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2016

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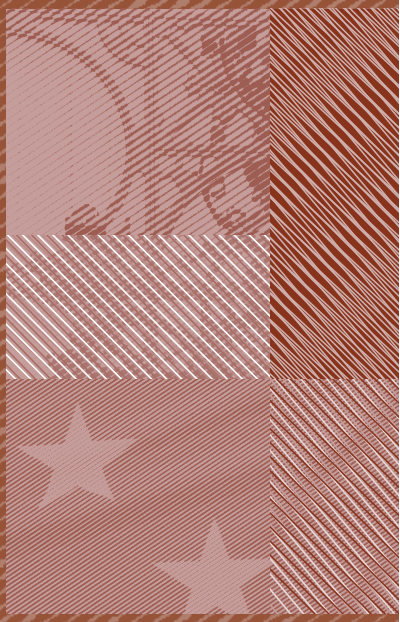

Documentos de Trabajo
N.º 1618

BANCO DE ESPAÑA
Eurosistema

Electronic copy available at: http://ssrn.com/abstract=2836430

FISCAL MULTIPLIERS ACROSS THE CREDIT CYCLE (*)

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(*) I would like to thank Máximo Camacho, Matteo Ciccarelli, María Dolores Guilló, Francesco Turino, and seminar participants at the Banco de España, STATEC, ASSET 2015, SAEe 2015, and RES 2016 for their valuable comments and suggestions. Furthermore, I am grateful to Yuriy Gorodnichenko for kindly sharing the data on government spending forecast errors. This paper was partly written while visiting the Associate Directorate General Economics and Research and the Associate Directorate General International Affairs of the Banco de España. The views expressed in this paper are those of the author and do not necessarily reflect the views of the Banco de España. All remaining errors are my own.
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Documentos de Trabajo. N.º 1618

2016

ISSN: 1579-8666 (on line)

Abstract

This paper studies the differences between fiscal multipliers in OECD economies across the credit cycle. Impulse responses are obtained using a state-dependent model with direct projections, in which multipliers depend on the state of credit markets. Identification of the effects of fiscal stimulus and austerity measures is achieved by distinguishing between unanticipated increases and decreases in government spending. The empirical results imply that the financial environment matters. Expansionary fiscal policies are associated with large multipliers during credit crunch episodes, and spending increases likewise foster economic growth in periods of rapid credit expansion, albeit to a lesser extent. In contrast, the output effect of contractionary fiscal policies is never statistically different from zero. Regime-specific multipliers of the individual components of GDP and the unemployment rate suggest that reductions in public expenditure should help constrain the economy during unsustainable credit booms, whereas spending increases in financial recessions should facilitate the repair of private sector balance sheets in order to revive market confidence and boost economic recovery.

Keywords: credit cycle, fiscal multiplier, fiscal policy, government spending, state dependence.

JEL classification: E20, E44, E62, G10.

Resumen

Este trabajo estudia las diferencias entre los multiplicadores fiscales a lo largo del ciclo de crédito en las economías de la OCDE. Se obtienen respuestas al impulso mediante un modelo estado dependiente con proyecciones directas, en el que los multiplicadores dependen del estado de los mercados de crédito. La identificación de los efectos de las medidas de estímulo y de austeridad fiscal se logra mediante la distinción entre los incrementos y las disminuciones no anticipados en el gasto público. Los resultados empíricos destacan la importancia del entorno financiero. Las políticas fiscales expansivas están asociadas con grandes multiplicadores durante los episodios de crisis crediticias y, además, un aumento del gasto también fomenta el crecimiento económico en los períodos de expansiones rápidas de crédito, aunque en menor medida. Por el contrario, el efecto de las políticas fiscales contractivas en la producción no es nunca estadísticamente distinto de cero. Los multiplicadores para cada componente del PIB y la tasa de desempleo implican que las reducciones en el gasto público deben ayudar a restringir la economía durante los auges de crédito excesivos, mientras que el aumento de los gastos en las recesiones financieras debería facilitar la reparación de los balances del sector privado con el fin de reactivar la confianza del mercado e impulsar la recuperación económica.

Palabras clave: ciclo de crédito, multiplicador fiscal, política fiscal, gasto público, dependencia de estado.

Códigos JEL: E20, E44, E62, G10.

1 Introduction

Credit cycles are remarkable for two reasons. On the one hand, episodes of excessive private borrowing may lead to vulnerabilities in the financial system through looser lending standards, increased leverage, and systemic risks, which are often followed by severe economic downturns (Mendoza and Terrones, 2012; Schularick and Taylor, 2012). On the other, economic crises associated with credit crunches tend to be deeper and more prolonged than normal recessions (Reinhart and Rogoff, 2009; Claessens, Kose, and Terrones, 2009; Jordà, Schularick, and Taylor, 2013). In addition, empirical evidence suggests that credit cycles have much lower frequency and greater amplitude than the traditional business cycles (Aikman, Haldane, and Nelson, 2015). Interestingly, however, these salient features observed in industrialized economies for over a century now (Kindleberger, 1978; Schularick and Taylor, 2012) have been largely ignored until the global financial crisis of 2007-2008. Since then, a rich set of works have documented the role of finance in shaping macroeconomic dynamics (e.g., Brunnermeier, Eisenbach, and Sannikov, 2012; Christiano, Motto, and Rostagno, 2014, and references therein), which poses new challenges for policymakers going forward.[1]

A variety of measures have been proposed in recent years to deal with unhealthy credit booms and subsequent busts, such as more active monetary policy interventions and macroprudential policy instruments (see, for instance, Adrian and Shin, 2009; Mishkin, 2009; Bank of England, 2011; Gertler and Karadi, 2011; Borio and Zhu, 2012). Besides, given that the conventional monetary policies are typically ineffective in liquidity traps with interest rates at or near zero, fiscal tools have gained increasing attention in the aftermath of the latest economic crisis.[2] Nonetheless, despite the burgeoning of studies that assess the impact of fiscal policies, the effectiveness of government interventions in addressing financial imbalances is still subject of much debate (e.g., Corsetti, Kuester,

[1] For a detailed discussion of the role and implications of the financial cycle for macroeconomics, see Borio (2014). From the methodological standpoint, however, a recent article by Gadea Rivas and Perez-Quiros (2015) emphasizes the limitations of credit in the identification of the economic cycle.

[2] Several studies have looked at the quantitative effects of fiscal policies in liquidity traps and find that government spending multipliers can be substantially large when the zero lower bound on the nominal interest rate binds (e.g., Woodford, 2011; Christiano, Eichenbaum, and Rebelo, 2011; Eggertsson and Krugman, 2012). Against this view, Mertens and Ravn (2014) argue that a government spending stimulus is relatively ineffective when a liquidity trap is caused by a self-fulfilling state of low consumer confidence.

Meier, and Müller, 2010; Mishkin, 2011; Kollmann, Roeger, and in't Veld, 2012; DeLong and Summers, 2012; Blanchard and Leigh, 2013). In fact, contrasting viewpoints about the magnitude of fiscal multipliers ever since the seminal work of Keynes (1936) emphasize the sensitivity of predictions, owing particularly to the differences in economic conditions regarding the level of development, exchange rate regime, trade openness, or public indebtedness, for instance (see, e.g., Corsetti, Meier, and Müller, 2012; Ilzetzki, Mendoza, and Vegh, 2013; Nickel and Tudyka, 2014).[3] In addition, Galí, López-Salido, and Vallés (2007) and Aghion, Hémous, and Kharroubi (2014) show that the expansionary effects of positive fiscal shocks increase with the share of liquidity-constrained households and industries in the economy. There is thus reason to believe that the size of fiscal multipliers depends critically on the state of credit markets, and failure to recognize that may undermine the power of public policy decisions.

Against this background, the purpose of this paper is to offer important implications for the design of optimal fiscal policies, by analyzing the macroeconomic effects of changes in government spending across the credit cycle. In this regard, the paper also contributes to a growing literature that employs non-linear models to study the impact of fiscal policy in economic expansions and recessions, including Bachmann and Sims (2012), Auerbach and Gorodnichenko (2012), Auerbach and Gorodnichenko (2013), Candelon and Lieb (2013), Owyang, Ramey, and Zubairy (2013), and Riera-Crichton, Vegh, and Vuletin (2015).

Based on the conjecture that the effect of government spending varies according to the financial environment, state-dependent impulse responses are calculated for a panel of OECD countries using the local projections method advocated by Jordà (2005), where the size of the multiplier depends on the credit regime, being expansionary or contractionary. Specifically, fiscal multipliers are evaluated under the most extreme financial conditions, that is, during episodes of rapid credit booms and severe credit crunches. Unanticipated innovations in public expenditure are identified using forecast errors of the OECD government spending projections. Moreover, by distinguishing between positive and negative shocks – i.e., increases and decreases in government spending –, the non-linear approach

[3] Existing studies provide a a range of estimates of the government spending multiplier from less than 0 to well over 3, depending on the identifying assumptions and the state of the economy, among other factors. For critical surveys of the literature on fiscal multipliers, see Hall (2009) and Ramey (2011a).

enables to gauge the economies' true response to procyclical and countercyclical fiscal behavior in different credit regimes.[4] Finally, the exploration of the responses of the different components of GDP and the unemployment rate sheds further light on the strength of fiscal policies in curbing the adverse effects of the credit cycle, and the channels through which they propagate to the real economy. Insights into the underlying transmission mechanisms should help frame fiscal policy decisions in order to tame the overheating in the economy during excessive credit booms, and reverse the downward spiral of aggregate demand when the bust comes.

The findings of the empirical analysis establish the importance of the state of credit markets in predicting the extent to which fiscal intervention can be effective in industrialized economies. Three main results emerge. First, regime-specific impulse responses display a strong and statistically significant reaction of real GDP to fiscal policy shocks on average during episodes of severe credit contractions. On the contrary, when credit growth is excessive, the mean response of output to a change in government spending is close to zero, and not significant in statistical terms. Second, distinguishing between increases and decreases in public expenditure reveals that countercyclical fiscal stance is desirable both when credit markets are dysfunctional, and when there is a surge in private borrowing. In fact, fiscal austerity measures have essentially no impact on real GDP across the credit cycle. However, even though positive government spending shocks could stimulate the economy in periods of large credit expansions, consolidation during the boom years can help create fiscal space to stabilize the financial sector and boost economic recovery when credit markets collapse. Therefore, commitment to fiscal discipline in the expansionary regime can facilitate macroeconomic stability in the long run at a relatively low cost. Third, multipliers of private consumption, net exports, unemployment, and the weak response of private investment during credit crunches in particular suggest that fiscal policies could be more efficient if government spending would be targeted directly to repair and strengthen the private balance sheets. Fixing the financial system by reestablishing the flow of credit to the economy would in turn revive market confidence, crowd in more private investment, and restore economic growth. The contractionary fiscal

[4] Throughout the analysis, procyclical (countercyclical) fiscal policy refers to changes in government spending that are positively (negatively) correlated with the state of the credit cycle.

policy measures and subsequent stagnation observed in Europe following the latest financial crisis lend further support to these findings, indicating that austerity in financially depressed economies is less of a cure than previously thought.

The remainder of the paper proceeds as follows. Section 2 offers a brief description of the data and describes the methodology. Section 3 presents the empirical results. Section 4 considers the broader implications of the main findings, and finally concludes.

2 Data and methodology

2.1 Data

The study makes use of a comprehensive dataset including 24 OECD economies over the period 1985-2012.[5] Data for real GDP, real government spending, real private consumption, real private investment, real net exports, consumer price index, and the unemployment rate come from the OECD's Statistics and Projections database. In line with the related literature, government spending refers to the sum of public consumption expenditure and government gross capital formation. Fiscal policy shocks are identified using government spending forecast errors constructed by Auerbach and Gorodnichenko (2013).[6] Specifically, unanticipated changes in public spending are computed as the difference between actual, first-release series of the government spending growth rate and the forecast series prepared by professional OECD forecasters. This novel approach using government spending forecast errors provides a preferable alternative to the standard VAR shocks, which – as argued in Ramey (2011b) and Auerbach and Gorodnichenko (2013) – are predicted by professional forecasters to a significant degree.[7] Since the OECD's forecasts are available only in June and December of each year, all data have been converted to semiannual frequency. Series of credit to the non-financial private sector by domestic banks is obtained from the Bank of International Settlements (BIS) database.

[5] Data are consistently available for 24 out of the 35 OECD member states. These countries are Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, the United Kingdom, and the United States.

[6] The sample for government spending forecast errors ends in 2008.

[7] For a thorough discussion on the conveniences of employing forecast errors based on OECD projections, see Auerbach and Gorodnichenko (2013).

Private credit is deflated by the consumer price index, and all variables except for the unemployment rate are in logs.

2.2 Methodological framework

Following Auerbach and Gorodnichenko (2013), regime-specific impulse response functions are estimated with the local projections method introduced by Jordà (2005). The main advantage of using direct projections is that it conveniently accommodates state dependence without imposing any dynamic restrictions implicitly embedded in VARs, for instance. Since it does not constrain the shape of the impulse responses, the estimation is more robust to misspecification errors. This single-equation approach only requires the estimation of a collection of regressions for each horizon and variable of interest. In particular, impulse response functions are obtained here by directly projecting output, private consumption, private investment, net exports, or the unemployment rate on its lags and on the lags of government spending. Potential heteroskedasticity and error correlation problems across countries and time are addressed by using White-robust standard errors. As discussed in Ramey (2012), despite the advantages of estimating non-linear multipliers using local projections, the Jordà method tends to induce statistically significant oscillations at larger horizons. Even so, impulse responses are computed for only 6 horizons, i.e., three years, throughout the paper, therefore the estimation results are not likely to be affected by this methodological concern.

The baseline specification to calculate non-linear government spending multipliers for GDP ($Y_{i,t}$) – or any other macroeconomic variable – at the horizon h is given by the following fixed effects panel data model:

$$\begin{aligned} Y_{i,t+h} = \alpha_{i,h} &+ I(\theta_{i,t-1})\beta_{C,h}FE^G_{i,t} + (1 - I(\theta_{i,t-1}))\beta_{E,h}FE^G_{i,t} \\ &+ I(\theta_{i,t-1})\Psi_{C,h}(L)Y_{i,t-1} + (1 - I(\theta_{i,t-1}))\Psi_{E,h}(L)Y_{i,t-1} \\ &+ I(\theta_{i,t-1})\Omega_{C,h}(L)G_{i,t-1} + (1 - I(\theta_{i,t-1}))\Omega_{E,h}(L)G_{i,t-1} + \epsilon_{i,t,h}, \end{aligned} \tag{1}$$

with

$$I(\theta_{i,t}) = \frac{e^{-\gamma\theta_{i,t}}}{1 + e^{-\gamma\theta_{i,t}}}, \quad \gamma > 0,$$

where the subscripts i and t index countries and time, α_i captures country fixed effects, $G_{i,t}$ refers to government spending, and $FE^G_{i,t}$ is the government spending forecast error based on the projections prepared by professional forecasters at time $t-1$ for period t. The treatment $FE^G_{i,t}$ may be understood as a series of unanticipated innovations in public expenditure, and the essential coefficients $\{\beta_{C,h}\}_{h=0}^{H}$ and $\{\beta_{E,h}\}_{h=0}^{H}$ measure the average response of output to a government spending shock during credit contractions and expansions, respectively.[8] Note that the dynamic impact of a shock is obtained from separate regressions for each horizon $h = 1, 2, ..., H$. Unlike in standard VAR models, the lag polynomials only enter as controls in Equation 1, and they are not used to compute the dynamics. $\Psi(L)$ and $\Omega(L)$ correspond to lag operator polynomials of order 4, to control for the history of government spending shocks. $I(\theta_{i,t})$ is a smooth transition function that varies between 0 and 1 depending on the credit regime of the economy, and can be interpreted as the probability of being in a credit contraction, given $\theta_{i,t}$. The variable $\theta_{i,t}$ measures the state of the credit cycle in country i at time t, based on the deviation of the 6-quarter moving average of the growth rate of private credit from its trend, normalized to have zero mean and unit variance.[9,10] The trend is extracted using the Hodrick and Prescott (1997) filter, with the smoothing parameter set to 10,000.[11] Consistent with Auerbach and Gorodnichenko (2012), a credit contraction is defined here as a period in which $I(\theta_{i,t})$ is greater than 0.8, and the curvature parameter γ is calibrated to match the average frequency of credit contractions observed in the sample.[12,13] Specifically, $\gamma = 1.7$ so that a typical OECD economy in the panel spends about 23% of the time in a contractionary regime. Throughout the analysis, government spending multipliers are estimated for the most severe credit crunches (i.e., $I(\cdot) \approx 1$) and largest credit booms (i.e., $1 - I(\cdot) \approx 1$).

[8] The corresponding linear multiplier can be easily obtained when the impulse responses in Equation 1 are restricted to be identical across the different states of the credit cycle, i.e., $\beta_{C,h} = \beta_{E,h}$ for all h.

[9] One-period lag of $\theta_{i,t}$ is considered to minimize the contemporaneous correlation between government spending shocks and the variation in private credit.

[10] While the results are largely robust to using the credit/GDP ratio to define the credit regime, considering the rate of real credit growth allows to capture the direct role of private credit flow as a source of financial instability.

[11] The very high smoothing parameter ensures that the filter removes even the lowest frequency variations in the private credit series (see Auerbach and Gorodnichenko (2013) for details).

[12] Auerbach and Gorodnichenko (2012) define economic recessions as periods in which $I(\cdot) > 0.8$.

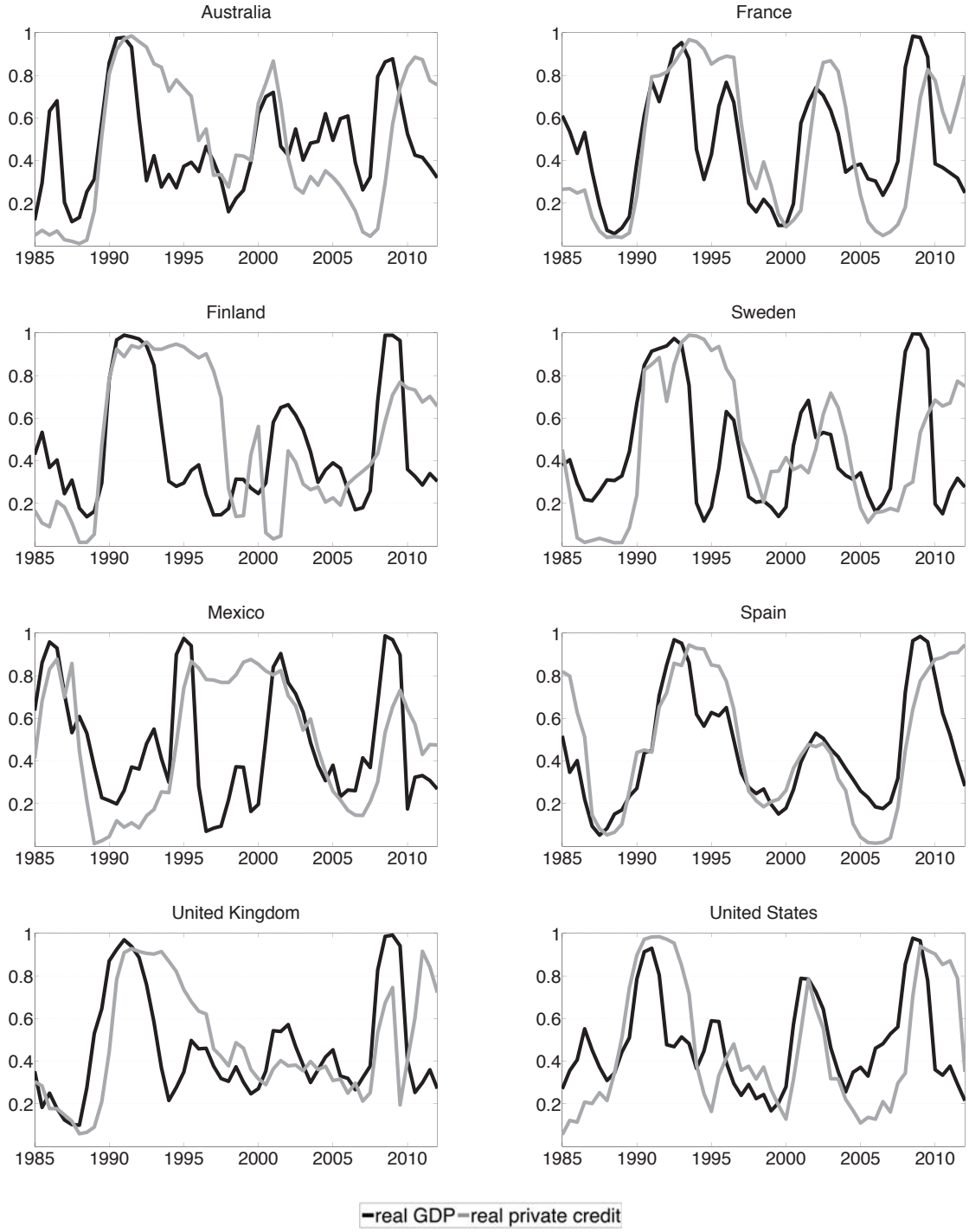
[13] The fraction of credit contractions in the sample is calculated by employing the Bry and Boschan (1971) dating algorithm, where the duration of a contractionary phase is given by the number of periods between a credit peak and the subsequent trough.

The key contribution of the paper to the emerging literature on non-linear government spending multipliers is to analyze how the macroeconomic effects of fiscal policies depend on the evolution of private credit. As argued before, focusing solely on the state of the business cycle may be misleading under extreme financial conditions. In support of this claim, the most recent crisis made it abundantly clear that business fluctuations cannot be looked at in isolation from developments in financial markets. In particular, financial frictions give rise to credit cycles distinct from the business cycle, characterized by lower frequency and larger amplitude (Aikman et al., 2015). Ignoring these differences can lead to erroneous policy responses, especially because policymakers tend to overlook that a credit cycle has a longer duration than a business cycle. In the context of financial downturns, Drehmann, Borio, and Tsatsaronis (2012) refer to this phenomenon as "unfinished recessions". Figure 1 shows for selected OECD countries that the smooth transition function in Equation 1 performs well in capturing the disparities between the cyclical dynamics of private credit and output. Note that the state of the business cycle is determined in a similar manner as for the credit cycle, with the weight given by the growth rate of real GDP.[14] Some of the most striking examples of "unfinished recessions" include the financial crisis in the Nordic countries (Finland and Sweden) in the early 1990s, the Savings and Loan crisis of the 1980s and 1990s in the U.S., the Mexican peso crisis that erupted in December 1994, and the most recent financial recession in Spain.

While the baseline specification takes account of the differences across regimes, Riera-Crichton et al. (2015) demonstrate that ignoring whether government spending is going up or down during economic recessions and expansions yields biased estimates of the fiscal multiplier. They show that the problem originates in the fact that output does not respond symmetrically to increases or decreases in government spending, when distinguishing between procyclical and countercyclical fiscal behavior. Regarding the sample considered, in as much as 50% of the cases government spending is procyclical, i.e., government spending is going up in credit booms and going down in credit busts. Thus, in order to avoid the introduction of potential bias, Equation 1 is modified to estimate

[14] As in Auerbach and Gorodnichenko (2013), $\gamma = 1.5$ is fixed so that a typical economy spends about 20% of the time in a recessionary regime, which is consistent with the duration of recessions in the U.S. identified by the NBER.

Figure 1: Transition dynamics across regimes of GDP growth and private credit growth



Note: The figures show the dynamics of smooth transition functions $I(\theta_{i,t})$ for selected OECD countries between 1985-2012. The weights on recession regimes and contraction regimes are given by the growth rates of real GDP (black lines) and real private credit (gray lines), respectively.

the effects of unanticipated increases ($FE_{i,t}^{G_{POS}} > 0$) and decreases ($FE_{i,t}^{G_{NEG}} < 0$) in government spending during credit contractions and expansions separately:

$$\begin{aligned} Y_{i,t+h} = \alpha_{i,h} &+ I(\theta_{i,t-1})\beta_{C,h}^{POS} FE_{i,t}^{G_{POS}} + (1 - I(\theta_{i,t-1}))\beta_{E,h}^{POS} FE_{i,t}^{G_{POS}} \\ &+ I(\theta_{i,t-1})\beta_{C,h}^{NEG} FE_{i,t}^{G_{NEG}} + (1 - I(\theta_{i,t-1}))\beta_{E,h}^{NEG} FE_{i,t}^{G_{NEG}} \\ &+ I(\theta_{i,t-1})\Psi_{C,h}^{POS}(L) Y_{i,t-1}^{POS} + (1 - I(\theta_{i,t-1}))\Psi_{E,h}^{POS}(L) Y_{i,t-1}^{POS} \\ &+ I(\theta_{i,t-1})\Psi_{C,h}^{NEG}(L) Y_{i,t-1}^{NEG} + (1 - I(\theta_{i,t-1}))\Psi_{E,h}^{NEG}(L) Y_{i,t-1}^{NEG} \\ &+ I(\theta_{i,t-1})\Omega_{C,h}^{POS}(L) G_{i,t-1}^{POS} + (1 - I(\theta_{i,t-1}))\Omega_{E,h}^{POS}(L) G_{i,t-1}^{POS} \\ &+ I(\theta_{i,t-1})\Omega_{C,h}^{NEG}(L) G_{i,t-1}^{NEG} + (1 - I(\theta_{i,t-1}))\Omega_{E,h}^{NEG}(L) G_{i,t-1}^{NEG} + \epsilon_{i,t,h}, \end{aligned} \tag{2}$$

where $Y_{i,t-1}^{POS} = Y_{i,t-1}$ and $G_{i,t-1}^{POS} = G_{i,t-1}$ if $FE_{i,t}^{G} = FE_{i,t}^{G_{POS}}$, and zero otherwise, and similarly, $Y_{i,t-1}^{NEG} = Y_{i,t-1}$ and $G_{i,t-1}^{NEG} = G_{i,t-1}$ if $FE_{i,t}^{G} = FE_{i,t}^{G_{NEG}}$, and zero otherwise.

3 Estimation results

This section first presents impulse responses of real GDP to a 1 percent change in government spending for each of the above model specifications.[15] In what follows, responses are estimated for the major components of output as well as for the unemployment rate, to get a grasp of the potential mechanisms in different credit regimes that could explain the results. The responses are scaled to ensure that a shock in $FE_{i,t}^{G}$ changes government spending by unity. In addition, 90 percent confidence bands associated with the impulse response functions are computed using the standard errors of the estimated coefficients of interest.[16]

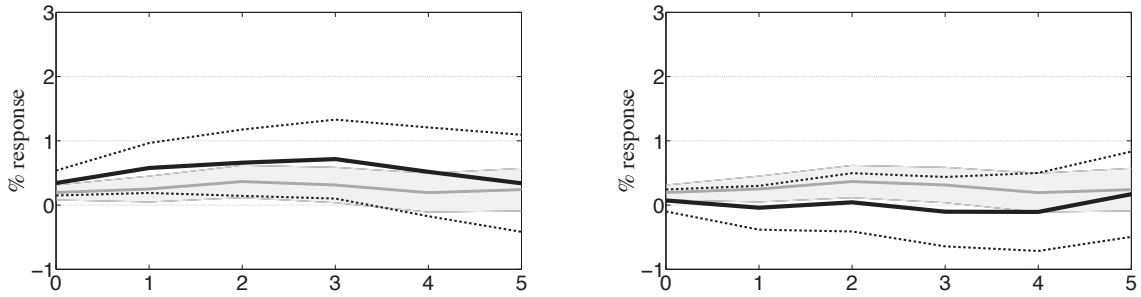
3.1 Fiscal multipliers in credit contractions and expansions

Based on Equation 1, the cumulated response of output is computed for 3 years following an unanticipated 1 percent government spending shock during credit crunches and credit booms (Figure 2). The first result that emerges is that the response of real GDP in severe

[15] Results are robust to the inclusion of year fixed effects, not reported here to save space.

[16] Distinguishing between unanticipated increases and decreases in government spending during credit expansions and contractions yields a comparatively small number of observations, therefore, 80 percent confidence intervals are considered along the impulse responses when using Specification 2.

Figure 2: Fiscal multipliers in credit contractions and expansions: **real GDP**



(a) Contraction (b) Expansion

Note: Thick black lines represent the average cumulated response of real GDP to a government spending shock in (a) credit contractions and (b) credit expansions. Thin gray lines indicate the estimates of the linear multiplier. Shaded regions and dashed lines correspond to the 90% confidence bands of the impulse response functions for the linear and non-linear specifications, respectively. Horizons are considered at the semiannual frequency.

credit contractions is positive on impact, and statistically significant for the next 3 periods, whereas the response in strong credit expansions is not significantly different from zero at any horizon considered. Following Auerbach and Gorodnichenko (2013), percentage changes are converted into dollar changes by multiplying the estimated impulse responses by the sample-period U.S. mean ratio of GDP to government purchases (≈ 5.12). The resulting fiscal multiplier in contractionary regimes reaches a maximum of 3.67 after 4 semesters, and the mean response over three years is about 2.69. In sharp contrast, the average multiplier in credit expansions is only 0.03, and never statistically significant.

Both subfigures in Figure 2 additionally report the impulse responses obtained from the linear specification of the baseline model, i.e., by ignoring the distinction between credit contractions and expansions. The average linear multiplier over three years is slightly above one – when using the ratio of real GDP to government spending in the U.S. as before –, but responses are significant only in the first two years. For the next two periods, responses remain positive, but not significant in statistical terms. This is consistent with the previous literature on single government spending multipliers, exemplified by the work of Blanchard and Perotti (2002). Nonetheless, since OECD economies spend on average about 77% of the time in an expansionary regime and 23% of the time in contractions, the estimates of the linear model are likely to be driven by the muted effect of fiscal shocks in credit booms, substantially understating the impact in contractions, yet, overestimating

it in expansions. Therefore, it is crucial to differentiate between the states of the credit cycle in order to identify the true size of the corresponding government spending multiplier instead of evaluating the average effect across different regimes.

It is difficult to situate the results reported here amidst the long-running public policy debate on spending multipliers due to the lack of empirical attempts using panel estimation techniques to study the effects of fiscal shocks over the credit cycle. Nevertheless, the current work is still comparable to a handful of articles that estimate non-linear fiscal multipliers under special financial conditions. For instance, Ferraresi, Roventini, and Fagiolo (2015) employ a threshold vector autoregression (TVAR) model using the BAA spread as a proxy for credit market conditions in the U.S., and show that fiscal multipliers are significantly larger in the tight credit regime. Specifically, they find that the multiplier is 2.26 on impact, reaching 4.16 after five quarters, whereas the spending multiplier in the normal credit regime is never greater than one. In line with Ferraresi et al. (2015), a novel study on the Spanish economy by Hernández de Cos and Moral-Benito (2016) estimates fiscal multipliers to be markedly greater during banking stress episodes. They consider a smooth transition vector autoregression (STVAR) approach as in Auerbach and Gorodnichenko (2012) to identify the impact of spending shocks during periods of banking stress versus tranquil times, and report a peak multiplier of 2.27 under the credit stress regime and responses below one in normal episodes. On a related theme, Corsetti et al. (2012) find for a panel of OECD countries that output rises about twice as much as the initial increase in government spending in times of financial crises. In addition, using nearly identical data, two recent papers on state-dependent multipliers based on local projections and fiscal shocks identified by government spending forecast errors obtain significantly stronger responses during economic downturns. Auerbach and Gorodnichenko (2013) find that the average spending multiplier over three years is about 2.3 in recessions and is not significantly different from zero in expansions. Similarly, Riera-Crichton et al. (2015) conclude that the long-run multiplier reaches 2.08 in extreme recessions and is close to zero during large economic booms. Qualitatively speaking, a general picture that emerges from the non-linear effects of government spending shocks is that fiscal multipliers tend to be much greater in 'bad times' than in 'good times', irrespective of how the

dichotomies, i..e, expansions and contractions, are defined.[17]

The findings of this subsection pose new challenges to policymakers. It seems that the fiscal policies' effectiveness depends largely on the credit regime. Moreover, while there exist considerable differences between business cycle fluctuations and the cyclical dynamics of private credit (see Figure 1), the size of fiscal multipliers in severe credit crunches and rapid credit booms are highly comparable to those obtained for periods of deep economic recessions and large expansions. This calls for significant adjustments to macroeconomic policies, by incorporating the empirical realities of the credit cycle.

3.2 State-dependent multipliers when government spending increases and decreases

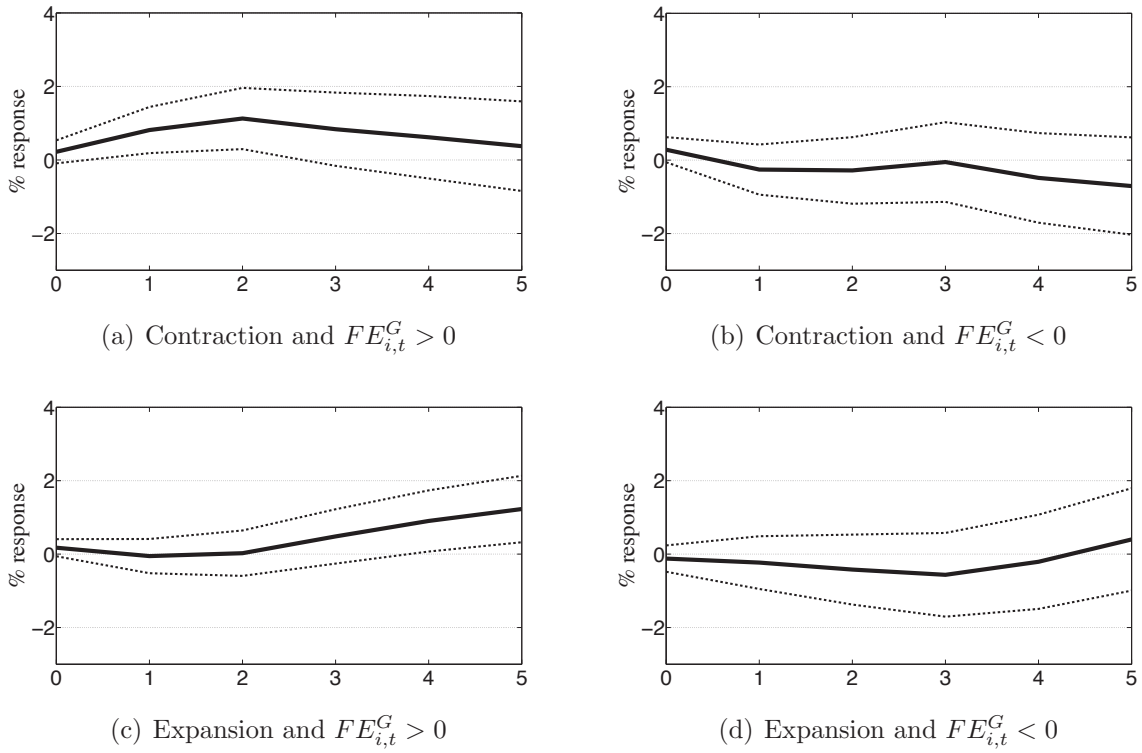
There has been no distinction made between fiscal stimuli and fiscal adjustments up to this point, thus, asymmetric responses to increases and decreases in government spending are explored next. To this end, fiscal multipliers are estimated using Specification 2, where positive and negative values of the forecast error indicate whether government spending goes up ($FE^G_{i,t} > 0$) or down ($FE^G_{i,t} < 0$) during credit contractions and expansions. As forecast errors are positive about 49% of the time and negative 51% of the time in the sample, interacting this new dimension with the state of the credit cycle yields fairly robust and comparable estimates. In addition, distinguishing between the resulting scenarios enables to evaluate the size of procyclical (contraction and $FE^G_{i,t} < 0$, or expansion and $FE^G_{i,t} > 0$) versus countercyclical (contraction and $FE^G_{i,t} > 0$, or expansion and $FE^G_{i,t} < 0$) fiscal multipliers for the sample of OECD economies.[18]

Cumulative government spending responses for each of the four possible cases are illustrated in Figure 3. By comparing the estimates to the ones obtained in Section 3.1, several differences become apparent. Most importantly, averaging across public spending in credit contractions produces a large downward bias in the estimated response to

[17] Owyang et al. (2013) is an important exception that investigates this proposition using historical data for the United States and Canada. They find no evidence that multipliers are higher during periods of slack in the United States, whereas in Canada multipliers are substantially higher during times of slack in the economy.

[18] Positive (negative) values of the point estimates of the impulse responses following an unanticipated decrease in government spending ($FE^G_{i,t} < 0$) correspond to a decrease (increase) in the dependent variable.

Figure 3: Fiscal multipliers in credit contractions and expansions, associated with increases and decreases in government spending: **real GDP**



(a) Contraction and $FE^G_{i,t} > 0$

(b) Contraction and $FE^G_{i,t} < 0$

(c) Expansion and $FE^G_{i,t} > 0$

(d) Expansion and $FE^G_{i,t} < 0$

Note: Solid black lines represent the average cumulated response of real GDP to a government spending shock ($FE^G_{i,t}$) in the following cases: (a) credit contraction and increase in government spending, (b) credit contraction and decrease in government spending, (c) credit expansion and increase in government spending, (d) credit expansion and decrease in government spending. Dashed lines correspond to 80% confidence bands. Horizons are considered at the semiannual frequency.

a countercyclical fiscal policy. The true size of the multiplier associated with contractions following an unanticipated 1 dollar increase in government spending is about 3.41 over three years, and reaches a peak of 5.77 after three semesters (Figure 3/(a)).[19] On average, this is about 30% greater than the magnitude of the response when ignoring whether government spending increases or decreases during a contractionary episode (see Figure 2/(a)). In contrast, Figure 3/(b) shows that the procyclical spending multiplier associated with credit crunches is remarkably different. The contemporaneous response of output to a decrease in government spending is about 1.45 and marginally significant, but the responses turn negative, although not statistically different from zero in all subse-

[19] Note that this exceptionally large fiscal multiplier applies to very severe credit contractions, such as the ones experienced in many OECD countries during the recent global financial crisis. Consistent with related studies, the focus of the paper is to evaluate the size of government spending multipliers under the most extreme conditions, that is, under deep credit crunches and very large credit expansions.

quent periods. In sum, these estimates imply that by distinguishing between increases and reductions in government spending in times when credit markets are exceedingly tight, a countercyclical fiscal policy would substantially boost economic performance, whereas austerity packages would have virtually no impact on real GDP.

The output effects of government spending shocks in credit booms are not as unambiguous. Recall that the size of the multiplier in expansions following an unanticipated change in government spending is close to zero – and even negative at some horizons –, and not statistically significant (see Figure 2/(b)). It appears that this is not always the case, when taking account of the differential impact of fiscal stimuli and fiscal adjustments. In fact, the response to a procyclical fiscal stance is positive, and borderline significant on impact, and it does breach statistical significance after two years (Figure 3/(c)). The three-year average multiplier is about 2.35. The response of output in the expansionary regime to a countercyclical fiscal policy is relatively weaker (see Figure 3/(d)). The impact multiplier is -0.62, and the response is nearly -1 on average over three years, but generally one cannot reject the null that the response is zero for any horizon. Hence, when not considering the statistically non-significance observed for most of the estimates associated with credit expansions, it seems that irrespective of the fiscal stance, a change in government spending could potentially stimulate output. In other words, during large run-ups in private credit markets, a one-dollar spending cut as well as a dollar increase would raise output in the next three years, by about 1 dollar and 2.35 dollars on average, respectively. Given that excessive private borrowing often leads to financial and economic dislocations, however, a countercyclical fiscal behavior may be more rewarding in the long run, as it would both help constrain the boom and improve the fiscal space by reducing the debt-to-GDP ratio.

The empirical findings presented so far suggest that policymakers should focus on building up buffers during large credit expansions and make use of them in times of severe credit crunches to stabilize the economy. Nevertheless, the main results raise important questions about the underlying propagation mechanisms. Although a formal investigation of the potential transmission channels is beyond the scope of this paper, the following subsection aims to provide a better understanding of how fiscal shocks could affect economic activity across the credit cycle.

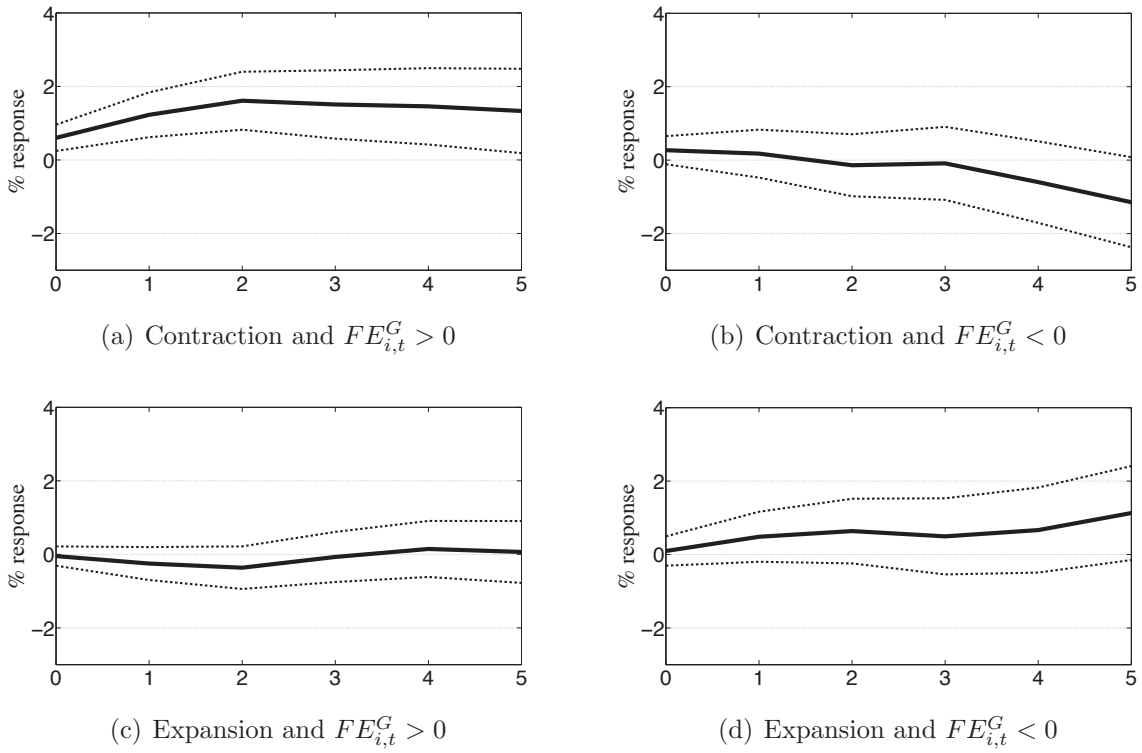
3.3 Disentangling the fiscal policy effects in credit contractions and expansions

It is now clear that the size of the fiscal multiplier differs according to the state of credit markets. In what follows, analyzing the behavior of the key components of aggregate output and unemployment helps to uncover some further insights on the empirical relationship between government spending shocks and the real economy. To this effect, Equation 2 is re-estimated using private consumption, private investment, net exports, and the unemployment rate as the dependent variable ($Y_{i,t}$). Figures 4 to 7 present the respective impulse responses to increases and decreases in public expenditure during severe credit contractions and large credit expansions.

The first thing to notice is that private consumption is the main channel through which an expansionary fiscal policy affects economic growth in times of financial distress (see Figure 3/(a) and Figure 4/(a)). When taking the ratio of private consumption to government purchases for the United States (≈ 3.5), the average size of the multiplier is about 4.52. This is evocative of the idea that during severe credit contractions liquidity constraints are binding, and therefore private consumption is more sensitive to positive income variations. For further insights on consumption multipliers when households are financially constrained, see, for instance, Galí et al. (2007). Figure 5/(a) reveals that the impact on private investment is much weaker. The contemporaneous response is close to zero, but it becomes positive and marginally significant at some horizons. The average multiplier over three years is about 1.10, and peaks at a maximum of 1.97 after 4 semesters when using the ratio of private investment to government spending in the United States (≈ 0.8). In addition, Figure 7/(a) shows that when credit dries up, a debt-financed expansionary fiscal policy proves to be successful in reducing unemployment, shrinking it by as much as 0.5 percent. Note, finally, that in line with conventional wisdom, the positive spending shock prompts real appreciation and thus deteriorates the trade balance significantly (Figure 6/(a)).

Recall that the spending multipliers are evaluated here under very tight financial conditions, typically accompanied by deep economic recessions. The estimated responses corresponding to such extreme events thereby indicate that fiscal expansion can be a

Figure 4: Fiscal multipliers in credit contractions and expansions, associated with increases and decreases in government spending: **Private consumption**



(a) Contraction and $FE^G_{i,t} > 0$

(b) Contraction and $FE^G_{i,t} < 0$

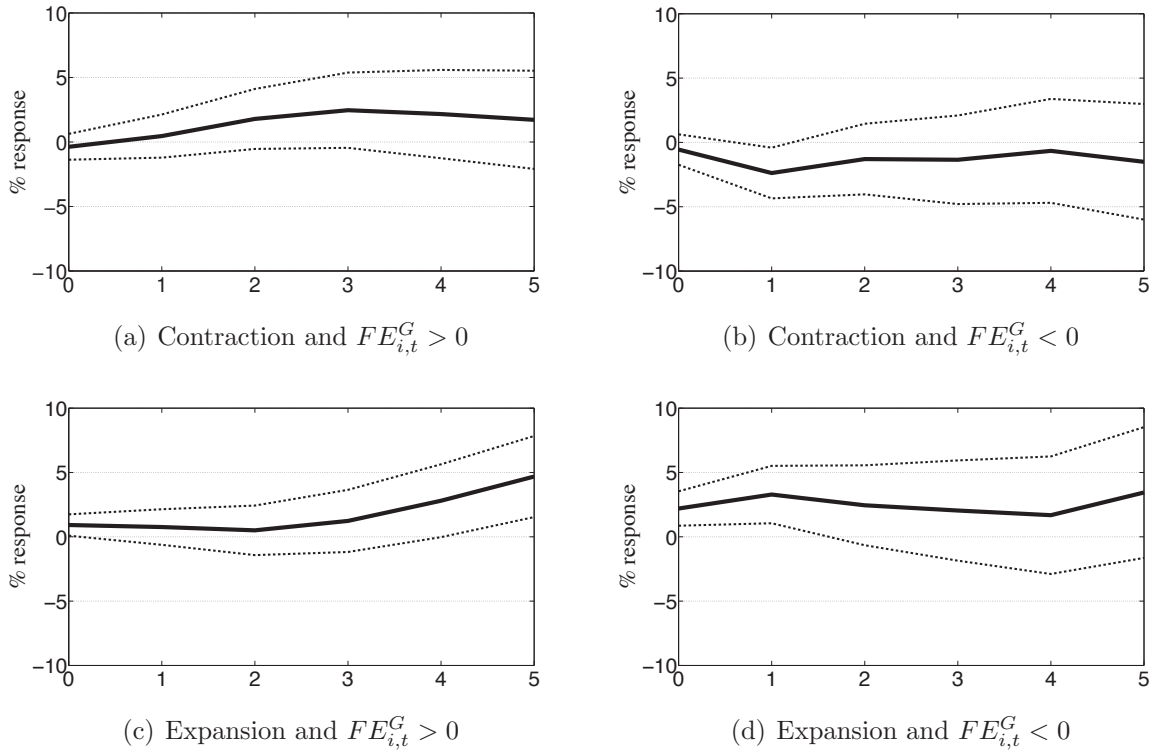
(c) Expansion and $FE^G_{i,t} > 0$

(d) Expansion and $FE^G_{i,t} < 0$

Note: Solid black lines represent the average cumulated response of real private consumption to a government spending shock ($FE^G_{i,t}$) in the following cases: (a) credit contraction and increase in government spending, (b) credit contraction and decrease in government spending, (c) credit expansion and increase in government spending, (d) credit expansion and decrease in government spending. Dashed lines correspond to 80% confidence bands. Horizons are considered at the semiannual frequency.

powerful tool to stimulate output, as an increase in government expenditure crowds in private demand (private consumption in particular), moreover, it also contributes to job creation. The small and borderline significant effect observed for private investment can be explained by the binding liquidity constraints during severe credit downturns. When credit markets are extremely tight, given the shortfall of available financial resources, investor confidence and activity cannot be completely restored. It appears that debtors can simply not spend more if their creditors insist they cut back. As a comparison, Riera-Crichton et al. (2015) find evidence in a similar framework that a countercyclical fiscal policy during economic recessions triggers sizable and persistent increases in private investment. Thus, fiscal policy tends to be less effective in balance sheet recessions than in normal recessions, since heavily indebted agents are likely to prioritize the repayment

Figure 5: Fiscal multipliers in credit contractions and expansions, associated with increases and decreases in government spending: **Private investment**



(a) Contraction and $FE^G_{i,t} > 0$

(b) Contraction and $FE^G_{i,t} < 0$

(c) Expansion and $FE^G_{i,t} > 0$

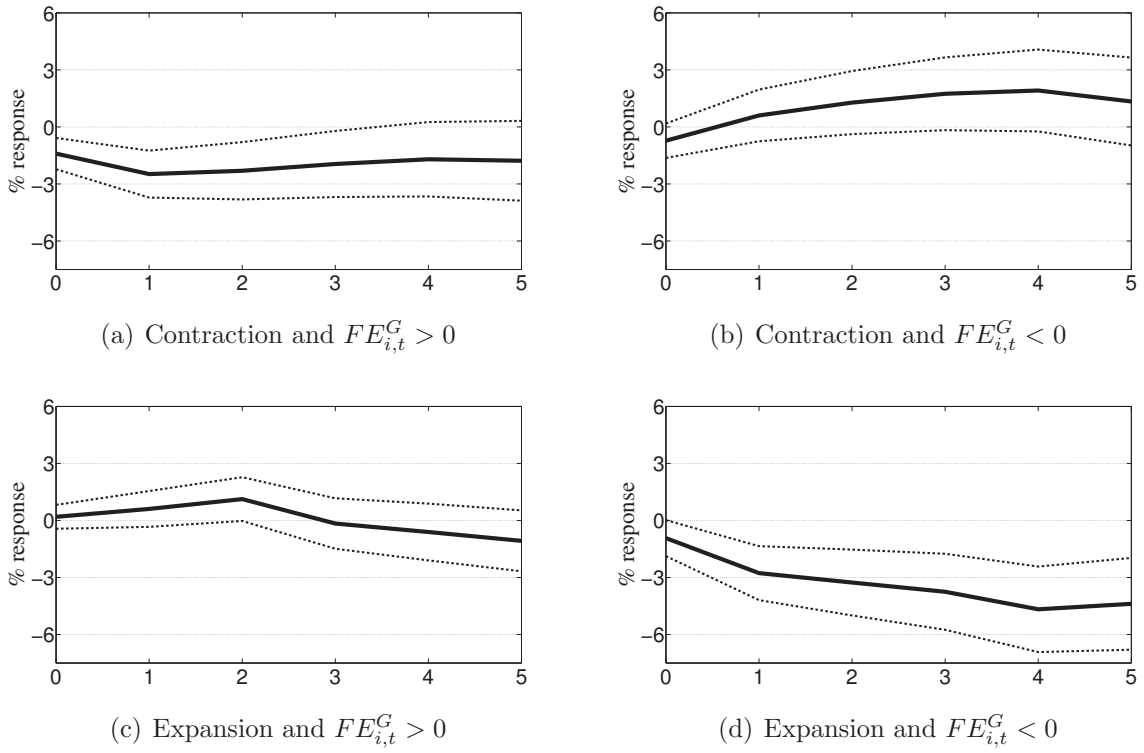
(d) Expansion and $FE^G_{i,t} < 0$

Note: Solid black lines represent the average cumulated response of real private investment to a government spending shock ($FE^G_{i,t}$) in the following cases: (a) credit contraction and increase in government spending, (b) credit contraction and decrease in government spending, (c) credit expansion and increase in government spending, (d) credit expansion and decrease in government spending. Dashed lines correspond to 80% confidence bands. Horizons are considered at the semiannual frequency.

of their debt over additional spending on investment. These results also underline the importance of the allocation of government spending for economic recovery in the aftermath of a financial meltdown. For instance, Eggertsson and Krugman (2012) and Borio (2014) argue that offsetting an economic downturn from private debt overhang can only be successful if fiscal stimulus addresses financial imbalances via debt relief first.

The multiplier of private consumption associated with spending decreases in credit crunches (Figure 4/(b)) likewise closely resembles the response of output to a procyclical fiscal policy in a contractionary regime (Figure 3/(b)). While consumption initially suffers, with an impact multiplier nearly one and marginally significant, it gradually decreases and becomes insignificant. By the third year, impulse responses turn negative (i.e., private consumption starts to increase) and borderline significant. Simultaneously,

Figure 6: Fiscal multipliers in credit contractions and expansions, associated with increases and decreases in government spending: **Net exports**



(a) Contraction and $FE^G_{i,t} > 0$

(b) Contraction and $FE^G_{i,t} < 0$

(c) Expansion and $FE^G_{i,t} > 0$

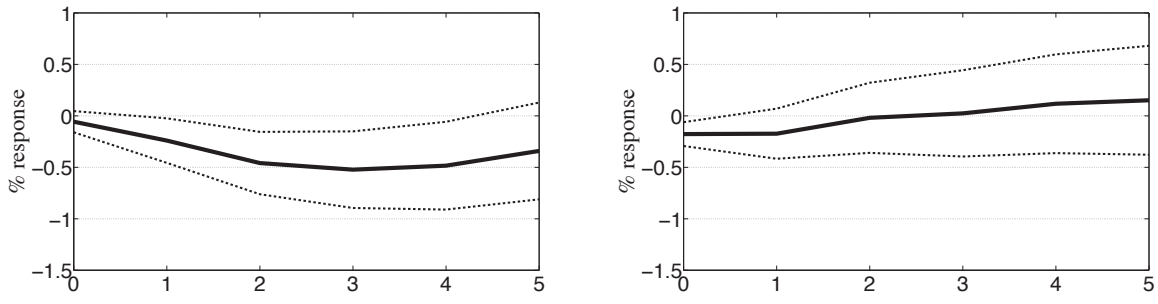
(d) Expansion and $FE^G_{i,t} < 0$

Note: Solid black lines represent the average cumulated response of real net exports to a government spending shock ($FE^G_{i,t}$) in the following cases: (a) credit contraction and increase in government spending, (b) credit contraction and decrease in government spending, (c) credit expansion and increase in government spending, (d) credit expansion and decrease in government spending. Dashed lines correspond to 80% confidence bands. Horizons are considered at the semiannual frequency.

net exports increase slightly on impact, but then decrease over time (Figure 6/(b)). A possible explanation for such patterns is that fiscal adjustments during credit contractions trigger a short-lived currency depreciation, coupled with an immediate increase in the rate of unemployment (Figure 7/(b)) and a fall in private consumption. Still, a decline in public spending may also cause price levels to go down, having some positive effects on aggregate demand in the medium run. The average multiplier of private investment following a spending decrease in credit contractions is only about -1 over three years, but one cannot reject the null that responses are zero for most horizons (Figure 5/(b)). Hence, if a procyclical fiscal policy has any effect on economic growth in periods when credit markets are dysfunctional, it propagates by and large through private consumption.

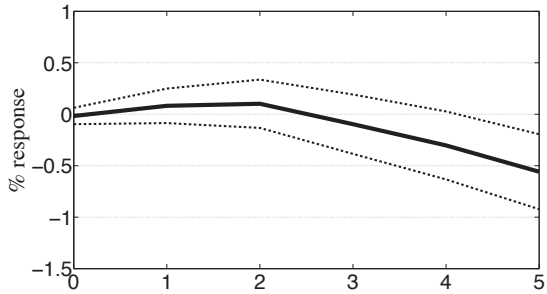
In contrast, the response of output to a positive fiscal shock in an expansionary credit

Figure 7: Fiscal multipliers in credit contractions and expansions, associated with increases and decreases in government spending: **Unemployment rate**

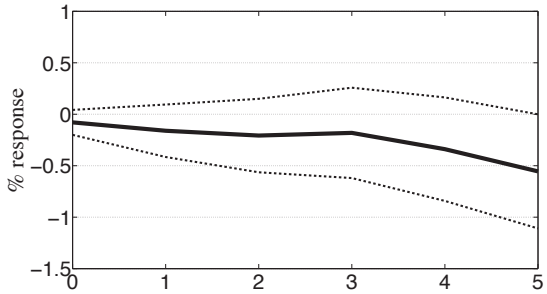


(a) Contraction and $FE^G_{i,t} > 0$

(b) Contraction and $FE^G_{i,t} < 0$



(c) Expansion and $FE^G_{i,t} > 0$



(d) Expansion and $FE^G_{i,t} < 0$

Note: Solid black lines represent the average cumulated response of the unemployment rate to a government spending shock ($FE^G_{i,t}$) in the following cases: (a) credit contraction and increase in government spending, (b) credit contraction and decrease in government spending, (c) credit expansion and increase in government spending, (d) credit expansion and decrease in government spending. Dashed lines correspond to 80% confidence bands. Horizons are considered at the semiannual frequency.

regime is more correlated with private investment. The significant increase in real GDP about 2.5 years after a rise in government expenditure reflects the run-up in investment activity (Figure 5/(c)), accompanied by an approximately 0.5 percent fall in unemployment (Figure 7/(c)). The responses are statistically significant at the longer horizon, and an additional dollar of government spending crowds in up to 3.75 dollars of private investment by the third year. At the same time, private consumption and net exports remain largely unchanged, on average, in response to spending increases during credit expansions (see Figure 4/(c) and Figure 6/(c)). These findings raise important concerns about procyclical fiscal policies in times of rapid credit growth, as an increase in government spending may lead to further financial deepening, i.e., excessive borrowing and speculative investment activities, which often end in devastating financial crises. It is

also worth noting here that Riera-Crichton et al. (2015) finds no effect on investment – and output – during extreme economic expansions, which is more consistent with simple Keynesian models under situations of full employment.

Finally, the effects of a countercyclical fiscal policy in credit booms are somewhat puzzling. Even though not significant in the statistical sense, a reduction in government spending in an expansionary regime increases output (Figure 3/(d)). Such stimulatory effects are not apparent, however, in the response of private demand. On the contrary, Figure 5/(d) shows that a one-dollar spending cut decreases private investment by about 1.75 dollars on impact, and the responses are significantly different from zero in the first two semesters. The decline in investment is followed by a fall in private consumption (Figure 4/(d)) and an increase in the unemployment rate (Figure 7/(d)), with variations breaching statistical significance by the last semester. Notwithstanding these adverse effects, a decrease in government spending causes currency depreciation and therefore increases net exports (Figure 6/(d)), resulting in a muted, yet positive aggregate output response. Thus, engaging in fiscal consolidation and conducting countercyclical fiscal policy in times of large credit expansions may help reduce the potential vulnerabilities associated with excessive debt accumulation at a relatively low cost.

4 Discussion and concluding remarks

The results presented in this paper do not always fall in line with the findings of the literature on fiscal multipliers. Yet, this empirical fact emerges only when distinguishing between government spending increases and decreases along the credit cycle. The traditional Keynesian thinking as well as a number of more recent works (e.g., Bachmann and Sims, 2012; Auerbach and Gorodnichenko, 2012, 2013) argue that fiscal policy is more effective in times of economic recessions, with increases in government expenditure crowding in private demand. In addition, Bachmann and Sims (2012) emphasize the role of confidence in the propagation mechanism, according to which government spending shocks during recessions are particularly geared toward investment, which in turn

stimulates productivity in the private sector and output.[20] While the neoclassical and standard New Keynesian models imply that government purchases tend to crowd out private expenditure, more recent variants of dynamic general equilibrium models extended with rule-of-thumb consumers (Galí et al., 2007), binding zero lower bound episodes (e.g., Christiano et al., 2011; Woodford, 2011), and costly financial intermediation (Canzoneri, Collard, Dellas, and Diba, 2015) are consistent with existing evidence on the expansionary effects of government spending.[21]

In some respects, the non-linear effects of fiscal shocks across the credit cycle diverge from the conventional wisdoms. The two most notable differences are *i*) the feeble response of private investment, as opposed to the unusually strong positive reaction of private consumption, to a countercyclical fiscal policy during severe credit contractions, and *ii*) the crowding-in effect of a procyclical fiscal policy on private investment in times of excessive credit booms. The first result suggests that whenever credit frictions are pervasive, an expansionary fiscal policy can be very successful in offsetting the collapse in private consumption. However, unlike the predictions of Keynesian theory for economic recessions, traditional fiscal stimulus itself is not powerful enough to stabilize credit markets and revive investor confidence and activity in periods of financial turmoil, when liquidity constraints are binding. Corsetti et al. (2012) derive a similar prediction by estimating the effects of government spending shocks during financial crises, i.e., in economic recessions when access to credit is severely restricted. Regarding the second discrepancy, it seems that a positive innovation in public spending is compatible with an increase in private investment and growth, even during large expansions.[22] Intuitively, a reason for such crowding-in effect is that during a credit frenzy bank lending standards are extremely loose, thereby investment in the private sector is less affected by an increase in interest rates caused by a surge in government spending. Hence, when financial markets become overly turbulent, the complementary effect supported by the Keynesian view under recessionary regimes is likely to prevail over the crowding-out effect advocated by the

[20] For an early contribution on the complementary effect between public investment and private sector productivity, see Aschauer (1989).

[21] The underlying crowding-out mechanisms are described in detail in Christiano and Eichenbaum (1992), Baxter and King (1993), Fatás and Mihov (2001), and Linnemann and Schabert (2003), among others.

[22] Empirical evidence suggests that rapid credit booms are typically associated with periods of strong economic expansion (see, e.g., Mendoza and Terrones, 2012).

neoclassical theory, and a rise in public expenditure can lead to further increases in private investment. Interestingly, private consumption remains largely unchanged in response to a procyclical fiscal policy during rapid credit expansions, which again points to the rather speculative nature of private investment in such episodes.

The findings of the paper suggest that the financial environment at the time the government expenditure becomes effective matters. Successful policy packages should therefore take account of credit market dynamics besides the phases of a typical business cycle to achieve the desired effect. Above all, since deficit-financed government spending may reduce the ability to cope with deep and long-lasting financial recessions, fiscal consolidation should take place during economic expansions associated with credit booms, and public reserves should be used to relieve private debt burdens and restore aggregate demand in times of severe credit crunches. In this way, anchors in the fiscal regime can also help restrain the build-up of unsustainable booms and prevent excessive private investment. In terms of future research, analyzing the allocation of government spending would be vital for a better understanding of the effectiveness of fiscal interventions during financial crises, especially in situations where monetary policy is constrained by the zero lower bound on interest rates.

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