Fiscal multipliers of public consumption in Italy

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Abstract

In this paper we estimate Italian fiscal multipliers for government public consumption using a sample that goes from the last quarter of 1998 to the end of 2014. The innovation that we propose within the literature on fiscal multipliers is a factor model approach. We use a factor model to identify the exogenous component of public consumption time series. Then we use a structural VAR augmented with factors (FAVAR) to estimate fiscal multipliers. We check the stability over time of the estimated multipliers using both a rolling window and an expanding window sample. We obtain two main results. First, the 1-year estimated multiplier for government public consumption ranges between 0.3 and 0.45, while in the long run the range is 0.2-0.3. Second, the level and the variability of fiscal multipliers show changes over time: they seem increasing and unstable during the 2008-2010 recession and more small but stable from 2011 to the end of our sample, a period that includes a sovereign debt turmoil and an episode of fiscal consolidation. We provide a comparative literature analysis and in the concluding section of the paper we suggest some interpretations for the dimension and dynamic of Italian fiscal multipliers.

Keywords: factor models, favar, Fiscal policy, Fiscal multiplier, Italy

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1 Introduction

In this paper we estimate fiscal multipliers of public consumption expenditure in Italy and their changes through time. The innovation that we propose within the literature on fiscal multipliers is a factor model approach.

We extract factors with a principal component analysis from a dataset containing the main macroeconomic variables of the Italian economy. We use factors to remove the influences that macroeconomic shocks and interdependencies between macroeconomic variables exercise on fiscal variables, so trying to eliminate the possible simultaneous causality between public expenditure and Gdp (Stock and Watson 2002a,b). Then we use a structural VAR augmented with factors (FAVAR) to estimate fiscal multipliers (Bernanke et al. 2005; Forni et al. 2000, 2005).

The discussion about fiscal multipliers is related with the effectiveness of active fiscal policies and it has revived after the blast of the Great Recession. Before 2008 the dominant opinion was that active fiscal policies were ineffective as a consequence of a Barro-Lucas ricardian effect of crowding out consumption and investment expenditure of the private sector. The Great Recession has undermined this conventional wisdom. Fiscal policy has been again proposed and implemented as a tool to boost economic activity, in particular when monetary policy loses effectiveness at the zero interest lower bound, or criticised for the underestimated effects on real economy of fiscal consolidations (DeLong and Summers 2012; Blanchard and Leigh 2013). The size of fiscal multipliers allows the measurement of costs and benefits of active (expansive or contractionary) fiscal policies. This political demand has driven an impressive flourishing of studies for the empirical estimation of fiscal multipliers, that we will shortly review in the next section.

A not controversial acquisition of the recent research is that it does not exist "the" multiplier (Parker 2011). The measure of Gdp reaction to a fiscal shock may be influenced by the structural and cyclical conditions of the economy, may change over time, may be different in relation to the fiscal instrument activated. As Corsetti and Muller (2015) stated, fiscal multiplier is not a parameter but an outcome contingent on the state of the economy.

The estimation of fiscal multipliers must take into account many channels of interdependency between government expenditures, taxes and economic activity. Public finance channels are automatically activated during a recession through the increase of social expenditure (unemployment benefits and more) and the reduction of tax revenue, and the contrary happens during a recovery. Active fiscal policies may determine changes in other economic variables, like interest rates, prices and expectations. In summary, there are different sources of endogeneity growing from the relations between business cycle and fiscal variables that affect the estimation of multipliers.

The empirical literature has widely discussed two methodological issues: how to identify truly exogenous fiscal shocks and which are the optimal strategies for econometric estimation of multipliers. The goal of our contribution is to propose a coherent and simple method to estimate fiscal shocks and fiscal multipliers using a factor model. This approach can help to solve the problem of endogeneity between Gdp and fiscal variables and so to overcome the misspecification problem that arises with SVAR methodology (Blanchard and Perotti 2002). Common factors extracted from a large dataset of series can be interpreted as structural elements influencing all the macroeconomic variables and can be used as instruments to clean distortions due to omitted variable bias and other possible endogeneity sources.

As we will see in the next section, there is a majority consensus in literature that fiscal multipliers are higher during recessions but lower with conditions of weak public finance and sovereign crisis. The application of our methodology to the Italian case allows an analysis, from the side of expenditures cuts, of the impact of the 2011-2012 episode of fiscal consolidation, when both recession and weak public finance conditions were present, in search of which of the two effects prevailed.

The paper is divided in 6 sections. After the introduction in section 2 we have a synthetic review of literature. Section 3 and 4 are dedicated to the estimation strategy and to dataset description. In Section 5 we presents the estimation of Italian fiscal multipliers and results. In section 6 we comment the results and we provide some conclusions.

2 Literature review

Literature on fiscal multipliers has grown at an exponential rate during the past ten years. Independent scholars and public national and international institutions have tried to estimate them with the aim of prove (or disprove) the effectiveness of fiscal policies.

The problem is that fiscal multipliers depend on nearly every aspect of the economic system, both in public and private sectors. So not only models rooted in different theoretical environments but also similar models can arrive at different conclusions. In a large survey of US literature Ramey (2011) shows that most estimates of fiscal multipliers based on the narrative approach method lie in the range of 0.5 to 2.0, while those based on aggregate time series have a range going from 0.8 to 1.5. From Figure 1 to 4 we have collected a (small) sample of the results of this huge empirical literature, limited to the impact on Gdp of a government expenditure shock. In this sample the size of the fiscal multiplier for a 1% increase of public expenditure ranges between -0.7 and 5.99. These sharply differences constitute a morass (Leeper et al. 2017).

A tentative guide in the morass is roughly composed of seven factors from which the variability of estimations can originate (Gechert and Will 2012;

Gechert and Rannenberg 2014; Sims and Wolff 2017): (i) model specification, in particular various type of DSGE models, with neoclassical or neokeynesian characteristics, vs. structural macroeconometric models or VAR models; (ii) different specifications in the class of VAR models (e.g. using local projection method or regime-switching or time-varying parameters etc.); (iii) procedure for the identification of the exogenous fiscal instrument (e.g. Blanchard and Perotti method or forecast errors or narrative approach etc.); (iv) single country analysis vs. panel and, in the latter case, composition of panel; (v) short run vs. long run multipliers, at least in models that allow this distinction; (vi) quality of data for fiscal variables; (vii) sample periods and frequency of data (annual, semi-annual, quarterly).

If we do not care about punctual estimations but look at general aspects, a consensus exists that fiscal multipliers are influenced by a set of characteristics of the economy, are different for different fiscal instruments and that they are state-dependent (Ilzetzki et al. 2013; Batini et al. 2014).

Trade openness influences multipliers through the elasticity of imports to domestic demand, so countries with a lower propensity to import tend to have higher fiscal multipliers (Barrell et al. 2012). Labour market rigidity is a second structural factor affecting multipliers, because reduced wage flexibility tends to amplify the response of output to demand shocks. The exchange rate regime is a third factor, because with flexible rates the exchange movement can offset the effects of discretionary fiscal shocks (Born et al. 2013). Fiscal multipliers are reported to be highly sensitive with a positive sign to the fraction of population who face binding credit constraints and to wealth inequalities (Brinca et al. 2016). They are higher in developed vs developing countries (Karras 2014). Last but not the least, multipliers are linked to the efficiency of public administrations, that affects the timing of implementation and the effectiveness of public policies; they also depend from the size of automatic stabilizers, whose dimension and efficiency reduce the impact of discretionary fiscal shocks (Dolls et al. 2012).

Fiscal multipliers may change across different fiscal instruments. From the side of expenditure, the empirical literature suggests a hierarchy of instruments, with investment multipliers higher (and more persistent) than government consumption multipliers, low multipliers for social transfers and not significant multipliers for public wages (Heppke-Falk et al. 2006; Giordano et al. 2007; Coenen et al. 2012; Auerbach and Gorodnichenko 2012). This evidence however is not always clear-cut: as an example, the most recent estimations of Italian fiscal multipliers do not find a relevant difference in the size of public investment and public consumption impacts on Gdp (Carreras et al. 2016; De Nardis and Pappalardo 2018).

Fiscal multipliers are dependent from the state of the economy, in particular the business cycle and the directions of monetary policy. These two aspects are linked and distinct at the same time: they are linked because monetary policy reacts to business cycle but they are distinct because they involve different transmission channels. Large evidence exists that the multiplier effect on Gdp of a government expenditure shock is larger in recessions compared to expansions. This evidence emerges both in the empirical estimations for single countries and in panel studies, also if implemented within different methodological frameworks[1].

For what concerns monetary policy, the theoretical literature suggests that when monetary policy has room for manoeuvre lowering interest rates could reduce the impact of fiscal contractions on demand and that when interest rate is at zero lower bound multipliers could be higher (Christiano et al. 2009; Woodford 2011). Empirical research seems to confirm these predictions. Both in US and in Eurozone the effectiveness of fiscal shocks depends from the degree of cooperation of monetary policy and fiscal multipliers are higher during periods characterized by persistent low interest rates (Coenen et al. 2012; Kilponen et al. 2015; Bonam et al. 2017). A corollary issue concerns the behaviour of fiscal multipliers during periods of financial stress and banking crisis, when tight credit restrictions constraint the behaviour of consumers and producers. Empirical analysis report that in these circumstances the size of fiscal multipliers shows tendencies toward higher values (Corsetti et al. 2012; Canzoneri et al. 2016; Hernndez de Cos and Moral-Benito 2016). Regarding this point however the Italian evidence is mixed (Afonso et al. 2011; Locarno et al. 2013).

It is fair to say that the least consensual and most controversial topic in the literature that we are reviewing is related to the potential influence on fiscal multipliers of what are generally denominated as weak public finance conditions, namely situations of high public debt ratio to Gdp and risk of sovereign crisis. When sovereign risk takes an important weight in expectations, a successful fiscal consolidation can determine a reduction of interest rates and an improvement of confidence. These potential gains can counterbalance the output costs of fiscal consolidation, so reducing the size of multipliers and the implied contractionary impacts of fiscal tightening policies (Kirchner et al. 2010). A theoretical extreme situation could occur if the gains from fiscal consolidation prevail and outweight the costs: if this happens fiscal multipliers should change their algebraic sign (so-called hypothesis of expansionary fiscal consolidation based on non Keynesian effects of fiscal policy; Forni et al. 2010).

Well before the Great Recession a stream of literature suggested that in countries with weak public finances fiscal consolidation could be expansionary, due to increase in confidence, lower interest rates, wealth effects and crowding-in effects for private sector demand (Alesina and Perotti 1996). These counter-

[1]For US see Auerbach and Gorodnichenko (2012), Arin et al. (2015), Caggiano et al. (2015). For Italy see Caprioli and Momigliano (2013). For OECD countries see Auerbach and Gorodnichenko (2013), Riera-Crichton et al. (2015), Jord and Taylor (2016). For Eurozone countries see Batini et al. (2012), Boitani and Perdichizzi (2018). For G7 countries see Baum et al. (2012).

intuitive non Keynesian results, bringing to fiscal multipliers with negative sign, have been challenged and more recently critically reviewed by some of the authors that originally proposed them starting from the observation of specific European countries episodes in the 1980s and 1990s (Denmark, Ireland, Sweden, Finland). The surge of demand after fiscal consolidations in these episodes was driven not by internal demand thanks to confidence and wealth effects but by external demand, fueled by large depreciations and wage moderation managed through highly centralized income policies (Perotti 2011). After the Great Recession a different stream of literature has grown arguing the possibility that fiscal consolidations during a recession could be self-defeating, i.e. that they can end up with higher debt-to-Gdp ratios because multipliers in "bad times" are higher, produce negative impacts underestimated by policy makers and moreover through hysteresis mechanisms the contraction can be transmitted on potential Gdp and become permanent (Fatas and Summers 2016).

A few numbers of empirical studies find a reversal in the algebraic sign of fiscal multipliers when weak public finance conditions prevail (Corsetti et al. 2012). The predominant evidence in empiric literature is however that weak public finance conditions reduce the size of fiscal multipliers, also during recessions, but without a sign reversal. Estimated values of fiscal multipliers remain positives, though smaller, implying that a successful fiscal consolidation in situation of high public debt and sovereign crisis can obtain some gains through interest rates and confidence, so reducing the output costs of fiscal contraction, but it is far from operating without pain[2].

Fiscal multipliers may change over time (Perotti 2002). A decline in the size of government spending multipliers and a reduction of their persistence are reported in the long run both in the US and in the Eurozone. In the US the turning point seems around 1980 (Bilbiie et al. 2008; Leeper et al. 2017), in the Eurozone around 1990 (Kirchner et al. 2010). In the Italian case Cimadomo and D'Agostino (2016) suggest a U-shaped time evolution of fiscal multipliers, with a decline from the beginning of the 90s and an increase after the 2008 recession. Reminding the structural and state-dependent factors that influence the size of fiscal multipliers, this historical inversion could be explained by: (i) the new non cooperative and anti-inflationary rules of monetary policies (Volcker-Greenspan rule in the US and European Monetary Union rule for Eurozone); (ii) the increase in the degree of openness of the economies; (iii) the reduction of credit-rationed subjects and the increase in asset market participation of families.

The empirical estimation of fiscal multipliers raises two main challenges. The first is about the identification of fiscal shocks that are not induced by the macroeconomic environment but generated by truly discretionary government decisions. The two main methods utilised in the empirical literature are the

[2]See Auerbach and Gorodnichenko 2013; Ilzetzki et al. 2013; Guajardo et al. 2014; Hernndez de Cos and Moral-Benito 2016; Boitani and Perdichizzi 2018.

narrative approach, choosing the episodes of exogenous fiscal shocks through a qualitative and historical analysis, and the SVAR methodology. In this second stream the main problem is to not incur in omitted variable bias; it follows the need to add different kind of control variables, and their nature and number can determine a severe loss in degrees of freedom.

The second challenge is the frequency of data and the problem of evaluating the stability of fiscal multipliers through time. What seems important from this point of view is a research strategy that allows the evaluation of different sub-samples in the investigated period. In this perspective an alternative to VAR is to calculate multipliers with the local projection technique (Jord 2005).

Our contribution tries to deal with these challenges with an innovation of SVAR methodologies. At our knowledge the use of a FAVAR model for the estimation of fiscal multipliers is an innovation in the literature. Principal components have been sometimes used as instruments for robustness analysis, but not to identify the exogenous component of government expenditure. Moreover, since our sample goes from 1998:4 to 2014:4 we are interested not only on the size of multipliers and their persistence, but also to check if the Great Recession induced some break in the time path of Italian public consumption multipliers.

3 Estimation strategy.

Factors help in taking properly into account the unobserved heterogeneity that can determine bias in a SVAR framework of coefficients estimation. Factors are used as control variables in order to remove the omitted variable bias and to interpret pervasive information that are not captured in variable dynamics. Through factors it is possible to make a decomposition of every time series in two parts, the common and idiosyncratic one.

A Factor Model could be described with the following equation:

$$X_t = \chi_t + \xi_t \tag{1}$$

or, if we look to the i-th variable:

$$x_{i,t} = \chi_{i,t} + \xi_{i,t} \tag{2}$$

In which X_t is a large dataset that contains all the possible aspects of the economy, $\chi_{i,t}$ is the Common Component while $\xi_{i,t}$ is the idiosyncratic component. The common part take into account all the macroeconomic influences, and the space spanned by them is associated with a set of latent factors, $f_{i,t}$ from which we can capture the common comovements of all the variables. We can write equation (4) as follows:

$$x_{i,t} = \lambda_{i,1} f_{1,t} + ... + \lambda_{i,r} f_{r,t} + \xi_{i,t} \tag{3}$$

Where $f_{1,t}, ..., f_{r,t}$ are the common factors and $\lambda_{1,t}, ..., \lambda_{r,t}$ are the "loading factors" that relates common factors with every variables of X_t.

To correctly identify the model we make the usual key assumptions: an high sample number N of time series ($N >> r$), to represent all the characteristics of the economy and to correctly estimate the space spanned by the factors (Stock and Watson 2002b); the idiosyncratic component $\xi_{i,t}$ must be uncorrelated to the common component $\chi_{i,t}$, and $\xi_{i,t}$ could be serially correlated and weakly cross-correlated. We estimate factors as "diffusion indexes" (Stock and Watson 2002a), usually with the support of Bai and Ng (2002) criteria to represent as well as possible the space spanned by pervasive component. Consequently we are able to dentify the idiosyncratic part of each series.[3]

In our case Bai-Ng criteria seem not to indicate a stable number of factors to extract: the first factors is, obviously, the main relevant, but criteria suggest that relevant informations could be extracted also for other factor number as for example 6. In this case it is useful to look at the Scree Plot in Figure 5, from which we are able to see that the "scree" (a steep change in the slope of the curve) seems to be focused on the third factor. For this reason, and for the fact that we work with a small sample, we use 3 as benchmark number for r, and then we provide robustness check for other numbers.

After the factors estimation, we can write the FAVAR system equation as follows:

$$\begin{bmatrix} f_{1,t} \\ \vdots \\ f_{r,t} \\ \Delta G_t \\ \Delta Gdp_t \end{bmatrix} = \Phi(L) \begin{bmatrix} f_{1,t-1} \\ \vdots \\ f_{r,t-1} \\ \Delta G_{t-1} \\ \Delta Gdp_{t-1} \end{bmatrix} + \begin{bmatrix} v_{f_{1,t}} \\ \vdots \\ v_{f_{r,t}} \\ v_{\Delta G_t} \\ v_{\Delta Gdp,t} \end{bmatrix} \tag{4}$$

In which $\Phi(L)$ is a qxq matrix of VAR lag polynomials with $q = r + 2$. The model is composed by our variables of interest (the public expenditure, G, and the real gross domestic product, Gdp) augmented with factors. Imposing $Y_t = [f_{1,t}, .., f_{r,t}, \Delta G_t, \Delta Gdp_t]'$ we can write the previous equation as follows:

$$Y_t = \Phi(L)Y_{t-1} + v_t \tag{5}$$

$$Y_t = \Phi_1 Y_{t-1} + \Phi_2 Y_{t-2} + ... + \Phi_k Y_{t-k} + v_t$$

[3]See Baldini and Causi (2018) for a wide discussion on this point e for the procedures of estimation of common factors. In practice Consider the NxN sample covariance matrix $\hat{\Gamma_0} = T^{-1}XX'$ of X - that is a NxT matrix of stationary time series - and consider $\hat{W}$ the Nxr matrix of the normalized eigenvectors of $\hat{\Gamma_0}$ corresponding to the first largest r eigenvalues. The standard estimators of loadings and factors are: $\hat{\Lambda} = \sqrt{n}\hat{W}$ and $\hat{F}_t = \frac{1}{\sqrt{n}}\hat{W}'X = \frac{1}{n}\hat{\Lambda}'X$.

In which the term v_t represents unidentified shocks, and we can write it in the following way:

$$v_t = Ku_t \tag{6}$$

The term v_t represents the FAVAR residuals of non-identified shocks. We specify the K matrix in order to impose a recursive identification via the Cholesky decomposition. As usual in this econometric framework (in which, as in a VAR, there is the rule of "most exogenous first") factors are the first element of the vector Y_t because they represent the pervasive comovements of all the sample variables; after them, there is our relation of interest that consist in the estimation of the impact of public expenditure on Gdp.

To compute fiscal multiplier we use the standard definition of multiplier at horizon i and cumulative multiplier for fiscal multipliers as follows:

$$Multiplier_{h=i} = \frac{\Delta Gdp_{t+i}}{\Delta G_t} \tag{7}$$

$$Cum.Multiplier_{h=i} = \sum_{i}^{T} \frac{\Delta Gdp_{t+i}}{\Delta G_t} \tag{8}$$

This means that we will estimate Impulse Response Functions (IRF) and then take them at horizon i or cumulate them until T horizon. To estimate IRF we need a parsimonious specification of our equation paying attention to the lag number of our relation. For this reason we will augment our relation between G and Gdp with factors.

At this point there is another challenge: we have to obtain an exogenous measure for G. At this aim, our strategy is to use different public consumption expenditure measures, obtained after the removal of factors influence. The goal is to have a G variable not influenced by macroeconomic systematic shocks and past values of them, removing possible reverse and simultaneous causality between Gdp and G. We use three models:

Model 1:

$$\Delta G_t = \sum_{i=1}^{3} \lambda_{i,t} f_{i,t} + \gamma_0 \Delta Gdp_t + v_{0_t} \tag{9}$$

Model 2:

$$\Delta G_t = \sum_{i=1}^{3} \lambda_{i,t} f_{i,t} + \sum_{i=1}^{3} \lambda_{i,t-1} f_{i,t-1} + \sum_{j=0}^{1} \gamma_j \Delta Gdp_{t-j} + v_{1,t} \tag{10}$$

Model 3:

$$\Delta G_t = \sum_{i=1}^{3} \lambda_{i,t} f_{i,t} + \sum_{i=1}^{3} \lambda_{i,t-1} f_{i,t-1} + \sum_{i=1}^{3} \lambda_{i,t-2} f_{i,t-2} + \sum_{j=0}^{2} \gamma_j \Delta Gdp_{t-j} + v_{2,t} \tag{11}$$

The first model takes into consideration the contemporaneous effects of pervasive factors of the economy and of Gdp dynamics on fiscal public spending expenditure. The estimated residuals represent the Government Consumption Expenditure that is not influenced by these regressors. In order to consider some inertia that could be present between the economic dynamics and the public spending we estimate also model 2 and 3, in which we have introduced the first and the second lags of the same variables. In Tab.5 we report the results for the three models estimated. The contemporaneous impact of Gdp on G is always significant, while Gdp lags are not. All the lags of the first factor are significant, while for the second factor the only significant lag is the first. Third factor is significant in model 1, containing only contemporaneous relations.

All these measures are built in order to analyse which kind of information we can obtain using $\hat{v}_{0,t}$, $\hat{v}_{1,t}$ or $\hat{v}_{2,t}$ as measures for fiscal shock (from now $\Delta\hat{G}_t^1$, $\Delta\hat{G}_t^2$ and $\Delta\hat{G}_t^3$) that can be considered as proxies of exogenous public expenditure.

4 Data and descriptive evidence.

The building of a FAVAR model requires a large panel of stationary time series that represents all the possible aspects of the economy at quarterly frequency. We use 100 time series of the Italian economy for a period that goes from 1998:4 to 2014:4. All the series are taken from FRED database, except for the credit market series, for which the source is Bank of Italy. The complete list and sources are in the Appendix. The dataset includes several blocks of time series, for example credit market, international trade, real production, Gdp components, labour market, private consumption and sales, consumer prices, production prices, business surveys and expectations and interest rates. There is also another block of miscellaneous variables.

After the usual transformations[4], we use break in the mean literature to have a good characterization of our large dataset and to estimate factors from stationary variables (Altissimo and Corradi 2003). Dropping out the break in the mean induced by the Great Recession is useful to obtain stationary time series without over-differencing the data. The point is widely discussed in Baldini and Causi (2018) and we adopt here the same methodology[5].

[4]Transformations depend from every single series. Series are usually treated with logarithm, but there are series (as Interest Rates for example) that are not. There are series that are manipulated with a D1 transformation (first difference) and series with D4 transformation (quarterly transformation) and so on. The list is in the Appendix.

[5]We drop out the break using dummy variables. We estimate a regression of the form $X_t = \beta_0 + \beta_1 D_{2008_1} + \epsilon_t$ and, after this, we work on detrended variable detected as $X^{WB} = \hat{\epsilon_t}$. We consider the same breakdates used in Baldini and Causi (2018).

From Tab.1 to Tab.3 we provide Advanced Dickey Fuller Tests to show that, dropping out the break in the mean, is possible to induce stationarity in the data. We present the simple series (the series manipulated with usual transformation) and the series without breaks. ADF test is provided for 91 time series (interest rates are considered stationary by construction) and lags are selected with a BIC criterion with a maximum of 4 lags. It is possible to see how, while in column 1 there are 44 series that don't pass the test, in column 2 there are only 2 series that seem to be not stationary.

The public spending variable in our dataset is associated with Government Consumption Expenditure as calculated in National Accounts statistics. It is a crucial variable for Italian fiscal sustainability and it's subcomponents - that correspond roughly to public wages and public purchases of goods and services - have been affected by the 2011-2012 fiscal consolidation as shown in Tab.4.
Figure 6 shows a comparation between the levels of Gdp and Government Consumption Expenditure (that we will call G). Great Recession starts in the first quarter of 2008 with a sharp decline of Gdp but the G trend remains positive until the third quarter of 2010, though at a lower growth dynamics as compared with the previous period. After this date fiscal consolidation starts and G decreases, more or less, constantly. We can observe the same evidence reflected by growth rates in Figure 7.

Looking at descriptive evidences, Great Recession in Italy seems divided in two different phases. A first period of huge and deep crisis, during which G continue to increase, and a second period during which fiscal consolidation induces a change in the amount and dynamics of Government Consumption Expenditure. It is important to remind that the turning point coincides with a sharp increase of risk premium on Government Bond interest rates and with the sovereign debt crisis (Figure 8). Note that the working of automatic stabilizers is not mainly reflected in our G variable but in other fiscal variables such as government social transfers and tax revenues.

5 Results

We can now estimate a FAVAR model in order to analyse IRF in a VAR context. Given the methodology in section 3, the equation form to estimate could be specified as follows:

$$\Delta Gdp_t = \sum_{l=1}^{r} \lambda_k^*(L) f_{k,t-1} + \gamma_j(L)\Delta\hat{G}^i_{t-1} + \beta(L)\Delta Gdp_{t-1} + v_t \tag{12}$$

In which we can see that Gdp is function of the common factors and of the lagged value of $\Delta\hat{G}^i_{t-1}$, where i is equal to 1, 2 or 3 depending on the previous (9), (10) or (11) models. This is exactly the last equation of the FAVAR model

(4) exposed in Section 3.

Results are shown in Tab.6. We impose the lags number equal to 2 because we have seen the strong significance of the second lag of G in every specification. Both the lags of G seems to be significant in the estimation of Gdp: along the models, the first-lag coefficient changes from 0.25 to 0.22 while the second-lag coefficient changes from 0.17 to 0.20, and they are always significant. Gdp second lag seems to have high significance, as the first factor, while the other factors seem to exhibit no strong significance in the regressions.

With these estimations we can compute IRF (Figure 9). We simulate IRF along 20-horizon, for Gdp growth rate and Gdp, using all the fiscal shock previously specified. Focusing the attention to Gdp, we can see that the fourth horizon (the annual multiplier) has a mean close to 0.36, while for the long run fiscal multipier after 20 quarters (5 year multiplier) the mean is close to 0.26. Moreover, these results are obtained using a sample that goes from the last quarter of 1998 to the last of 2014. During this period, italian economy was severely affected by a huge number of global and national shocks, that could have an effect on the economic system fundamentals.

This work tries to give answer also to another research question: how the multipliers change over-time? Answering to this point is important not only to study if the estimated multiplier is confirmed in each sub-sample, but also to study the stability of fiscal multipliers both in recession an expansion period. Primarly, the estimations of the Italian fiscal multiplier must takes into account what happened during the Great Recession, that hitted hardly the economic system and change public policy. For this reason seems plausible to study how multipliers change from the beginning of Great Recession to the end of our sample.

We select a window that goes from the last quarter of 1998 to the last of 2006, and then we compute the cumulative annual multiplier taking the Gdp IRF until the fourth horizon, that corresponds to the annual Gdp increase after a spending shock. Than we replicate the computations quarter by quarter, using both a rolling and an expanding window. The first one is useful to analyze how multipliers change with a fixed window non affected by informations too far in time, while the second is useful to evaluate the effects on the estimations adding one data at each step. Even if we could incur in a loss of degrees of freedom, this is an interesting exercise not only to evaluate the 'exact' measure of fiscal multiplier, but its stability over time.

Results are shown in Figure 10. and Figure 11. For a synthetic view of the evidences, we report graphs with IRFs computed with the three $\hat{G}$ previously identified, and a mean of these three multipliers (the black line).

In rolling and expanding estimations the multiplier seems to go from 0.15 to 0.64, but looking at the black line, that reports the mean of the three model of IRFs obtained, we have a good synthesis. The majority of estimates are close to 0.3 and 0.4, while the temporal mean of multipliers (the general mean) is 0.27 in the rolling window case, 0.42 in the expanding window case. From these results we can confirm that fiscal multiplier of the italian Government Public Expenditure is characterized by a medium-low size compared to other countries, even looking to the different subsamples of the period that we have analyzed.

Anyway there are two important features that must be stressed.
Looking at the rolling window there is a clear cut in the sample: before the mid of 2010 we have an higher fiscal multipliers in mean; after the mid of 2010 (the same point in which Government expenditure starts to decline in Figure 6) we can observe a decreasing path of multipliers. If we look to the black line, we start from a situation in which the average multiplier was close to 0.32, and, after the mid of 2010, we observe a strong and continue decreasing trend that arrives, at the end of the sample, below 0.2[6].
From the expanding window we can appreciate another evidence: we have an increasing path of multipliers before the mid of 2010, while, after this date, we have a change in this trend that become stable and related to less volatile estimations.

This means that in the mid of 2010 there is a change in sample features, that is reflected by the path of multipliers. Before this date italian economy was severly affected by the great recession, there was not started the fiscal consolidation, and multipliers were, in accordance with literature results, higher or increasing. After the beginning of fiscal consolidation we can observe a reduction of the multiplier level or a change in trend, that became from increasing to stable.

5.1 Robustness Check.

As Robustness checks, we replicate computations using different number of factors for the fiscal multipliers estimation. We treat the entire sample case and also the rolling and expanding window cases. We use always the same model specification, but we vary the factors number from 2 to 5 (given the fact that the 3-factors case is the base-case). Results seem to confirm the evidence of the base-case, and can be viewed from figure 12 to figure 20. The size of annual multipliers, computed on all the sample, is similar of the 3-factors case, and this is true also for the long run multiplier (after 20 horizon). From rolling window estimations we can observe that multipliers computed before the mid of 2010 are higher than those computed after, and that, after this date, there is a strong and negative trend. From expanding window evidence it is possible to see that a strong and increasing trend of multipliers is followed (always after the mid of 2010) by a stagnant and volatile tendency. We reply the estimations using different breakdates, but the results are always stable.

[6] Trend before and after mid of 2010 are interpreted by blue and orange fitting line in the graphs.

6 Conclusions

In this paper we have estimated Italian fiscal multipliers of public consumption with a factor augmented VAR method (FAVAR) for the period 1998:4 2014:4. With this technique we are able not only to estimate fiscal multipliers for the entire sample period but also to investigate on their possible variation over time, in particular for what concerns the potential effects of the changing macroeconomic framework induced by the dramatic double dip recession that hit the Italian economy after 2008.

Our estimated values for the impact of public consumption on Gdp in the entire sample period are 0.3-0.45 in one year and 0.2-0.3 in the long run. We found moreover that Italian fiscal multipliers changed during the time comprised in our sample: they seem higher, increasing and more volatile during the 2008-2010 first phase of the Great Recession, while they seem more small and more stable during the 2011 turmoil, the 2012 episode of fiscal consolidation and subsequent years.

According to the IMF comparative classifications first-year multipliers are considered of medium size if comprised between 0.4 and 0.6, of low size if less than 0.4, of high size if more than 0.4 (Batini et al. 2014). Our results would suggest that the Italian economy is characterised by a medium-low one-year multiplier of public consumption on Gdp and by a poor persistence of the multiplier effect in following periods.

These results seem coherent with the previous empirical literature regarding Italy (highlighted in Figure 1-4). The existing estimations of one-year Italian multipliers for government expenditure, when obtained with comparable models (VAR), are comprised between 0.25 and 0.6 and show very poor persistence in time. As examples, long run multipliers obtained by Giordano et al. (2007) and Caprioli and Momigliano (2013) go to zero or to negative values within a span of 2-3 years.

Fiscal multipliers estimated through structural macroeconometric models are in general higher than those resulting from VAR (Gechert and Hill 2012), and so it is also in Italy, where the range that emerges in literature goes from 0.5 to 0.8 for one-year impact. When the results originate from research frameworks that allow comparisons between different countries, in particular in the Euro Area, Italian fiscal multipliers are located in a median position: at a glance, above Germany and below France (Kilponen et al. 2015; Carreras et al. 2016). Evaluating in the same methodological setting the US and Italian multipliers Brinca et al. (2016) conclude that the impact on Gdp of government consumption in US is the double of the corresponding Italian value.

Having in mind the structural factors that influence fiscal multipliers, reviewed in section 2, among the characteristics of the Italian economy that could explain these results we can suggest four elements: an high degree of openness to international trade; a lower credit dependence of the household sector, deriving from an high ratio of families owners of the home of residence; a permanent condition of weakness in public finance; an high flexibility of wages and labour market conditions. Other possible explanatory factors for a medium-low multiplier could originate from the composition of Italian government expenditure, mainly for two aspects. First, small shares are allocated in activities bringing potentially the highest impact on output, as for example investments. Second, an important share of government consumption is allocated in the purchase of drugs and technologies destined to the national health system (36% in 2015 vs. 22% in 1995; Ufficio Parlamentare di Bilancio 2017). Since these goods have high import components, the fairly low impact on domestic Gdp of government consumption could be partially explained by this structural element.

A second result of our analysis is that fiscal multiplier of public consumption in Italy seems showing significant changes starting from the beginning of the Great Recession in 2008. During the first phase its increased values, though unstable, confirm that multipliers tend to be higher in "bad times". From the end of 2010 and for the entire 2011 Italy suffered a sovereign financial crisis and economic policy turned toward a hard fiscal contraction. The bulk of the adjustment was charged on tax increases, and the reduction of government consumption contributed roughly for a third to the overall fiscal manoeuvre.

Being our analysis limited to public consumption we can't derive a comprehensive evaluation of the 2011 Italian fiscal consolidation. But the results obtained allow two final comments. First, expenditure multipliers maintained a positive sign, so the Italian 2011 case seems another evidence against the hypothesis of expansionary fiscal consolidation. Second, the reduction and stabilization of multipliers during and after 2011 can be interpreted as an empirical evidence that the transmission of fiscal policy performs in slightly different ways when conditions of weak public finance and sovereign financial crisis prevail. The pain of public expenditure contraction is partially offset by the gain of financial stability: fiscal multipliers remain positive, but smaller.

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Table 1: ADF Test.Id 1-40

ID	**ADF t-value simple series**	**ADF Lags**	**ADF t-value. (without breaks)**	**ADF (lags)**
1	-2,259	3	-3,940***	1
2	-2,571*	2	-3,826***	1
3	-0,914	3	-2,180**	3
4	-2,264	3	-2,772**	3
5	-5,703***	1	-5,968***	1
6	-3,377**	4	-3,430 ***	4
7	-3,205**	1	-4,161***	1
8	-1,074	3	-2,908***	1
9	-3,568***	2	-4,331***	1
10	-3,998***	1	-4,346***	1
11	-2,923**	4	-3,091***	4
12	-3,243**	2	-3,597***	2
13	-3,540***	2	-3,686***	2
14	-5,271***	1	-5,974***	1
15	-3,707***	3	-3,796***	3
16	-2,935**	2	-5,372***	1
17	-1,319	3	-4,046***	1
18	-2,668*	3	-3,624***	3
19	-3,898***	1	-4,128***	1
20	-3,786***	1	-3,986***	1
21	-1,812	4	-7,216***	1
22	-3,926***	1	-4,186***	1
23	-3,490***	2	-4,585***	2
24	-5,230***	1	-5,582***	1
25	-3,935***	1	-4,131***	1
26	-3,533***	1	-3,647***	1
27	-1,977	4	-3,384***	4
28	-3,539***	2	-3,669***	2
29	-2,037	4	-2,566***	4
30	-2,587*	2	-4,034***	2
31	-3,254**	2	-4,449***	1
32	-2,742*	2	-3,193***	2
33	-3,251**	2	-4,507***	1
34	-2,652*	4	-4,601***	1
35	-3,251**	2	-4,507***	1
36	-2,013	3	-4,687***	2
37	-2,951**	3	-4,131***	3
38	-3,906***	2	-3,899***	2
39	-2,052	4	-4,150***	2
40	-2,374	2	-4,727***	1
41	-2,442	2	-4,821***	1

Sample goes from 1998:4 to 2014:4. For ADF t-value critical values are determined by the ADF test with a constant, and are equal to -3,4583 for 1%, -2,87104 for 5% and -2,59369 for 10%. Moreover, for ADF test without break critical values are determined by the ADF test without deterministic terms and are equal to -2,58364 for 1%, -1,9573 for 5% and -1,6311 for 10%.

Table 2: ADF Test. Id settori, 41-80

ID	**ADF t-value simple series**	**ADF Lags**	**ADF t-value. (without breaks)**	**ADF (lags)**
42	-2,227	3	-5,108***	1
43	-3,302**	3	-4,319***	3
44	-5,441***	1	-5,636***	1
45	-1,119	3	-2,149**	3
46	-0,2119	3	-1,455	3
47	-2,542	1	-2,935***	1
48	-0,2742	4	-2,274**	1
49	-2,200	4	-3,872***	3
50	-2,522	3	-3,905***	2
51	-2,398	3	-4,386***	1
52	-4,073***	1	-4,342***	1
53	-5,097***	1	-5,449***	1
54	-3,300**	2	-3,539***	2
55	-4,233***	1	-4,567***	1
56	-3,582***	1	-3,687***	1
57	-2,266	4	-2,314**	4
58	-1,900	4	-1,720*	4
59	-2,941**	1	-3,854***	1
60	-1,668	4	-3,141***	1
61	-2,404	1	-2,773***	1
62	-3,249**	1	-3,284***	1
63	-2,101	4	-2,125**	4
64	-3,118**	1	-3,203***	1
65	-0,6635	4	-2,213**	1
66	-2,382	4	-2,595***	4
67	-4,518***	1	-4,579***	1
68	-2,909**	1	-2,928***	1
69	-3,846***	2	-3,076***	4
70	-4,627***	1	-4,726***	1
71	-1,833	4	-2,111**	4
72	-1,870	4	-2,150**	4
73	-2,774*	4	-2,794***	4
74	-2,346	4	-2,623***	4
75	2,904**	2	-3,516***	1
76	-4,938***	1	-5,432***	1
77	-3,095**	4	-3,378***	4
78	-0,8586	1	-3,246***	1
79	-0,7434	1	-2,476**	3
80	-0,5386	1	-3,440***	1
81	-3,801***	1	-4,729***	1

Sample goes from 1998:4 to 2014:4. For ADF t-value critical values are determined by the ADF test with a constant, and are equal to -3,4583 for 1%, -2,87104 for 5% and -2,59369 for 10%. Moreover, for ADF test without break critical values are determined by the ADF test without deterministic terms and are equal to -2,58364 for 1%, -1,9573 for 5% and -1,6311 for 10%.

Table 3: ADF Test. Id settori, 81-100

ID	**ADF t-value simple series**	**ADF Lags**	**ADF t-value. (without breaks)**	**ADF (lags)**
82	-2,240	1	-3,478***	1
83	-3,223**	1	-4,208***	1
84	-3,369**	1	-4,027***	1
85	-2,639*	2	-5,070***	1
86	-3,394**	1	-4,274***	1
87	-2,202	1	-2,847***	1
88	-1,454	1	-2,853***	1
89	-0,9527	1	-2,265**	1
90	-1,955	1	-2,615***	1
91	-1,635	4	-1,800*	3

Sample goes from 1998:4 to 2014:4. For ADF t-value critical values are determined by the ADF test with a constant, and are equal to -3,4583 for 1%, -2,87104 for 5% and -2,59369 for 10%. Moreover, for ADF test without break critical values are determined by the ADF test without deterministic terms and are equal to -2,58364 for 1%, -1,9573 for 5% and -1,6311 for 10%.

Table 4: Public consumption expenditures and GDP average yearly growth rates in Italy 1999-2014 (constant prices)

	1999-2007	**2007-2010**	**2010-2014**	**2014-2017**
Public consumptions	1.4%	0.6%	-1.1%	-0.1%
GDP	1.5%	-1.7%	-1.0%	1.2%

Source: Istat, National Accounts

Table 5: G estimation with 3 factors

VARIABLES	((1))	(2)	(3)
$f_{1,t}$	0,0173***	0,0303***	0,0259***
	(0,0059)	(0,0076)	(0,0077)
$f_{1,t-1}$	——-	-0,0144**	-0,0236***
	——-	(0,0062)	(0,0070)
$f_{1,t-2}$	——-	——-	0,0099*
	——-	——-	(0,0059)
$f_{2,t}$	0,0028	0,0096*	0,0085
	(0,0017)	(0,0051)	(0,0059)
$f_{2,t-1}$	——-	-0,0125**	-0,0140
	——-	(0,0061)	(0,0095)
$f_{2,t-2}$	——-	——-	0,0069
	——-	——-	(0,0069)
$f_{3,t}$	-0,0081***	-0,0141***	-0,0100
	(0,0024)	(0,0051)	(0,0063)
$f_{3,t-1}$	——-	0,0069	0,0066
	——-	(0,0052)	(0,0066)
$f_{3,t-2}$	——-	——-	-0,0044
	——-	——-	(0,0069)
$\Delta \mathrm{Gdp}_t$	0,9823***	1,2030***	1,0293**
	(0,3769)	(0,3701)	(0,3851)
$\Delta \mathrm{Gdp}_{t-1}$	——-	-0,4444	-0,6486
	——-	(0,3574)	(0,3541)
$\Delta \mathrm{Gdp}_{t-2}$	——-	——-	0,1968
	——-	——-	(0,3205)
R-squared	0,1547	0,2796	0,3392
F(,)	4,7655	4,3867	6,5214

Sample goes from 1999:2 to 2014:4, and we estimate 3 models: in model (1) relative to equation (10), model (2) relative to equation (11), and model (3) linked to equation (12). We estimate G with 3 factors. Errors are roboust respect to autocorrelation (HAC errors).

Table 6: FAVAR Gdp estimation.

VARIABLES	((1))	(2)	(3)
$f_{1,t-1}$	-0,0072	-0,0044	-0,0036
	(0,0058)	(0,0056)	(0,0058)
$f_{1,t-2}$	-0,0031	-0,0069**	-0,0073**
	(0,0036)	(0,0033)	(0,0034)
$f_{2,t-1}$	-0,0013	0,0004	0,0008
	(0,0058)	(0,0058)	(0,0058)
$f_{2,t-2}$	-0,0080	-0,0111	-0,0117
	(0,0069)	(0,0069)	(0,0071)
$f_{3,t-1}$	0,0071*	0,0063	0,0067*
	(0,0036)	(0,0038)	(0,0037)
$f_{3,t-2}$	-0,0079**	-0,0069*	-0,0074*
	(0,0039)	(0,0041)	(0,0040)
$\Delta\hat{G}_{t-1}$	0,3063***	0,2646**	0,2897***
	(0,1005)	(0,0992)	(0,1002)
$\Delta\hat{G}_{t-2}$	0,2201***	0,1766**	0,1914***
	(0,0561)	(0,0674)	(0,0537)
$\Delta \mathrm{Gdp}_{t-1}$	0,0578	0,1051	0,1303
	(0,1910)	(0,1925)	(0,1855)
$\Delta \mathrm{Gdp}_{t-2}$	-0,3840**	-0,5192***	-0,5234***
	(0,1862)	(0,1788)	(0,1677)
R-squared	0,6779	0,6634	0,6737
F(10,51)	10,7335	10,0541	10,5318

Sample goes from 1999:2 to 2014:4. The number of lags is selected looking to the ACF and PACF, and we estimate 3 models: in model (1) we impose $G_t = \hat{v}_{1,t}$ from equation (10), in model (2) we impose $G_t = \hat{v}_{2,t}$ from equation (11), and for model (3) we impose $G_t = \hat{v}_{3,t}$ from equation (12). In all this model we estimate G with 3 factors. Errors are roboust respect to autocorrelation (HAC errors).

Source	Country	Estimation method	Period	Frequency	Fiscal variable	Estimated multipliers on output	State of the economy and further notes
Blanchard Perotti 2002	USA	VAR	1947-1997	Q	GP	0,8-0,9 (1Q), 0,5-0,6 (1Y)	
Heppke-Falk Tenhofen Wolff 2006	Germany	VAR	1974-2004	Q	GE	0,62 (1Q)	FM for personnel expenditure are not significant, total FM derives from operating expenditure. High and persistent FM for investment
Giordano Momigliano Neri Perotti 2007	Italy	VAR	1982-2004	Q	GP	0,5 (4Q)	Effects are not persistent, they go to zero in the second year and show possible reversal. FM for public wages are not significant
Bilbie Meier Muller 2008	USA	VAR and LDSGE	1957-2004	Q	GCI	5,99 (20Q) 57-89, 2,62 (20Q) 83-04	
Kirchner Cimadomo Hauptmeier 2010	Euro Area	Bayesian Time-varying parameter VAR	1980-2008	Q	GE	0,54 (1Q) with reversal	Multipliers increased until 1990 (impact was 1 in 1990) and then decreased. Multipliers decrease with D/GDP, credit/GDP, wage share in G, while increase with output gap and investment share in G
Ramey 2011	USA	VAR	1939-2008	Q	GCI	0,8 (1Q), 1 (1Y)	
Afonso Baxa Slavik 2011	Italy	Threshold VAR	1980-2009	Q		0,49 (4Q)	0,7 with financial stress, 0,2 without (peak). Condition of financial crisis defined through IMF Financial stress Index
Corsetti Meier Muller 2012a	USA	VAR	1983-2007	Q	GCI	1 (1Q) with reversal	similar results with Ramey 2011 identification

Figure 1: Sample of fiscal multiplier estimation (impact on Gdp)

Y: year; A: annual; SA: semi-annual; Q: quarterly; GP: government purchases; GE: government expenditures; GC: government consumption; GCI: government consumption and investment; GS: GE share on GDP.

Corsetti Meier Muller 2012b	panel 17 OECD countries	VAR	1975-2008	A	GC	0,0 (1Y)	-0,7 (1Y) with weak public finance, 2,3 (1Y) with financial crisis. 1Y multiplier without conditioning: 0,7 in unbalanced panel, 1,1 in Italy. State of weak public finance defined as D/GDP over 100% or government borrowing over 6%. State of financial crisis defined as in Reinhart and Rogoff 2008.
Coenen et al 2012	USA , UE	structural DSGE		A	GC	model with 2Y monetary accomodation: USA 1,2 (1Y) 1,6 (2Y); UE 0,9 (1Y) 1,5 (2Y)	
Batini Callegari Melina 2012	Euro countries, USA, Japan	VAR with regime-switching		Q	GCI	1Y: 0,93 in baseline, 0,82 in good times, 2,1 in bad times	Sample periods: Euro Area 85-09; Japan 81-09; USA 75-10
Batini Callegari Melina 2012	Italy	VAR with regime-switching	1981-2007	Q	GCI	1Y: 0,81 in baseline, 0,41 in good times, 1,57 in bad times	
Barrell Holland Hurst 2012	Italy	NiGEM macroecono metric model		A	GC	0,62 (1Y)	
Auerbach Gorodnichenko 2012	USA	VAR with regime-switching	1947-2008	Q	GP	peak over 20Q: 1 in baseline, 0,57 in good times, 2,48 in bad times	Higher multipliers for investment spending than consumption spending (2,1 vs 1,2 as peak over 20Q). Higher multipliers in recession, but not in expansion, with identification through forecast errors
Auerbach Gorodnichenko 2013	panel OECD countries	VAR with local projection	1985-2000	SA	GCI	mean over 3Y: 0,14 in baseline, -0,2 in good times, 0,46 in bad times	State of weak public finance, defined as D/GDP over 100%, reduces multiplier also in recession (0,05 mean over 3 years)

Figure 2: Sample of fiscal multiplier estimation (impact on Gdp)

Y: year; A: annual; SA: semi-annual; Q: quarterly; GP: government purchases; GE: government expenditures; GC: government consumption; GCI: government consumption and investment; GS: GE share on GDP.

Auerbach Gorodnichenko 2013	panel OECD countries	VAR with local projection	1985-2000	SA	GCI	mean over 3Y: 0,14 in baseline, -0,2 in good times, 0,46 in bad times	State of weak public finance, defined as D/GDP over 100%, reduces multiplier also in recession (0,05 mean over 3 years)
Ilzetzki Mendoza Vegh 2013	panel 44 countries	VAR	1960-2007	Q	GC	0,39 (1Q) 0,66 (20Q) in high income countries vs -0,029 (1Q) -0,63 (20Q) in low income countries. 0,15 (1Q) 1,4 (20Q) with fixed exhange rates vs 0,14 (1Q) -0,69 (20Q) with flexible. 0,61 (1Q) 1,1 (20Q) for closed economie vs -0,077 (1Q) -0,46 (20Q) for open economies. FM lower in highly indebted countries	
Locarno Notarpietro Pisani 2013	Italy	structural DSGE		Q	GC	temporary 0,86 (1Y) permanent 0,59	Temporary 0,88 (1Y) with monetary accomodation. Temporary 0,78 (1Y) with financial crisis
Caprioli Momigliano 2013	Italy	VAR	1982-2011	Q	GC	0,25 (4Q)	FM higher in recession but not so much and in any case positive in expansion. Effects non persistent, go to zero in the long run
Guajardo Leigh Pescatori 2014	panel 17 OECD countries	VAR	1978-2009	A	GC	0,3 (4Q)	Perception of sovereign risk reduces multiplier, but without sign reversal
Karras 2014	panel 61 countries	VAR	1952-2007	A	GS	long run: 1,35 in baseline, 0,89 in good times, 1,57 in bad times	Multipliers higher in high income countries, difference between bad times and good times higher in low income countries
Gechert Rannenberg 2014	meta-regression analysis with a set of 98 studies				GC	0,5 in upper cycles, 1,8 in lower cycles	
Riera-Chricton Veg Vuletin 2015	panel 29 OECD countries	VAR with local projection		SA		1Q: 0,25 in baseline, 0,09 in good tomes, 0,73 in bad times	
Caggiano Castelnuovo Colombo Nodari 2015	USA	VAR with regime-switching	1981-2013	Q	GCI	sum over 8Q: 0,33 in good times, 3,05 in bad times	

Figure 3: Sample of fiscal multiplier estimation (impact on Gdp)

Y: year; A: annual; SA: semi-annual; Q: quarterly; GP: government purchases; GE: government expenditures; GC: government consumption; GCI: government consumption and investment; GS: GE share on GDP.

Kilponen et al 2015	Euro countries	structural DSGE		A	GC	1Y: Italy 0,79, France 0,92, Germany 0,52	FMs calculated by ECB through the country economies models of national european central banks
Brinca Holfer Krusell Malafry 2016	panel 44 countries	VAR and LDSGE	1960-2007	Q	GC	Same data base as Ilzetzki et al 2013. FMs increase with the fraction of credit-constrained families and with inequalities (measured with wealth Gini coefficient). Estimated FM for Italy is one of the lowest	
Carreras Kirby Liadze Piggott 2016	Euro countries	NIESR macroeconometric model		A		1Y FM range from 0,22 (Ireland) to 0,94 (Greece). Italy 0,55 France 0,58 Germany 0,46	
Hernandez de Cos Moral-Benito 2016	Spain	VAR with regime-switching	1986-2012	Q	GE	8Q: -0,01 in good times, 1,25 in bad times	Condition of weak public finance reduces FMs close to zero, multipliers are higher in a regime of banking stress
Jorda' Taylor 2016	panel 17 OECD countries	VAR with local projection	1978-2009	A	GC	sum over 5Y: 1,8 in good times, 3,5 in bad times	Statistical design for narrative unanticipated shocks using inverse propensity score weighting
Cimadomo D'Agostino 2016	Italy	VAR with regime-switching	1981-2013	Q/A	GCI	Time evolution of FMs is U-shaped: from 1,5 at the beginning of 90s to 0,8-0,9 in the first phase of EMU then unity during the recession; the applied method allows the use of both A and Q data	
Bonam De Haan Soederhuizen 2017	panel 17 OECD countries	VAR	1960-2015	Q	GC	1Q: 0,3 without monetary accomodation, 0,9 with monetary accomodation	
Leeper Traum Walker 2017	USA	LSDGE	1955-2014	Q	GC	1,2-1,5 (4Q)	Reduction of FMs betwwen 55-79 and 82-07
Boitani Perdichizzi 2018	panel 12 Euro countries	VAR with local projection	1985-2015	SA	GC	mean over 3Y: 0,0 in baseline, -0,13 in good times, 1,68 in bad times	Multipliers during recession do not change significantly controlling for the level of D/GDP and for sovereign risk. Multipliers increase after 2007
De Nardis Pappalardo 2018	Italy	MeMo-it macroeconometric model	1970-2014	A	Gc	0,6 (1Y)	FM for investment 0,67. FMs in 2008-14 indirectly calculated through FMs estimations deriving from 1970-2008 and 1970-2014 results of the model: for intermediate consumption 1,3, for investment 2,7

Figure 4: Sample of fiscal multiplier estimation (impact on Gdp)

Y: year; A: annual; SA: semi-annual; Q: quarterly; GP: government purchases; GE: government expenditures; GC: government consumption; GCI: government consumption and investment; GS: GE share on GDP.

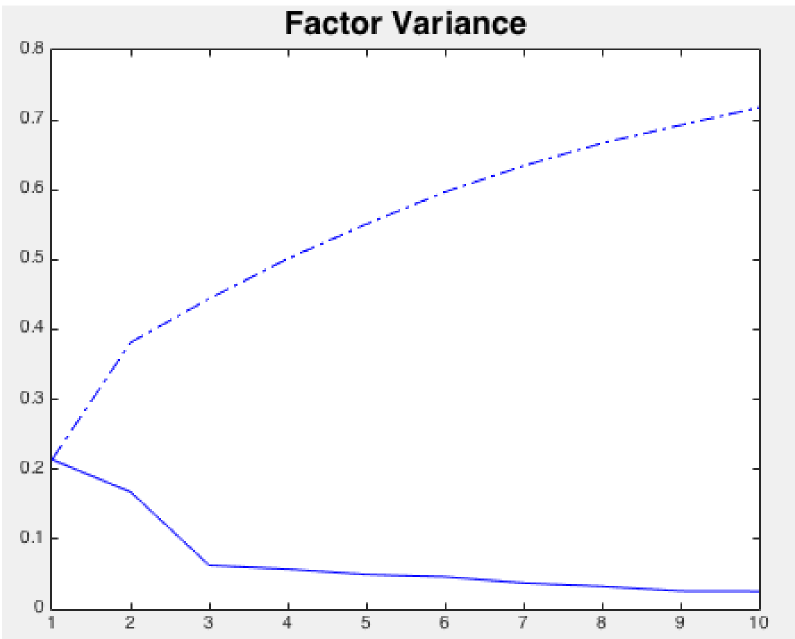

Figure 5:

The Scree Plot is computed looking at the portion of variance explained by every ordered factors.

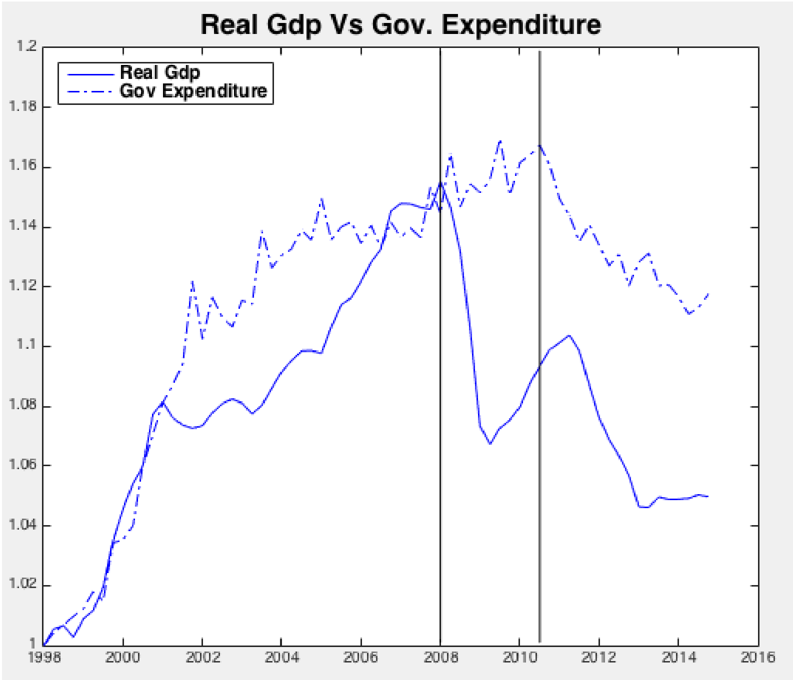

Figure 6: Real Gdp Vs Gdp Government Public Expenditure

Variables are divided for their first value to be compared. Variables are in level and taken at constant prices.

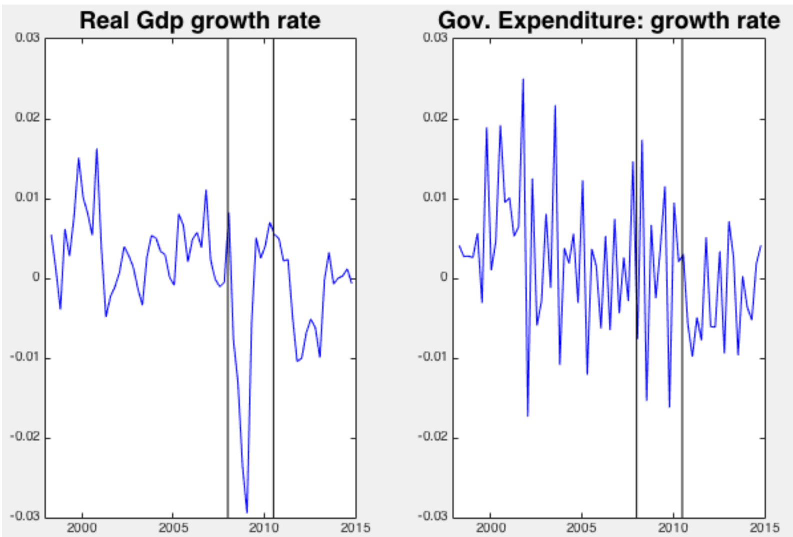

Figure 7: Real Gdp Vs Gdp Government Public Expenditure growth rate

Variables are differenced in logarithm and taken at constant prices.

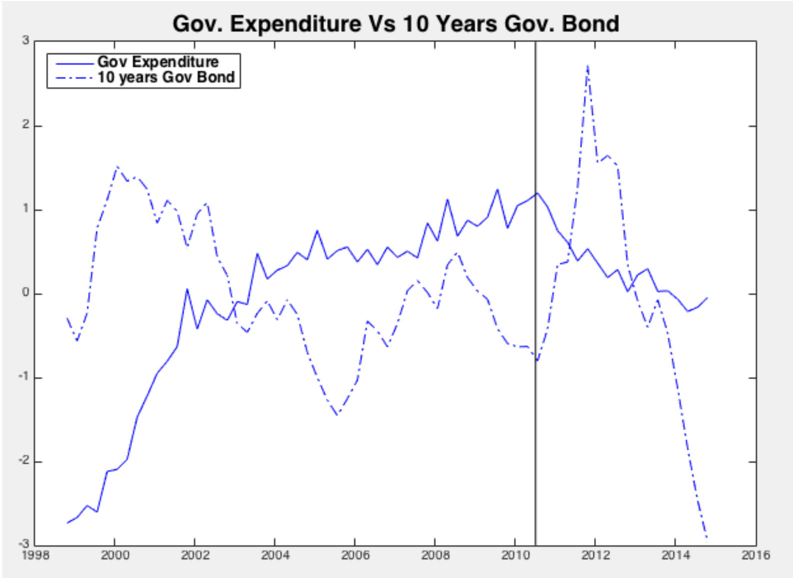

Figure 8: Government Public Expenditure Vs 10 Years Government Bond

Variables are divided for their first value to be compared. Variables are in level and taken ad constant prices.

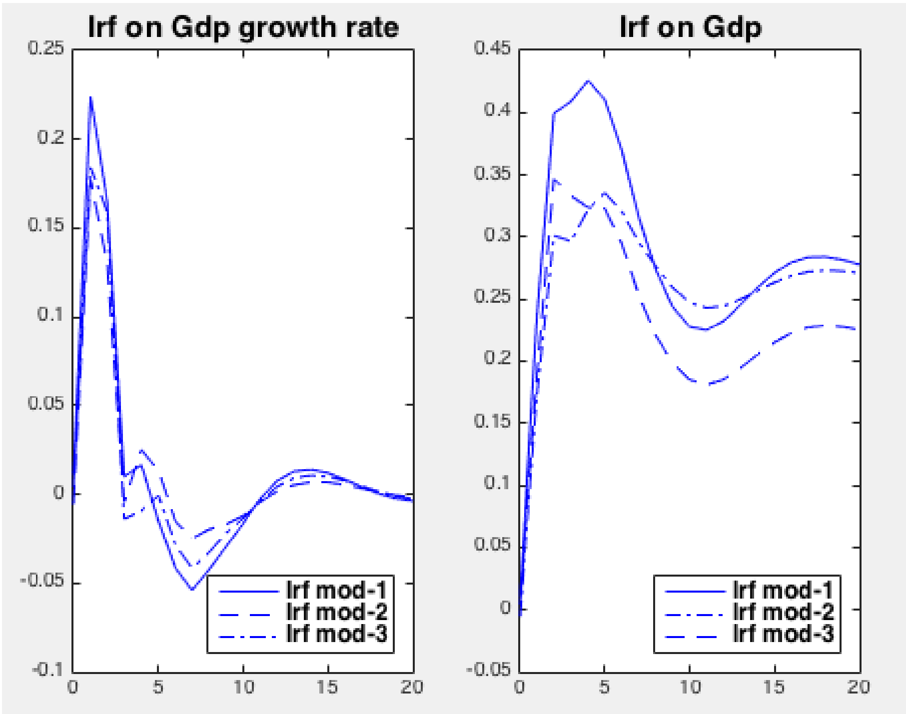

Figure 9: Impulse Response Function on Gdp

We take into consideration Impulse response function for 20 steps for the entire sample, from the last quarter of 1998 to the last quarter of 2014.

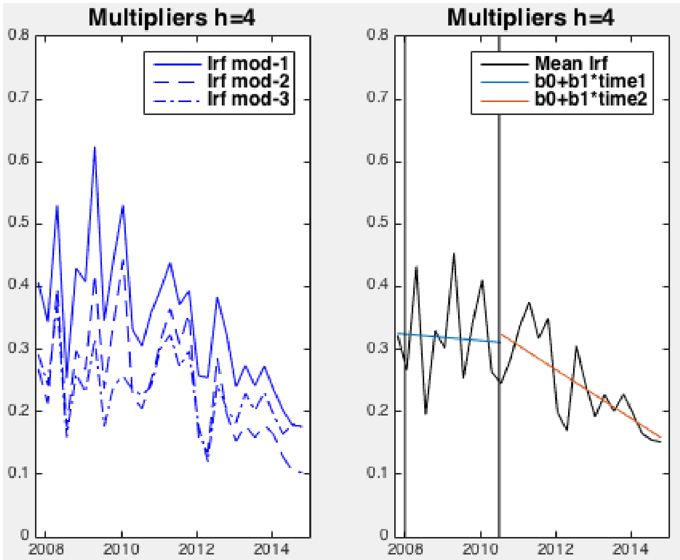

Figure 10: Impulse Response Function on Gdp: rolling window

We use a rolling window sample, in which the first sample goes from the last quarter of 1998 to the last quarter of 2006. Then we compute the annual Impulse Response Function for Gdp, obtaining the first observation (last quarter of 2007). We replicate the computations quarter by quarter, rolling the sample until the last observation.

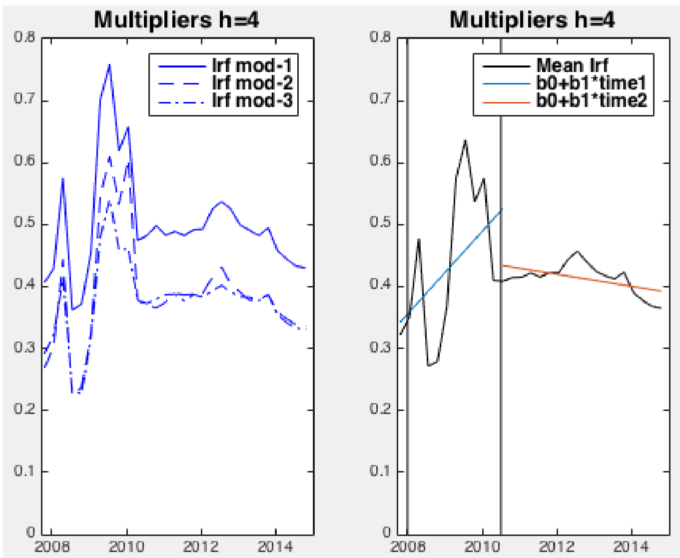

Figure 11: Impulse Response Function on Gdp: expanding window

We use a expanding window sample, in which the first sample goes from the last quarter of 1998 to the last quarter of 2006. Then we compute the annual Impulse Response Function for Gdp, obtaining the first observation (last quarter of 2007). We replicate the computations quarter by quarter, expanding the sample until the last observation.

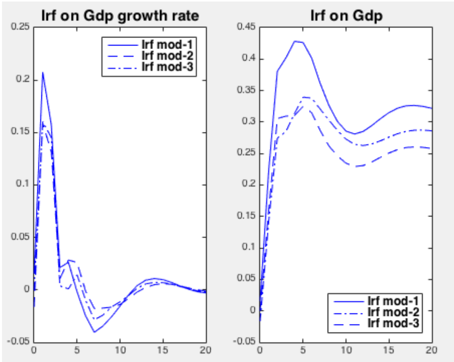

Figure 12: Impulse Response Function on Gdp, 2 factors specification: all sample

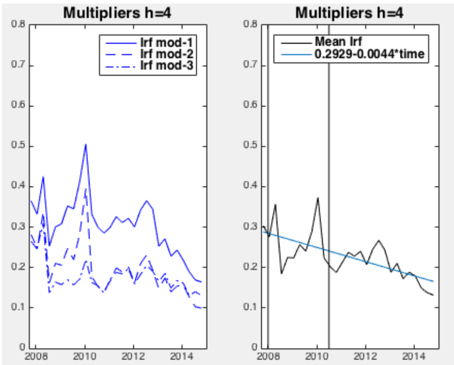

Figure 13: Impulse Response Function on Gdp, 2 factors specification: rolling window

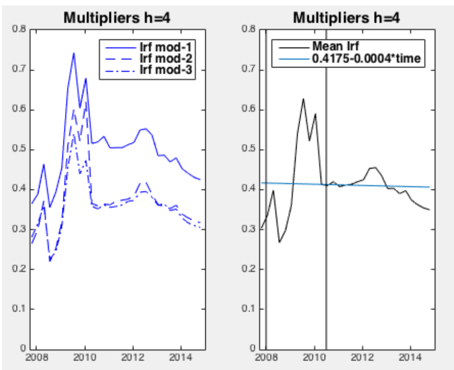

Figure 14: Impulse Response Function on Gdp, 2 factors specification: expanding window

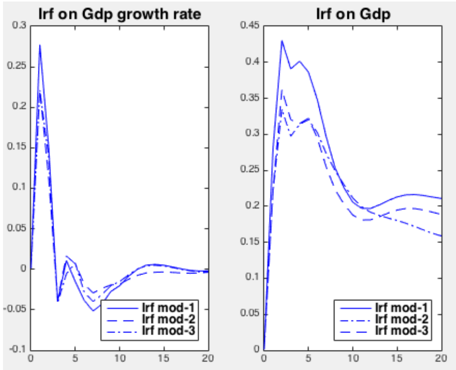

Figure 15: Impulse Response Function on Gdp, 4 factors specification: all sample

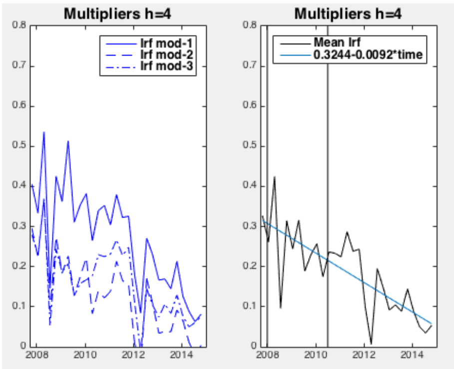

Figure 16: Impulse Response Function on Gdp, 4 factors specification: rolling window

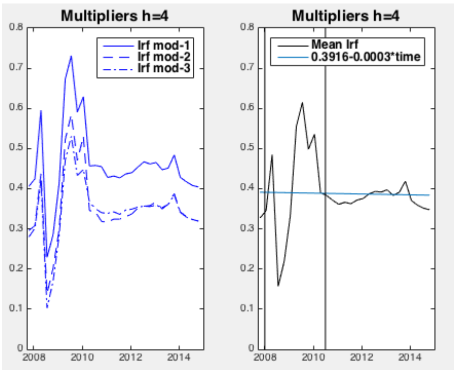

Figure 17: Impulse Response Function on Gdp, 4 factors specification: expanding window

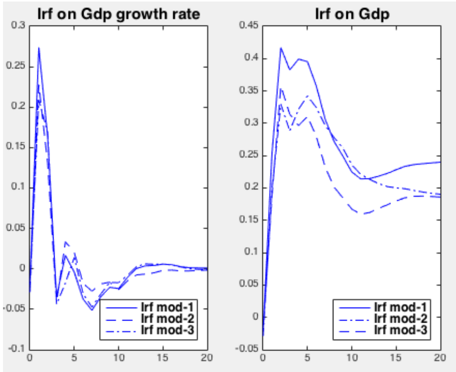

Figure 18: Impulse Response Function on Gdp, 5 factors specification: all sample

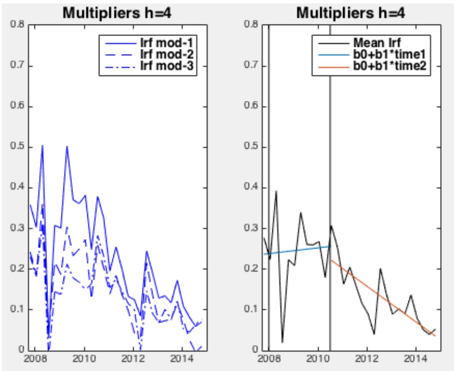

Figure 19: Impulse Response Function on Gdp, 5 factors specification: rolling window

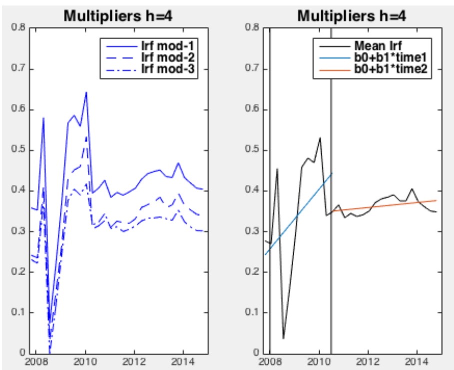

Figure 20: Impulse Response Function on Gdp, 5 factors specification: expanding window

Appendix

A DATA APPENDIX.

In this appendix we expose the series utilized for the analysis. We do not provide reference to the country (Italy) and to the temporal window of analisys (1998:4-2014:4) because are already specified in the paper. SA means 'Seasonally Adjusted', while NSA means 'Not Seasonally Adjusted'. Harmonized Consumption Price Indexes and Business Tendency Surveys are at monthly frequency: quarterly price indexes are obtained with the average of each quarter.

We use the following transformation (transf. in the Table):
(1) D1= First difference.
(2) D1-log= First difference of logarithm.
(3) D4-log= Quarterly difference of logarithm
(4) log=Logaritmic transformation.
(5) No trasf= No transformation.

BTS = Business Tendency Surveys and COS= Consumer Opinion Surveys. Loans 'in bonis' are computed subtracting bad loans on total loans, while bad loans ratio is obtained from a ratio between bad loans and total loans.

	Transf.	Data Source
CREDIT MARKET		
Bad Loans for Non Financial Sector NSA	2	Bank of Italy
Bad Loans for Households NSA	2	Bank of Italy
Loans ‘in bonis’ for Non Financial Sector NSA	2	Bank of Italy
Loans ‘in bonis’ for Households NSA	2	Bank of Italy
New Bad Loans for Non Financial Sector, NSA	2	Bank of Italy
New Bad Loans for Household, NSA	2	Bank of Italy
Total Bad loans ratio NSA	1	Bank of Italy
New Bad Loans Entry Rate for Non Financial Sector, NSA	1	Bank of Italy
New Bad Loans Entry Rate for Non Financial Sector, NSA	1	Bank of Italy
TRADE		
Exports of Goods and Services, Billions, SA	2	FRED database
Imports of Goods and Services Billions, SA	2	FRED database
National Currency to US Dollar Exchange Rate: Average of Daily Rates, NSA	2	FRED database
Net Trade: Value Goods, National Currency, SA	1	FRED database
Real Effective Exchange Rates Based on Manufacturing Consumer Price Index, Index 2010=1, NSA	2	FRED database
Value of Total Retail Trade sales, Index 2010=1, SA	2	FRED database
Volume of Total Retail Trade sales, Index 2010=1, SA	2	FRED database
MISCELLANEOUS		
Value added of Non Financial Sector	2	Bank of Italy
Gross Fixed Capital Formation, Billions, SA	2	FRED database
Real Residential Property Prices, Index 2010=100, NSA	2	FRED database
Total Cost of Residential Construction, Index 2010=1, NSA	2	FRED database
Value of Total Orders for Manufacturing, Index 2010=1, SA	2	FRED database
REAL PRODUCTION		
Production in Total Manufacturing, Index 2010=100, SA	2	FRED database
Production of Total Construction, Index 2010=100, SA	2	FRED database
Production of Total Industry, Index 2010=100, SA	2	FRED database
Total Energy Production, Index 2010=1, SA	2	FRED database
Total Production of Consumer Goods for Manufacturing Index 2010=1, SA	2	FRED database
Total Production of Intermediate Goods for Manufacturing Index 2010=1, SA	2	FRED database
Total Production of Investment Goods for Manufacturing Index 2010=1, SA	2	FRED database
GDP		
GDP Implicit Price Deflator, Index 2010=100, SA	2	FRED database
Gross Domestic Product by Expenditure in Constant Prices: Exports of Goods and Services, Index 2010=1, SA	2	FRED database
Gross Domestic Product by Expenditure in Constant Prices: Government Final Consumption Expenditure, Index 2010=1, SA	2	FRED database
Gross Domestic Product by Expenditure in Constant Prices: Gross Fixed Capital Formation, Index 2010=1, SA	2	FRED database
Gross Domestic Product by Expenditure in Constant Prices: Less: Imports of Goods and Services, Index 2010=1, SA	2	FRED database
Gross Domestic Product by Expenditure in Constant Prices: Private Final Consumption Expenditure Index 2010=1, SA	2	FRED database
Gross Domestic Product by Expenditure in Constant Prices:	2	FRED database

	Transf.	Data Source
LABOUR MARKET		
Compensation of Employees, Millions, SA	2	FRED database
Early Estimate of Quarterly ULC Indicators: Total Labor Compensation per Unit of Labor Input, Index 2010=1, SA	2	FRED database
Hourly Wage Rate: Industry, Index 2010=1, SA	2	FRED database
Unemployment Rate: Aged 15-24: All Persons, Percent, SA	1	FRED database
Unemployment Rate: Aged 15-64: All Persons, Percent, SA	1	FRED database
Unemployment Rate: Aged 15-74: All Persons, Percent, SA	1	FRED database
Unemployment Rate: Aged 25-54: All Persons, Percent, SA	1	FRED database
Unemployment Rate: Aged 55-64: All Persons, Percent, SA	1	FRED database
Working Age Population: Aged 15-64: All Persons, Persons, SA	2	FRED database
CREDIT MISCELLANEA		
Credit to Private Non-Financial Sector by Domestic Banks Adjusted for Breaks, Billions, NAS	2	FRED database
Total Credit to Households and Non-Profit Institutions Serving Households, Adjusted for Breaks, Billions NAS	2	FRED database
CONSUMPTION EXPENDITURE AND SALES		
Government Final Consumption Expenditure, Billions, SA	2	FRED database
Private Final Consumption Expenditure Implicit Price Deflator, Index 2005=100, SA	2	FRED database
Private Final Consumption Expenditure, Billions, SA	2	FRED database
Sales Value of Manufactured Intermediate Goods, Index 2010=1 SA	2	FRED database
Sales Value of Manufactured Investment Goods, Index 2010=1, SA	2	FRED database
Sales Value of Total Manufactured Consumer Goods, Index 2010=1, SA	2	FRED database
Sales Value of Total Manufactured Goods, Index 2010=1, SA	2	FRED database
CONSUMER PRICE INDEX (Harmonized)		
Harmonized Index of Consumer Prices: Food, Index 2015=100, NSA	3	FRED database
Harmonized Index of Consumer Prices: Energy, Index 2015=100, NSA	3	FRED database
Harmonized Index of Consumer Prices: Non-Energy Industrial Goods Non-Durables, Index 2015=100, NSA	3	FRED database
Harmonized Index of Consumer Prices: Non-Energy Industrial Goods Semi-Durables, Index 2015=100, NSA	3	FRED database
Harmonized Index of Consumer Prices: Non-Energy Industrial Goods Durables, Index 2015=100, NSA	3	FRED database
Harmonized Index of Consumer Prices: Actual Rentals for Housing Index 2015=100, NSA	3	FRED database
Harmonized Index of Consumer Prices: Services Related to Communication, Index 2015=100 Monthly, NSA Adjusted	3	FRED database
Harmonized Index of Consumer Prices: Transport Index 2015=100, Monthly, NSA	3	FRED database
Harmonized Index of Consumer Prices: Industrial Goods Index 2015=100, Monthly, NSA	3	FRED database
Harmonized Index of Consumer Prices: Services Index 2015=100, Monthly, NSA	3	FRED database
Consumer Price Index: Harmonized Prices: Total All Items Index 2010=100, NSA	3	FRED database
Consumer Price Index: All Items Excluding Food and Energy Index 2010=100, NSA	3	FRED database

	Transf.	Data Source
PRODUCER PRICE INDEX		
Domestic Producer Prices Index: Manufacturing Index 2010=100, NSA	3	FRED database
Producer Prices Index: Domestic Consumer Goods Index 2010=1, NSA	3	FRED database
Producer Prices Index: Domestic Durable Consumer Goods Index 2010=1, NSA	3	FRED database
Producer Prices Index: Domestic Intermediate Goods Index 2010=1, NSA	3	FRED database
Producer Prices Index: Domestic Nondurable Consumer Goods Index 2010=1, NSA	3	FRED database
Producer Prices Index: Economic Activities: Domestic Energy Index 2010=1, NSA	3	FRED database
Producer Prices Index: Economic Activities: Domestic Industrial Activities Index 2010=1, NSA	3	FRED database
Producer Prices Index: Economic Activities: Domestic Manufacture of Food Products Index 2010=1, NSA	3	FRED database
Producer Prices Index: Economic Activities: Domestic Mining and Quarrying Activities Index 2010=1, NSA	3	FRED database
Producer Prices Index: Domestic Investments Goods Index 2015=100, NSA	3	FRED database
BUSINESS TENDENCY SURVEYS		
BTS - Construction, Confidence Indicator, Net percent, SA	5	FRED database
BTS - Construction, Employment Future Tendenencies, Net percent, SA	5	FRED database
BTS - Construction, Selling Prices, Net percent, SA	5	FRED database
BTS - Manufacturing, Confidence Interval, Net percent, SA	5	FRED database
BTS - Manifacturing, Employment Future Tendenencies, Net percent, SA	5	FRED database
BTS - Manifacturing, Finished Good Stocks, Net percent, SA	5	FRED database
BTS - Manifacturing, Order Books, Net percent, SA	5	FRED database
BTS - Manifacturing, Production, Net percent, SA	5	FRED database
BTS - Manifacturing, Selling Prices, Net percent, SA	5	FRED database
BTS - Services, Confidence Indicator, Net percent, SA	5	FRED database
BTS - Services, Demand Evolution, Net percent, SA	5	FRED database
BTS - Services, Employment Future Tendenencies, Net percent, SA	5	FRED database
COS - Confidence Indicator, Net percent, SA	5	FRED database
Economic Policy Uncertainty Index for Italy, index, NSA	5	FRED database
BTS - Manufacturing, Orders Inflow Tendency: net percent, SA	5	FRED database
INTEREST RATES AND FINANCIAL VARIABLES		
Real Interest Rate for Non Financial Sector	5	Bank of Italy
Interest Rate for Non Financial Sector NFS	5	Bank of Italy
Interest Rate for Households	5	Bank of Italy
3-Month or 90-day Rates and Yields: Interbank Rates, Percent, NSA	5	FRED database
Change in Stocks, Billions, SA	5	FRED database
Long-Term Government Bond Yields: 10-year Main (Including Benchmark) Percent, NSA	5	FRED database
Interest Rates, Government Securities, Treasury Bills, percent, NSA	5	FRED database
Interest Rates, Government Securities, Government Bonds, percent, NSA	5	FRED database