Universidade do Minho

Documentos de Trabalho

Working Paper Series

"The Impact of Government Spending on the Private Sector: *Crowding-out* versus *Crowding-in* Effects""

Davide Furceri
Ricardo M. Sousa

NIPE WP 6 / 2009

NÚCLEO DE INVESTIGAÇÃO EM POLÍTICAS ECONÓMICAS
UNIVERSIDADE DO MINHO

"The Impact of Government Spending on the Private Sector: Crowding-out versus Crowding-in Effects"

Davide Furceri
Ricardo M. Sousa

NIPE* WP 6 / 2009

URL:
http://www.eeg.uminho.pt/economia/nipe

* NIPE – *Núcleo de Investigação em Políticas Económicas* – is supported by the Portuguese Foundation for Science and Technology through the *Programa Operacional Ciência, Teconologia e Inovação* (POCI 2010) of the *Quadro Comunitário de Apoio III*, which is financed by FEDER and Portuguese funds.

The Impact of Government Spending on the Private Sector: *Crowding-out* versus *Crowding-in* Effects [*]

Davide Furceri[♠]
OECD and University of Palermo

Ricardo M. Sousa[♦]
University of Minho, NIPE, London School of Economics, and FMG

February 2009

Abstract

The aim of this paper is to analyze the impact of government spending on the private sector, assessing the existence of *crowding-out* versus *crowding-in* effects. Using a panel of 145 countries from 1960 to 2007, the results suggest that government spending produces important crowding-out effects, by negatively affecting both private consumption and investment. Moreover, while the effects do not seem to depend on the different phases of economic cycle, they vary considerably among regions. The results are economically and statistically significant, and robust to several econometric techniques.

Keywords: Fiscal Policy, Government Spending, Crowding-out, Crowding-in.
JEL: E0, E6.

[*] The views expressed in this paper are those of the author and do not necessarily represent those of the OECD or its member countries.

[♠]Mailing address: OECD, 2 rue Andre Pascal, 75775 Paris Cedex 16. E-mails: davide.furceri@oecd.org; furceri@economia.unipa.it

[♦]University of Minho, Department of Economics and Economic Policies Research Unit (NIPE), Campus of Gualtar, 4710-057 - Braga, Portugal; London School of Economics, Department of Economics and Financial Markets Group (FMG), Houghton Street, London WC2 2AE, United Kingdom. E-mails: rjsousa@eeg.uminho.pt; r.j.sousa@lse.ac.uk.

1. Introduction

The theoretical and empirical literature has provided in the last year extensive analysis on the effect of government spending on economic activity. Despite this, there is no consensus on the effects of government spending on private consumption and investment (both in the short and in the long term) neither from a theoretical nor from an empirical point of view.

Indeed, from a theoretical perspective, the effect of an increase of government spending on those variables can be of both signs. The standard Real Business Cycle (RBC) model predicts a decline in private consumption in response to a rise in government spending: with infinitely-lived Ricardian households, an increase in government spending lowers the present value of after-tax income, and thus generates a negative wealth effect on consumption (Aiyagari et al., 1990; Baxter and King, 1993; Christiano and Eichenbaum, 1992; and Fatás and Mihov, 2001). In contrast, the standard IS-LM model predicts that consumption should rise in response to a positive government spending shock: when consumers behave in a non-Ricardian fashion, their consumption is a function of their current disposable income, thus an increase in income will generate an increase in private consumption (Blanchard, 2001).

Similarly to consumption, the two theories also predict different outcomes for investment. The standard RBC model claims that an increase of government consumption will have a positive effect on investment: an increase of government consumption induces a rise in employment which, if sufficiently persistent, leads to a rise in the expected return to capital and, therefore, may trigger a rise in investment. In contrast, the standard IS-LM model predicts that investment should decline in response to a positive government spending shock: an increase in government consumption (if

not followed by an accommodating increase of money supply) leads to an increase in interest rate, which in turn will translate into a decrease in investment.

From this discussion it emerges that the predictions of the above mentioned theories are orthogonal to each other. These contrasting views gave rise to several empirical studies attempting to assess the impact of public expenditures on consumption and private investment. Unfortunately, the predictions of the empirical evidence are also quite mixed in support of one theory or the other as can be seen from Table 1 .

The main purpose of this paper is to contribute to the empirical literature by analyzing the impact of changes in government spending on private consumption and investment. By doing this, we provide an additional test on whether government spending generates "crowding-out" or "crowding-in" effects on the private sector. In addition, we can also discriminate between the standard RBC and IS-LM model.

While most of the tests of the “crowding-out” versus “crowding-in” hypothesis that have been carried in previous papers focus on a time series or cross-country approach, this work extends such analysis to a panel data set of 145 countries from 1960 to 2007.

The results show that government spending produces important crowding-out effects, by negatively affecting both private consumption and investment. The empirical evidence also suggests that neither the prediction of the standard RBC model nor the one of IS-LM model can be taken overall as valid. In fact, our results are in contrast with the RBC prediction of a rise in investment and with the IS-LM prediction of a rise in consumption.

In addition, we analyze possible asymmetries of the effect of government consumption on private consumption and investment. In particular, we test: i) whether the effect varies among regions; and ii) whether it depends on to the phase of the

economic cycle. We find that the effect varies substantially among regions, but it does not seem to depend on the phase of the economic cycle.

We show that all results are economically and statistically significant, and robust to several econometric techniques.

The rest of the paper is organized as following. Section two describes the data. Section three shows the empirical methodology used to assess the "crowding-out" *versus* the "crowding-in" effects and discusses the major results. Section four provides additional robustness results and addresses the existence of potential asymmetries on the effect of government consumption on private consumption and investment. Finally, Section five concludes with the main findings and suggestions for further research.

2. Data

This section provides a summary description of the data employed in the empirical analysis.

The data cover 145 countries and are obtained from the World Bank's World Development Indicators for the time period 1960-2007.

We consider annual data for GDP, private consumption, private investment and government spending. Due to data availability (both in terms of time and country dimension), we decided to proxy private investment and government spending by using gross fixed capital formation and public consumption, respectively. All variables are expressed in real per capita terms, where we use the GDP deflator to convert nominal in real constant terms.

The focus of the analysis is on the existence of "crowding-in" *versus* "crowding-out" effects of government spending. Consequently, we study the impact of changes in

the ratio of government spending to GDP on the growth of real per capita private consumption and private investment.

Table 2 provides the list of the countries used in the study and Table 3 summarizes the descriptive statistics of the above-mentioned variables. Looking at Table 3, we can see that the private sector is a very important component of GDP: private consumption represents almost two thirds (68.22%) of GDP, while the ratio of private investment to GDP corresponds to an average of 21.55%. By its turn, government consumption represents 15.47% of GDP.

Over the period 1960-2007, real per capita private consumption grew at an annual rate of 1.34% while the growth rate of private investment was 0.72%. Despite the lower growth rate, private investment exhibited a much larger volatility as expressed by the standard deviation. The change in government spending in percentage of GDP was negative (-0.02).

Finally, Table 4 summarizes the correlation coefficients between the growth rate of private consumption, the growth rate of private investment and the change in the ratio of government spending to GDP. It shows that although private consumption and private investment are positively correlated, their correlations with government spending are negative and small.

3. Empirical Methodology and Results

We analyze the relationship between private consumption growth and the change in the ratio of government spending to GDP, and estimate a model similar to the empirical specification used in Romer and Romer (2007) and Furceri and Karras (2009) to estimate the impact of tax changes on economic activity:

$$\frac{\Delta C_{i,t}}{C_{i,t}} = \nu_i + \mu_t + \sum_{j=0}^{J} \beta_j \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right) + \varepsilon_{i,t}\,. \qquad (1)$$

We also look at the impact of a change in the government spending to GDP ratio on private investment growth by estimating the following model:

$$\frac{\Delta I_{i,t}}{I_{i,t}} = \nu_i + \mu_t + \sum_{j=0}^{J} \beta_j \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right) + \varepsilon_{i,t}\,. \qquad (2)$$

In the above specifications, *C* represents private consumption, *I* is the private investment, *Y* is the GDP, the β's are parameters to be estimated, *i* is indexing over countries and *t* over time, ν and μ represent country- and time-specific effects, Δ is the first difference operator, *J* is the number of lags (set equal to four), and ε is the error term.

Tables 5a and 5b present the results for the estimation of, respectively, equations (1) and (2). The columns of the tables show the results obtained using different econometric specifications, namely: i) OLS with time fixed effects; ii) OLS with country fixed effects; iii) OLS with both country and time fixed effects; iv) Fixed effect estimator; and v) Random effects estimator.

Starting with the analysis of the effect of government consumption on private consumption (Table 5a), we can immediately see that it is negative and statistically significant. The results also suggest that not only contemporaneous changes in the government consumption-GDP ratio matter, but also its past lags (specifically, the 2nd and 3rd ones). In particular, the cumulative effect of government spending on private consumption is about 1.9 %, of which about 1.2% captured by contemporaneous changes in the government consumption-GDP ratio and 0.7 % by its lags. This result can be interpreted as follows: an increase of government consumption by 1 % of real GDP immediately reduces consumption by approximately 1.2%, with the decline

continuing for about four years when the cumulative decrease in consumption has reached approximately 1.9 %. The result is broadly robust to both country and time effects, and both to Fixed and Random effects specification.

In Table 5b, we report the results obtained estimating the investment equation (2). Similarly to what we obtained for private consumption, both current and lagged changes in government consumption-GDP ratio have a negative and significant effect on private investment, with a cumulative effect of approximately 1.8%. The main difference between the effect on consumption and investment is that, while contemporaneous change in the government consumption-GDP ratio seems to have a bigger effect on consumption, lagged changes are more detrimental for investment.

4. Robustness Analysis and Asymmetric Effects

4.1 Exogeneity

Since our measure of the change in the ratio of government spending to GDP may not be completely exogenous, there is the risk that the estimated β's in models (1) and (2) are biased (and inconsistent).

A first attempt to address this issue is carried out by eliminating the contemporaneous change in the ratio of government spending to GDP in models (1) and (2). In fact, since both the growth rate of consumption (and investment) and our independent variable are (for the vast majority of the countries in the sample) stationary and not persistent, we should expect that the lagged values of our independent variables are not influenced by the current value of consumption (and investment) growth rates.

Following this approach, we revise models (1) and (2) to:

$$\frac{\Delta C_{i,t}}{C_{i,t}} = \nu_i + \mu_t + \sum_{j=1}^{J} \beta_j \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right) + \varepsilon_{i,t} \qquad (3)$$

and

$$\frac{\Delta I_{i,t}}{I_{i,t}} = \nu_i + \mu_t + \sum_{j=1}^{J} \beta_j \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right) + \varepsilon_{i,t}. \qquad (4)$$

respectively, thereby simply excluding the contemporaneous change in the ratio of government spending to GDP from the original equations. Due to space constraints, we only report the estimated sums of the β's obtained with this analysis, and we compare them with the ones obtained previously (Tables 6a and 6b). Looking at both tables, we can still see that government consumption crowds-out both private consumption and investment. However, as already pointed out in the previous section, the cumulative effect of lags of changes in government consumption-GDP ratio is lover that the one due to contemporaneous changes. In particular, the cumulative effect of (lagged) changes in government consumption-GDP ratio on private consumption (investment) is approximately 0.10% (0.35%).

A second attempt to correct for possible endogeneity problems is carried out by using the GMM estimator proposed by Blundell and Bond (1998). The results are reported in Table 6c and 6d and clearly show that the estimated impact of government spending on both private consumption and investment is qualitatively (in terms of sign) and quantitatively (in terms of magnitude) unchanged.

4.2 Serial Correlation

Another possible problem with specifications (1) and (2) is the presence of serial correlations. To tackle this issue, we modify models (1) and (2) to:

$$\frac{\Delta C_{i,t}}{C_{i,t}} = w_i + \nu_t + \sum_{j=1}^{J} \alpha_j \left(\frac{\Delta C_{i,t-j}}{C_{i,t-j}}\right) + \sum_{j=0}^{J} \beta_j \Delta\left(\frac{G_{i,t-j}}{GDP_{i,t-j}}\right) + u_{i,t} \qquad (5)$$

and

$$\frac{\Delta I_{i,t}}{I_{i,t}} = w_i + v_t + \sum_{j=1}^{J} \alpha_j \left(\frac{\Delta I_{i,t-j}}{I_{i,t-j}} \right) + \sum_{j=0}^{J} \beta_j \Delta \left(\frac{G_{i,t-j}}{GDP_{i,t-j}} \right) + u_{i,t} \qquad (6)$$

where we add lags of the dependent variables to the set of explanatory variables, so that α's are parameters to be estimated.

The results (Tables 7a and 7b) confirm the robustness of the previous findings and, therefore, suggest that our original specifications do not suffer from serial correlation..

4.3 Identification Problem

We repeat our empirical exercise using the changes in the deficit-GDP ratio as an additional control:

$$\frac{\Delta \boldsymbol{C}_{i,t}}{\boldsymbol{C}_{i,t}} = \nu_i + \mu_t + \sum_{j=0}^{J} \beta_j \Delta \left(\frac{\boldsymbol{G}_{i,t-j}}{\boldsymbol{Y}_{i,t-j}} \right) + \sum_{j=0}^{J} \beta_j \Delta \left(\frac{\boldsymbol{D}_{i,t-j}}{\boldsymbol{Y}_{i,t-j}} \right) + \varepsilon_{i,t}\,. \qquad (7)$$

$$\frac{\Delta \boldsymbol{I}_{i,t}}{\boldsymbol{I}_{i,t}} = \nu_i + \mu_t + \sum_{j=0}^{J} \beta_j \Delta \left(\frac{\boldsymbol{G}_{i,t-j}}{\boldsymbol{Y}_{i,t-j}} \right) + \sum_{j=0}^{J} \beta_j \Delta \left(\frac{\boldsymbol{D}_{i,t-j}}{\boldsymbol{Y}_{i,t-j}} \right) + \varepsilon_{i,t}\,. \qquad (8)$$

The inclusion of this variable allows us to control for a possible misspecification of the model. In fact, to the extent that changes in government revenue and spending are correlated, our results could be capturing the effect of tax changes on the economic activity. Thus, the inclusion of the deficit allows us to overcome this identification problem.

This approach has, however, a potential caveat: if changes in government revenue and spending are not correlated, then changes in government spending may be correlated with changes in deficit which would lead to multicollinearity problems.

The results are reported in Table 8a and 8b and once again confirm the existence of crowding-out effects.[1]

4.4 Asymmetric Regional Effects

The analysis presented so far has shown robust evidence on the existence of crowing-out effects. But is the effect similar for different regions and countries? To answer this question, we replicate the estimations for specific geographical areas and countries. Tables 9a and 9b present the results for eight different areas: i) Africa, ii) Asia and Pacific, iii) Europe, iv) Middle-East, v) North America, vi) South America and West Indies, vii) OECD, and viii) Developing Countries.

The results show that the effect varies substantially between areas. In particular, while we find statistically significant crowding-out effects in Africa, Europe and South America, government spending does not seem to have (statically) significant affects in the other areas considered.

We also assess whether the effect is different between developed (OECD) and developing countries. The results suggest that the impact of government spending on both private consumption and investment is more detrimental in the OECD group. However, also among OECD countries there seems to be some degree of heterogeneity. In fact, analyzing the results in table 9c and 9d, it emerges that the "crowding-out" effects of government consumption are largest in relatively less developed countries (such as Mexico and Turkey) and in those countries with a high share of government spending (such as Finland, Sweden and Norway).

[1] The absence of statistically significance of the estimated coefficients in the investment equation is due to the high correlation (0.15 for the entire sample) between our explanatory variables.

4.5 Asymmetric Effects over the Business Cycle

The effect of government spending on economic activity may also differ between different phases of the economic cycles (Perotti, 2004). To address this issue, we now look at the effects of government spending on the private sector conditioning on the information about the business cycle. To be more specific, we construct the following dummy variables:

$$\boldsymbol{og}^{+} = \begin{cases} 1, & \text{if} \quad og > 0 \\ 0, & \text{otherwise} \end{cases}$$

and

$$\boldsymbol{og}^{-} = \begin{cases} 1, & \text{if} \quad og < 0 \\ 0, & \text{otherwise} \end{cases}$$

where *og* is a measure of output gap, constructed as the difference between our series and its trend (computed using the HP filter with a smoothness parameter equal to 6.25 as suggested by Ravn and Uhlig (2002)).

Then, we interact the dummy variables with the change in the ratio of government spending to GDP, that is, we estimate the following models:

$$\frac{\Delta \boldsymbol{C}_{i,t}}{\boldsymbol{C}_{i,t}} = \boldsymbol{w}_i + \boldsymbol{v}_t + \sum_{j=0}^{J} \beta_j^{+} \Delta \left(\frac{\boldsymbol{G}_{i,t-j}}{\boldsymbol{GDP}_{i,t-j}} \right) \boldsymbol{og}^{+} + \sum_{j=0}^{J} \beta_j^{-} \Delta \left(\frac{\boldsymbol{G}_{i,t-j}}{\boldsymbol{GDP}_{i,t-j}} \right) \boldsymbol{og}^{-} + \boldsymbol{u}_{i,t} \qquad (9)$$

and

$$\frac{\Delta I_{i,t}}{I_{i,t}} = w_i + v_t + + \sum_{j=0}^{J} \beta_j^{+} \Delta \left(\frac{G_{i,t-j}}{GDP_{i,t-j}} \right) og^{+} + \sum_{j=0}^{J} \beta_j^{-} \Delta \left(\frac{G_{i,t-j}}{GDP_{i,t-j}} \right) og^{-} + u_{i,t} \quad (10)$$

where β_j^{+} and β_j^{-} measure the effect of government spending during upturns and downturns, respectively. Tables 10a and 10b summarize the results and show that the effect of government spending on both private consumption and investment does not significantly vary according to different phases of the cycles.[2]

5. Conclusions

We contribute to the empirical literature on the effect of government spending on economic activity, by assessing the impact of changes in government spending-GDP ratio on (the short-term growth rates) of private consumption and investment. We do this by analysing a panel sample of 145 countries from 1960 to 2007.

The results of our paper suggest that government spending produces important crowding-out effects, by negatively affecting both private consumption and investment. Consequently, the predictions of both the standard RBC and IS-LM models cannot be taken overall as valid: our results are in contrast with the RBC prediction of a rise in investment, and with the IS-LM prediction of a rise in consumption.

We find that the cumulative effect of government spending on private consumption (investment) is about 1.9 % (1.8 %), of which about 1.2 % (0.6 %) is captured by the contemporaneous change in the government consumption-GDP ratio and 0.7% (1.2%) by its lags. This result is interpreted as follows: an increase of government consumption by 1% of real GDP immediately reduces consumption

[2] The results are quantitavely unchanged if we use the average growth rate as measure of trend instead of the HP trend.

(investment) by approximately 1.2% (0.6%), with the decline continuing for about four years when the cumulative decrease in consumption has reached approximately 1.9% (1.8%). The result is broadly robust to both country and time effects, and different econometric specifications.

In addition, we show that the effect of government consumption on private consumption and investment does not depend on the phase of the business cycle, but differ substantially among regions.

The differentiated effects of government consumption on private consumption and investment among geographical areas are extremely important and need to be further investigated. In particular, it would be interesting to assess to which extent the effect of government spending on consumption and investment depends on political and institutional variables (e.g. democracy, corruption, political stability) as well as macro economic variables (income, interest rates, degree of openness). We leave this challenging avenue for future research.

References

Afonso, A.; Sousa, R. M. (2009), "The macroeconomic effects of fiscal policy", ECB Working Paper Nº. 991.

Afonso, A.; Sousa, R. M. (2009), "The macroeconomic effects of fiscal policy in Portugal: a Bayesian SVAR Analysis", European Central Bank, manuscript University of Minho, NIPE Working Paper Nº. 3/2009; ISEG-Technical University of Lisbon (UTL), Working Paper Nº. 9/2009/DE/UECE.

Aiyagari, R.; Christiano, L.; Eichenbaum, M. (1990), "Output, employment and interest rate effects of government consumption", *Journal of Monetary Economics*, 30, 73–86.

Argimón, J. M.; González-Páramo, J. M.; Roldán, J. M. (1997), "Evidence of public spending crowding-out from a panel of OECD countries", *Applied Economics*, 29, 1001-1010.

Aschauer, D. A. (1989), "Does public capital crowd-out private capital?", *Journal of Monetary Economics*, 24, 171-188.

Barro, R. (1991), "A cross-country study of growth, saving and government", in Bernheim, D.; Shoven, J. (eds), *National saving and economic performance*, NBER, University of Chicago Press, Chicago, IL, 271- 301.

Baxter, M.; King, R. (1993), "Fiscal policy in general equilibrium", *American Economic Review*, 83, 315–334.

Biau, O.; Girad, E. (2005), "Politique budgétaire et dynamique économique en France: l'approche VAR structurel.", *Économie et Prévision*, 169–171, 1–24.

Blanchard, O. (2003), *Macroeconomics*, 3rd ed., Prentice Hall.

Blanchard, O.; Perotti, R. (2002), "An empirical characterization of the dynamic effects of changes in government spending and taxes on output", *Quarterly Journal of Economics*, 117(4), 1329-1368.

Burnside, C.; Eichenbaum, M.; Fisher, J. (2003), "Fiscal Shocks and their Consequences", NBER Working Paper Nº. 9772.

Christiano, L.; Eichenbaum, M. (1992), "Current real business cycles theories and aggregate labor market fluctuations", *American Economic Review*, 82, 430–450.

Edelberg, W.; Eichenbaum, M.; Fisher, J. (1999), "Understanding the effects of a shock to government purchases", *Review of Economics Dynamics*, 2, 166–206.

Easterly, W.; Rebelo, S. (1993), "Fiscal policy and economic growth: an empirical investigation", *Journal of Monetary Economics*, 32, 458-493.

Erenburg, S. J. (1993), “The real effects of public investment on private investment”, *Applied Economics*, 25, 831-837.
Erenburg, S. J.; Wohar, M. E. (1995), “Public and private investment: are there causal linkages?”, *Journal of Macroeconomics*, 17, 1-30.

Fatas, A.; Mihov, I. (2001), “The effects of fiscal policy on consumption and employment: theory and evidence”, CEPR Discussion Paper Nº. 2760.

Furceri, D.; Karras, G. (2009), “Tax changes and economic growth: empirical evidence for a panel of OECD countries”, European Central Bank, manuscript.

Galí, J.; Vallés, J.; López-Salido, J. D. (2007), “Understanding the effects of government spending on consumption”, *Journal of the European Economic Associaton*, 5(1), 227-270.

Grier, K. G.; Tullock, G. (1989), “An empirical analysis of cross-national economic growth, 1951-1980”, *Journal of Monetary Economics*, 24, 259-279.

Favero, C.; Giavazzi, F. (2008), "Debt and the effects of fiscal policy", University of Bocconi, Working Paper Nº. 317.

Giordano, R.; Momigliano, S.; Neri, S.; Perotti, R. (2007), “The effects of fiscal policy in Italy: Evidence from a VAR model”, *European Journal of Political Economy*, 23, 707-733.

Günter C.; Straub, R. (2005), "Does government spending crowd in private consumption? Theory and empirical evidence for the euro area", ECB Working Paper Nº. 513.

Heppke-Falk, K.H.; Tenhofen, J.; Wolff, G. B. (2006), “The macroeconomic effects of exogenous fiscal policy shocks in Germany: a disaggregated SVAR analysis”, Deutsche Bundesbank, Discussion Paper Nº. 41.

Karras, G. (1994), “Government spending and private consumption: some international evidence”, *Journal of Money, Credit, and Banking*, 26, 9-22.

Mountford, A.; Uhlig, H. (2005), "What are the effects of fiscal policy shocks?", Humboldt-Universität zu Berlin Working Paper SFB Nº. 649.

Nieh, C. C.; Ho, T. (2006), "Does the expansionary government spending crowd out the private consumption?: Cointegration analysis in panel data", *The Quarterly Review of Economics and Finance*, 46(1), 133-148.

Perotti, R. (2004), "Estimating the effects of fiscal policy in OECD countries",University of Bocconi, Working Paper Nº. 276.

Ravn, M. O.; Uhlig, H. (2002), ”On adjusting the Hodrick-Prescott filter for the frequency of observations”, *The Review of Economics and Statistics*, 84(2), 371-376.

Ramey, V.; Shapiro, M. (1998), “Costly capital reallocation and the effects of government spending”, *Carnegie Rochester Conference on Public Policy*, 48, 145-194.

Romer, C.; Romer, D. H. (2007), "The macroeconomic effects of tax changes:estimates based on a new measure of fiscal shocks", NBER Working Paper Nº. 13264.

Table 1

References.

Authors (Year)	Methodology	Country	Effect on Consumption	Effect on Investment
Afonso and Sousa (2009)	VAR	US, UK, Germany and Italy	Not significant	Negative
Afonso and Sousa (2009)	VAR	Portugal	Negative	Negative
Argimón et al.(1997)	Panel	OECD		Positive
Aschauer (1989)	Time series	US	-	Positive
Barro (1991)	Cross-country	Developed and Developing countries	-	Negative
Biau and Girard (2005)	VAR	France	Positive	Positive
Blanchard and Perotti (2002)	VAR	US	Positive	Positive
Burnside et al. (2004)	Narrative	US	Not significant	Positive
Coenen and Straub (2005)	VAR	Euro area	Negative	-
Easterly and Rebelo (1993)	Time series and cross country	US, and Developed and Developing countries	-	Positive
Edelberget al. (1999)	Narrative Approach	US	Negative	Positive
Erenburg (1993)	Time Series	US	-	Positive
Erenburg and Wohar (1995)	Time Series	US	-	Positive
Perotti (2004)	VAR	Australia, Canada, Germany and UK	Positive	Not significant
Fatás and Mihov (2001)	VAR	US	Positive	Not significant
Giordano et al. (2007)	VAR	Italy	Positive	Positive
Grier and Tullock (1989)	Cross-country	Developed and Developing countries	-	Positive
Hepke-Falk et al. (2006)	VAR	Germany	Positive	Positive
Karras (1995)	Time Series	Developed and Developing countries	Positive	
Mountford and Uhlig (2004)	VAR	US	Not Significant	Negative
Nien and Ho (2005)	Panel	OECD	Positive	-
Ramey and Shapiro (1998)	Narrative Approach	US	Negative	-

Table 2

Country Sample.

Country list				
Albania	Croatia	Jordan	Portugal	Uruguay
Algeria	Cyprus	Kazakhstan	Puerto Rico	Venezuela
Artigua and Barbuda	Czech Republic	Kenya	Romania	Yemen
Argentina	Denmark	Korea	Russian Federation	Zambia
Armenia	Djibouti	Kyrgyz Republic	Rwanda	Zimbabwe
Australia	Dominica	Latvia	Sao Tome e Principe	
Austria	Dominican Republic	Lesotho	Senegal	
Azerbaijan	Ecuador	Luxembourg	Seychelles	
Bahamas	Egypt	Macao	Sierra Leone	
Bangladesh	El Salvador	Macedonia	Slovak Republic	
Barbados	Estonia	Madagascar	Slovenia	
Belarus	Ethiopia	Malawi	Solomon Islands	
Belgium	Finland	Malaysia	Somalia	
Belize	France	Mali	South Africa	
Benin	Gabon	Malta	Spain	
Bhutan	Gambia	Mauritania	Sri Lanka	
Bolivia	Germany	Mauritius	St. Kitts and Nevis	
Botswana	Ghana	Mexico	St. Vincent and the Grenadines	
Brazil	Greece	Moldova	Sudan	
Brunei Darussalam	Grenada	Morocco	Swaziland	
Bulgaria	Guatemala	Mozambique	Sweden	
Burkina Faso	Guinea	Namibia	Switzerland	
Cambodia	Guinea-Bissau	Netherlands	Syrian Arab Republic	
Cameroon	Guyana	New Zealand	Tajikistan	
Canada	Haiti	Nicaragua	Tanzania	
Cape Verde	Honduras	Niger	Thailand	
Chad	Hong Kong	Nigeria	Togo	
Chile	Hungary	Norway	Trinidad and Tobago	
China	Iceland	Pakistan	Tunisia	
Colombia	India	Panama	Turkey	
Comoros	Indonesia	Papua New Guinea	Uganda	
Congo, Dem. Rep.	Iran	Paraguay	Ukraine	
Congo, Rep.	Ireland	Peru	United Arab Emirates	
Costa Rica	Italy	Philippines	United Kingdom	
Côte d'Ivoire	Japan	Poland	United States of America	

Table 3

Summary Statistics.

Variable	# Observations	Mean	Standard Deviation
Private Consumption (% of GDP)	5023	68.22	16.76
Private Investment (% of GDP)	4472	21.55	8.78
Government Spending (% of GDP)	5014	15.47	6.34
Private Consumption Growth	4870	1.34	8.06
Private Investment Growth	4322	0.72	21.62
Change in Government Spending (% of GDP)	5014	-0.02	1.62

Table 4

Correlation Coefficients.

Variable	Private Consumption (% of GDP)	Private Investment (% of GDP)	Change in Government Spending (% of GDP)
Private Consumption (% of GDP)	1		
Private Investment (% of GDP)	0.25	1	
Change in Government Spending (% of GDP)	-0.23	-0.07	1

Table 5a

Effects of Government Spending on Private Consumption Growth, $\frac{\Delta C_{i,t}}{C_{i,t}}$.

Without lags of Consumption Growth: model (1)

	OLS	OLS	OLS	FE	RE
$\Delta\left(\frac{G_t}{Y_t}\right)$	-1.25***	-1.23***	-1.24***	-1.23***	-1.24***
	(0.16)	(0.17)	(0.17)	(0.07)	(0.07)
$\Delta\left(\frac{G_{t-1}}{Y_{t-1}}\right)$	-0.11	-0.10	-0.11	-0.10	-0.12*
	(0.12)	(0.12)	(0.13)	(0.07)	(0.07)
$\Delta\left(\frac{G_{t-2}}{Y_{t-2}}\right)$	-0.27**	-0.24**	-0.26**	-0.24***	-0.25***
	(0.13)	(0.12)	(0.13)	(0.07)	(0.07)
$\Delta\left(\frac{G_{t-3}}{Y_{t-3}}\right)$	-0.17*	-0.15	-0.17*	-0.15**	-0.16**
	(0.11)	(0.12)	(0.11)	(0.07)	(0.07)
$\Delta\left(\frac{G_{t-4}}{Y_{t-4}}\right)$	-0.11	-0.10	-0.11	-0.10	-0.10
	(0.09)	(0.09)	(0.09)	(0.07)	(0.07)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.10	0.13	0.16	0.07	0.07

Notes: "OLS" denotes Ordinary Least Squares, "FE" represents Fixed effects and "RE" refers to Random Effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 5b

Effects of Government Spending on Private Investment Growth, $\frac{\Delta I_{i,t}}{I_{i,t}}$.

Without lags of Investment Growth: model (2)

	OLS	OLS	OLS	FE	RE
$\Delta\left(\frac{G_t}{Y_t}\right)$	-0.59**	-0.62*	-0.61**	-0.62***	-0.61***
	(0.30)	(0.33)	(0.32)	(0.20)	(0.19)
$\Delta\left(\frac{G_{t-1}}{Y_{t-1}}\right)$	-0.38	-0.43	-0.42	-0.43**	-0.40**
	(0.31)	(0.32)	(0.33)	(0.20)	(0.19)
$\Delta\left(\frac{G_{t-2}}{Y_{t-2}}\right)$	-0.48**	-0.57**	-0.53**	-0.57***	-0.53***
	(0.23)	(0.24)	(0.24)	(0.19)	(0.19)
$\Delta\left(\frac{G_{t-3}}{Y_{t-3}}\right)$	-0.39***	-0.49**	-0.46**	-0.49***	-0.43**
	(0.22)	(0.22)	(0.22)	(0.19)	(0.19)
$\Delta\left(\frac{G_{t-4}}{Y_{t-4}}\right)$	-0.03	-0.13	-0.11	-0.13	-0.07
	(0.21)	(0.23)	(0.23)	(0.19)	(0.18)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.04	0.05	0.07	0.01	0.01

Notes: "OLS" denotes Ordinary Least Squares, "FE" represents Fixed effects and "RE" refers to Random Effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 6a

Effects of Government Spending on Private Consumption Growth, $\frac{\Delta C_{i,t}}{C_{i,t}}$.

Without lags of Consumption Growth: model (1)

	OLS	OLS	OLS	FE	RE
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.38***	-0.36***	-0.38***	-0.36***	-0.37***
	(0.06)	(0.06)	(0.06)	(0.04)	(0.03)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.06	0.09	0.12	0.03	0.03

Without lags of Consumption Growth: model (3)

	OLS	OLS	OLS	FE	RE
$\sum_{j=1}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.12**	-0.09	-0.09	-0.09**	-0.11***
	(0.06)	(0.06)	(0.06)	(0.04)	(0.04)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.03	0.07	0.09	0.00	0.00

Notes: "OLS" denotes Ordinary Least Squares, "FE" represents Fixed effects and "RE" refers to Random Effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 6b

Effects of Government Spending on Private Investment Growth, $\frac{\Delta I_{i,t}}{I_{i,t}}$.

Without lags of Investment Growth: model (2)

	OLS	OLS	OLS	FE	RE
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.37***	-0.44***	-0.42***	-0.44***	-0.40***
	(0.12)	(0.14)	(0.14)	(0.10)	(0.09)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.04	0.04	0.07	0.01	0.01

Without lags of Investment Growth: model (4)

	OLS	OLS	OLS	FE	RE
$\sum_{j=1}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.29**	-0.37***	-0.34**	-0.37***	-0.34***
	(0.13)	(0.14)	(0.15)	(0.10)	(0.10)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.03	0.04	0.07	0.00	0.00

Notes: "OLS" denotes Ordinary Least Squares, "FE" represents Fixed effects and "RE" refers to Random Effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 6c

Effects of Government Spending on Private Consumption Growth, $\frac{\Delta C_{i,t}}{C_{i,t}}$.

Without lags of Consumption Growth: model (1)

	GMM
$\sum_{j=0}^{4} \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.41***
	(0.06)
Hansen p-value	1.00
AR2 p-value	0.80

Without lags of Consumption Growth: model (3)

	GMM
$\sum_{j=1}^{4} \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.10*
	(0.06)
Hansen p-value	0.81
AR2 p-value	1.00

Notes: "GMM" denotes Generalized Method of Moments. Estimation method Blundell-Bond (1998). ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 6d

Effects of Government Spending on Private Investment Growth, $\frac{\Delta I_{i,t}}{I_{i,t}}$.

Without lags of Investment Growth: model (2)

	GMM
$\sum_{j=0}^{4} \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.45***
	(0.12)
Hansen p-value	1.00
AR2 p-value	0.12

Without lags of Investment Growth: model (4)

	GMM
$\sum_{j=1}^{4} \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.36**
	(0.15)
Hansen p-value	0.12
AR2 p-value	1.00

Notes: "GMM" denotes Generalized Method of Moments. Estimation method Blundell-Bond (1998). ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 7a

Effects of Government Spending on Private Consumption Growth, $\frac{\Delta C_{i,t}}{C_{i,t}}$.

With lags of Consumption Growth: model (5)

	OLS	OLS	OLS	FE	RE
$\sum_{j=1}^{4} \frac{\Delta C_{i,t-j}}{C_{i,t-j}}$	-0.11***	-0.15***	-0.15***	-0.15***	-0.12***
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
$\sum_{j=0}^{4} \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.41***	-0.39***	-0.41***	-0.39***	-0.40***
	(0.06)	(0.06)	(0.06)	(0.04)	(0.03)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.07	0.11	0.14	0.04	0.04

With lags of Consumption Growth: model (5')

	OLS	OLS	OLS	FE	RE
$\sum_{j=1}^{4} \frac{\Delta C_{i,t-j}}{C_{i,t-j}}$	-0.10***	-0.14***	-0.14***	-0.14***	-0.11***
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
$\sum_{j=1}^{4} \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.16***	-0.13**	-0.14**	-0.13***	-0.15***
	(0.06)	(0.06)	(0.06)	(0.04)	(0.04)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.04	0.09	0.11	0.01	0.01

Notes: "OLS" denotes Ordinary Least Squares, "FE" represents Fixed effects and "RE" refers to Random Effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 7b

Effects of Government Spending on Private Investment Growth, $\frac{\Delta I_{i,t}}{I_{i,t}}$.

With lags of Investment Growth: model (6)

	OLS	OLS	OLS	FE	RE
$\sum_{j=1}^{4} \frac{\Delta I_{i,t-j}}{I_{i,t-j}}$	-0.07	-0.17**	-0.18***	-0.17***	-0.06
	(0.07)	(0.07)	(0.07)	(0.05)	(0.05)
$\sum_{j=0}^{4} \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.36***	-0.45***	-0.44***	-0.45***	-0.39***
	(0.13)	(0.14)	(0.15)	(0.10)	(0.09)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.03	0.05	0.08	0.00	0.01

With lags of Investment Growth: model (6')

	OLS	OLS	OLS	FE	RE
$\sum_{j=1}^{4} \frac{\Delta I_{i,t-j}}{I_{i,t-j}}$	-0.07	-0.07**	-0.18***	-0.17***	-0.06
	(0.07)	(0.07)	(0.07)	(0.05)	(0.05)
$\sum_{j=1}^{4} \Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.31**	-0.41***	-0.39***	-0.41***	-0.34***
	(0.14)	(0.14)	(0.15)	(0.10)	(0.10)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.03	0.05	0.08	0.00	0.00

Notes: "OLS" denotes Ordinary Least Squares, "FE" represents Fixed effects and "RE" refers to Random Effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 8a

Effects of Government Spending on Private Consumption Growth, $\frac{\Delta C_{i,t}}{C_{i,t}}$.

Without lags of Consumption Growth: model (1)

	OLS	OLS	OLS	FE	RE
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.34***	-0.35***	-0.36***	-0.35***	-0.35***
	(0.08)	(0.09)	(0.09)	(0.05)	(0.05)
$\sum_{j=0}^{4}\Delta\left(\frac{\boldsymbol{D}_{i,t-j}}{\boldsymbol{Y}_{i,t-j}}\right)$	-0.08**	-0.09**	-0.08*	-0.09***	-0.10***
	(0.04)	(0.05)	(0.05)	(0.03)	(0.03)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.06	0.13	0.15	0.03	0.03

Notes: "OLS" denotes Ordinary Least Squares, "FE" represents Fixed effects and "RE" refers to Random Effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 8b

Effects of Government Spending on Private Investment Growth, $\frac{\Delta I_{i,t}}{I_{i,t}}$.

Without lags of Investment Growth: model (2)

	OLS	OLS	OLS	FE	RE
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.15	-0.16	-0.17	-0.16	-0.15
	(0.19)	(0.23)	(0.23)	(0.13)	(0.12)
$\sum_{j=0}^{4}\Delta\left(\frac{D_{i,t-j}}{Y_{i,t-j}}\right)$	-0.13	-0.19**	-0.15*	-0.19***	-0.18***
	(0.09)	(0.09)	(0.09)	(0.07)	(0.06)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.03	0.07	0.09	0.01	0.01

Notes: "OLS" denotes Ordinary Least Squares, "FE" represents Fixed effects and "RE" refers to Random Effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 9a

Effects of Government Spending on Private Consumption Growth, $\frac{\Delta C_{i,t}}{C_{i,t}}$.

Without lags of Consumption Growth: model (1)

	Africa	Asia and Pacific	Europe	Middle East	North America	South America and West Indies	OECD	Developing Countries
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.36***	-0.13	-0.39**	0.02	-0.09	-0.66***	-0.59***	-0.37***
	(0.07)	(0.16)	(0.17)	(0.19)	(0.24)	(0.15)	(0.07)	(0.06)
R^2	0.09	0.20	0.25	0.24	0.49	0.17	0.27	0.11

Without lags of Consumption Growth: model (3)

	Africa	Asia and Pacific	Europe	Middle East	North America	South America and West Indies	OECD	Developing Countries
$\sum_{j=1}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.06	0.06	-0.11	0.22	-0.05	-0.40***	-0.36***	-0.08
	(0.09)	(0.18)	(0.11)	(0.19)	(0.27)	(0.16)	(0.08)	(0.07)
R^2	0.07	0.21	0.22	0.25	0.49	0.13	0.22	0.09

Notes: We estimate the model using "OLS" denotes Ordinary Least Squares and including both country and time effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 9b

Effects of Government Spending on Private Investment Growth, $\frac{\Delta I_{i,t}}{I_{i,t}}$.

Without lags of Investment Growth: model (2)

	Africa	Asia and Pacific	Europe	Middle East	North America	South America and West Indies	OECD	Developing Countries
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.22	-0.52	-0.49**	0.22	-0.74	-0.91***	-1.50***	-0.37***
	(0.22)	(0.44)	(0.23)	(0.37)	(0.61)	(0.28)	(0.20)	(0.15)
R^2	0.08	0.19	0.18	0.29	0.52	0.18	0.22	0.08

Without lags of Investment Growth: model (4)

	Africa	Asia and Pacific	Europe	Middle East	North America	South America and West Indies	OECD	Developing Countries
$\sum_{j=1}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.26	-0.44	-0.17	0.04	-0.91	-0.79***	-0.69***	-0.33**
	(0.23)	(0.48)	(0.22)	(0.42)	(0.70)	(0.28)	(0.23)	(0.15)
R^2	0.08	0.19	0.17	0.29	0.52	0.17	0.18	0.08

Notes: We estimate the model using "OLS" denotes Ordinary Least Squares and including both country and time effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 9c

Effects of Government Spending on Private Consumption Growth, $\frac{\Delta C_{i,t}}{C_{i,t}}$.

Without lags of Consumption Growth: model (1)

	Australia	Austria	Belgium	Canada	Czech Republic	Denmark	Finland
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.81*	-0.63	-0.59***	-0.44**	-0.25	-0.14	-0.97**
	(0.45)	(0.44)	(0.17)	(0.18)	(0.48)	(0.70)	(0.38)
R^2	0.17	0.08	0.26	0.26	0.05	0.01	0.28

	France	Germany	Greece	Hungary	Ireland	Italy	Japan
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.37**	-0.71***	-0.37	-0.94	-0.31	-0.26	-0.99***
	(0.17)	(0.17)	(0.32)	(0.60)	(0.21)	(0.23)	(0.16)
R^2	0.19	0.30	0.04	0.19	0.13	0.03	0.58

	Korea	Luxembourg	Mexico	New Zealand	Norway	Poland	Portugal
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-1.00	-0.33	-3.11***	-1.36***	-0.21	-0.43**	-0.36
	(0.84)	(0.59)	(0.98)	(0.40)	(0.29)	(0.17)	(0.53)
R^2	0.25	0.02	0.27	0.43	0.101	0.18	0.02

	Slovak Republic	Spain	Sweden	Switzerland	Turkey	United Kingdom	United States
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.27	-0.81**	-0.76***	-1.03***	-3.46**	-0.68***	-0.11
	(0.31)	(0.37)	(0.18)	(0.25)	(1.23)	(0.23)	(0.18)
R^2	0.03	0.21	0.49	0.40	0.32	0.27	0.01

Notes: We estimate the model using "OLS" denotes Ordinary Least Squares and including both country and time effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 9d

Effects of Government Spending on Private Investment Growth, $\frac{\Delta I_{i,t}}{I_{i,t}}$.

Without lags of Investment Growth: model (2)

	Australia	Austria	Belgium	Canada	Czech Republic	Denmark	Finland
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-1.66	-0.30	-0.86	-1.56***	-0.66	-1.23	-3.95***
	(1.39)	(1.05)	(1.19)	(0.56)	(0.88)	(1.38)	(1.17)
R^2	0.03	0.00	0.03	0.29	0.05	0.06	0.41

	France	Germany	Greece	Hungary	Ireland	Italy	Japan
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-0.92	-1.40***	0.88	-1.21	-0.13	-0.70**	-2.56***
	(0.66)	(0.46)	(1.13)	(0.73)	(0.66)	(0.36)	(0.73)
R^2	0.10	0.15	0.03	0.12	0.00	0.04	0.36

	Korea	Luxembourg	Mexico	New Zealand	Norway	Poland	Portugal
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-2.67*	-1.00	-5.75*	-3.01	-1.91*	-0.22	-0.96
	(1.57)	(3.24)	(2.85)	(2.23)	(1.06)	(1.21)	(1.62)
R^2	0.10	0.01	0.15	0.13	0.13	0.00	0.02

	Slovak Republic	Spain	Sweden	Switzerland	Turkey	United Kingdom	United States
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)$	-1.08	-2.23*	-2.19**	-1.88	-11.84**	-1.28**	-1.86***
	(1.12)	(1.20)	(0.87)	(1.88)	(4.50)	(0.59)	(0.53)
R^2	0.02	0.18	0.36	0.07	0.34	0.16	0.25

Notes: We estimate the model using "OLS" denotes Ordinary Least Squares and including both country and time effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 10a

Effects of Government Spending on Private Consumption Growth, $\frac{\Delta C_{i,t}}{C_{i,t}}$.

	Without lags of Consumption Growth: model (9)				
	OLS	OLS	OLS	FE	RE
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)og^{+}$	-0.41***	-0.39***	-0.40***	-0.39***	-0.41***
	(0.08)	(0.08)	(0.08)	(0.05)	(0.05)
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)og^{-}$	-0.35***	-0.33***	-0.35***	-0.33***	-0.33***
	(0.08)	(0.08)	(0.08)	(0.05)	(0.05)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.06	0.09	0.12	0.03	0.03
$\sum_{j=0}^{J}\beta_j^{+}=\sum_{j=0}^{J}\beta_j^{-}$	p-value	p-value	p-value	p-value	p-value
	(0.64)	(0.57)	(0.75)	(0.33)	(0.24)
	Without lags of Consumption Growth: model (9')				
	OLS	OLS	OLS	FE	RE
$\sum_{j=1}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)og^{+}$	-0.19**	-0.18**	-0.17*	-0.18***	-0.20***
	(0.08)	(0.01)	(0.09)	(0.05)	(0.05)
$\sum_{j=1}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)og^{-}$	-0.04	-0.01	-0.02	0.01	-0.01
	(0.08)	(0.08)	(0.09)	(0.06)	(0.06)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.03	0.07	0.09	0.00	0.00
$\sum_{j=1}^{J}\beta_j^{+}=\sum_{j=1}^{J}\beta_j^{-}$	p-value	p-value	p-value	p-value	p-value
	(0.20)	(0.13)	(0.22)	(0.02)	(0.01)

Notes: "OLS" denotes Ordinary Least Squares, "FE" represents Fixed effects and "RE" refers to Random Effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Table 10b

Effects of Government Spending on Private Investment Growth, $\frac{\Delta I_{i,t}}{I_{i,t}}$.

	Without lags of Investment Growth: model (10)				
	OLS	OLS	OLS	FE	RE
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)og^{+}$	-0.38**	-0.47***	-0.43**	-0.47***	-0.43***
	(0.17)	(0.19)	(0.19)	(0.13)	(0.12)
$\sum_{j=0}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)og^{-}$	-0.35**	-0.41**	-0.40**	-0.41***	-0.37***
	(0.14)	(0.19)	(0.19)	(0.14)	(0.13)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.04	0.04	0.07	0.01	0.01
$\sum_{j=0}^{J}\beta_j^{+}=\sum_{j=0}^{J}\beta_j^{-}$	p-value	p-value	p-value	p-value	p-value
	(0.89)	(0.79)	(0.91)	(0.73)	(0.72)
	Without lags of Investment Growth: model (10')				
	OLS	OLS	OLS	FE	RE
$\sum_{j=1}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)og^{+}$	-0.34**	-0.45***	-0.40**	-0.45***	-0.40***
	(0.17)	(0.18)	(0.18)	(0.14)	(0.14)
$\sum_{j=1}^{4}\Delta\left(\frac{G_{i,t-j}}{Y_{i,t-j}}\right)og^{-}$	-0.25	-0.29	-0.28	-0.29*	-0.26*
	(0.17)	(0.20)	(0.20)	(0.15)	(0.14)
Time effects	Yes	No	Yes		
Country effects	No	Yes	Yes		
R^2	0.03	0.04	0.07	0.00	0.00
$\sum_{j=1}^{J}\beta_j^{+}=\sum_{j=1}^{J}\beta_j^{-}$	p-value	p-value	p-value	p-value	p-value
	(0.65)	(0.51)	(0.62)	(0.44)	(0.47)

Notes: "OLS" denotes Ordinary Least Squares, "FE" represents Fixed effects and "RE" refers to Random Effects. Estimated standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels.

Most Recent Working Papers

NIPE WP 6/2009	**Furceri, Davide e Ricardo M. Sousa,** "The Impact of Government Spending on the Private Sector: Crowding-out versus Crowding-in Effects", 2009
NIPE WP 5/2009	**Esteves, Rosa Branca,** "A Survey on the Economics of Behaviour-Based Price Discrimination", 2009
NIPE WP 4/2009	**Peltonen, Tuomas A., Ricardo M. Sousa e Isabel S. Vansteenkiste,** "Wealth Effects in Emerging Market Economies", 2009
NIPE WP 3/2009	**Afonso, António e Ricardo M. Sousa,** "The Macroeconomic Effects of Fiscal Policy in Portugal: a Bayesian SVAR Analysis", 2009
NIPE WP 2/2009	**Bastos, Paulo e Natália P. Monteiro**, "Managers and wage policies", 2009
NIPE WP 1/2009	**Afonso, António e Ricardo M. Sousa**, " Assessing Long-Term Fiscal Developments: Evidence from Portugal ", 2009
NIPE WP 22/2008	**Afonso, António e Ricardo M. Sousa**, "The Macroeconomic Effects of Fiscal Policy", 2008
NIPE WP 21/2008	**Afonso, António e Ricardo M. Sousa**, "Fiscal Policy, Housing and Stock Prices", 2008
NIPE WP 20/2008	**Magalhães, Pedro C., Luís Aguiar-Conraria,** "Growth, Centrism and Semi-Presidentialism: Forecasting the Portuguese General Elections", 2008
NIPE WP 19/2008	**Castro, Vítor,** "Are Central Banks following a linear or nonlinear (augmented) Taylor rule?", 2008
NIPE WP 18/2008	**Castro, Vítor,** "The duration of economic expansions and recessions: More than duration dependence", 2008
NIPE WP 17/2008	**Holmås, Tor Helge, Egil Kjerstad, Hilde Lurås and Odd Rune Straume,** "Does monetary punishment crowd out pro-social motivation? The case of hospital bed-blocking", 2008.
NIPE WP 16/2008	**Alexandre, Fernando, Miguel Portela and Carla Sá,** "Admission conditions and graduates' employability", 2008.
NIPE WP 15/2008	**Alexandre, Fernando, Pedro Bação and Vasco Gabriel,** "Taylor-type rules versus optimal policy in a Markov-switching economy", 2008.
NIPE WP 14/2008	**Bastos, Paulo, Natália P. Monteiro and Odd Rune Straume**, "Firm heterogeneity and wages in unionised labour markets: Theory and evidence", 2008.
NIPE WP 13/2008	**Esteves, Rosa Branca**, "Price Discrimination with Private and Imperfect Information", 2008.
NIPE WP 12/2008	**Esteves, Rosa Branca,** "Price Discrimination with Partial Information: Does it pay off?", 2008.
NIPE WP 11/2008	**Ribeiro, José Cadima and José Freitas Santos,** "Portuguese quality wine and the region-of-origin effect: consumers' and retailers' perceptions", 2008.
NIPE WP 10/2008	**Lommerud, Kjell Erik, Frode Meland and Odd Rune Straume,** "Mergers and capital flight in unionised oligopolies: Is there scope for a 'national champion' policy?", 2008.
NIPE WP 9/2008	**Gabriel, Vasco J., Paul Levine and Christopher Spencer,** "How forward-looking is the Fed? Direct estimates from a 'Calvo-type' rule", 2008.
NIPE WP 8/2008	**Brekke, Kurt R., Roberto Cellini, Luigi Siciliani and Odd Rune Straume,** "Competition and quality in regulated markets: a differential-game approach", 2008.
NIPE WP 7/2008	**Neto, Delfim Gomes, and Francisco José Veiga**, "Financial globalization, convergence and growth", 2008.
NIPE WP 6/2008	**Brekke, Kurt R., Luigi Siciliani and Odd Rune Straume,** "Hospital competition and quality with regulated prices", 2008.