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Demand–side economics in times of high debt: The case of the European Union

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Abstract

We analyze the effectiveness of an increase in government consumption for stimulating growth for diverse levels of public debt in the European Union. We conclude, that growth rate can be stimulated in the short run by an increase in government consumption but only at low levels of public debt. Moreover, we find that an increase in intermediate consumption is more effective than an increase in compensation of public employees in stimulating output growth.
JEL classifications: E62, H30, H50, H63
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1. Introduction

Since the start of the financial and economic crisis governments in many countries tried to overcome the drop in private demand by an expansion of government expenditure. However, as structural problems stay unsolved for a large degree of European Union Member States, the question of the effectiveness and sustainability of publicly driven growth arises.

From the theoretical perspective, the impact of fiscal stimulus on savings and investment and, thus growth of output can be summarized by three approaches: the "Keyensian" approach which predicts that demand can be stilumated by an expansionary fiscal policy, the "Ricardian" approach, pointing to ineffectiveness of fiscal policies for stimulating demand and the non-Keyensian perspective, which ephasizes the role fiscal policy plays in shaping consumers' expectations. In a standard IS-LM model, higher government expen-

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diture raises both income and the interest rates, therefore the overall effect is ambigous. Dynamic approaches offer more clear–cut predictions: In an infinite horizon model with complete tax discounting and no tax distortions, government consumption "crowds out" private consumption one for one: each dollar of extra government spending subtracts a dollar from permanent income and hence from consumption. For a given path of pre-tax income, an increase in government expenditure leaves national saving unchanged (Giavazzi et al., 2000). The overall effect is therefore close to zero, that is the Ricardian equivalence holds. Other models give diverse predictions. Finite horizon models (e.g., a standard overlapping generations model) predict a negative effect of an increase in government consumption on national saving. Yet, other models predict non–linear reactions of increases in government consumption on saving: Feldstein (1982) predicts that the reaction of national saving depends on the size of the increase in G: negative if increase is small, no effect for large increases; Bertola and Drazen (1993) point to the role of initial consumption levels: if the initial government consumption to GDP is small, the reaction of saving is negative and positive for large initial G/Y. Finally Perotti (1999) shows the dependence of the sign on debt-to-GDP ratio.

The most important aspect of this analysis concerns the role of expectations, and whether Ricardian equivalence holds. An increase in government expenditure, if financed by debt, could be expected to be followed by consolidative fiscal policies in the future, which in turn reduce lifetime disposable income. This in turn will curb spending today as precautionary savings increase (see e.g., Ricardo, 1817; Barro, 1974). Expectations can also work through interest rates if the real interest rate faced by the private sector increases in response to a higher government bond interest rate caused by potentially unsustainable fiscal expansion. Therefore, an important aspect of whether government intervention has an effect on growth should depend on the initial levels of public indebtness, which in turn affects the expectations of private consumers regarding the sustainability of fiscal policies.

In this work, we want to test whether the level of public debt affects the effectiveness of government consumption in stimulating growth for the case of European Union countries. We concentrate on the role of government consumption, components of which have either a direct effect on the aggregate demand (intermediate consumption) or an indirect one (compensation of public employees). Moreover, increasing public demand is expected to positively affect the levels of innovation which contribute to endogenous growth. We briefly look at the two possible channels of transmission: private savings and total factor productivity growth.

In the next section we present the theoretical predictions, and previous empirical evidence linking growth to public debt and fiscal stimulus. Section 3 describes the data and the empirical model. Section 4 contains the main findings. Section 5 concludes the paper.

2. Theory and previous empirical evidence

There is a large literature in existing determining the impact of public expenditure on growth[1]. Depending on the theoretical framework, outcomes may differ substantially[2]. Elmendorf and Mankiw (1999) formulate a theoretical framework in which the government of a country changes its financing from taxation into the issuance of debt. The authors assume that while the Ricardian Equivalence does not hold, the short-run demand will be increased since the reduction in taxation has a positive effect on disposable income of private households. If output is below capacity and monetary policy remains unchanged, increased demand will result in rising production. However, in the long-run if the Ricardian

[1]See e.g. Romp and De Haan (2007) and Riet (2010)

[2]Baxter and King (1993) show that in a neoclassical model of optimizing agents and fully flexible prices a shock in government purchases will be accompanied by an increase in production and thus employment but also by a decrease in real wages and thus reduced private consumption. However using a New Keynesian approach with sticky prices Linnemann and Schabert (2003) show that rising public spending can also generate increasing real wages. These models operate under basic assumptions (Kirchner et al., 2010) such as non-Ricardian consumers (Galí et al., 2007) and imperfect substitutes of public and private consumption (Monacelli and Perotti, 2008)

Equivalence does not hold, increased debt will not be fully offset by higher private savings. Consequently total investment will decrease resulting in lower production (either abroad or at home). In a standard OLG Model public debt will decrease private savings and thus capital accumulation lowering economic growth in the long-run[3]. Further endogenous growth models also indicate to a negative effect of public debt on growth[4]. Panizza and Presbitero (2014) apply the theoretical framework of Elmendorf and Mankiw for the US economy. They conclude that an increase of debt above 100 percent of GDP reduces output annually by 20 basis points for a horizon of 20 years.

According to the Keynesian view public spending can compensate for decreasing private spending in a situation of economic slowdown and thus stabilize the growth cycle. An enduring recession may discourage workers to participate in the labor market and thus may deteriorate their skills and reduce future potential output. Cerra and Saxena (2008) cast evidence that a lasting recession affects the level of future output growth. Blanchard and Perotti (2002) show that the effect of public spending on output in the U.S. varies across different periods of time. Kirchner et al. (2010) investigate the macroeconomic effects of government spending shocks using structural VAR techniques for a sample of the Euro Area for nearly 30 years (1980-2008). They find that the effectiveness of government spending in stabilizing real GDP is changing over time. While the effect increased towards the end of the 1980s its impact has been declining since for the short-run as well as for the long-run. According to their findings the response of real wages to public expenditure shocks has weakened while the response of the nominal interest rate is stronger.

The model by Elmendorf and Mankiw (1999) is based on the assumption that there is no uncertainty and that the public sector can borrow at a sustainable interest rate. According to Cochrane (2011) the negative impact on output growth may be higher if uncertainty

[3]See e.g. Modigliani (1961), Diamond (1965), and Blanchard (1985).

[4]See e.g. Barro (1974), and Saint-Paul (1992).

leads private agents to expect debt-financing instruments in the future lowering private investment (Laubach, 2009). Uncertainty of public finance may increase if debt levels are high and thus cause negative growth effects even in the short-run. A formal model of how such unceratinty works is given by Sutherland (1997)[5]. In this model, consumers with finite lives form expectations about the future path of taxation (or fiscal consolidation) given current levels of public debt. The author concludes that, for low levels of public debt, the consumers react less than one-to-one to a change in fiscal deficit as they perceive the effect of the new debt on future taxes as low. On the other hand, for very high levels of public debt the effect is stronger than one-to-one. The main conclusion is, therefore, that a fiscal deficit increases individual consumption provided public debt is low, which is the traditional Keyensian view. A similar fiscal deficit at high values of indebtness causes individual consumption to fall. Intuitively, at low values of public debt there is a high probability that current consumers will die before the next stabilisation tax is imposed. These consumers discount the future heavily (Sutherland, 1997).

The level at which sustainability of levels of debt becomes disputable will depend on the one hand on structure of debt debt denominated in foreign currency limits the governments ability to enact counter-cyclical policies[6] (Eichengreen et al., 2007) on the other hand on the strength of public institutions (Reinhart et al., 2012; Kraay and Nehru, 2006; Manasse and Roubini, 2009; Kourtellos et al., 2013) and a countrys production technologies (Reinhart et al., 2012). Consequently the correlation between public indebtedness and economic growth may not be of a linear kind.

Nicoletti (1988) finds that agents may take precautionary savings once they believe debt levels are unsustainable. Perotti (1999) and Sutherland (1997) point to the impact of

[5]Similar theoretical predictions come from Bertola and Drazen (1993).

[6]This is also of relevance for the Euro area, as the monetary policy is not set at the national level. See e.g. De Grauwe (2011), and De Grauwe and Ji (2013).

initial levels of debt on the effects of fiscal policies, claiming that fiscal policies may display Keynesian effects during moderate levels of public debt while this effect reverses at high levels of debt. Giavazzi et al. (2000) find empirical evidence that national savings respond to fiscal policies in a non-linear fashion especially if fiscal impulses are strong and steady. Ilzetzki et al. (2013) find some evidence using a SVAR that fiscal multipliers turn negative for high levels of debt. Furthermore, fiscal multipliers are higher in developed and closed economies operating under a predetermined exchange rate[7].

Favero and Giavazzi (2007) show that dealing with public debt as an exogenous factor may lead to substantial biases in the estimated coefficients. Recent attention to the topic was given by the contribution by Reinhart and Rogoff (2010). In their empirical analysis they find a non-linear relationship between a countrys debt and its output growth. They sort 20 advanced economies into four subsamples depending on the countrys level of debt. They find that debt levels above 90 percent of GDP exhibit significantly lower output growth than the comparing groups[8]. As debt is likely to be endogenous there are different approaches how to address endogeneity. In line with the findings of Reinhart and Rogoff (2010): Kumar and Woo (2010) using GMM estimates with internal instruments, Cecchetti et al. (2011) using lagged values of debt-to-GDP levels and Checherita-Westphal and Rother (2012) with average debt-to-GDP levels of partner countries as instruments also find a negative correlation between high levels of debt and growth rates. While the negative relationship between debt and growth has been well documented (see, e.g., Eberhardt and Presbitero, 2015) Panizza and Presbitero (2014) claim, however, that there is no evidence for a causal effect of debt on output growth. They further conclude that: The

[7]This result is in line with the standard Mundell-Fleming model. A fiscal shock increases output causing an increase in the interest rate followed by a passive FDI and thus puting upward pressure on the currency which has to be offset by expansionary monetary policy

[8]Égert (2015) who extends the observation period back to 1790 also finds a negative correlation between debt and growth. However, the author states that results are not robust to small changes in country selection or data frequency.

fact that we do not find a negative effect of debt on growth dies not mean that countries can sustain any level of debt. There is clearly a level od debt which is unsustainable. [] What our results seem to indicate, however, is that the advanced economies in our sample are still below the country-specific threshold at which debt starts having a negative effect on growth.

A work closest to this one comes from Nickel and Tudyka (2013), who investigate the effect of public consumption at different debt levels for the Euro area. They analyze the time horizon 1970 to 2010 using an interacted panel VAR framework. The authors find that the effect of fiscal shocks is of a non-linear nature. As the overall effect of a spending shock to real GDP is positive at moderate levels of debt it displays a negative impact for high levels of public debt. In their analysis the expansionary shock of public consumption in a moderate indebted country is followed by a positive response of real GDP and a negative response of private investment (Keynesian paradigm) and deteriorating trade balance (increase domestic demand will partially satisfied by imports)[9]. With increasing debt however the overall effect on GDP turns negative, while private investment is crowded-out indicating to some degree the presence of the Ricardian Equivalence proposition.

2.1. Predictions

The analysis of a general fiscal shock on output growth may be misleading if government expenditure is defined in a broader sense including all forms of public spending as of investments, social and income transfers and consumption. In general it is not clear why these different types of public expenses should be expected to have the same impact. While all forms can have a positive impact on output public consumption in a direct increase in demand, social and income transfers indirectly through increased disposable income and public investment through direct consumption as well as crowding-in effects

[9]See also Ravn et al. (2007), Kim and Roubini (2008), and Abbas et al. (2011).

of private investments[10]. Afonso and Alegre (2011) highlight the importance of public expenditure on education with respect the development of productivity. The literature[11] rather suggests different effects for public investment and public consumption. On the other hand public expenditure has to be financed mainly through taxation. Tax distortions are usually associated with a loss in efficiency. Thus lowering the growth impact. Afonso and Furceri (2010) analyze in a time series approach the growth impact of 28 OECD countries with respect to the public expenditure components. They conclude that the overall effect of social contributions, government consumption and subsidies as well as public investments is significantly lowering economic growth. There is also evidence that public expenditure impacts may vary with the level of economic development[12].

Pritchett (1996) claims that public investment in developing countries may be often used for unproductive projects following the white–elephant hypothesis. In order to separate the growth effect our work concentrates on a sample of developed countries. Regarding social transfers there may also be a problem of identifying the direction of causation. Higher transfers can increase aggregate demand while on the other hand output can affect public spending through automatic stabilizers. In consequence we focus on the effects of public financial consumption and in detail on public intermediate consumption as well as public employment on growth. As earlier mentioned public intermediate consumption increases demand and as production capacity is not reached increase output. As compensation of public employment increases the purchasing power, demand does not have to increase to the same degree while part of earnings can be retained as savings. Alesina et al. (1999) find evidence for a negative impact of public wages on business investment. According to

[10]Exceeding those impacts there may be additionally induced effects if emyployment is positively influenced by the increased demand.

[11]See, e.g., Romp and De Haan (2007); Zagler and Dürnecker (2003); Addison and Roe (2006)

[12]See, e.g., Devarajan et al. (1996); Pritchett (1996); Nelson and Singh (1994); Hakro (2009); Ghura (1995); Bairam (1990); Easterly and Rebelo (1993); Lee (1995); Slemrod et al. (1995)

the authors public wages drive up wages in the private sector[13] increasing production costs and lowering profits and investments.

In this work we concentrate on government consumption, and its two main components: intermediate consumption and compensation of public employees. Even within the final consumption of the government, these components should in theory have a different (at least in terms of size) effect on the growth of output. Intermediate consumption enters the output directly, almost "mechanically", through the aggregate demand. Therefore, in the absence of Ricardian equivalence, thus as we predict for lower level of public indebtness, the effect on growth should be positive. On the other hand, compensation of public employees has only an indirect effect on output, as an additional disposable income of an individual does not necessarily translate into higher demand, as part of the additional income could be saved or e.g., invested abroad. Therefore, *ceteris paribus* an increase in the compensation of employees should have at most the same effect as an increase in the intermediate consumption.

Government intermediate consumption is also related to increasing innovation (see, e.g., Slavtchev and Wiederhold, 2011). Empirical evidence points to a conclusion, that public demand can be an important driver of innovative behavior (see, e.g., Ruttan, 2006; Aschhoff and Sofka, 2009; Lichtenberg, 1984). It relies on the importance of the inter-industrial composition of public purchases. Government demand is likely to affect decision making within supplier firms, particularly with respect to investment in R&D, since in a number of industries the public sector is the first user of innovations, patents, and products (see, e.g., Edquist and Hommen, 2000; Edler and Georghiou, 2007).

Theoretical considerations (e.g., Cavallo, 2005; Censolo and Colombo, 2015) provide some predictions on how the effects of intermediate consumption and public compensation

[13] Holm-Hadulla et al. (2010)

differ. Cavallo (2005) finds that an unanticipated increase in government expenditure on goods represents a resource drain for households: it entails a substantial negative wealth effect that leads to a negative impact on private consumption and a positive impact on both the number of hours worked and output in the private sector. In contrast, an unanticipated increase in government expenditure on public employment has a negative impact on the number of hours worked[14] and output in the private sector, but it does not generate a negative wealth effect on private consumption and total labor supply. The reason for these different effects is that government wages and salaries represent income for households and, as such, act essentially as transfers.

3. Data and model

3.1. Government final consumption and its components

According to ESA 2010, final consumption expenditure by government includes two categories of expenditures:

1. the value of goods and services produced by general government itself other than own-account capital formation, market output and payments for non-market output;
2. purchases by general government of goods and services produced by market producers that are supplied to households, without any transformation, as social transfers in kind (European Union, 2013).

In other words, final consumption of the government encompasses a part of current expenditure, excluding, for instance other current expenditures such as social benefits (other than in kind) and direct subsidies. A more detailed description of the components is presented in Table 1

[14] For further empirical evidence of crowing out of private employment see, e.g., Behar and Mok (2013)

Table 1: Government total expenditure

Current expenditure	
Intermediate consumption (P.2)	
Compensation of employees (D.1)	Final consumption expenditure
Social transfers in kind (D.631)	Adjustment
Other taxes on production, payable (D.29)	
Property income (D.4)	
Social benefits other than in kind (D.62)	Remaining current expenditure
Subsidies, payable (D.3)	
Other (D.5;D.7;D.8)	
Capital expenditure	
Capital transfers, payable (D.9)	
Gross capital formation (P.5)	Capital expenditure
Net acquisitions of non-produced non-financial assets (K.2)	

Source: Based on Pulpanova (2013).

As noted in Table 1, the final consumption of the government cannot be straightforwardly derived from the government's current expenditure. The adjustment term, therefore, consists of several terms, which need to be substracted, most notably consumption of fixed capital by the government (K.1), payable taxes on production (D.29) and intermediate output (P.12), among others. What remains, are the two posts of practical importance: intermediate consumption and compensation of public employees.

Final consumption of the government can be alternatively further classified according to function, based on COFOG classification: expenditure of individual and collective goods. The first category typically comprises education, health services, sports and recreation, culture, provision of housing services, collection of household refuse, operation of public transport, etc. The second category includes general administration, national defense, security and other common benefits to the community as a whole (Vu Quang Viet, 2011).

Table 2 summarizes final consumption of the government, as well as the two main components as percentage of GDP in our sample. Moreover, Figures 7 and 8 in the Appendix shows that the variables on interest show significant variation over time, which allows us to interpret the regression results.

Table 2: Average final consumption of the government and its components as % of GDP, and debt as % of GDP

Country	Compensation of employees	Intermediate Consumption	Final consumption	Public Debt
Austria	11.0	5.9	19.1	70.2
Belgium	11.8	4.0	22.2	105.8
Czech Republic	7.3	5.8	20.7	26.6
Denmark	16.1	8.2	26.3	48.3
Estonia	10.7	7.5	20.0	8.1
Finland	14.1	8.8	22.9	44.9
France	12.8	5.0	23.5	68.0
Germany	8.0	4.0	19.1	65.3
Greece	11.2	5.7	17.2	136.5
Hungary	11.2	6.9	21.9	67.2
Ireland	9.9	5.2	17.2	57.4
Italy	10.4	5.0	19.4	109.5
Netherlands	9.2	6.2	24.4	57.1
Poland	11.0	6.5	18.8	54.6
Portugal	13.3	5.0	18.9	72.5
Slovakia	8.5	5.9	20.4	38.9
Slovenia	11.4	6.2	19.1	30.5
Spain	10.5	4.7	18.3	57.2
Sweden	12.7	8.4	26.9	49.5
United Kingdom	10.3	9.4	20.2	52.3
Total	11.1	6.3	20.9	61.2

3.2. The empirical model

We consider a panel of 20 European countries between 1990 and 2013, a total of 397 observations[15]. Most data come from the AMECO database, further complemented by the United Nations data on education levels, and other datasets, listed in detail in the Appendix. The empirical model bases on endogenous growth theory, that is including the investment/saving to GDP ratio and population growth, as well as including conditional convergence, that relates the the growth of per capita GDP to the initial levels of income.

[15]In the regression, the actual number of observations will typically be lower due to the use of lags, and partially missing information on specific variables for specific countries.

In all cases, the dependent variable is the real growth of GDP per capita. Main variables of interest are the government final consumption (and its components) to GDP. We also allow the debt levels to non-linearily enter the growth equation, in line with the previous findings. The most important component of the analysis is the interaction term between the goverment consumption and the debt levels.

Additional control variables inculded are: (i) long-run interest rate, capturing the effects of monetary policy (ii) indicator of trade openness (the sum of imports on exports to GDP) (iii) output gap (trend–based), capturing the cyclical components affecting growth (iv) human capital indicator (secondary education enrollment) (v) average inflation rate.

All fiscal variables enter in real terms and the same currency (ECU/EUR). All equations further include country fixed effects to further control for unobservable characteristics of countries without losing too many degrees of freedom, given a relatively small sample size. Further, all equations are estimated with time effects, capturing common shocks across countries and fiscal and monetary policy regime changes such as e.g., introduction of the Maastricht criteria. The main equation of interest is, therefore

$$\begin{aligned} g_{i,t+k} = \beta_0 + \beta_1 GDPpc_{i,t} + \beta_2 Debt_{i,t} + \beta_3 Debt^2_{i,t} + \\ + \beta_4 GovCons_{i,t} + \beta_5 GovCons_{i,t} \times Debt_{i,t} + \Gamma \mathbf{X}_{i,t} + \mu_i + \nu_t + \varepsilon_{i,t}, \quad (1) \end{aligned}$$

where $\mathbf{X}$ denotes the vector of control variables. The signs of β_4 and β_5 are of particular interest, as well as marginal effects of changes in *GovCons* for the levels of *Debt*. We consider $k = 1, \ldots, 5$, therefore the change in the impact of government consumption over time for up to five years. Furthermore, we estimate the same equations replacing the government final consumption with its components: intermediate consumption and compensation of employees. The basic estimation method is a panel fixed–effects model with White-corrected standard errors clustered at the country level[16]

As government-consumption-to-GDP ratio is likely to be endogenous to the output, one needs to assure that the estimates are not biased. Including lagged variables, as is done in the main specification solves the problem only partially, as agents with rational expectations are able to predict future developments of output, and adjust their behavior accordingly. Final consumption measured as % of GDP could increase simply as a result of a period of lower (or negative) growth accompanied by "sticky" expenditure in the public sector. In such a case, following increase in output growth, being simply a result of cyclical behavior of the economy, which cannot be fully controlled for, cannot be causally related the an increase in government consumption. Additionally, government consumption could be increasing in anticipation of increased output in the future or as a reaction of the government to expectations of negative economic development due to external factors, in which case the causal effect runs in the opposite direction.

In the attempt to address the issue of causation, we propose instrumental variable estimation. In the IV regressions, we make use of the above observation, and use instrumenting technique similar to Nunn and Qian (2014). In the first stage, we instrument the government consumption in the following way:

$$GovCons_{i,t} = \alpha + \beta * Oilprice_{i,t-1} + \gamma * Oilprice_{i,t-1} \times \overline{Frac_i} + \Theta * \mathbf{X}_{i,t} + \tau_t + \alpha_i + \varepsilon_{i,t}. \quad (2)$$

In this specification, *Oilprice* (Ross, 2016) measures exposure of an economy to oil price changes, which presumably affects the general economic situation in country, which in turn might encourage politicians to introduce changes to the patterns of government spending.

[16] In the Appendix we report the results of estimation corrected for cross-panel autocorrelation using Driscoll-Kraay standard errors with lag-structure corresponding to k.

Widespread increases in government consumption across the European economies following the recent financial crisis are a best example of such behavior. More generally, a supply shock, such as an oil-price shock would typically yield a similar reaction. Oil price is time-varying but the same for all analyzed economies, thus using oil price only would preclude inclusion of time fixed effects. The second term, threfore is an interaction between the oil price an the *average* fractionalization of the legislature over the analyzed period, measured as the probability that two deputies picked at random from among the government parties will be of different parties (Data by Williams, 2015, as included in the QoG2015 Database).

Given that changes in the government might be a reaction to changing economic circumstances, time-varying composition of the legislature is not exogenous. However, since we average out the time changes in the legislative composition, average orientation will be fully captured by the country fixed effects[17]. The interaction term itself varies by country and year, which allows us to control for time fixed effects. Conceptually, instrumenting for the government consumption with the interaction term is similar to a difference-in-differences estimation, in which the first-stage estimates compare changes in the government consumption to GDP between countries which highly fragmented legisltive bodies (and possibly instances of coalitional governments with many members) and countries in which the decision process is not as fragmented, following changes in the world oil prices[18].

The idea behind this instrument, relies on the speed of the decision-making process in the legislature as well as the established political economy observation that coalitional governments tend to increase spending. So, on the one hand, highly fractionalized legislatures will tend to show higher government consumption. On the other hand, highly fractionlized legislatures are likely to react differently to exgenous shocks, due to differences in the speed

[17]That is why, we also do not include the $\overline{Frac_i}$ term in the regression.

[18]The main difference to a standard difference-in-differences estimation is that the treatment $\overline{Left_i}$ is continous rather than binary.

Table 3: Main results, for lags $i = 1, \ldots, 5$

	(1) 1 Year Lag	(2) 2 Years Lag	(3) 3 Years Lag	(4) 4 Years Lag	(5) 5 Years Lag
Initial GDP	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(-4.40)	(-4.38)	(-4.19)	(-4.55)	(-5.53)
LR Interest Rate	-0.40***	-0.45***	-0.52***	-0.57***	-0.57***
	(-5.12)	(-5.40)	(-5.42)	(-5.57)	(-5.60)
Average inflation 5Y	33.02***	27.22***	27.06***	26.88***	32.09***
	(3.29)	(2.76)	(2.82)	(2.68)	(3.29)
Output Gap	0.32***	0.29***	0.23***	0.22***	0.22***
	(6.68)	(6.54)	(5.25)	(4.57)	(4.33)
Initial Trade to GDP 5Y	3.36***	2.99***	2.17*	2.10*	2.63**
	(2.80)	(2.68)	(1.89)	(1.80)	(2.21)
Initial Secondary Educ. 5Y	-0.01	-0.00	0.00	-0.00	-0.01
	(-1.20)	(-0.48)	(0.16)	(-0.06)	(-0.62)
Initial Total Invest. to GDP 5Y	-1.78	-1.49	-1.45	-2.52**	-2.88**
	(-1.54)	(-1.29)	(-1.24)	(-2.07)	(-2.55)
Initial Gov Cons to GDP 5Y	-0.11*	-0.13*	-0.03	-0.02	-0.02
	(-1.77)	(-1.91)	(-0.53)	(-0.27)	(-0.40)
L.i Gross Debt	0.13**	0.17***	0.15**	0.08	0.02
	(2.14)	(3.46)	(2.37)	(1.48)	(0.37)
L.i Gross Debt × L.i Gross Debt	-0.00***	-0.00***	-0.00***	-0.00**	-0.00
	(-4.30)	(-4.70)	(-3.01)	(-2.29)	(-1.53)
L.i Gross Debt × L.i Government Consumption	-0.00	-0.00**	-0.00*	-0.00	0.00
	(-0.88)	(-2.42)	(-1.94)	(-0.98)	(0.24)
L.i Government Consumption	0.25	0.48***	0.30**	0.10	-0.10
	(1.65)	(2.92)	(2.02)	(0.67)	(-0.74)
Constant	-5.07	-8.80	-2.17	7.66	13.81*
	(-0.61)	(-1.07)	(-0.27)	(0.91)	(1.68)
Debt threshold	136%	102%	66%	50%	-
Observations	317	308	298	287	274
R2	0.848	0.859	0.856	0.856	0.862
FE	YES	YES	YES	YES	YES
YE	YES	YES	YES	YES	YES

Robust t-Statistics in parentheses, standard errors clustered at country level; p 0.1 * p 0.05 ** p 0.01 ***

of the decision-making process and necesitty to conclude political compromises.

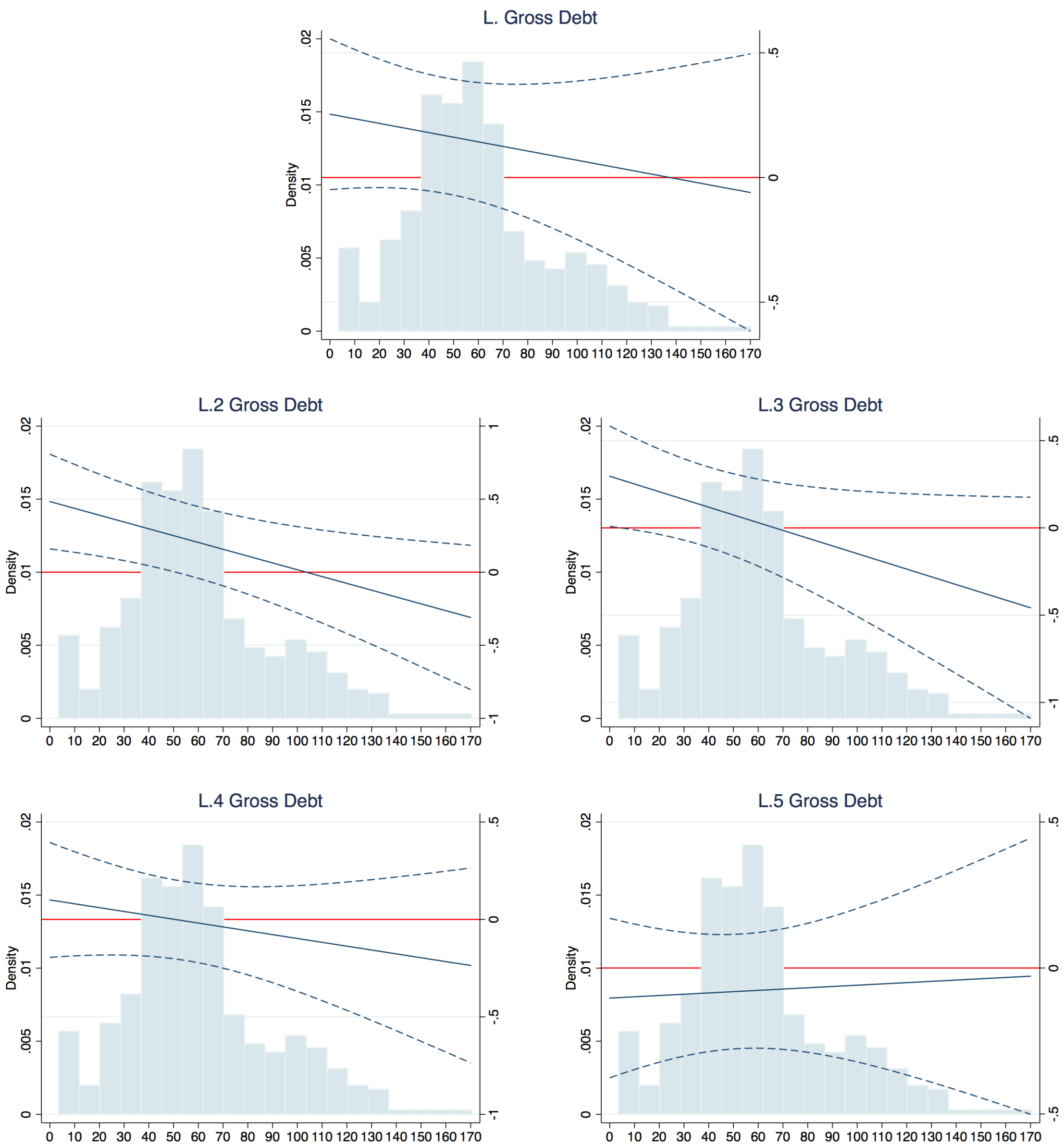
Causal interpretation using the interacted instrumental variables relies on an exclusion resctriction that, conditional on other country characteristics, changes in the growth rates following changes in the oil prices do differ between countries with highly and moderately fractionalized legislatures only through the government behavior channel.

4. Results

4.1. Main results

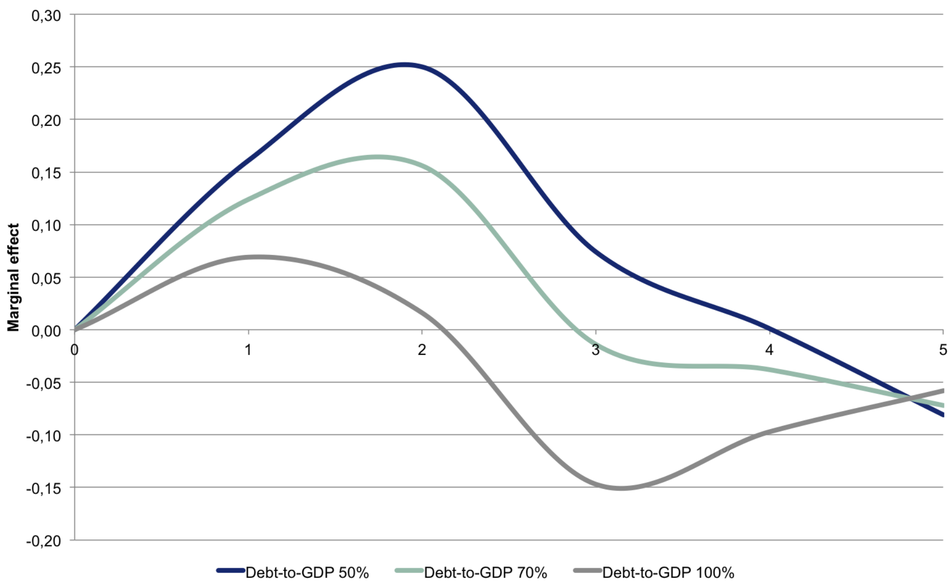
As indicated in Table 3 and Figure 1, an increase in government final consumption is associated with increased growth of output per capita in the second and third year after the change. Thus indicating in line with Keynes prediction a positive influence of government spending on the growth prospects. However, as visualized in Panels two and three in Figure 1, a positive stimulation effect is only present at lower levels of public debt. This is in line with Perotti (1999) and Sutherland (1997) pointing to the importance of the initial

Figure 1: Conditional marginal effects of an increase in government consumption



level of debt. Public consumption as well seems to display a non-linear feature as seen for general public spending. As expected for countries with low levels of public debt a fiscal stimulus via public consumption can be an effective measure to stimulate output growth in the short-run. However, as debt levels raise the government seems more limited in its

Figure 2: Marginal effects of an increase in government consumption over time



ability to use public consumption to assess growth enhancement. This may be due to the anticipation of agents responding to the threat of higher taxation as source of financing the debt. As stated earlier there might be a turning point at which agents start to believe that the debt burden has to be financed by their own generation instead of future ones causing a change in the agents response to public spending. The turning point for the estimate in the second year lies at around 105% public debt to GDP and thus around the estimates of Reinhart and Rogoff (2010). The whole 95% confidence interval lies above zero only for the debt levels below 40% of GDP.

In the third year the turning point estimated lies at around 70% of GDP suggesting that the growth effect can be sustained longer within lower levels of public debt. Thus it seems as that agents do react to an increased public consumption already at lower levels of public debt, however, their consumption behavior is less elastic and rather delayed reducing the growth effect only in later years. In general the results exhibit a positive impact of public consumption on growth for about two years if public debt levels do not exceed

100% of GDP, whereas the effect in the third consecutive year is only positive for debt levels below 70% of GDP. In the fourth and fifth year, there is no statistically significant correlation between increased government consumption and growth of output implying that the fiscal stimulus of government consumption is limited a short-run improvement of growth in contrast to e.g. investments which are often claimed to increase long-run economic performance.

Turning to the actual size of the effects, in the second year the maximum size of the marginal effect equals around 0.5, but only at very low debt levels. For the debt levels between 40% and 70% of GDP, is the effect about 0.25, which means that 1 percentage point higher governement consumption-to-GDP ratio is associated with a quarter percentage point higher real GDP growth. In the third year the effects drops to about 0.1 for the relevant debt levels. In the fourth and fifth year, the marginal effect of government consumption on real GDP growth is not significantly different from zero. The latter observations are briefly summarized in Figure 2, which shows the size of the marginal effects over time at three levels of debt-to-GDP ratios.

4.2. Components of government consumption

A presented in Table 4 and Figure 3, an increase in government intermediate consumption is positively correlated with growth in the first two years at the levels of public debt below 60% and in the third year for public debt below 38% of GDP. On the other hand, an increase in another consumption subcomponent, compensation of public employees, is not associated with an increase of output growth in the full sample (Table 5 and Figure 5) for any lag-structure. In line with the theory, as intermediate consumption directly affects aggregated demand, the positive impact of increasing the demand through public employment is much less clear. Public wages significantly play a role in wage finding processes of the public sector, thus an increase in public compensation may increase production cost of

Table 4: Intermediate consumption of the government, for lags $i = 1, \ldots, 5$

	(1) 1 Year Lag	(2) 2 Years Lag	(3) 3 Years Lag	(4) 4 Years Lag	(5) 5 Years Lag
Initial GDP	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(-6.34)	(-6.02)	(-5.56)	(-5.73)	(-5.49)
LR Interest Rate	-0.58***	-0.60***	-0.62***	-0.62***	-0.67***
	(-6.87)	(-6.71)	(-8.44)	(-7.33)	(-6.90)
Average inflation 5Y	23.53**	17.37*	16.95*	17.90*	23.35**
	(2.58)	(1.90)	(1.79)	(1.70)	(2.09)
Output Gap	0.27***	0.25***	0.23***	0.23***	0.26***
	(6.62)	(6.01)	(5.34)	(5.02)	(4.75)
Initial Trade to GDP 5Y	2.59**	1.85	1.19	1.28	2.07
	(2.21)	(1.56)	(1.05)	(1.02)	(1.44)
Initial Secondary Educ. 5Y	-0.02*	-0.01	-0.00	-0.00	-0.01
	(-1.76)	(-1.11)	(-0.02)	(-0.24)	(-0.86)
Initial Total Invest. to GDP 5Y	-1.82	-1.64	-2.15*	-2.94**	-3.11**
	(-1.62)	(-1.34)	(-1.84)	(-2.18)	(-2.19)
Initial Gov Cons to GDP 5Y	-0.10*	-0.07	-0.01	0.00	-0.03
	(-1.75)	(-1.36)	(-0.11)	(0.02)	(-0.56)
L.i Gross Debt	0.15***	0.16***	0.20***	0.13**	-0.01
	(3.95)	(3.85)	(3.84)	(2.39)	(-0.19)
L.i Gross Debt × L.i Gross Debt	-0.00***	-0.00***	-0.00***	-0.00*	0.00
	(-3.49)	(-3.42)	(-3.54)	(-1.97)	(0.12)
L.i Gross Debt × L.i InterCons	-0.01***	-0.01***	-0.02***	-0.01***	-0.00
	(-2.75)	(-3.40)	(-3.77)	(-2.83)	(-0.46)
L.i InterCons	0.60**	0.78***	0.72**	0.54	0.02
	(2.22)	(2.64)	(2.45)	(1.62)	(0.06)
Constant	4.35	5.71	8.32	15.09	19.40*
	(0.50)	(0.61)	(0.95)	(1.58)	(1.91)
Debt threshold	66%	60%	38%	36%	8%
Observations	291	278	265	250	234
R2	0.874	0.877	0.878	0.873	0.866
FE	YES	YES	YES	YES	YES
YE	YES	YES	YES	YES	YES

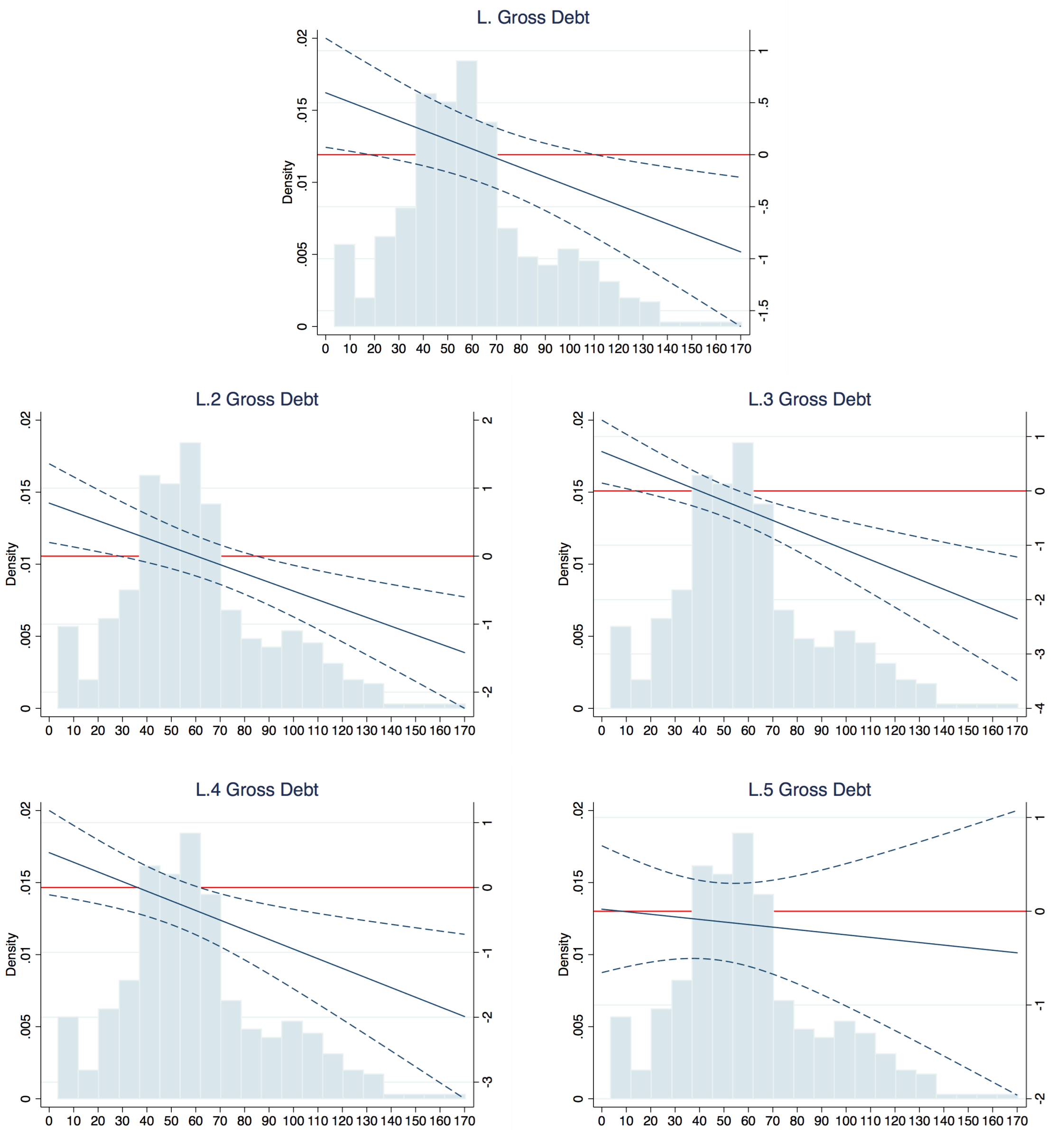
Robust t-Statistics in parentheses, standard errors clustered at country level; p 0.1 * p 0.05 ** p 0.01 ***

Table 5: Compensation of public employees, for lags $i = 1, \ldots, 5$

	(1) 1 Year Lag	(2) 2 Years Lag	(3) 3 Years Lag	(4) 4 Years Lag	(5) 5 Years Lag
Initial GDP	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(-5.91)	(-5.81)	(-5.20)	(-5.86)	(-5.62)
LR Interest Rate	-0.55***	-0.60***	-0.64***	-0.69***	-0.69***
	(-6.25)	(-6.71)	(-7.18)	(-7.03)	(-7.19)
Average inflation 5Y	24.53***	18.22**	15.57*	18.57*	23.04**
	(2.77)	(2.03)	(1.68)	(1.90)	(2.04)
Output Gap	0.26***	0.25***	0.22***	0.23***	0.26***
	(5.44)	(5.43)	(4.83)	(4.50)	(4.51)
Initial Trade to GDP 5Y	1.47	1.06	0.99	1.23	2.25
	(1.20)	(0.93)	(0.83)	(0.92)	(1.59)
Initial Secondary Educ. 5Y	-0.02	-0.02	-0.01	-0.01	-0.01
	(-1.63)	(-1.51)	(-1.15)	(-1.09)	(-1.08)
Initial Total Invest. to GDP 5Y	-2.04*	-2.41**	-2.39*	-2.85**	-2.99**
	(-1.97)	(-2.17)	(-1.96)	(-2.12)	(-2.25)
Initial Gov Cons to GDP 5Y	-0.03	-0.01	0.02	0.00	-0.04
	(-0.59)	(-0.23)	(0.29)	(0.06)	(-0.66)
L.i Gross Debt	0.13**	0.14***	0.13***	0.04	-0.05
	(2.57)	(3.03)	(2.62)	(0.82)	(-1.02)
L.i Gross Debt × L.i Gross Debt	-0.00***	-0.00**	-0.00*	-0.00	0.00
	(-3.15)	(-2.10)	(-1.78)	(-0.21)	(0.61)
L.i Gross Debt × L.i PubEmploy	-0.00	-0.01**	-0.01**	-0.00	0.00
	(-1.20)	(-2.47)	(-2.43)	(-0.98)	(0.38)
L.i PubEmploy	-0.15	0.16	0.20	0.03	-0.10
	(-0.74)	(0.80)	(0.97)	(0.13)	(-0.48)
Constant	13.55*	14.47*	13.63*	19.89**	20.09**
	(1.77)	(1.87)	(1.67)	(2.24)	(2.24)
Debt threshold	-	22%	26%	8%	-
Observations	291	278	265	250	234
R2	0.873	0.875	0.873	0.868	0.866
FE	YES	YES	YES	YES	YES
YE	YES	YES	YES	YES	YES

Robust t-Statistics in parentheses, standard errors clustered at country level; p 0.1 * p 0.05 ** p 0.01 ***

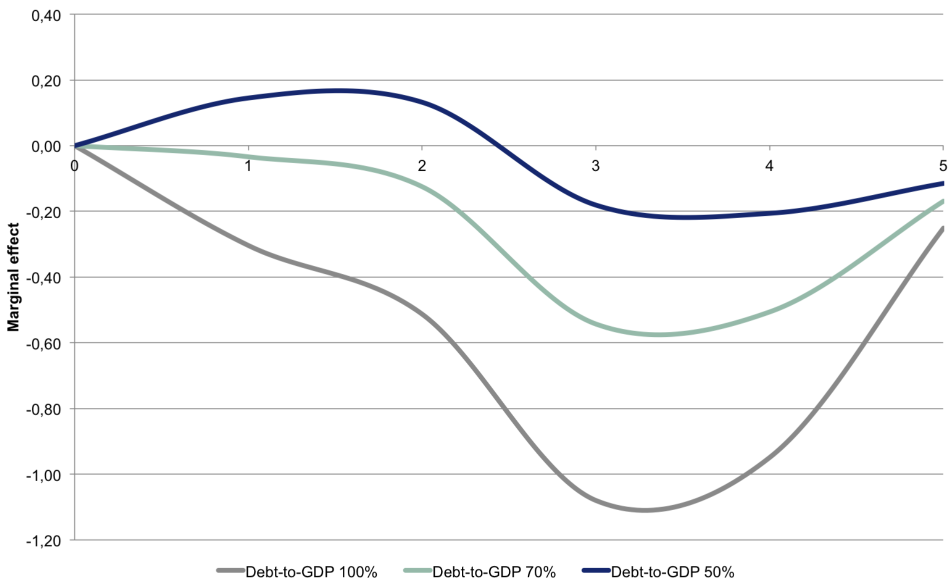
Figure 3: Conditional marginal effects of an increase in government intermediate consumption



the private sector and reduce investments and ultimately output growth. In consequence, the public wage bill can rather decrease than increase output performance.

The size of the effects can be found in Figures 3 and 5. Regarding the intermediate consumption of the government, in the first year highest positive effect at very low debt

Figure 4: Marginal effects of an increase in government intermediate consumption over time

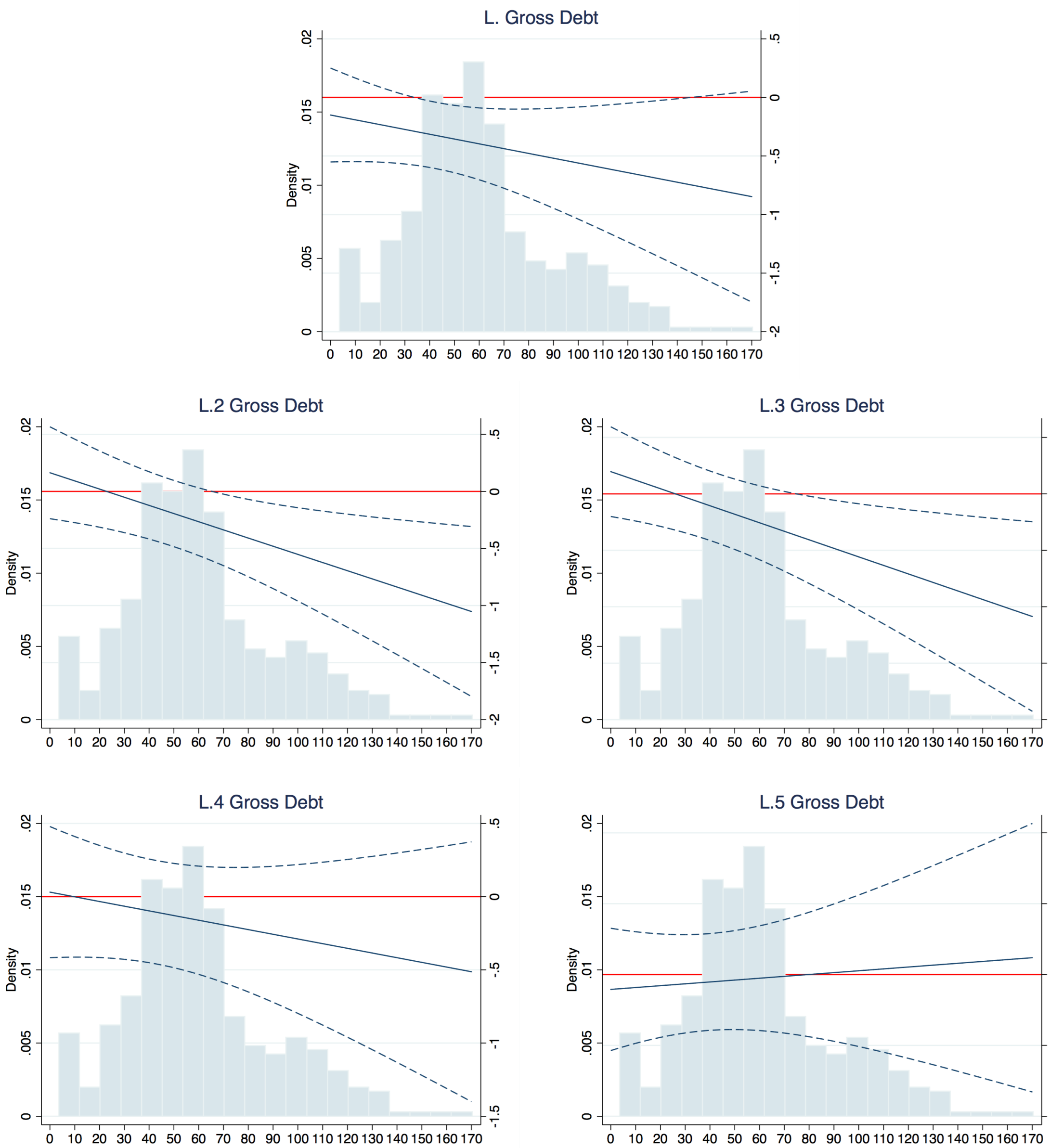


levels reaches 0.5. The effect is strongest in the second year and reaches slightly less than one, which means that at very low debt levels, an increase in intermediate consumption-to-GDP ratio by 1 percentage point is associated with an almost one-to-one increase in the real GDP growth. At the debt levels betwen 40% and 60% of GDP, the effect varies between 0.4 and zero, and turns negative above the 60% threshold. In the third and fourth year the effect is significantly negative at almost all debt levels, and reaches level of between -1 and -2.

Regarding the effect of compensation of public employees, a slightly positive effect can be found in the second and the third year, which however does not exceed 0.2 and is barely different from zero. On the other hand, at higher debt levels the overall correlation is significantly negative and reaches a minimum of about -1 in the second and third year, that is 1 percentage point increase in the public compensation-to-GDP is associated with up to -1 percentage point difference in the real GDP growth.

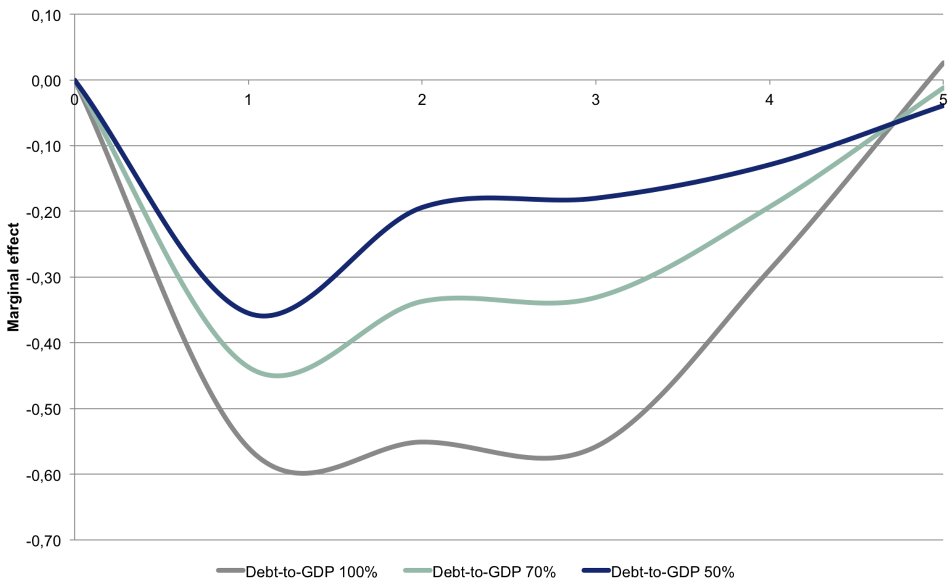
Figures 4 and 6 additionally visualize, that at debt-to-GDP ratios observed in most

Figure 5: Conditional marginal effects of an increase in compensation of public employees



European countries, the effect of an increase in intermediate consumption is positive at lower debt levels, however only temporarily. For the case of the public compensation, the effect is negative already in the first year for most European countries.

Figure 6: Marginal effects of an increase in compensation of public employees



4.3. Channels of transmission

According to Ricardian equivalence, an increase in government consumption will be (partially) offset by an increase in private savings. In this work we point to the hypothesis that private savings should increase following an increase in government consumption at high levels of debt, and be less affected at lower levels of debt. We estimate the following equation to test this hypothesis:

$$DV_{i,t+k} = \beta_0 + DV_{i,t+k-1} + \beta_1 GDPpc_{i,t} + \beta_2 Debt_{i,t} + \beta_3 Debt^2_{i,t} + \\ + \beta_4 GovCons_{i,t} + \beta_5 GovCons_{i,t} \times Debt_{i,t} + \Gamma \mathbf{X}_{i,t} + \nu_t + \varepsilon_{i,t}, \quad (3)$$

where $DV_{i,t+k}$ is the ratio of private savings to GDP or growth rate of total factor productivity. The equation is estimated with system GMM method, with lags of the dependent variable used as instruments in the differenced equation, and year effects used as (IV-type) instruments in the level equation. Instruments have furthermore been collapsed to avoid

Table 6: Private savings to GDP $i = 1, \ldots, 5$

	(1) 1 Year Lag	(2) 2 Years Lag	(3) 3 Years Lag	(4) 4 Years Lag	(5) 5 Years Lag
L. Private savings	-0.02	-0.14	0.49	1.07**	0.59
	(-0.07)	(-0.41)	(1.12)	(2.45)	(0.44)
Initial GDP	-0.00	-0.00	-0.00	-0.00	-0.00
	(-0.96)	(-0.82)	(-0.88)	(-0.33)	(-0.31)
LR Interest Rate	-0.23	0.08	0.34	0.09	0.14
	(-0.87)	(0.59)	(0.60)	(0.27)	(0.55)
L.i Gross Debt	0.75	1.00***	0.96***	-0.12	0.68
	(1.62)	(4.15)	(5.56)	(-0.19)	(0.35)
L.i Gross Debt × L.i Gross Debt	0.00	-0.00	-0.01***	-0.00	-0.00
	(0.31)	(-0.96)	(-3.76)	(-0.05)	(-0.30)
L.i Gross Debt × L.i Conspumtion	-0.04***	-0.04**	-0.00	0.01	-0.01
	(-4.76)	(-2.17)	(-0.03)	(0.62)	(-0.54)
L.i Conspumtion	2.54***	2.06***	0.32	-0.00	0.51
	(5.40)	(2.88)	(0.19)	(-0.01)	(0.30)
Observations	326	315	303	290	275
YE	YES	YES	YES	YES	YES
No. of instruments	42	41	40	39	38
AR(1) p-value	0.51	0.99	0.22	0.07	0.90
AR(2) p-value	0.88	0.54	0.47	0.94	0.72

Two-step Arellano-Bond estimator; GMM instruments: collapsed L(2/3).DV
IV instruments for the level equation - year effects; p 0.1 * p 0.05 ** p 0.01 ***

Table 7: Growth of total factor productivity $i = 1, \ldots, 5$

	(1) 1 Year Lag	(2) 2 Years Lag	(3) 3 Years Lag	(4) 4 Years Lag	(5) 5 Years Lag
L. TFP growth rate	0.43**	-0.32	-0.52**	-0.30**	-0.59***
	(2.39)	(-0.48)	(-2.45)	(-2.04)	(-2.67)
Output Gap	0.49***	0.13	0.32**	0.26	-0.34
	(5.09)	(0.27)	(2.56)	(1.56)	(-1.58)
Initial Secondary Educ. 5Y	0.15***	0.05	0.13*	0.06	0.07
	(4.26)	(0.55)	(1.83)	(0.68)	(0.73)
Initial GDP	-0.00***	-0.00	-0.00***	-0.00	-0.00***
	(-3.13)	(-0.46)	(-3.46)	(-0.46)	(-2.86)
LR Interest Rate	-0.67**	0.06	-0.09	-0.26	0.17
	(-2.51)	(0.15)	(-0.52)	(-0.75)	(0.26)
L.i Gross Debt	-1.21***	0.06	-0.19	-0.28	0.78**
	(-5.15)	(0.11)	(-1.09)	(-0.47)	(2.31)
L.i Gross Debt × L.i Gross Debt	0.00**	-0.00	0.00	0.00	-0.01
	(2.15)	(-0.62)	(0.51)	(0.82)	(-1.47)
L.i Gross Debt × L.i Conspumtion	0.03***	0.01	-0.00	-0.02	0.01
	(3.20)	(0.34)	(-0.04)	(-1.44)	(0.21)
L.i Conspumtion	1.16	-0.20	0.07	0.91	-0.88
	(1.51)	(-0.37)	(0.12)	(1.37)	(-0.81)
Observations	346	346	336	325	312
YE	YES	YES	YES	YES	YES
No. of instruments	42	41	40	39	38
AR(1) p-value	0.32	0.97	0.66	0.63	0.61
AR(2) p-value	0.26	0.19	0.20	0.46	0.16

Two-step Arellano-Bond estimator; GMM instruments: collapsed L(2/3).DV
IV instruments for the level equation - year effects; p 0.1 * p 0.05 ** p 0.01 ***

biad stemming from a large number of instruments compared to the sample size. The results are presented in Tables 6 and 7.

Preliminary results presented in Tables 6 and 7 are broadly consistent with the savings transmission channel. Firstly, confirming Checherita-Westphal and Rother (2012), the debt levels have a direct non–linear effect on the savings rate, particularly after two and three years. On the other hand, public consumption is associated with an increased savings rate in the first and the second year, broadly consistent with the Ricardian view. The overall effect is nonlinear: at the debt levels of under 30% of GDP there is negative correlation

Table 8: IV Estimation

	(1) 1 Year Lag	(2) 2 Years Lag	(3) 3 Years Lag	(4) 4 Years Lag	(5) 5 Years Lag
Initial GDP	-0.00***	-0.00*	0.00	-0.00	-0.00***
	(-4.43)	(-1.77)	(0.25)	(-0.99)	(-3.05)
LR Interest Rate	-0.44***	-0.66***	-0.72***	-0.64***	-0.63***
	(-3.78)	(-4.12)	(-4.17)	(-6.41)	(-6.26)
Average inflation 5Y	42.09***	35.06**	20.92	30.00**	38.59***
	(3.44)	(2.51)	(1.13)	(2.15)	(3.48)
Output Gap	0.38***	0.38***	0.38***	0.29***	0.28***
	(4.34)	(5.56)	(4.69)	(5.31)	(5.20)
Initial Trade to GDP 5Y	5.24**	6.52**	4.90**	2.85*	2.56*
	(2.44)	(2.45)	(2.24)	(1.82)	(1.68)
Population growth rates	-0.02	-0.28	-0.67**	-0.56**	-0.24
	(-0.04)	(-0.87)	(-2.23)	(-2.20)	(-0.88)
Initial Secondary Educ. 5Y	-0.01	-0.01	0.00	-0.00	-0.02
	(-1.12)	(-0.72)	(0.04)	(-0.12)	(-1.32)
Initial Total Invest. to GDP 5Y	-4.87**	-3.30*	-1.77	-2.62**	-3.28***
	(-2.34)	(-1.68)	(-0.97)	(-2.19)	(-2.78)
Initial Gov Cons to GDP 5Y	-0.60	-0.78	-0.68	-0.20	0.09
	(-1.33)	(-1.51)	(-1.32)	(-0.97)	(0.56)
L.i Gross Debt × L.i Government Consumption	0.00	-0.00	-0.02*	-0.01	0.01
	(0.67)	(-0.95)	(-1.86)	(-0.61)	(1.26)
L.i Government Consumption	1.27	2.08**	2.55**	0.80	-1.16
	(1.30)	(2.15)	(2.09)	(0.83)	(-1.32)
L.i Gross Debt	-0.06	0.09	0.35*	0.14	-0.18
	(-0.60)	(0.83)	(1.82)	(0.72)	(-1.07)
L.i Gross Debt × L.i Gross Debt	-0.00	-0.00	-0.00	-0.00	-0.00
	(-0.39)	(-0.78)	(-1.26)	(-1.48)	(-0.75)
Constant	-10.66	-38.24*	-51.19*	-8.06	41.91*
	(-0.58)	(-1.68)	(-1.73)	(-0.31)	(1.68)
Observations	273	271	268	264	258
R2	0.818	0.782	0.747	0.859	0.845
FE	YES	YES	YES	YES	YES
YE	YES	YES	YES	YES	YES

Robust t-Statistics in parentheses, standard errors clustered at country level; p 0.1 * p 0.05 ** p 0.01 ***

between the government consumption and the savings rate, which above this level turns positive and increases quadratically along with the increasing indebtness.

Evidence of government consumption working through the innovation channel is very weak. As shown in Table 7, total factor productivity is positively associated with with public consumption after one year, but the effect is not statistically significant at any standard level. Other results are rather inconsistent, and we carefully conclude that we do not find confirmation of the innovation through increase consumption of the government in our dataset.

4.4. Robustness

Results of the IV-2SLS regression are presented in Table 8. The main conclusions of the study remain unaffected, although the significance of the coefficients is weaker.

5. Conclusions

Many European Union Member States tried to overcome the recent economic and financial crisis with increasing public expenditure to boost demand. Eight years have past, and while most economies have accumulated significant levels of public debt they are still stuck in moderate growth. This brings back the question of effectiveness of publicly stimulated growth. We consider a panel fo 20 European Union Member States between 1990 and 2013. The model is based on the endogenous growth theory, thus including investment/savings to GDP ratio and population growth as well as conditional convergence. Our analysis points to a non-linear interaction between levels of public debt and a positive correlation of public consumption and output growth. The findings are in line with earlier empirical findings. The turning point for the level of public debt lies in the second year after the increase in public consumption around the 100% debt to GDP benchmark indicating a similar result as the work by Reinhart and Rogoff (2010). Furthermore, the positive link only prolongs at decreasing levels of debt. While a positive significant correlation can be found for the second year after an increase in public consumption with debt levels up to 105% of GDP it gradually decreases to 70% of GDP in the third year. As some public spending may be lead to problems of the direction of causality such as automatic stabilizers, we further decompose public consumption into public intermediate consumption and compensation of public employees, excluding social expenditure in kind. Our results show a significant interaction between intermediate consumption and economic growth in the first, second and third year after the increase in consumption. The link is positive for debt levels up to 60% of GDP in the first and second year while only positive in the third year for debt levels below 40% of GDP. An increase in the compensation of public employees on the other hand is not associated with an increase in growth for any lag structure. This is in line with the findings of Alesina et al. (1999) who conclude a negative impact of public wages on business investment. Our findings suggest that while public intermediate consumption can have a positive and temporary influence on growth, compensation of public employees does not. However, as debt levels rise above the level of 70% of GDP, increases in government intermediate consumption become counterproductive. Preliminary results suggest that, consistently with the Ricardian view, public consumption is associated with an increased savings rate in the first and the second year. Since, confirming Checherita-Westphal and Rother (2012), debt levels have a non-linear impact on saving rates, the overall effect is non-linear. We carefully conclude that the overall shape of the effect of government consumption on growth conditional on debt levels works through the savings channel.

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Appendix

Table 9: Data description and sources

Real GDP Growth	Real GDP growth per capita	AMECO
Population Growth	Population growth	AMECO
Gross Debt	Gross government debt (% of GDP)	AMECO
Government Consumption	Government final consumption (% of GDP)	AMECO
Initial GDP	5-Year initial GDP p.c. (EURO)	AMECO
LR Interest Rate	Long-run nominal interest rate	AMECO
Average inflation 5Y	5-year average inflation rate	AMECO
Output Gap	Output gap based on trend GDP	AMECO
Initial Trade to GDP 5Y	5-year initial sum of exports and imports (% of GDP)	AMECO
Initial Total Invest. to GDP 5Y	5-year initial total investment (% of GDP)	AMECO
Initial Gov Cons to GDP 5Y	5-year initial government final consumption (% of GDP)	AMECO
PubEmploy	Compensation of public employees (% of GDP)	AMECO
InterCons	Government intermediate consumption (% of GDP)	AMECO
Initial Secondary Educ. 5Y	5-year initial secondary gross enrollment ratio	UN
Government Fractionalization	The probability that two deputies picked at random from among the government parties will be of different parties	Williams (2015)
Oilprice	Constant price of oil in 2000 $/brl	Ross (2016)

Table 10: Main results - Driscoll-Kraay standard errors

	(1) 1 Year Lag	(2) 2 Years Lag	(3) 3 Years Lag	(4) 4 Years Lag	(5) 5 Years Lag
Initial GDP	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(-3.89)	(-4.19)	(-4.43)	(-4.29)	(-4.82)
LR Interest Rate	-0.40***	-0.45***	-0.52***	-0.57***	-0.57***
	(-4.37)	(-4.80)	(-5.03)	(-5.21)	(-4.79)
Average inflation 5Y	33.02**	27.22**	27.06**	26.88**	32.09*
	(3.18)	(2.72)	(2.86)	(2.52)	(2.11)
Output Gap	0.32***	0.29***	0.23***	0.22***	0.22***
	(6.23)	(6.54)	(5.28)	(4.37)	(3.75)
Initial Trade to GDP 5Y	3.36***	2.99***	2.17***	2.10**	2.63***
	(4.17)	(4.72)	(3.62)	(3.32)	(3.84)
Initial Secondary Educ. 5Y	-0.01	-0.00	0.00	-0.00	-0.01
	(-1.46)	(-0.55)	(0.20)	(-0.06)	(-0.61)
Initial Total Invest. to GDP 5Y	-1.78*	-1.49	-1.45	-2.52***	-2.88***
	(-2.03)	(-1.70)	(-1.97)	(-3.74)	(-4.39)
Initial Gov Cons to GDP 5Y	-0.11	-0.13	-0.03	-0.02	-0.02
	(-1.68)	(-1.80)	(-0.56)	(-0.29)	(-0.46)
L.i Gross Debt	0.13**	0.17***	0.15**	0.08	0.02
	(2.40)	(4.18)	(2.92)	(1.63)	(0.30)
L.i Gross Debt * L.i Gross Debt	-0.00***	-0.00***	-0.00***	-0.00**	-0.00
	(-4.18)	(-6.61)	(-5.38)	(-2.79)	(-1.45)
L.i Gross Debt * L.i Government Consumption	-0.00	-0.00***	-0.00**	-0.00	0.00
	(-1.10)	(-3.46)	(-2.61)	(-1.22)	(0.20)
L.i Government Consumption	0.25	0.48**	0.30**	0.10	-0.10
	(1.82)	(2.87)	(2.66)	(1.00)	(-0.77)
Constant	0.00	-9.93	-8.99	0.00	7.22
	(.)	(-1.63)	(-1.61)	(.)	(0.90)
Observations	317	308	298	287	274
(Pseudo) R2	0.579	0.616	0.538	0.533	0.525
FE	YES	YES	YES	YES	YES
YE	YES	YES	YES	YES	YES

Driscoll-Kraay standard errors with two AR lags in parentheses; p 0.1 * p 0.05 ** p 0.01 ***

Figure 7: Time variation of government consumption to GDP and real GDP growth

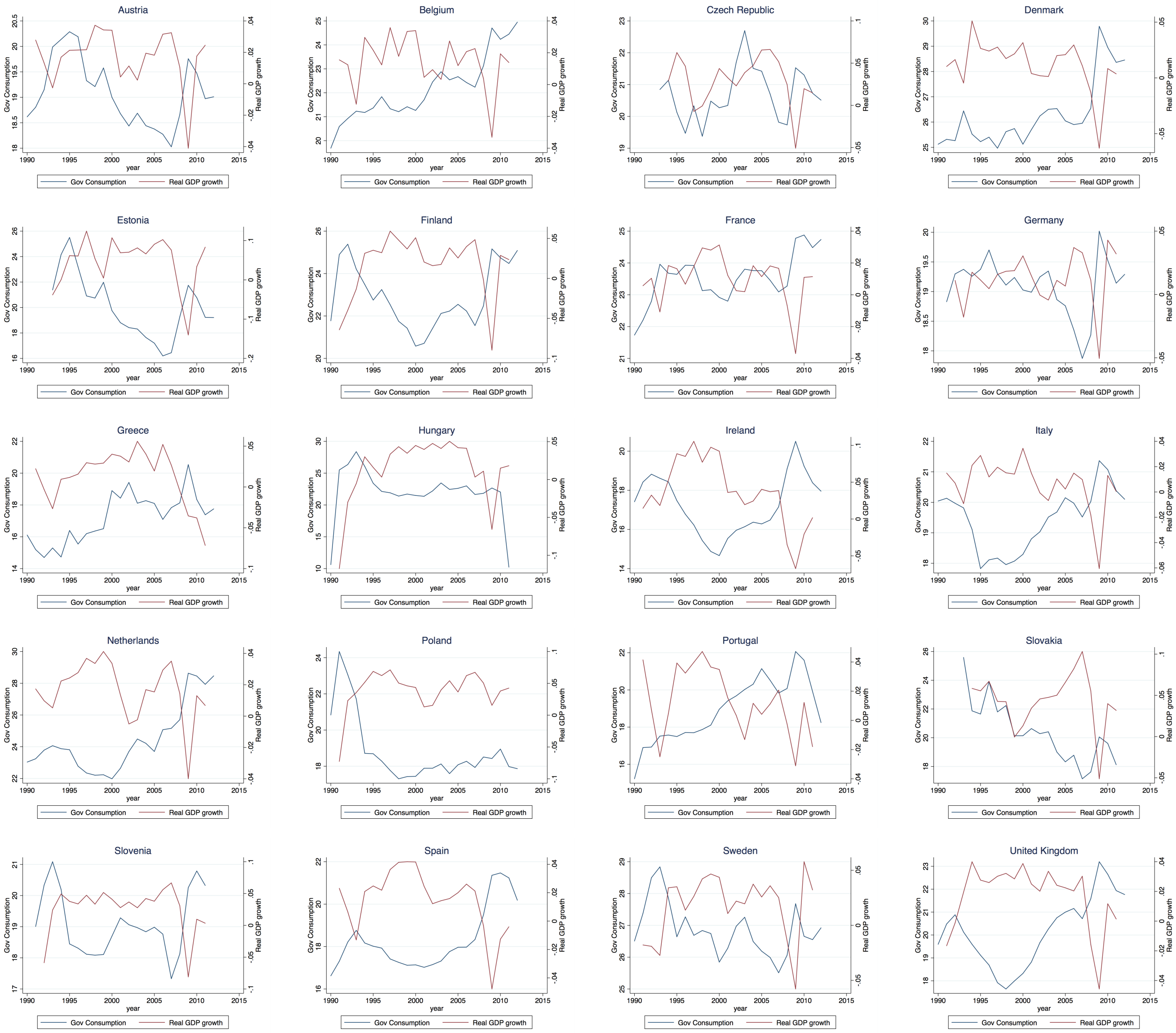

Figure 8: Time variation of intermediate consumption and compensation of public employees