been implemented in R, using the BMS library, developed by Feldkircher and Zeugner (2009).

novel finding, and can be explained in several ways. The first explanation is through the supply-side effects - public investment, in addition to the main demand effect, increases the capital stock, i.e. the potential GDP. However, this effect is unlikely to be the main driving force behind our results, since this effect primarily refers to the long run. A second explanation may be the smaller crowding out of the government investment. Government investment is usually focused on goods which are imperfect substitutes with private expenditure. Numerous studies have documented that public investment crowds in private investment, instead of crowding out (Stephan (2003), Belloc and Vertova (2006), Andrade and Duarte (2016)). Heintz (2010) finds that public capital stock raises the productivity of the private capital stock. Third, public investment has fewer "leakages" than public consumption - it is more labour-intensive, so less likely to end up in imports than public consumption (see Spilimbergo, Symansky, and Schindler (2009), p. 2-3).

The second message from the analysis is that, contrary to the widespread belief, the (investment) multiplier is likely to be higher in countries with high public debt, than in countries with not-so-high public debt. We propose two possible explanations. The first one is that the indebted countries may have, at the same time, a low level of public capital (relative to the optimal level), as a result of which its marginal product is high. Similar logic, though in the opposite direction, is proposed by Perotti (2004), in his findings that the investment multiplier does not differ from the consumption multiplier in the US, UK, Canada, Germany and Australia (the argument there is that these countries may have too high a level of capital, which makes the investment multiplier low).

To check how likely this explanation is, we divide the highly-indebted countries in our sample into two groups: countries with a high level of public capital and countries with a low level of public capital. We use the quality of overall infrastructure from the Executive Opinion Survey of the Global Competitiveness Report as a proxy for public capital (WEF (2011), p. 412). In particular, in the high public capital group, we include Iceland, Portugal, Japan, Belgium and the US, while in the low capital group - Ireland, Greece and Italy.[13] Then, we estimate the baseline regression, restricting the sample of high-public-debt countries only to those with high-capital (Table 6, column 2), and only to those with low-capital (Table 6, column 3). It can be seen that when only the high-capital high-public-debt countries are included, we no longer find evidence that the multipliers differ. On

13. The index covers three aspects of the infrastructure - transport, telephony and energy. It covers around 140 countries. The highest possible value of the index is 7, the lowest 1. The average value of the index in 2010-11 for the whole world is 4.3. However, as only Italy has a value lower than this average, we choose 5 as the cut-off point for high vs. low public capital. The US, the lowest ranked high-capital country has a value of 5.7 and is ranked 24th in the world. Ireland, the highest ranked low-capital country, has a value of 4.6 and is ranked 53rd.

the other hand, when the low-capital high-public-debt countries are included, our previous findings regarding the higher investment multiplier in the highly-indebted countries remain. Hence, we may say that the explanation for the higher investment multiplier in the indebted-countries through the low public capital, and, consequently high marginal product on it, is supported by the data.

Table 6 here

Another explanation for the higher investment multiplier in the highly-indebted countries is through the confidence effects. Confidence effects are usually used to justify non-Keynesian effects of fiscal expansion and are the basis of "the German view" on fiscal policy (Giavazzi and Pagano (1990), p. 76). Hellwig and Neumann (1987), p.137-138, for instance, say: *"The direct demand impact of slower public expenditure growth is clearly negative. (...) The indirect effect on aggregate demand of the initial reduction in expenditure growth occurs through an improvement in expectations if the measures taken are understood to be part of a credible medium-term program of consolidation"* (see also Fels and Froehlich (1987)). Blanchard (1990) proposes a model in which fiscal consolidation increases consumption. The idea is that by undertaking consolidation today, the government eliminates the need for larger, probably more disruptive consolidation in the future, which increases the expected lifetime income of households, and hence consumption. Baxter and King (1993) analyse, through a model, under which circumstances fiscal expansions can produce a negative response in economic activity, finding that this is likely to happen when the expansion is financed by taxes, since they increase the expected future tax burden. Sutherland (1997) and Perotti (1999) develop models in which fiscal policy has standard, Keynesian effects under low public debt, but switches to non-standard effects as the level of public debt becomes high.[14] What all these models have in common is that the non-standard effects emerge from some form of the wealth effect - fiscal contraction reduces the probability for a future increase in taxes, as a result of which the expected lifetime income increases, which raises consumption. Non-Keynesian effects can emerge through a slightly different source, too, as discussed in Giavazzi, Jappelli, and Pagano (2000). If the fiscal policy stance is unsustainable, it may lead, if not corrected, to public debt repudiation and severe output losses. Fiscal contraction in such cases reduces the probability of default, which would have affected output adversely. As a result,

14. Bertola and Drazen (1993) also develop a model in which the relationship between fiscal policy (government consumption as a share of GDP) and private consumption (as a share of GDP) is non-linear, depending on the level of debt. However, in their model the relationship is negative when the debt is low and positive when the debt is high.

the expected net lifetime income rises, leading to an increase in current private consumption. Miller, Skidelsky, and Weller (1990) propose a model with a similar reasoning - there is a critical level of public debt above which the government imposes a tax on bond holders. As the level of public debt increases, the rate on government bonds rises to reflect the increased risk of the tax being imposed. The increased interest rate crowds out private spending. Fiscal contraction then, in a situation when the debt is high, is expected to reduce the debt, hence the probability that the tax will be imposed, hence the interest rate, and increases output[15].

But, suppose that, in a situation when public debt is high, agents expect that contractionary fiscal policy will increase the debt, instead of decreasing it. Why would this happen? If agents perceive that the multiplier is greater than one, then they would expect that cutting public spending will decrease the GDP more than it will decrease the debt, as a result of which the debt-to-GDP ratio will increase further. The interest rate on government bonds will then rise, to reflect the higher probability of default. In such a situation, the confidence effects may add up to the Keynesian effects, resulting in a greater multiplier when the debt is higher, contrary to the conventional belief. Hence, if agents believe that the multiplier is high, then this may indeed lead to a higher multiplier, when the debt is high. If agents believe that the investment multiplier is higher than the consumption multiplier, and if the consolidation is implemented mainly through cuts in public investment, this explanation is likely to hold only for investment spending, not necessarily for consumption.

The possibility for these self-fulfilling multiple equilibria has recently been discussed by Blanchard, Mauro, and Dell'Ariccia (2013), p. 12, and IMF (2013a), p. 21. Support for this explanation is found in Jovanovic and Manzo (2014), who analyse sovereign credit risk premia in six advanced countries during 2008-2013, finding that the premia usually increase after public spending cuts. They also find different response to shocks in public investment and public consumption, with public investment cuts increasing the risk premium more. Similarly, Born, Muller, and Pfeifer (2015) analyse sovereign yield spreads for 26 emerging and advanced economies between 1986 and 2013. They find that during fiscal stress cuts in government spending fail to bring about a reduction in spreads. Other studies on sovereign bonds dynamics find that markets value GDP growth more than reduction in fiscal deficit. Romer (2012) finds that bad news about growth is the second most important factor driving increases in the Spanish government bond rate in the period April 2011-April 2012, after news about the response to the European crisis. The analysis in EC (2012b), p.35, also points out that financial

15. There is a third channel through which non-Keynesian effects can arise, as Alesina and Ardagna (2010) note, thorugh the labour supply. This channel is more applicable to longer horizons, so we leave it aside.

markets may indeed prefer GDP growth to fiscal adjustment - sovereign spreads are found to react much stronger to expected GDP growth than to changes in fiscal balance. Similar results are found in Caggiano and Greco (2011).

The existing literature (Auerbach and Gorodnichenko (2012a), Ilzetzki, Mendoza, and Vegh (2010), Kirchner, Cimadomo, and Hauptmeier (2010), Nickel and Tudyka (2014), Rusnak (2011)), finds that the fiscal multiplier is lower when the public debt is high. Our findings about the higher multiplier in the highly-indebted countries is not necessarily at odds with these studies, because these studies actually exclude the recent consolidation. The shocks in Auerbach and Gorodnichenko (2012a) end in 2008 or 2009 (see Figure 3), the data in Ilzetzki, Mendoza, and Vegh (2010) end in 2009 (see Tables A1 and A2), the data in Kirchner, Cimadomo, and Hauptmeier (2010) end in 2008Q4, while those of Nickel and Tudyka (2014) - in 2010.

What are the implications of these findings? If one strongly believes in them, i.e. if the investment multiplier is really that higher than the consumption multiplier, that would suggest that by cutting public consumption and increasing public investment less than proportionately, one can, at the same time, lower the budget deficit and stimulate growth. However, the results may be imprecisely estimated for such a strong interpretation - there are only 62 observations. Also, the multiplier is likely to be different for every country, so, the averages we estimate do not have to hold for every analysed country. The weaker interpretation is, thus, that since the investment multiplier in the indebted countries is likely to be higher than the consumption multiplier, the consolidation should allow for some space for support through public investment. This has not been the practice during the recent consolidation. As can be seen on Figure 1, public investment was cut in 20 of the 37 countries, while consumption - in only 7. Similar arguments, that governments should expand infrastructure investment, have been recently proposed by IMF (2014), Chapter 3.

VI. Conclusion

Fiscal consolidation has dominated discussions among researchers and policy makers, recently. With this paper, we join the discussion, offering some new evidence on the size of the government consumption and investment multipliers during the consolidation, in advanced economies with and without high public debt. We find that the actual investment multiplier for the highly-indebted countries is likely to be much higher than the assumed by more than one (1.7 in the baseline scenario).

This further implies that the investment multiplier is likely to be higher than the consumption multiplier in the highly-indebted countries, and that the investment multiplier is likely to be higher in countries with high public debt than in countries with not-so-high public debt. The first finding is not novel and can be explained by supply-side effects, smaller crowding out or smaller leakages of public investment. The second finding is at odds with the conventional wisdom, though, and we put through two possible explanations. First, the highly indebted countries may have at the same time low level of public capital, which would make its marginal product high. Second, in a situation where the highly indebted economies are depressed, with interest rates at the zero lower bound, markets may assume that the fiscal multiplier in them is high. Hence, they may expect that fiscal consolidation will increase the public debt to GDP ratio, instead of decreasing it, because GDP will fall more than the reduction in deficit. This would increase the probability to default and the sovereign bond rates, which may adversely affect output. Consequently, the expectations effects may add up to the Keynesian effects and result in a higher multiplier in the indebted countries. Whatever the explanation, the results have important implications for the design of the consolidation. They suggest that the consolidation should be accompanied by increased public investment.

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VIII. Appendix

Table A1: Definitions of the additional variables used in the analysis

Variable	The way it is constructed	Source
Exports	Exports of goods and services in 2011 and 2012, as % of GDP, minus average value for 2007-2010.	WDI March 2013
FDI	Foreign direct investment, net inflows, in 2011 and 2012, as % of GDP, minus the average for 2007-2010.	WDI March 2013
Portfolio flows	Portfolio Investment, net incurrence of liabilities (excluding exceptional financing) in 2011 and 2012, as % of GDP, minus the average for 2007-2010. The original data is in USD, so it is divided by the nominal GDP.	IFS
Monetary aggregate M1	Monetary aggregate M1 ('money' series in WDI), in 2010 and 2011, as % of GDP, minus the average for 2007-2009 . The original series is in local currency units, so it is divided by the nominal GDP.	WDI
Interest rate	The discount rate of the central bank in 2010 and 2011, minus the average for 2007-2009.	IFS
Capital adequacy	Bank capital to asset ratio in 2010 and 2011.	WDI March 2013
Non-performing loans	Bank nonperforming loans to total loans in 2010 and 2011.	WDI March 2013
Private credit	Growth rate of domestic credit to private sector (% of GDP) in 2011 and 2012, relative to 2007-2010.	Global Financial Development Database, World Bank
Property prices	Growth rate of property prices in 2011 and 2012, relative to the average for 2007-2010.	Residential property price statistics, Bank for International Settlements
Taxes	Tax revenues in 2010 and 2011, as % of GDP, minus average value for 2007-2009.	WDI March 2013
Public debt	General government gross public debt in 2010 and 2011, % of GDP.	WEO April 2013
Budget balance	General government structural balance in 2010 and 2011, % of potential GDP.	WEO April 2013
Current account balance	Current account balance in 2010 and 2011, % of GDP.	WEO April 2013
Coalition government	Dummy if the government in year $t-1$ was a coalition.	DPI 2012
All houses	Dummy if the ruling party had a control over all the parliament houses (name of variable in DPI: ALLHOUSE).	DPI 2012
Left government	Dummy if the ruling party was from the left side of the political spectrum (name of variable in DPI: EXECRLC).	DPI 2012
Share of parliament seats	Share of parliament seats held by the government (name of variable in DPI: MAJ).	DPI 2012

Table 1: Baseline results and some sensitivity analysis

	-1 Baseline	-2 High income economies	-3 Advanced economies	-4 Quantile regression	-5 Robust regression	-6 Bootstrapped st. errors
Government consumption	0.04	-0.13	-0.32	0.06	0.01	0.04
	(0.48)	(0.21)	(0.13)	(0.25)	(0.85)	(0.59)
Government investment	-0.34	-0.43*	-1.01***	-0.33	-0.12	-0.34
	(0.14)	(0.25)	(0.00)	(0.11)	(0.53)	(0.33)
Government consumption	-0.53	-0.47	-0.38	-0.29	-0.28	-0.53
*High public debt	(0.23)	(0.44)	(0.33)	(0.47)	(0.45)	(0.17)
Government investment	2.06***	2.33***	3.05***	1.40***	1.17**	2.06*
*High public debt	(0.00)	(0.57)	(0.00)	(0.01)	(0.03)	(0.06)
Constant	-0.05	0.08	0.18	-0.08	-0.16	
	(0.74)	(0.21)	(0.40)	(0.56)	(0.23)	
Observations	62	58	50	62	62	62
R-squared	0.17	0.19	0.36		0.08	
Gov. inv.*High pub. debt	1.72***	1.90***	2.04***	1.07**	1.05**	1.72*
+ Gov. inv.	(0.00)	(0.00)	(0.00)	(0.02)	(0.04)	(0.09)

Dependent variable in all regressions is the growth forecast error.

p-values in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively.

Table A2: Correlation matrix of the variables

	Growth forecast errors	Gov. cons.	Gov. inv.	Exports	FDI	Portfolio flows	M1	interest rate	Budget balance	NPL	Capital adequacy	Public debt	CA balance	Property prices	Private credit
Growth forecast error	1														
Gov. cons.	0.06	1													
Gov. inv.	0.02	0.40	1												
Exports	0.49	-0.29	-0.35	1											
FDI	-0.16	0.30	0.39	-0.22	1										
Portfolio flows	0.18	-0.07	-0.21	0.08	-0.90	1									
M1	0.03	0.26	0.37	-0.08	0.76	-0.79	1								
interest rate	-0.18	0.19	0.37	-0.33	0.10	-0.01	0.15	1							
Budget balance	0.22	-0.12	0.18	-0.16	0.15	-0.11	0.31	-0.13	1						
NPL	0.07	-0.08	-0.49	0.46	-0.17	0.10	-0.28	-0.77	-0.19	1					
Capital adequacy	0.07	-0.33	-0.45	0.37	-0.25	0.18	-0.30	-0.53	0.01	0.62	1				
Public debt	-0.35	0.20	-0.16	-0.25	-0.07	0.10	-0.21	0.04	-0.54	0.12	-0.16	1			
CA balance	0.08	0.11	0.31	-0.19	0.16	-0.13	0.52	0.22	0.70	-0.42	-0.37	-0.29	1		
Property prices	0.00	0.17	0.62	-0.50	0.17	-0.03	0.19	0.12	0.28	-0.21	-0.14	-0.11	0.15	1	
Private credit	-0.53	-0.06	0.06	-0.51	-0.10	0.10	-0.23	0.56	-0.31	-0.37	-0.31	0.28	-0.28	0.24	1

Table 2: Additional controls

	-1 Current fiscal	-2 Trade and finance	-3 Monetary policy	-4 Banking	-5 Private debt	-6 Fiscal variables	-7 External sector	-8 Political variables
Government consumption	1.38***	0.05	0.11	0.07	0.03	0.01	0.03	0.07
	(0.01)	(0.46)	(0.22)	(0.27)	(0.65)	(0.78)	(0.55)	(0.23)
Government investment	-1.14*	-0.05	-0.68**	-0.32	-0.15	-0.18	-0.34	-0.37
	(0.07)	(0.85)	(0.02)	(0.19)	(0.57)	(0.37)	(0.14)	(0.12)
Government consumption	0.10	-0.62	-0.52	-0.99*	-0.66	-0.25	-0.52	-0.45
*High public debt	(0.94)	(0.22)	(0.25)	(0.09)	(0.16)	(0.59)	(0.24)	(0.36)
Government investment	4.25***	1.84***	2.27***	2.14***	1.43*	1.58**	1.93***	1.55**
*High public debt	(0.01)	(0.01)	(0.00)	(0.00)	(0.08)	(0.03)	(0.01)	(0.03)
Government cons., current	-1.39***							
	(0.01)							
Government inv., current	0.80							
	(0.17)							
Government cons., current	-0.20							
*High public debt	(0.88)							
Government inv., current	-0.05							
*High public debt	(0.94)							
Exports		0.11***						
		(0.00)						
FDI		0.00						
		(0.90)						
Portfolio flows		0.01						
		(0.50)						
Monetary aggregate M1			0.00					
			(1.00)					
Interest rate			0.03					
			(0.79)					
Capital adequacy				0.14**				
				(0.03)				
Non-performing loans				-0.03				
				(0.33)				
Private credit					-0.04**			
					(0.02)			
Property prices					0.00			
					(0.87)			
Public debt						-0.00		
						(0.57)		
Budget balance						-0.01		
						(0.89)		
Taxes						0.05		
						(0.33)		
Current account balance							0.02	
							(0.53)	
Left government								-0.40
								(0.30)
All houses								-0.44
								(0.27)
Coalition government								-0.14
								(0.75)
Share of parliament seats								1.30
								(0.44)
Constant	-0.68*	-0.54**	-0.10	-0.92**	-0.05	-0.02	-0.06	-0.51
	(0.09)	(0.02)	(0.74)	(0.04)	(0.77)	(0.96)	(0.72)	(0.63)
Observations	35	50	48	54	52	56	62	62
R-squared	0.50	0.46	0.27	0.26	0.32	0.21	0.17	0.22
Gov. inv.*High pub. debt	3.11***	1.79***	1.59**	1.82***	1.28*	1.40**	1.59**	1.17*
+Gov. inv.	(0.04)	(0.00)	(0.02)	(0.01)	(0.09)	(0.04)	(0.01)	(0.09)

Dependent variable in all regressions is the growth forecast error.
p-values in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively

Table 3: Other forecasts, periods and countries

	-1 European Commission	-2 Consensus Forecasts	-3 Developing, during consolidation	-4 Developed, before consolidation	-5 GDP growth as a dependent variable
Government consumption	0.02	0.02	0.30	0.19	0.04
	(0.66)	(0.66)	(0.19)	(0.12)	(0.48)
Government investment	-0.49**	-0.43*	-0.17	0.23	-0.41*
	(0.02)	(0.08)	(0.33)	(0.15)	(0.08)
Government consumption	-0.39	-0.49	0.50	-1.93	-0.52
*High public debt	(0.29)	(0.23)	(0.72)	(0.40)	(0.23)
Government investment	2.05***	1.88***	1.29	-0.08	1.51**
*High public debt	(0.00)	(0.00)	(0.47)	(0.91)	(0.04)
Forecasted GDP growth					1.16***
					(0.00)
Constant	-0.10	-0.07	-0.44*	-0.09	-0.34
	(0.46)	(0.66)	(0.08)	(0.71)	(0.16)
Observations	58	55	67	70	62
R-squared	0.24	0.18	0.07	0.10	0.81
Gov. inv.*High pub. debt	1.56***	1.44**	1.12	0.16	1.10
+Gov. inv	(0.00)	(0.01)	(0.53)	(0.80)	(0.12)

Dependent variable in the first four regressions is the growth forecast error, in the fifth, it is the GDP growth. p-values in parentheses. ***, ** and * denote significance at 1%, 5

Table 4: Randomly discarding 20 percent of the sample

	-1	-2	-3	-4	-5	-6
Government consumption	0.03	0.04	0.11	0.06	0.04	0.11
	(0.70)	(0.53)	(0.25)	(0.29)	(0.56)	(0.25)
Government investment	-0.29	-0.49*	-0.56*	-0.55**	-0.28	-0.39
	(0.26)	(0.05)	(0.09)	(0.05)	(0.27)	(0.14)
Government consumption	-0.56	-0.89	-0.53	-0.90*	-0.61	-0.54
*High public debt	(0.27)	(0.15)	(0.26)	(0.08)	(0.27)	(0.31)
Government investment	2.92***	2.74***	2.18***	2.79***	2.08***	2.08***
*High public debt	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.07	-0.07	-0.13	0.05	-0.04	-0.08
	(0.72)	(0.68)	(0.49)	(0.77)	(0.81)	(0.67)
Observations	50	50	50	50	50	50
R-squared	0.18	0.25	0.19	0.27	0.17	0.20
Gov. inv + Gov. inv.*High pub. debt	2.63***	2.25***	1.62**	2.24***	1.80***	1.69**
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)

Dependent variable in all regressions is the growth forecast error.
p-values in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively.

Table 5: Results of the BMA analysis

	hyper	UIP	BRIC	EBL
Exports	0.98*	0.94*	0.79*	0.99*
Government investment * High public debt	0.94*	0.9*	0.78*	0.97*
Government consumption	0.25	0.17	0.07	0.28
Capital adequacy	0.24	0.16	0.06	0.26
All houses	0.20	0.17	0.12	0.21
Portfolio flows	0.20	0.13	0.06	0.22
Budget balance	0.17	0.13	0.07	0.18
Government consumption * High public debt	0.15	0.12	0.07	0.15
Left government	0.14	0.10	0.05	0.15
Current account balance	0.14	0.10	0.04	0.16
Interest rate	0.12	0.08	0.04	0.13
FDI	0.11	0.08	0.04	0.12
Monetary aggregate M1	0.11	0.08	0.04	0.12
Share of parliament seats	0.10	0.07	0.04	0.11
Coalition government	0.1	0.08	0.05	0.11
Public debt	0.08	0.07	0.06	0.08
Non-performing loans	0.08	0.06	0.04	0.08
Government investment	0.06	0.06	0.04	0.06

The figures in the table are the Posterior Inclusion Probabilities (PIP).
* indicates variables with PIP above 0.5 (significant variables).

Table 6: Checking the public capital explanation

	-1 Baseline	-2 Excluding high-debt, low-public capital countries	-3 Excluding high-debt, high-public capital countries
Government consumption	0.04	0.04	0.04
	(0.48)	(0.49)	(0.50)
Government investment	-0.34	-0.31	-0.34
	(0.14)	(0.17)	(0.17)
Government consumption	-0.53	-0.38	-0.47
*High public debt	(0.23)	(0.41)	(0.49)
Government investment	2.06***	-0.08	2.29***
*High public debt	(0.00)	(0.96)	(0.00)
Constant	-0.05	-0.07	-0.04
	(0.74)	(0.64)	(0.79)
Observations	62	57	55
R-squared	0.17	0.06	0.19
Gov. inv. + Gov. inv.*High pub. debt	1.72***	-0.40	1.95***
	(0.00)	(0.79)	(0.00)

Dependent variable in all regressions is the growth forecast error.
p-values in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively

Figure 1: Change in government investment (left) and government consumption (right), as a percent of GDP, in 2010-2011 with respect to 2007-2009 (percentage points)

Figure 1(a) here

Figure 1(b) here

Source: Author's calculations, using data from Gwartney et al. (2013a) and World Bank's World Development Indicators. The dashed lines are the averages for all the countries.