International Journal of Academic Research in Business and Social Sciences
March 2013, Vol. 3, No. 3
ISSN: 2222-6990

Governmental Expense, Tax Revenue and Total Tax Rate Effects on GDP in Global Economic Crisis: An Econometric Cross Sectional Approach

Cristian Mihai Dragos
Associate professor, Babes-Bolyai University of Cluj Napoca, Romania

Abstract

The global economic crisis started in 2008 affected almost all the countries in the world and almost all activity sectors. Numerous studies have attempted to explain the appearance and the development of this unanticipated phenomenon. Our study researches the effect of amplification/reduction of the crisis considering the level of *governmental expenses, tax revenue and total tax rate.* The sample includes 114 countries from all the continents. The results show significant effects of the explanatory variables, both at the starting of a crisis and in the next years. Though, the values of R^2 are relatively low, which confirms once more that the phenomenon is very complex and must be treated all over.

Keywords: governmental expense, tax revenue, total tax rate, global economic crisis

1. Introduction and literature review

Even if the origin of the crisis was in the US real estate sector, the effects have spread rapidly in the global financial system, causing considerable economic disruptions – Ciumas, Dragos and Vaidean (2009). In the economic literature exists a wide range of empirical studies on the relationship between growth and governmental spending. Barro (1990) state that increases in government expenditures on infrastructure determines higher long-run growth rates. After a turning point these growth rates begin to fall down – the hump shaped Barro curve. Endogenous growth theory demonstrates that government spending along with other variables like R&D investment, human capital investment and institutions, play an important role in raising the economic potential of an economy – Barro and Sara-i-Martin (2004), Acemoglu (2009), Aghion and Howitt (2009). Bucci (2012) has improved the public spending growth theory of Barro (1990) and Barro and Sala-i-Martin (1992) by removing the assumption of constant population and using a logistic process for the ratio of government expenditure to aggregate income.

Butkiewicz and Yanikkaya (2011) argue that in order to stimulate growth, emerging markets should limit their governments' consumption spending because government consumption expenditures have negative growth effects in developing nations with ineffective governments. Previously, Grier and Tullok (1989) and Barro (1991) have also found a significant negative impact of government consumption expenditure on growth. Fidrmuc (2003) found that the

International Journal of Academic Research in Business and Social Sciences
March 2013, Vol. 3, No. 3
ISSN: 2222-6990

variable "government expenditure" is not statistical significant, but the impact of liberalization on growth is positive and strongly significant – Fidrmuc (2003), Dragos, Beju and Dragos (2009).

In an analyse for Switzerland, Schaltegger and Torgler (2006) found that government spending from operating budgets has a negative growth effect. Gregoriou and Ghosh (2009) demonstrate that countries public capital spending have strong negative growth effects. Fiscal policy may play a stabilizing role in the economy according to the standard Keynesian analysis. Wahab (2011) considers that an increase in government spending can lower economic growth because of higher taxes needed to finance it.

Several empirical studies (Tanzi and Schuknecht, 2000; Florio and Colantti, 2005) use a logistic process to describe the dynamics of the ratio of public spending expenditure to GDP also considering the excess burden of taxation (Et):

$d/dt(Gt/Yt) = f(Gt/Yt , Et/Yt)$ where

Et- excess burden of taxation (see Hindriks and Myles, 2006)

Gt- government expenditures

Yt- homogeneous final goods.

Concerning the tax burden, different tax rates have different growth effects. Folster and Henrikson (1999, 2001) found that the average tax rate (tax revenue/GDP) is negatively correlated with growth. For disaggregates taxes, Angelopoulos, Economides and Kammas (2007) found that labor income tax rates are negatively related to growth, while Wildmalm (2001) evidenced the positive growth effect of capital income tax rate.

Gober and Burns (1997) have analyzed the relationship between tax revenues and GNP, in 18 industrial nations. Lee and Gordon (2005) found that the growth rate of GDP per capita is negatively correlated with statutory corporate tax rates for a set of 70 countries during 1970-1997. Ojede (2012) shows that sales and property taxes reduce long run economic growth while income taxes have no significant impact. Xing (2012) analyze the link between the tax revenues and the income per capita for 17 OECD countries over the period 1970-2004. Results of previous studies (Arnold et al., 2011; Pesaran et al., 1999) are not considered robust under the assumption about heterogeneity across countries.

2. Research hypotheses

Based on previous studies and on the personal empirical observations during the appearance of the Global Financial Crisis, we have constructed the following working hypotheses:

H1*. There is a negative correlation between GDP growth rate and governmental expense.*
We test H1 hypothesis both in the year of the world economy collapse (2009) and in the following years, 2010 and 2011, in which some economies have continued their falling but others have started to recover.

H2*. There is a negative correlation between GDP growth rate and tax revenue.*
As for the H1 hypothesis, we test the H2 hypotheses in each of the years 2009, 2010 and 2011.

International Journal of Academic Research in Business and Social Sciences
March 2013, Vol. 3, No. 3
ISSN: 2222-6990

H3*. The GDP growth rate is correlated with total tax rate.* We test the H3 hypotheses in each of the years 2009, 2010 and 2011.

3. Methodology, data, variables and equations

For the purpose of our research we have employed OLS regressions for a cross-section of countries. The data consists in the values made public by the World Bank (2012) through its Statistics Bureau, in the section Indicators, topics Economic Policy and External Debt, and Public Sector. The figures collected are from 2007 to 2011. The variables are presented below according to the World Bank definitions (2012):

Endogenous variables

GDP_GROWTH
GDP growth (annual % rate). "Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2000 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources" (World Bank, 2012). We use in our study the variables for the years 2009, 2010 and 2011.

Exogenous variables

GOV_EXPENSE
Expense (% of GDP). "Expense is cash payments for operating activities of the government in providing goods and services. It includes compensation of employees (such as wages and salaries), interest and subsidies, grants, social benefits, and other expenses such as rent and dividends" (World Bank, 2012). In this application we use the average values for the period 2006-2008.

TAX_REVENUE
Tax revenue (% of GDP). "Tax revenue refers to compulsory transfers to the central government for public purposes. Certain compulsory transfers such as fines, penalties, and most social security contributions are excluded. Refunds and corrections of erroneously collected tax revenue are treated as negative revenue" (World Bank, 2012). In this application we use the average values for the period 2006-2008.

TOTAL_TAX
Total tax rate (% of commercial profits). "Total tax rate measures the amount of taxes and mandatory contributions payable by businesses after accounting for allowable deductions and exemptions as a share of commercial profits. Taxes withheld (such as personal income tax) or collected and remitted to tax authorities (such as value added taxes, sales taxes or goods and

service taxes) are excluded" (World Bank, 2012). In this application we use the average values for the period 2006-2008.

To test the H_1, H_2 and H_3 hypotheses we chose four linear specifications of the model and estimated the parameters using OLS regressions:

$$GDP\_GROWTH_i\ (2009) = b_0 + b_1 GOV\_EXPENSE_i + b_2 TOTAL\_TAX_i + \varepsilon_i \quad (eq.1)$$
$$GDP\_GROWTH_i\ (2009) = b_0 + b_1 TAX\_REVENUE_i + b_2 TOTAL\_TAX_i + \varepsilon_i \quad (eq.2)$$
$$GDP\_GROWTH_i\ (2009) = b_0 + b_1 GOV\_EXPENSE_i + b_2 TAX\_REVENUE + b_3 TOTAL\_TAX_i + \varepsilon_i \quad (eq.3)$$
$$GDP\_GROWTH_i\ (2010) = b_0 + b_1 GOV\_EXPENSE_i + b_2 TOTAL\_TAX_i + \varepsilon_i \quad (eq.4)$$
$$GDP\_GROWTH_i\ (2010) = b_0 + b_1 TAX\_REVENUE_i + b_2 TOTAL\_TAX_i + \varepsilon_i \quad (eq.5)$$
$$GDP\_GROWTH_i\ (2010) = b_0 + b_1 GOV\_EXPENSE_i + b_2 TAX\_REVENUE + b_3 TOTAL\_TAX_i + \varepsilon_i \quad (eq.6)$$
$$GDP\_GROWTH_i\ (2011) = b_0 + b_1 GOV\_EXPENSE_i + b_2 TOTAL\_TAX_i + \varepsilon_i \quad (eq.7)$$
$$GDP\_GROWTH_i\ (2011) = b_0 + b_1 TAX\_REVENUE_i + b_2 TOTAL\_TAX_i + \varepsilon_i \quad (eq.8)$$
$$GDP\_GROWTH_i\ (2011) = b_0 + b_1 GOV\_EXPENSE_i + b_2 TAX\_REVENUE + b_3 TOTAL\_TAX_i + \varepsilon_i \quad (eq.9)$$

The error term ε_i is assumed to have the standard classical properties.

4. Results and discussions

So to have an idea regarding the variables from the regressions we analyzed the descriptive statistics. In table 1 we present some significant parameters of the involved variables.

Table 1: Descriptive statistics of variables

Variable	Mean	St. dev.	1st Quartile	Median	3rd Quartile
GDP_GROWTH 2009	-0.80	5.88	-4.40	-1.27	3.10
GDP_GROWTH 2010	4.46	4.25	1.69	4.02	6.77
GDP_GROWTH 2011	3.89	3.94	1.70	3.63	5.72
GOV_EXPENSE	24.8	9.8	16.9	24.1	32.5
TAX_REVENUE	17.2	6.6	13.3	16.4	22.2
TOTAL_TAX	42.8	14.0	35.3	42.9	49.9

Both the mean and the median of the *GDP_GROWTH* variable show a decrease in 2009 and an increase in 2010 and 2011. We must remark that even in the year of the global economic collapse (2009), 25% of the countries from the sample have had economic growth higher than 3,10%. The probabilistic behavior of the variables *GOV_EXPENSE*, *TAX_REVENUE*, and *TOTAL_TAX* is analyzed in figures 1, 2 and 3.

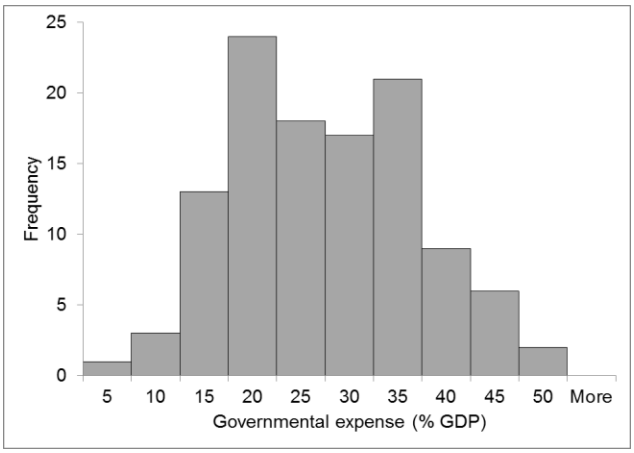

Fig. 1: Histogram of the variable *GOV_EXPENSE*

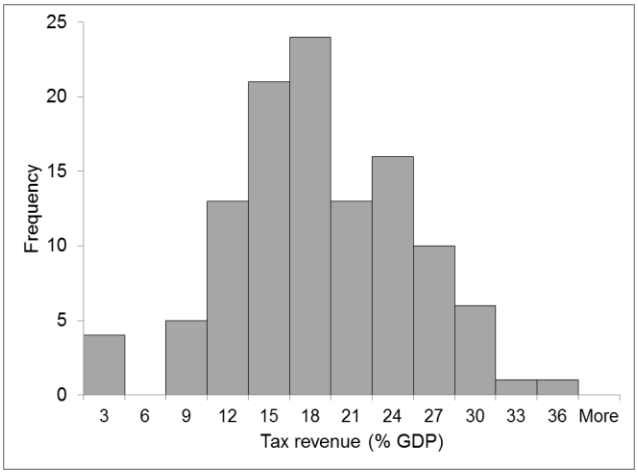

Figure 2: Histogram of the variable *TAX_REVENUE*

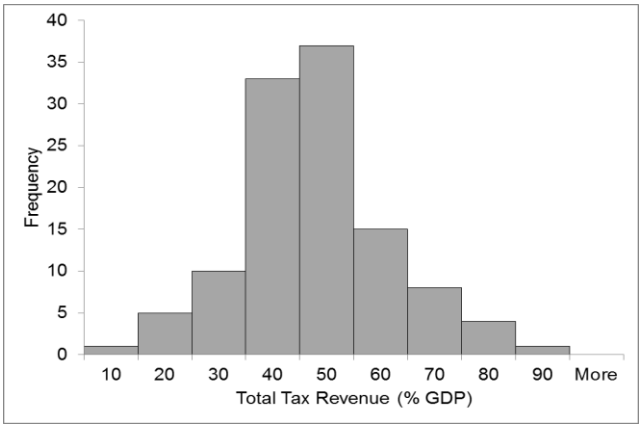

Figure 3: Histogram of the variable *TOTAL_TA**X***

The distributions of the values of the 3 explanatory variables show that they have enough variability, in order to be considered exogenous statistically.

International Journal of Academic Research in Business and Social Sciences
March 2013, Vol. 3, No. 3
ISSN: 2222-6990

Table 2: The matrix of the correlation coefficients

	GDP_GR. 2009	*GDP_GR. 2010*	*GDP_GR. 2011*	*GOV_EXP.*	*TAX_REV.*	*TOTAL_TAX*
GDP_GR. 2009	1.00					
GDP_GR. 2010	-	1.00				
GDP_GR. 2011	-	-	1.00			
GOV_EXPENSE	-0.42	-0.49	-0.38	1.00		
TAX_REVENUE	-0.32	-0.28	-0.19	0.62	1.00	
TOTAL_TAX	-0.04	-0.13	-0.16	0.08	0.06	1.00

We notice very weak correlation of the variable *TOTAL_TAX* both with *GDP_GROWTH 2009, GDP_GROWTH 2010, GDP_GROWTH 2011* and with the other explicative variables. We also notice a strong correlation of the variables *GOV_EXPENSE* and *TAX_REVENUE* (R=0.62). Therefore, their simultaneous introduction in regressions could cause multicolinearity problems. The formulated hypotheses (*H1*, *H2* and *H3)* should be tested separately for the years 2009, 2010 and 2011.

Table 3: The coefficients of the OLS regression on *GDP_GROWTH* in 2009 (p-values)

	Equation 1	Equation 2	Equation 3
GOV_EXPENSE	-0.2535*** (0.000)	-	-0.2159*** (0.000)
TAX_REVENUE	-	-0.2862*** (0.001)	-0.0906 (0.355)
TOTAL_TAX	-0.0035 (0.923)	-0.0099 (0.794)	-0.0030 (0.934)
Constant	5.6476*** (0.006)	4.5509*** (0.035)	6.2511*** (0.004)
	R^2 = 0.177 N = 114	R^2 = 0.104 N = 114	R^2 = 0.184 N = 114

****, **, * : significant at 1%, 5% and 10% level*
Source: own calculations using STATA 9.1 software.

We found in equation 1 a R^2 value significantly higher than in equation 2. Consequently, the *GOV_EXPENSE* variable explains better than *TAX_REVENUE* the economic growth. This conclusion is robust because the introduction of the variable *TAX_REVENUE* in the third equation does not increase significantly thr value of R^2. As we inferred from the correlation coefficients the introduction of those two variables in one equation makes one of them to look insignificant. In fact is a purely statistical problem of multicolinearity. The *TOTAL_TAX* variable is not significant, for any specification of the regression. Therefore, for the year 2009, the hypotheses *H1* and *H2* are confirmed and the *H3* hypothesis is rejected.

International Journal of Academic Research in Business and Social Sciences
March 2013, Vol. 3, No. 3
ISSN: 2222-6990

Table 4: The coefficients of the OLS regression on *GDP_GROWTH* in 2010 (p-values)

	Equation 4	Equation 5	Equation 6
GOV_EXPENSE	-0.2535*** (0.000)	-	-0.2159*** (0.000)
TAX_REVENUE	-	-0.2862*** (0.001)	-0.0906 (0.355)
TOTAL_TAX	-0.0035 (0.923)	-0.0099 (0.794)	-0.0030 (0.934)
Constant	5.6476*** (0.006)	4.5509*** (0.035)	6.2511*** (0.004)
	R^2 = 0.177 N = 114	R^2 = 0.104 N = 114	R^2 = 0.184 N = 114

****, **, * : significant at 1%, 5% and 10% level*
Source: own calculations using STATA 9.1 software.

Table 5: The coefficients of the OLS regression on *GDP_GROWTH* in 2011 (p-values)

	Equation 7	Equation 8	Equation 9
GOV_EXPENSE	-0.1485*** (0.000)	-	-0.1671*** (0.000)
TAX_REVENUE	-	-0.1067** (0.056)	-0.0447 (0.501)
TOTAL_TAX	-0.0365 (0.141)	-0.0421 (0.109)	-0.0367 (0.140)
Constant	9.1453*** (0.000)	7.5322*** (0.000)	8.8476*** (0.000)
	R^2 = 0.160 N = 114	R^2 = 0.058 N = 114	R^2 = 0.163 N = 114

****, **, * : significant at 1%, 5% and 10% level*
Source: own calculations using STATA 9.1 software.

We have found for the years 2010 and 2011 a similar behavior with 2009. Hypotheses *H1* and *H2* are confirmed, but the *H3* hypothesis is rejected. The multicolinearity problem also apears in the equations 6 and 9. Variables GOV_EXPENSE and TAX_REVENUE are statistical significant for GDP_GROWTH in the period that succeeded the global economic collapse.

5. Conclusions

Our study does not exhaustively approach the beginning, spreading and conservation mechanisms of an economic crisis. Although the used variables are statistical significant, the R^2 values are low, which means there are many other factors that have to be considered. Nevertheless the results obtained are not useless, the significant variables have an important role in the economy and have to be treated seriously in the economic policies. An economy can be more or less controlled by the state. We talk about the social protection, medical system and pension system. Generally, it is accepted in the literature that state control in these domains assures a better social equity. But is there this increased control more efficient economically? The present study demonstrates that a less regulated economy absorbs better the shock of a crisis and recovers more easily.

References

Acemoglu, D. (2009). *Introduction to Modern Economic Growth*. Princeton University Press, Princeton, New Jersey.

Aghion, P., Howitt, P. (2009). *The Economics of Growth*. MIT Press, Cambridge, MA.

Angelopoulos, K., Economides, G., Kammas, P. (2007). Tax-spending policies and economic growth: Theoretical predictions and evidence from the OECD. *European Journal of Political Economy*, 23(4), pp. 885-902.

Arnold, J.M., Brys, B., Heady, C.J., Johansson, A., Schwellnus, C., Vartia, L. (2011) "Tax policy for economic recovery and growth", *The Economic Journal*, 121(550), 59-80.

Barro, R.J. (1990). Government spending in a simple model of endogenous growth. *Journal of Political Economy*, 98(5), 103-125.

Barro, R.J. (1991). Economic growth in a cross section of countries. *Quarterly Journal of Economics*, 106(2), 407-443.

Barro, R.J., Sala-i-Martin, X. (1992). Public finance in models of economic growth. *Review of Economic Studies*, 59(4), 645-661.

Barro, R.J., Sala-i-Martin, X. (2004). *Economic Growth*. Second Edition, MIT Press, Cambridge, MA.

Bosi, S., Nourry, C. (2007). Growth and fluctuations: The role of public dividends and public spending. *Journal of Mathematical Economics,* 43(3-4), 420-445.

Bucci, A., Florio, M., Torre, D. (2012). Government spending and growth in second-best economies. *Economic Modelling*, 29(3), 654-663.

Butkiewicz, J.L., Yanikkaya, H. (2011). Institutions and the impact of government spending on growth. *Journal of Applied Economics,* 14(2), 319-341.

Ciumas C., Dragos S.L., Vaidean V.L. (2009). On the Current Financial Crisis: the US Insurance Industry, in: *The Financial and Economic Crisis - Causes, Effects and Solutions*, Alma Mater, Cluj Napoca, pp.125-132.

Dragos, C., Beju, D., Dragos, S. (2009). Public and Financial Institutions in Transition Economies: An Overview and Recent Evidences from Central and Eastern Europe. *Managing Global Transitions*, 7(2), 147-170.

Fidrmuc, J. (2003). Economic reform, democracy and growth during post-communist transition. *European Journal of Political Economy*, 19(3), 583-604.

Florio, M., Colautti, S. (2005). A logistic growth theory of public expenditures: a study of five countries over 100 years. *Public Choice*, 122(3-4), 355-393.

Folster, S., Henrekson, M. (1999). Growth and the public sector: A critique of the critics. *European Journal of Political Economy,* 15(2), 337-358.

Folster, S., Henrekson, M. (2001). Growth effects of government expenditure and taxation in rich countries. *European Economic Review,* 45(8), 1501-1520.

Gober, J.R., Burns, J.O. (1997). The Relationship Between Tax Structures and Economic Indicators. *Journal of International Accounting, Auditing and Taxation*, 6(1), 1-24.

Gregoriou, A., Ghosh, S. (2009). On the heterogeneous impact of public capital and current spending on growth across nations. *Economics Letters*, 105(1), 32-35.

Grier, K.B., Tullock, G. (1989). An empirical analysis of cross-section economic growth, 1951-1980. *Journal of Monetary Economics,* 24(2), 259-276.

Hindriks, J., Myles, G.D. (2006). *Intermediate Public Economics*. MIT Press, Boston.

Lee, Y., Gordon, R.G. (2005). Tax structure and economic growth. *Journal of Public Economics,* 89(5-6), 1027-1043.

Ojede, A., Yamarik, S. (2012). Tax policy and state economic growth: The long-run and short-run of it. *Economics Letters*, 116(2), 161-165.

Pesaran, M.H., Shin, Y., Smith, R.P. (1999). Pooled mean group estimations of dynamic heterogeneous panels. *Journal of the American Statistical Association*, 94(446), 621-634.

Schaltegger, C.A., Torgler, B. (2006). Growth effects of public expenditure on the state and local level: Evidence from a sample of rich governments. *Applied Economics,* 38(2), 1181-1192.

Tanzi, V., Zee, H.H. (1997). Fiscal policy and long-run growth. *IMF Staff Papers,* 44(2), 179-209.

Tanzi, V., Schuknecht, L. (2000). *Public Spending in the 20th Century: A Global Perspective*. Cambridge University Press, Cambridge, UK.

Wahab, M. (2011). Asymmetric output growth effects of government spending: Cross-sectional and panel data evidence. *International Review of Economics and Finance*, 20(4), 574-590.

Widmalm, F. (2001). Tax structure and growth: are some taxes better than others? *Public Choice*, 107(3-4), 199-219.

World Bank (2012). Indicators: Economic policy and external debt, Public sector. Washington, DC. http://data.worldbank.org/data-catalog/world-development-indicators.

Xing, J. (2012). Tax structure and growth: How robust is the empirical evidence? *Economics Letters,* 117(3), 379-382.