Growth Forecast Errors and Government Investment and Consumption Multipliers*

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ABSTRACT

We compare government investment and government consumption multipliers in developed economies during the recent fiscal consolidation, following the Blanchard and Leigh (2013) approach. We find that, in highly-indebted countries, the investment multplier is likely to be much higher than what has been assumed by policy makers and much higher that the consumption multiplier. This points out that the consolidation should be accompanied by increased public investment.

JEL classification: E62

Keywords: fiscal consolidation, fiscal multiplier, public consumption, public investment, public debt

I. Introduction

Developed economies are 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 higher impact on growth.

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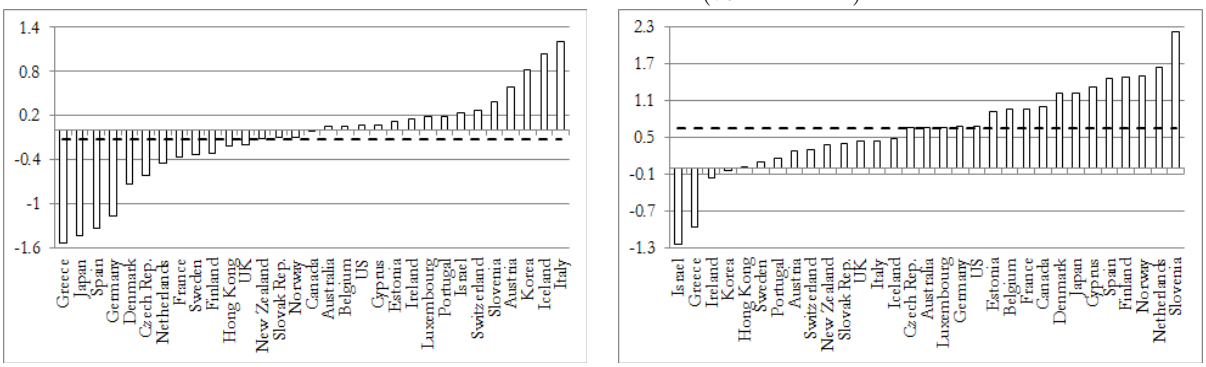
It is usually considered that government investment has higher impact on growth (i.e. multiplier) than government consumption. For instance, the Golden Rule of public finance states that governments should borrow only for investment, not for consumption, since investment pays for itself, through the future tax revenues generated by the new capital stock (Perotti, 2004). Some economists have argued that the current fiscal consolidation should allow some support through public investment. Christina Romer, for instance, 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). Similarly, Spilimbergo et al. (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"* (Spilimbergo et al., 2008, p. 5).

Despite these recommendations, there is a very scarce evidence that the government investment multiplier is higher than the government consumption multiplier in the distressed economies. Hence, it may not come as a surprise that the fiscal authorities in these countries have ignored these suggestions, as a result of what investment spending has been cut more than consumption expenditure during the on-going consolidation (see Figure 1). In Greece, for instance, public investment in 2010 and 2011 has been cut by 1.5 percent of GDP (relative to the previous three years), while public consumption has been cut by only 1 percent. Similarly, in Spain public investment in 2010 and 2011 has been cut by 1.3 percent of GDP (compared to the previous three years), while public consumption has been increased by 1.5 percent of GDP. As a matter of fact, public investment in the 31 countries that the International Monetary Fund (IMF) classifies as advanced economies[1], has been cut, on average, by 0.1 percent of GDP, while public consumption has been increased by 0.6 % of GDP (see section III on the data sources).

1. The following advanced economies will be used in the analysis: Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK and US. The remaining four countries that the IMF classifies as advanced (Malta, San Marino, Singapore and Taiwan), are excluded, due to unavailability of data on public investment.

FIGURE 1: GOVERNMENT INVESTMENT (LEFT) AND GOVERNMENT CONSUMPTION (RIGHT) IN 2010-2011 VS. 2007-2009 (% OF GDP)



Source: Author's calculations, using data from Gwartney et al. (2012) and World Bank's World Development Indicators. The dashed lines are the averages for all the countries.

This paper will aim to fill in that gap. It will compare the government investment and the government consumption multiplier in the advanced economies during 2011 and 2012. The approach that will be used is similar to that of Blanchard and Leigh (2013) - growth forecast errors (the difference between realized and expected GDP growth) for 2011 and 2012 will be regressed on variables measuring government investment and government consumption during the previous years (2010 and 2011). Since government consumption and government investment in 2010 were known when the forecasts for 2011 were prepared, the forecast errors should be uncorrelated with them if the right multipliers were used, because all the relevant information has been incorporated in the forecasts. If the coefficients 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 the highly-indebted and the non-highly-indebted countries, due to the conventional understanding that the fiscal multiplier may be lower, or even negative, in times of high 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 debt and for the countries with not-so-high 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, than those that were assumed in the forecasts. Assuming that the consumption and investment multipliers that were used in the forecasts are similar (a reasonable assumption, judging by Coenen et al., 2012, p. 46, Table 3), these results suggest that the investment multiplier is much higher than the consumption multiplier in the highly-indebted countries. 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 od 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 at a surprise, however, since it is usually believed that high debt reduces the multiplier, through the expectations effect (higher pribability for a default in the future). Our explanation for this finding 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 strong interpretation of these findings is that by increasing government investment and cutting government consumption more than proportionately, policy makers can achieve two goals at the same time - reduce the deficits and support the economy. The weak interpretation is that public investment should be the last on the list for cutting during a consolidation.

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

II. Related literature

Keynesian economics considers public investment as the most effective fiscal policy instrument - it combines the short-run support of the government consumption with the long-term supply-side benefits (see Skidelsky, 2001). The Golden Rule of fiscal policy follows from the same logic, and argues that goverment 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. However, there is a very weak evidence in support of the claims that the government investment is more effective for growth than government consumption. On the contrary, Perotti (2004) shows that neither the short-run, nor

the long-run multipliers from the government investment spending are higher than the multipliers from government consumption.

The vast literature on fiscal multipliers that has appeared recently has not overlooked this issue entirely, either. Eggertsson (2011) analyses what fiscal policy is likely to be effective in the current situation, with zero lower bound and insufficient demand, using a Dynamic Stochastic General Equilibrium (DSGE) model. He finds that temporary increase in government spending targetted at goods which are imperfect substitutes with private consumption, like public infrastructure, is one of the most effective measures. Coenen et al. (2012) compare the effects of different forms of fiscal stimulus using seven DSGE models used by leading policy-making institutions, including the International Monetary Fund (IMF). They find that the government investment spending has stronger effects on the GDP than the government consumption, but only marginally (see Table 3, p. 46). Auerbach and Gorodnichenko (2012b) compare the consumption and investment multipliers in the US, using a Smooth Transition Vector Autoregression that allows the multipliers to differ in recessions and expansions. They find out that the investment multiplier is much higher than the consumption multiplier, particularly in recessions (the cumulative investment multiplier in recessions is 4.3, while the corresponding consumption multiplier is 1.3). They also find that the multpliers, in general, are likely to be much larger in recessions that in expansions.

The dependence of the multiplier on the state of the business cycle has been analysed by other researchers, too, like Battini et al. (2012), Baum et al. (2012b) and Caprioli and Momigliano (2013). All these papers apply a similar technique (regime-switching Vector Autoregression) and arrive at similar conclusions - that the multipliers are likely to be bigger when the economy is in a downturn. The explanation is that in recessions, government spending is less likely to crow-out private spending.

Another strand of literature has investigated the relationship between the fiscal multiplier and the level of the public debt. The conventional wisdom argues that with high level of public debt the multiplier is likely to be lower, since the positive demand effects are off-set by negative expectations effect - the level of debt increases with the spending, and so does the probability for default. The recent literature investigating this relation unanimously finds that the level of debt reduces the multiplier; see Auerbach and Gorodnichenko (2012a), Ilzetzki et al. (2013), Kirchner et al. (2010), Nickel and Tudyka (2013), Rusnak (2011).

Because the current situation in most of the advanced economies is characterized both by a depressed economy with zero interest rates and high public debt, it is not straightforward to assess the

size of the current multipliers, since the first attribute pushes for high multipliers, while the second for low. Blanchard and Leigh (2013) investigate whether the multipliers that have been used by the IMF and other professional forecasters recently have been correct or not. They use a simple, yet very smart proposition - if the multipliers have been correct, there should be no correlation between the growth forecast errors (the difference between the realized and forecasted GDP growth) and the planned fiscal policy measures, since the planned measures have been taken into account when the forecasts have been prepared. Thus, by regressing the growth forecast errors on the planned fiscal consolidation, one can assess whether the models that have been used for the forecasts are correct or not. If one finds significant coefficients for the planned consolidation, that would imply that the multipliers "assumed"[2] in the models are incorrect. That is what they find - that the models 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 methodology that is used in this paper is a modified version of the approach in Blanchard and Leigh (2013) and is based on regressing the differences between realized and forecasted GDP growth (the growth forecast errors) on variables measuring fiscal policy during the previous year. If the models that are used for producing the forecasts are correct, the growth forecast errors should be uncorrelated with any relevant data that have been known when the forecasts have been prepared. Hence, a regression of the growth forecast errors for year $t+1$ on variables measuring fiscal decisions made during year t 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).

We extend the analysis of Blanchard and Leigh (2013) in two ways. First, 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[3]. Second, we will allow the multipliers to differ for the highly indebted countries, given the widespread belief that the multipliers are lower, or even negative, when the debt is high. Therefore, our basic

2. 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.

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

regression will be:

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

Where the subscript t indexes the years and i indexes the countries. The analysis will include the following 37 *developed* countries: Australia, Austria, Barbados, Belgium, Bulgaria, 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. The list consists of the high income economies of the World Bank, plus the EU countries, on which there are the required data. The growth forecast errors for 2011 and 2012 will be analyzed. Due to certain data unavailabilities, 62 observations in total will be analyzed..

The forecast errors for the GDP growth are calculated as a difference between the realized real GDP growth in year t and the projected growth for that year at the beginning of year t (2011 and 2012). Projected GDP growth is taken from the April editions of the World Economic Outlook in year t (WEO; IMF, 2010 and IMF, 2011). 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.

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. 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.

High public debt is a dummy variable which takes value of one for countries with *gross*[4] public debt above 95% of GDP in year $t-1$ (2010 and 2011). Five countries have debt above 95% in 2010: Belgium, Greece, Italy, Japan and US, and three more in 2011 - Iceland, Ireland and Portugal. The 95% threshold is chosen after Baum et al. (2012a). All in all, 13 of the 62 observations can be classified

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

as 'high debt episodes'.

Data on government consumption are from the World Development Indicators database of the World Bank (WDI). Data on government investment are calculated from Gwartney et al. (2012 and 2013), who, in their Economic Freedom of the World database, provide data on government investment as a share of total investment for around 130 countries. The main sources of the government investment data in the Gwartney et al. (2012) are the Government Finance Statistics Yearbook of the IMF, the WDI and the International Finance Statistics of the IMF (see Gwartney et al., 2013, p. 236). These values are then multiplied with the share of gross fixed capital formation in the GDP, from WDI. The forecasted GDP growth is from the April 2011 and April 2012 editions of the WEO (IMF, 2011 and IMF, 2012). GDP growth and public debt is from the April 2013 edition of the WEO (IMF, 2013).

IV. Results

The results of the main regression are presented in Table 1, column 1. All the variables in the regression are insignificant, except the cross-product of the high 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 debt. The insignificance of the cross-product of the government consumption with the high debt dummy points out 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 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 debt. The sum is significant at the 1% level, again, pointing out 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 points out that the investment multiplier is higher for the indebted countries.

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. In this way, we lose 6 observations, compared to the initial regression. In column 3, we restrict the sample to the countries that the IMF classifies as advanced, losing 6 additional observations. As can be seen, the results remain virtually unchanged - the cross product of the high debt and the government investment is always significant at one percent, as well as its sum with the government investment. Therefore, we continue the analysis with the initial group of countries, due to the highest number of observations in this case.

We next explore the possibility that our 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 five percent level). In column 6, we bootstrap the standard errors in the baseline regression, due to the small sample size[5]. The variable of interest remains significant, though only at the ten percent level.

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	-0.06	-0.32	0.06	0.01	0.04
	(0.48)	(0.80)	(0.13)	(0.25)	(0.85)	(0.59)
Government investment	-0.34	-0.36	-1.01***	-0.33	-0.12	-0.34
	(0.14)	(0.16)	(0.00)	(0.11)	(0.53)	(0.33)
Government consumption	-0.53	-0.45	-0.38	-0.29	-0.28	-0.53
*High public debt	(0.23)	(0.31)	(0.33)	(0.47)	(0.45)	(0.17)
Government investment	2.06***	2.11***	3.05***	1.40***	1.17**	2.06*
*High public debt	(0.00)	(0.00)	(0.00)	(0.01)	(0.03)	(0.06)
Constant	-0.05	-0.03	0.18	-0.08	-0.16	
	(0.74)	(0.91)	(0.40)	(0.56)	(0.23)	
Observations	62	56	50	62	62	62
R-squared	0.17	0.17	0.36		0.08	
Gov. inv.*High pub. debt	1.72***	1.75***	2.04***	1.07**	1.05**	1.72*
+ Gov. inv. (p-value)	(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.

5. 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.

Next, we add certain controls in the baseline regression. It is possible that certain factors, correlated with the growth forecast error and the fiscal support, may be driving the results, like some factors that push for expansionary fiscal policy and higher than expected growth at the same time. Also, by including additional controls, we, in a certain way, control for possible errors in the forecasts regarding the effects of the other variables on the GDP. We start by adding the trade and financial flows experienced in 2011 (exports, FDI and portfolio flows; see Table 5 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 2010, 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 2010. 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 accounted for well, then the significance of the fiscal variables may be due to their omission. Again, this does not seem to be the case. Next, we include the level of public debt and the fiscal balance in 2010 - high debt (or deficit) may be correlated with the fiscal policy, and is likely to affect growth, too. The results remain unchanged, again. Last, 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.

Table 2: Additional controls

	-1 Baseline	-2 Trade and finance	-3 Monetary	-4 Banking	-5 Fiscal distress	-6 External
Government consumption	0.04	0.05	0.11	0.07	0.01	0.03
	(0.48)	(0.46)	(0.22)	(0.27)	(0.87)	(0.55)
Government investment	-0.34	-0.05	-0.68**	-0.32	-0.15	-0.34
	(0.14)	(0.85)	(0.02)	(0.19)	(0.44)	(0.14)
Government consumption	-0.53	-0.62	-0.52	-0.99*	-0.24	-0.52
*High public debt	(0.23)	(0.22)	(0.25)	(0.09)	(0.60)	(0.24)
Government investment	2.06***	1.84***	2.27***	2.14***	1.49**	1.93***
*High public debt	(0.00)	(0.01)	(0.00)	(0.00)	(0.03)	(0.01)
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)		
Public debt					-0.00	
					(0.68)	
Budget balance					0.00	
					(0.97)	
Current account balance						0.02
						(0.53)
Constant	-0.05	-0.54**	-0.10	-0.92**	-0.07	-0.06
	(0.74)	(0.02)	(0.74)	(0.04)	(0.80)	(0.72)
Observations	62	50	48	54	58	62
R-squared	0.17	0.46	0.27	0.26	0.20	0.17
Gov. inv.*High pub. debt	1.72***	1.79***	1.59**	1.82***	1.34**	1.59**
+ Gov. inv (p-value)	(0.00)	(0.00)	(0.02)	(0.01)	(0.04)	(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.

As a further robustness check, we randomly discard twelve observations (20 percent of the sample),

and reestimate the baseline regression on the remaining 50 observations[6]. We repeat this exercise six times. The results, shown in Table 3, yield additional support to our main findings.

Table 3: 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**
(p-value)	(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.

As a final 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 large number of candidate explanatory variables exists, and the researcher does not know a priori what is the correct theoretical model. It estimates all the possible model combinations, using Bayesian techniques, weights them according to their goodness of fit, and calculates the weighted average for every variable. Inference in BMA is normally based on the Posterior Inclusion Probability (PIP), which is the probability that the variable is a robust determinant of the dependent variable. For a thorough elaboration of BMA, see Hoeting (1999), or for a short applied exposition, see Jovanovic (2012). The BMA results are shown in Table 4. We use four different priors for the model coefficients (benchmark prior, unit information prior (UIP), hyper prior, and empirical Bayes local prior (EBL)[7]). For the model size, we use the dilution prior suggested by Durlauf et al. (2008), which is an extension of the dilution prior proposed by George

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

7. The benchmark prior has been proposed by Fernandez et al. (2001), the UIP prior by Kass and Wasserman (1995), the EBL prior by Hansen and Yu (2001), and the hyper prior has by Liang et al. (2008).

(1999). This prior is used in situations when multicollinearity may be a problem (see Feldkircher, 2012, for example), because it punishes models which include variables with high correlation. We use this prior because three pairs of variables seemed to be highly collinear in our case, with correlation exceeding 0.8 in absolute terms (see Table 6 in the appendix). It should be noted that very similar results are obtained with other model priors. Each column of Table 4 presents results obtained with one of the model coefficients prior. All the results are based on the 500 best models. For clarity, we will present only the PIPs, the other statistics are available upon request[8].

Table 4: Results of the BMA analysis

	BRIC	UIP	hyper	EBL
Exports	0.85**	0.93**	0.98**	0.97**
Government investment * High public debt	0.85**	0.89**	0.9**	0.88**
Budget balance	0.10	0.19	0.32	0.30
Government consumption	0.10	0.19	0.35	0.32
Government consumption * High public debt	0.09	0.15	0.20	0.19
Capital adequacy	0.09	0.18	0.30	0.27
Portfolio flows	0.09	0.16	0.25	0.23
Public debt	0.08	0.11	0.16	0.15
Interest rate	0.06	0.11	0.18	0.17
Current account balance	0.06	0.12	0.22	0.20
FDI	0.06	0.10	0.16	0.15
Monetary aggregate M1	0.06	0.10	0.15	0.14
Non-performing loans	0.06	0.09	0.14	0.13
Government investment	0.05	0.09	0.12	0.11

The figures in the table are the Posterior Inclusion Probabilites (PIP).

* indicates variables with PIP above 0.5 (significant variables).

The only two significant variables in all the estimations are the exports and the cross product of the high 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.

Finally, we estimate the main regression, for developed countries, but during 'good times', i.e. for the period before the financial crisis (2007 and 2008), as well as for developing countries during the consolidation period, in order to see whether the correlation between the fiscal policy and the forecast errors is maybe a general pattern. These results are presented in Table 5. As can be seen, all the

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

fiscal variables are insignifiant 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.

Table 5: Growth forecast errors and fiscal policy for other periods and countries

	-1 Developed, before consolidation	-2 Developing, during consolidation
Government consumption	0.19	0.30
	(0.12)	(0.19)
Government investment	0.23	-0.17
	(0.15)	(0.33)
Government consumption	-1.93	0.50
*High public debt	(0.40)	(0.72)
Government investment	-0.08	1.29
*High public debt	(0.91)	(0.47)
Constant	-0.09	-0.44*
	(0.71)	(0.08)
Observations	70	67
R-squared	0.10	0.07
Gov. inv + Gov. inv.*High pub. debt	0.160	1.118
(p-value)	0.804	0.528

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

V. Discussion

Two main messages, in our opinion, should be taken from this analysis. The first one is that policymakers have underestimated the effect of the government investment on growth in the highly indebted countries. Why? Probably because they have assumed that the government investment multiplier is similar to the government consumption multiplier. Evidence from Coenen et al. (2012) suggest that this is likely to be the case - they examine the growth effects of government consumption and investment in the main workhorce models used by the leading policy institutions in the world, finding that the investment multiplier is only marginally higher than the consumption multiplier. Our study is not the only recent study to suggest that the investment multiplier is likely to be higher than the consumption multiplier - Auerbach and Gorodnichenko (2012b) also find that the

investment multiplier is much larger than the consumption multiplier (for example, in recessions, their consumption multiplier is 1.4, while the investment multiplier is 4.3).

Why would the investment multiplier be higher than the consumption multiplier? The first reason is due to 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 unlilkely to be the main driving force behind our results, since this effect primarily refers to the long run. Second reason my be the smaller crowding-out of the government investment. Government investment is usually focused on goods which are imperfect substitutes with private consumption, therefore, they are unlikely to crowd out private expenditure (see Eggertsson, 2011, for instance). 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 et al. 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, not lower in the indebted countries. One explanation for this is that the indebted countries may have, at the same time, low level of public capital (relative to the optimal level), as a result of what its marginal product is high. Similar logic, though in the opposite version, is proposed by Perotti (2004), for his findings that the investment multiplier does not differ from the consumption multiplier in US, UK, Canada, Germany and Australia (the argument there is that these countries may have too high level of capital, which makes the investment multiplier low). However, while this may sound reasonable for some of the indebted countries (Greece, Italy and Portugal), it is hard to justify for some others (Belgium, Japan and United States).

Another explanation is through the confidence effects. The confidence effects are usually used to justify non-Keynesian effects of fiscal expansion. 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".* Baxter and King (1993) show that fiscal expansions can produce a negative response in economic activity, when they are financed by taxes, since they increase the expected future tax burden (see also Bertola and Drazen, 1993). The empirical evidence about the validity of the expansionary fiscal contraction hypothesis is mixed - Giavazzi and Pagano (1990), Alesina and Perotti (1995), Alesina and Perotti (1997), Alesina and Ardagna (2009) and Broadbent and Daly (2010) find some evidence for the hypothesis, while IMF (2010, Chapter 3), Guajardo et al. (2011)

and Perotti (2011), argue that consolidations are always contractionary. It is conventionally believed that consolidations are most likely to be effective when the debt is high - in high-debt countries, a fiscal correction may reduce the likelihood of public sector default, thus improving confidence and increasing consumption and investment (see e.g. Giavazzi, Jappelli, Pagano, 2000). Blanchard (1990) and Perotti (1999) develop theoretical models in which this happens[9].

But, suppose agents expect that contractionary fiscal policy will increase the debt, hence the probability of default. Then the confidence effects may add-up to the Keynesian effects, resulting in higher multiplier when the debt is higher. Why would this happen? If agents perceive that the multiplier is above than one. In that case they would expect that cutting public spending will decrease the GDP more than it will decrease the debt, as a result of what the debt-to-GDP ratio will increase further, increasing the probability for a default. 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.

One implication of this reasoning is that agents should value growth more than they value fiscal adjustment. Existing empirical evidence suggests that this may be the case. Romer (2012) finds that bad news about growth are 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 European Commission (2012, p.35) also points out that financial 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 et al., 2013, Kirchner et al., 2010, Nickel and Tudyka, 2013, Rusnak, 2011), finds that the fiscal multiplier is lower when the 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 et al. (2013) end in 2009 (see Tables A1 and A2), the data in Kirchner et al. (2010) end in 2008Q4, while

9. The importance of the expectations for the fiscal policy effects has been recently emphasized again by Cimadomo et al. (2011), who point out that the response is likely to depend on agents' expectations about the future policy actions - if agents expect decrease in government expenditure in the future, fiscal expansion can have positive effects on growth and reduce debt, if fiscal expansion is accompanied by expectations about persistent increase in government spending, it has negative effects on growth and increases debt.

those of Nickel and Tudyka (2013) - in 2010.

Alternative explanation for the multiplier increasing with the level of debt is along the lines of Corsetti et al. (2009). They show that when fiscal expansion is followed by spending reversal, i.e. with credible plan for debt stabilization in the future, the multiplier can be higher even with rising debt. However, this explanation would be hard to justify for the indebted countries in our sample (Belgium, Greece, Italy, Japan, United States). It is hard to argue that they had a credible plan in 2010. In addition, this logic is as likely to hold for consumption, not just for investment, which we do not find in the data.

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 just 31 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 in the indebted countries the investment multplier is likely to be higher than the consumption multiplier, the public investment should come last on the list for cutting, as Alesina and Perotti (1997) argued some time ago. This has not been the practice during the recent consolidation, as was shown on Figure 1. As can be seen there, public investment was cut in 16 of the 31 countries, while consumption - in only 4.

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 government investment multipliers, in the highly-indebted and the less-indebted advanced economies. We find evidence that the investment multiplier is likely to be higher than the consumption multiplier, and than the multplier assumed by the policy-makers, in the highly-indebted countries. This suggests that the consolidation should be accompanied by increased public investment.

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VII. Appendix

Table 5: 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
FDI	Foreign direct investment, net inflows, in 2011 and 2012, as % of GDP, minus the average for 2007-2010.	WDI
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 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
Non-performing loans	Bank nonperforming loans to total loans in 2010 and 2011.	WDI
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

Table 6: Correlation matrix of the variables

	Growth forecast error	Government consumption	Government investment	Exports	FDI	Portfolio flows	Monetary aggregate M1	Interest rate	Non-performing loans	Capital adequacy	Public debt	Budget balance	Current account balance
Growth forecast error	1.00												
Government consumption	-0.13	1.00											
Government investment	0.38	0.17	1.00										
Exports	0.10	-0.05	0.08	1.00									
FDI	-0.09	0.10	0.33	-0.06	1.00								
Portfolio flows	0.16	-0.05	-0.15	-0.02	-0.90	1.00							
Monetary aggregate M1	-0.02	0.13	0.32	0.12	0.81	-0.88	1.00						
Interest rate	-0.21	-0.30	0.21	-0.18	0.04	0.01	0.08	1.00					
Non-performing loans	0.19	-0.26	-0.44	0.34	-0.23	0.13	-0.23	-0.54	1.00				
Capital adequacy	0.28	-0.51	-0.14	0.07	-0.13	0.23	-0.34	-0.14	0.52	1.00			
Public debt	-0.37	0.08	-0.33	-0.06	-0.14	0.09	-0.09	-0.01	0.00	-0.25	1.00		
Budget balance	0.32	0.06	0.33	-0.05	0.23	-0.10	0.19	-0.15	-0.04	0.13	-0.61	1.00	
Current account balance	-0.06	0.32	0.36	0.04	0.31	-0.24	0.46	0.21	-0.41	-0.41	-0.19	0.55	1.00