LIBERA UNIVERSITA' INTERNAZIONALE DEGLI STUDI SOCIALI

Department: Economics and Finance

Teaching: International Finance

# Fiscal Multipliers in a Liquidity Trap

Summary

Supervisor: Prof. Pierpaolo Benigno

Co-Supervisor: Prof. Pietro Reichlin

Candidate: Valerio Nispi Landi

Matr. 634451

Academic Year: 2011/2012

# Contents

**1. Introduction** .......... **3**
**2.The Participant of the Economy** .......... **4**
2.1 The linearized model .......... 6
**3.A Deleveraging Shock** .......... **7**
**4. Fiscal Multipliers** .......... **10**
**5. Conclusions** .......... **12**
**References** .......... **13**

# 1.Introduction

The recent economic crisis has given birth to a wide debate about the effectiveness of fiscal policy. The discussion began in the USA in 2007, when former President George W. Bush signed $158 billion in tax cuts in order to stop the first symptoms of this disease. One year later Obama settled at the Whitehouse and he had to face one of the biggest economic crises of capitalism. In 2009 he pushed $789 billion into the economy, followed by other expansionary fiscal policies still used to date. Meanwhile, the crisis spread through the European economies and western policy-makers started to think how to boost GDP and growth. However, fiscal programs of European economies have been less expansionary than American ones, because of fiscal constraints set by the Maastricht Treaty. Now some European countries, such as Italy and Greece, are implementing restrictive policies to reduce the high burden of their respective public debts.

On the other side, central banks have set the policy rate close to zero in order to restore the credit market and help economic recovery.

The multiplier of a fiscal variable measures the effect of a unit increase of that fiscal variable on the GDP. Therefore, one of the main issues in Macroeconomics is estimating the size of the government spending and tax multipliers, namely how much the GDP increases after a rise in government expenditure or a cut in taxation. The size of multipliers depends on the behaviors of the economic agents: firms, households and policies makers.

In this work we are going to analyze fiscal multipliers in an economy characterized by heterogeneity of households and nominal rate fixed at zero. The model of this paper is built on Eggertsson and Krugman (2012, EK henceforth).

In this summary we do not report all the steps of the model, but we just provide with the economic intuitions and the results we have found.

The paper is organized as follows: Chapter 2 describe the behaviors of participants in this economy. Chapter 3 explains in detail what we intend for "deleveraging shock". Chapter 4 calibrates the model to compute the value of fiscal multipliers after the shock. Chapter 5 concludes the work.

## 2. The Participants of the Economy

There are two kinds of households: a fraction of $\chi_s$ savers (type "s") and $\chi_b$ of borrowers (type "b"). The latter are more impatient since they have a lower discount factor: $\beta(s) = \beta > \beta(b)$.

Borrowers prefer to consume more today and borrow to do so. On the contrary, savers are more patient and prefer to save something to smooth consumption over time. Households maximize a utility function, separable between consumption $C_t^i$ and hours of work $H_t^i$. $C_t^i$ refers to a Dixit-Stiglitz aggregate of a continuum of differentiated goods giving the producer of each good market power with elasticity of demand given by $\theta$. Each household $i$ has to maximize the following utility function:

$$E_o \sum_{t=0}^{\infty} \beta(i)^t \left[1 - \exp(-zC_t^i) - \frac{H_t^{i\,(1+\omega)}}{(1+\omega)}\right] \text{with } i \ = \ s \text{ or } b.$$

They must respect the following constraints:

$$B_t(i) + (1-\tau_t^w)W_t(i)P_tH_t(i) + \left(1-\tau_t^p\right)\Pi_t = (1+i_{t-1})B_{t-1}(i) + P_tT_t(i)$$
$$+ P_t(1+\tau_t^c)C_t(i)$$

$$\frac{(1+r_t)B_t(i)}{P_t} \leq D_t > 0.$$

$W_t(i)$ is the hourly real wage received by each agent at the beginning of the period; $P_t$ is the aggregate price index; $B_t(i)$ is the amount (in nominal terms) borrowed by agent $i$; $i_t$ is the nominal interest rate, that is the return on one period risk-free nominal bond; $r_t$ is the risk-free real interest rate on a one period real bond; $\tau_t^w, \tau_t^p$ and $\tau_t^c$ are the tax rates on labor, profits and consumption, equal for both types; $\Pi_t$ is profit from ownership of firms, distributed in equal shares among agents; $T_t(i)$ denotes lump-sum taxes, different for the two types.

The first equation is the budget constraint: on the left hand side there are revenues, and on the right hand side there are expenditures. The second constraint is the debt limit: the total real debt (real face value plus interests) must not be higher than a positive exogenous value $D_t$, expressed in real terms (note that the debt limit can be different in each period.)

The nominal interest rate is fixed in every period by the central bank according to the following Taylor rule:

$$i_t = \max(0, r_t^n + \phi_\pi \pi_t).$$

where $r_t^n$ is the natural interest rate (namely the real rate if prices are fully flexible), $\pi_t$ is the rate of inflation and $\phi_\pi > 1$ measures the degree of aggressiveness of the central bank against changes in the price level. Notice the presence of a zero lower bound: nominal rate cannot be negative.

Fiscal variables (lump-sum taxes, tax rates, public consumption $G_t$ and public debt) are fixed by the government, which must respect the following budget constraint:

$$G_t + \frac{B_{t-1}^g}{P_{t-1}} \frac{P_{t-1}}{P_t}(1 + i_{t-1}) = \frac{B_t^g}{P_t} + \chi_s T_t^s + \chi_b T_t^b + \tau_t^c C_t + \tau_t^w W_t H_t + \tau_t^p \frac{\Pi_t}{P_t},$$

where $W_t = W_t^{\chi_s}(s) W_t^{\chi_b}$. For any variations in $T_t^b, G_t, \tau_t^c C_t, \tau_t^w W_t H_t, \tau_t^p \frac{\Pi_t}{P_t}$, we assume that current or future $T_t^s$ will be adjusted to satisfy government budget constraint.

Firms produce the differentiated good maximizing after-tax profits over the infinite horizon, subject to technology $Y_t = AH_t = AH_t^{\chi_s}(s) H_t^{\chi_b}(b)$ and the demand of households and government. A fraction $\lambda$ of the firms sets prices freely at all times, while a fraction $(1 - \lambda)$ charges prices one period in advance. This way, we exclude perfect price flexibility. Firms have to decide also the amount of hours worked by each type $i$.

We assume that all profits are paid out as dividends and that prices are exclusive of the consumption taxes.

### 2.1 The linearized model

Now we report the results of the households' and firms' problems. The equations are linearized around a steady state with zero inflation. We suppose that in *t-1* borrowers are in a steady state in which the debt limit is binding for them, because of their impatience to consume.

If not indicated differently, the lowercase letters denote the difference between the corresponding variable and its steady state, divided for the steady state of the output. Letters with a bar denote the steady state of the corresponding variable. All the parameters are positive and are defined in the full work.

Linearizing the households' first order conditions we obtain the consumption functions of the two households and the aggregate labor supply; (4) is a linearization of the good market clearing condition and the production function.

$$c_t^s = E_t c_{t+1}^s - \sigma(i_t - E_t\pi_{t+1} - \bar{r}) + \sigma\eta_c E_t\left[\widehat{\tau_{t+1}^c} - \widehat{\tau_t^c}\right] \quad (1)$$

$$c_t^b = \eta_c\left[\left(\eta_p^{-1} + \delta\mu_\vartheta\right)y_t + \delta\mu_\vartheta w_t - (1-\mu_\vartheta)\widehat{\tau_t^p} - \mu_\vartheta\widehat{\tau_t^w} + \beta\widehat{D_t} - \widehat{D}_{t-1} + \gamma_D\pi_t - \gamma_D\beta(i_t - E_t\pi_{t+1} - \bar{r}) - t_t^b - \gamma_C\widehat{\tau_t^c}\right] \quad (2)$$

$$w_t = \omega h_t + \sigma^{-1}c_t + \eta_c\widehat{\tau_t^c} + \eta_w\widehat{\tau_t^w} \quad (3)$$

$$y_t = c_t + g_t = \chi_{\mathrm{s}}c_t^s + \chi_{\mathrm{b}}c_t^b + g_t = h_t \quad (4)$$

where $w_t \equiv \frac{W_t - \bar{W}}{\bar{W}}$, $h_t \equiv \frac{H_t - \bar{H}}{\bar{H}}$ $\widehat{\tau_t^w} \equiv (\tau_t^w - \bar{\tau}^w)$, $\widehat{\tau_t^c} \equiv (\tau_t^c - \bar{\tau}^c)$, $\widehat{\tau_t^p} \equiv \left(\tau_t^p - \bar{\tau}^p\right)$.

We can notice the big difference between (1) and (2), the equations giving the consumption of households. The consumption function of the borrowers is increasing in current output and decreasing in taxes. Suppose an increase in government spending: this policy increases output, so inducing borrowers to consume more, generating a second round of output expansion and so on. Moreover, borrowers' consumption also positively depends on current inflation which reduces the real value of their debt.

On the other hand, savers' current consumption depends on the expectations on future consumption (and therefore on the expectations of future income): government can affect their decisions just by modifying the consumption tax rate. This happens because savers are more patient and prefer to smooth consumption over time. On the contrary, borrowers do not care about future, do not save and spend all their current income.

As far as the supply side of the economy is concerned, by the profit maximization problem of the firms, after a linearization, we get the following relationship:

$$\pi_t - E_{t-1}\pi_t = ky_t - k\varphi g_t + \mu_\lambda\left(\eta_c \widehat{\tau_t^c} + \eta_w \widehat{\tau_t^w}\right) \text{ (5).}$$

The last equation represents an aggregate supply line (AS), a relation between prices and production: if inflation is higher (lower) than expected, output will be above (below) its steady state, everything else being equal. This line is upward-sloping with a slope equal to $k$ in a $(y_t, \pi_t)$ plane. Higher output increases real wages, namely firms real marginal costs: the fraction λ of firms react by raising their prices.

## 3. A Deleveraging Shock

Now we are going to explain the intuition of EK.

When the debt limit experiences an abrupt drop, people having too high a level of debt ("borrowers" in the model) must deleverage and we assume they must do it in one period. They have two possibilities: to consume less or to work more; borrowers' dropped consumption reduces the natural interest rate by allowing savers to pick up the slack: if the reduction of the natural interest rate is big enough, the desired nominal interest rate can become negative; monetary authority sets it at zero (because of the zero lower bound) and cannot offset the output drop, which decreases below the potential. The economy falls in a liquidity trap: monetary policy loses effectiveness as it can no longer lower nominal interest rates and provide a good stimulus; economy is in a trap, as any injection of liquidity has no effects on nominal rates.

The recession is worsened for the consequent deflation, which increases the debt burden, further reducing borrowers' real income. The last step of this process is called “Fisher Effect”. In his explanation of the Great Depression, American economist Irving Fisher stated that in a crisis situation characterized by a liquidity trap a deflation can be very dangerous for the economy, as it makes debtors poorer and increases the real interest rate. The consequence is lower spending, which generates lower output, which causes a lower level of prices, starting the vicious circle again.

We assume that in $t$ an unexpected and permanent deleveraging shock hits the economy and borrowers have to deleverage in one period. After the shock, the debt limit remains stable, reaching its steady state:

$$D_t = \bar{D} < D_{t-1}.$$

In order to simplify the analysis, we split our economy between “short run” (denoted with S) and “long run” (denoted with L), and we assume that shock arrives in the short run. In the long run, we assume that fiscal variables are in their steady state values: this implies economy reaches the steady state with[1]: $y_L = c_L^s = c_L^b = \pi_L = 0, i_L = r_L^n$. Notice that, because of the specification of the Taylor rule, prices remain to the short-run level[2].

Moreover, we assume that the shock is big enough to force the central bank to fix $i_s = 0$.

By plugging (3) and (4) in (2) and by considering the last assumptions, the consumption functions of both households become:

$$c_S^s = \sigma\left(\bar{r} - \eta_c \widehat{\tau_S^c}\right)$$

$$c_S^b = \eta_c \Big[\mu_y y_S - \delta\mu_\vartheta \sigma^{-1} g_S - (1-\mu_\vartheta)\widehat{\tau_S^p} - \mu_\vartheta(1-\delta\eta_w)\,\widehat{\tau_S^w} + \delta\mu_\vartheta\eta_c\,\widehat{\tau_S^c} - \widehat{D} + \gamma_D \pi_S + \gamma_D \beta\bar{r} - t_S^b - \gamma_C \widehat{\tau_S^c}\Big],$$

where $\widehat{D} \equiv \frac{D_{t-1} - \bar{D}}{\bar{Y}}$ is a measure of the shock size.

By using (4), we can derive the following aggregate demand (AD):

[1] We remind that $y_L, c_L^s, c_L^b$ are deviations from the steady state divided by the steady state of the output.

[2] In the full work we present an extension of the model in which central bank fix long-run prices at pre-shock level. By this new rule, AD slope changes and so does the size of multipliers.

$$y_S = \frac{\chi_s\sigma + \chi_b\eta_c\gamma_D\beta}{1-\chi_b\eta_c\mu_y}\bar{r} + \frac{\chi_b\eta_c\gamma_D}{1-\chi_b\eta_c\mu_y}\pi_S - \frac{\chi_b\eta_c}{1-\chi_b\eta_c\mu_y}\widehat{D} - \frac{\chi_b\eta_c}{1-\chi_b\eta_c\mu_y}t_S^b$$
$$- \frac{\chi_s\sigma\eta_c + \chi_b\eta_c(\gamma_C - \delta\mu_\vartheta\eta_c)}{1-\chi_b\eta_c\mu_y}\widehat{\tau_S^c} + \frac{1-\chi_b\eta_c\delta\mu_\vartheta\sigma^{-1}}{1-\chi_b\eta_c\mu_y}g_S$$
$$- \frac{\chi_b\eta_c\mu_\vartheta(1-\delta\eta_w)}{1-\chi_b\eta_c\mu_y}\widehat{\tau_S^w} - \frac{\chi_b\eta_c(1-\mu_\vartheta)}{1-\chi_b\eta_c\mu_y}\widehat{\tau_S^p}$$

By considering that the shock is unexpected, so $E_0\pi_S = 0$, AS line becomes:

$$\pi_s = ky_s - k\varphi g_s + \mu_\lambda\left(\eta_c\widehat{\tau_s^c} + \eta_w\widehat{\tau_s^w}\right).$$

The following graph shows both lines on a plane:

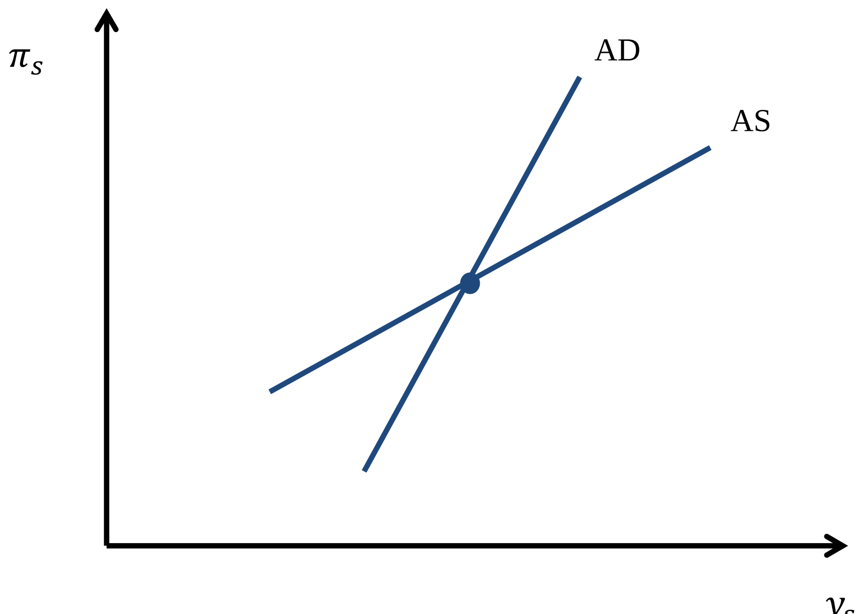


Figure 1

We can observe that also AD is upward sloping: a higher inflation reduces the real value of the debt, boosts borrowers' spending and therefore it increases the output. In normal conditions, this line is downward sloping, because central bank increases the nominal rate if inflation is higher, depressing aggregate consumption. However, in this situation central bank would like to reduce the nominal rate to stop deflation, but it cannot because there is a zero lower bound: the economy is in a liquidity trap.

By plugging AS in AD we can get output as function of fiscal instruments.

$$y_S = b_1\bar{r} - b_2\widehat{D} + a_1 g_S - a_2 t_S^b - a_3\widehat{\tau_S^c} - a_4\widehat{\tau_S^w} - a_5\widehat{\tau_S^p}$$

We define $a_1, a_2, a_3, a_4, a_5$, $b_1$, $b_2$ in the full work. Notice that if the government does not intervene (so all the fiscal variables remain at their steady state), $y_S = b_1\bar{r} - b_2\widehat{D} < 0$ with a big deleveraging shock: this means that the output falls under its steady state.

## 4. Fiscal Multipliers

Now we are going to show that government has good instruments available to improve the situation.

The following analysis considers operator $\Delta$ as the variation with respect to the benchmark of no changes. We remind that $y_S, g_S$ and $t_S^b$ are deviation from the steady state as a fraction of $\bar{Y}$. Therefore, $\frac{\Delta y_s}{\Delta g_S}$ and $\frac{\Delta y_s}{-\Delta t_S^b}$ give us the increase in $Y_s$ in Dollars, after respectively a one Dollar increase in $G_s$ and one Dollar reduction in $T_S^b$ .

On the other hand, tax rates are simply deviations from their steady state. So a tax rate multiplier measures the percentage increase in $Y_s$ if that tax rate decreases by 1%.

We calibrate the model by using parameters which are standard in American Macroeconomic literature.

The following table lists the values of fiscal multipliers, if borrowers represent half of households or if they are one-third of the population. We remind that each policy is financed with an increase in savers' lumps-sum taxes.

| **Multiplier** | $\chi_b = \mathbf{0.5}$ | $\chi_b = \mathbf{0.33}$ |
|---|---|---|
| $\frac{\Delta y_s}{\Delta g_S} = a_1$ | 2.54 | 1.52 |
| $\frac{\Delta y_s}{-\Delta t_S^b} = a_2$ | 1.88 | 0.63 |
| $\frac{\Delta y_s}{-\Delta \widehat{\tau_S^c}} = a_3$ | 1.54 | 0.85 |
| $\frac{\Delta y_s}{-\Delta \widehat{\tau_S^w}} = a_4$ | 0.63 | 0.21 |
| $\frac{\Delta y_s}{-\Delta \widehat{\tau_S^p}} = a_5$ | 0.31 | 0.11 |

Table 1

We can immediately notice that fiscal policy can be very effective in boosting the output: this is due to the behavior of borrowers, whose consumption directly depends on the available income. Suppose an increase in public expenditure: this policy increases $y_{s,}$ (because $g_s$ is a component of the aggregate demand), this increases borrowers' income and in turn gives stimulus to their consumption. Moreover, an increase in $g_s$ generates inflationary pressures which reduce the real burden of the debt, giving another stimulus to borrowers' spending. If we lower the percentage of borrowers, the multiplier is smaller, but remains above the unity.

Also a reduction in borrowers' lump-sum taxes have a high impact on output, because borrowers have more money to spend. Obviously, by reducing the number of borrowers, the multiplier is lower.

A reduction in consumption tax rate is the only policy which increases also the borrowers consumption (see equation 1). However, a lower $\widehat{\tau_S^c}$ implies also a lower wage for workers and this decreases the consumption of the borrowers (see equation 3). By lowering the number of borrowers, the multiplier is also smaller; albeit a lower reduction than the one occurring in the previous case.

If government reduces the $\widehat{\tau_S^w}$ and $\widehat{\tau_S^p}$, the effects on output are less relevant: differently from a reduction in $\widehat{\tau_S^c}$, these policies do not affect savers' decisions. If we reduce the share of borrowers to 1/3, the response in output after these policies becomes very small.

The following graph shows the shifts of AD and AS after an increase in government spending. In the new equilibrium (point B), output and prices are higher.

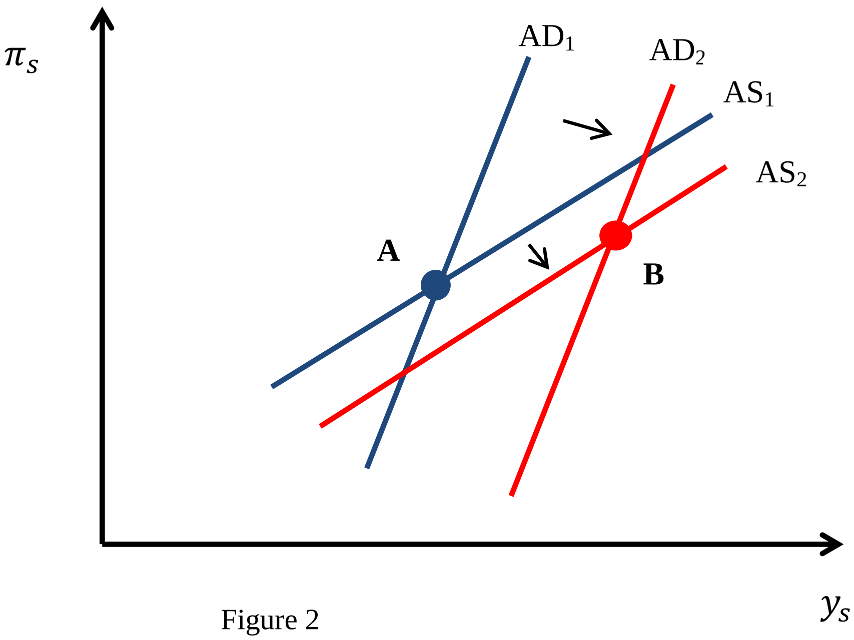


Figure 2

## 5. Conclusions

This paper analyzes a set of economic policies aiming to boost GDP after a deleveraging shock has led the economy in a liquidity trap.

In line with the literature, we find remarkable effectiveness of fiscal policy (financed with lump-sum taxes on savers), when central bank is forced to fix the nominal rate at zero. We notably get high multipliers if government decides to increase its spending or to cut consumption tax rate. Also a reduction in lump-sum taxes is very effective, but only if targeted on borrowers.

These above results are mainly due to the increase in borrowers' consumption, which positively depends on income and price level (higher prices reduce the real value of their debt). For instance, an increase in government spending leads to higher income and higher prices, borrowers spend more and this leads to another income expansion, and so forth. If we consider a cut in labor or profit tax rate, the multiplier is smaller: in this case, the impact on borrower's consumption is not so large.

The effect of a deleveraging shock is not only the GDP contraction: it also reduces the price level, generating a deflation which makes borrowers even poorer, thus starting the Fisher effect. Government can stop the Fisher effect, as its expansionary policies have a positive impact on prices.

Therefore, we can state that when the economy experiences a deleveraging shock, fiscal policy has effective instruments to avoid a crisis period. However, policy-makers should carefully evaluate the number of borrowers and the degree of price flexibility of firms[3]: these are two key variables to the effects of fiscal policy.

## References


Adji, A., Alm, J. and Ferraro, P. (2009): "Experimental tests of Ricardian equivalence with distortionary versus non-distortionary taxes", Economics Bulletin, 2009, vol. 29, issue 4, pages 2556-2572.

Benigno, P. (2012): "New Keynesian Economics: an AS-AD View, NBER Working Paper No. 14824.

Barro, R. J. (1974): "Are Government Bonds Net Wealth?", The Journal of Political Economy 82 (4), 1095-1117.

Baxter M. and R.G. King (1993): "Fiscal Policy in General Equilibrium", American Economic Review, Vol. 83 No. 3, pp. 315-334.

Bilbiie, F.O. and Straub, R. (2004): "Fiscal Policy, Business Cycles and Labor Market Fluctuations", MNB Working Papers 2004/6, Magyar Nemzeti Bank.

Brown,M., Haughwout A., Lee, D. and Van der Klaauw, W. (2011): "Have Consumers Been Deleveraging?" Liberty Street Economics Blog [online], available at: http://libertystreeteconomics.newyorkfed.org.

Campbell, J.Y. and Mankiw, N.G. (1989): "Consumption, Income, and Interest Rates: Reinterpreting the Time Series Evidence", O.J. Blanchard and S.Fischer (eds.), NBER Macroeconomics Annual 1989, pp. 185-216.

Christiano, L. (2004): "The zero bound, zero inflation targeting, and output collapse", available at: http://faculty.wcas.northwestern.edu/lchrist/research/zerobound/manuscript1.pdf.


[3] As shown in the full work.

Christiano, L., Eichenbaum, M. and Rebelo, S. (2009): “When is the Government Spending Multiplier Large?”, NBER Working Paper No. 15394.

Coenen, G., Straub, R. (2005): “Does Government Spending Crowd in Private Consumption? Theory and Empirical Evidence for the Euro Area”, *International Finance*, 8(3):435–470.

Cwik, T., Wieland, V. (2009): “Keynesian Government Spending Multipliers and Spillovers in the Euro Area”, CEPR Discussion Papers N° 7389.

Eggertsson, G.B. (2010a): “What Fiscal Policy Is Effective at Zero Interest Rates?”, Federal Reserve Bank of New York Staff Report No. 402.

Eggertsson, G.B. (2010b): “The Paradox of Toil,” Federal Reserve Bank of New York Staff Report, No. 433.

Eggertsson, G.B. and Woodford, M. (2003): “The zero interest-rate bound and Optimal Monetary Policy”, Brooking Panel on Economic Activity, March 2003.

Eggertsson, G.B. and Woodford, M. (2004): “Optimal Monetary and Fiscal Policy in a Liquidity Trap”, NBER Working Paper No. 10840.

Eggertsson, G.B. and Krugman, P. (2010): “Debt, Deleveraging and the Liquidity Trap: a Fisher-Minsky-Koo Approach” *Quarterly Journal of Economics, Forthcoming.*

Forni, L., Monteforte, L., Sessa, L. (2009): “The General Equilibrium Effects of Fiscal Policy: Estimates for the Euro Area”, *Journal of Public Economics,* 93:559–585.

Furceri, D., Mourougane, A. (2010): “The Effects of Fiscal Policy on Output: A DSGE Analysis”, OECD Economics Department Working Papers N° 770.

Galardo, M. (2010): “The Government Spending Multiplier with Limited Asset Market Participation”, Final Thesis, LUISS University.

Galì, J., López-Salido, D. and Vallés, J. (2004): “Rule-of-Thumb Consumers and the Design of Interest Rate Rules”, CEPR Discussion Paper N° 4347.

Galì, J., Lòpez-Salido, D. and Vallés, J. (2005): “Understanding the Effects of Government Spending on Consumption”, NBER Working Paper No. 11578.

Galì, J. (2008): “Monetary Policy, Inflation, and the Business Cycle: an Introduction to the New Keynesian Framework”, Princeton University Press.

Kaszab, L. (2011): "Fiscal Policy Multipliers in a New Keynesian Model under Positive and Zero Nominal Interest Rate," Cardiff Economics Working Papers E2011/11, Cardiff University, Cardiff Business School, Economics Section.

Keynes, J.M (1936): “The General Theory of Employment, Interest and Money”, New York: Macmillan.

Mankiw, N.G.(2000): “The Savers–Spenders Theory of Fiscal Policy.” American Economic Review 90, 120–125.

Mankiw, N.G. (2004): “Macroeconomia”, 4° ed. italiana, Bologna: Zanichelli.

Mankiw, N.G.(2008): “Spending and Tax Multiplier”, Gregory Mankiw’s Blog [online], available at: http://gregmankiw.blogspot.com.

Mankiw, N.G. (2010): “Are Stimulus Skeptics Logically Incoherent?” Gregory Mankiw’s Blog [online], available at: http://gregmankiw.blogspot.com

Smets F., Wouters, R. (2003): “An Estimated Stochastic Dynamic General Equilibrium Model of the Euro Area”, *Journal of the European Economic Association*, 1:1123–1175.

Uhlig, H. (2010): “Some Fiscal Calculus”, AER, forthcoming.

Woodford, M. (2003): “Interest Rate and Prices”, Princeton University Press.

Woodford, M. (2010): “Simple analytics of the government multiplier”, NBER Working Paper N° 15714.