Fiscal Policy and Sentiments in a Monetary Union*

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Abstract

Members of a monetary union have limited control over monetary policy. This can elevate the role of fiscal policy as the primary macroeconomic tool against country-specific shocks. In this paper, I argue that fiscal policy is highly effective at stimulating output in countries via its impact on consumer sentiments. Using data for the European Economic and Monetary union, I provide evidence that the sentiments channel for fiscal policy is strongly present in peripheral European countries but absent in core countries. The impact of fiscal policy on consumer sentiments also make fiscal consolidation more costly in terms of output in peripheral countries. I validate my empirical findings using a New Keynesian model of currency union where agents form expectations based on non-fundamental factors (animal spirits) correlated with fiscal policy. I show the existence of a stronger response of output to fiscal policy through the latter's impact on consumer sentiments.

JEL Classification: E60; E62; E70; F45.

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1 Introduction

Commonly missing from the analysis of macroeconomic policy is the role played by animal spirits in its propagation. This paper aims to understand the evolution of consumer sentiments in response to fiscal policy, and its impact on economic activity. The first part of the paper conducts an empirical investigation of how fiscal policy impact sentiments using data on eight European countries which are part of the Europe's Economic and Monetary Union (EMU), also known as the Euro area. The second part of the paper allows for a role of sentiments, evolving independently of other fundamentals, by incorporating non-rational expectations in a model of currency union.

The Euro area is a monetary union where monetary policy and exchange rate is determined centrally while individual nations set their fiscal policy independently[1]. In a union, monetary policy only responds to union-wide shocks. This makes fiscal policy as the more important macroeconomic tool in combating country-specific shocks (Gali and Monacelli, 2008). Farhi and Werning (2016) show that the fiscal multiplier in a currency union is higher due to the constraints on monetary policy. An increase in public spending can thus, transmit to economic expectations if agents believe fiscal policy to be the main policy tool for stabilization of domestic output and prices.

In this paper, I study the role of consumer sentiments in transmission of fiscal policy in the Euro area. In the summer of 2011, convinced of region's strong recovery from the financial crisis, the European Central Bank (ECB) raised their key interest rates by 50 basis points over a period of three months. The decision was widely criticized as increasing the woes of peripheral countries which had by then started to grasp the extent of their fiscal vulnerabilities. Throughout the financial crisis, the policy measures taken by ECB were targeted towards fighting the liquidity crunch and the threat of a banking crisis. While these actions complemented those of central banks around the world, it largely ignored the concerns about the impending sovereign debt crisis in one half of the continent (Lane, 2012). I use the unique coordination problem of fiscal and monetary policy in the EMU to study the cross-country heterogeneity in

[1]Subject to the constraints imposed by the European Stability and Growth Pact.

effectiveness of fiscal policy. I argue that the role of fiscal policy in stimulating the economy is stronger for European peripheral countries than core countries such as Germany and France. The main channel for higher prominence of fiscal policy in these economies is through its effect on economic sentiments.

Movements in sentiments have important aggregate implications. Milani (2017) shows that exogenous movements in consumer and business sentiments can account for a large proportion of U.S. business cycle. Blanchard (1993) uses U.S. data to show that the consumer sentiments index, as measured by the the Michigan Survey of Consumer Sentiments, could predict fall of future consumption. He also finds that the confidence dips before the actual decline in forecasts of output. More recently, Barsky and Sims (2012a) show that the expectations component of the Michigan Survey of Consumer Sentiments (for the U.S.) are noisy measures of changes in expected productivity over a long period of time. Nowzohour and Stracca (2020) provide a thorough survey of the literature on sentiments and its contribution to the business cycle.

One of the main hurdles in studying the empirical effects of fiscal policy is the identification of fiscal policy shock. Ramey (2011) and Ramey and Zubairy (2018) have criticized the identification method used in Blanchard and Perotti (2002) and papers following their methodology in failing to account for the anticipated fiscal policy measures differently from the unanticipated "news" shock. She introduces two approaches for identifying the unanticipated component of fiscal policy- narrative method and forecast errors. For Europe, Alesina et al. (2019a) uses the narrative approach to measure unanticipated government expenditure shocks. In this paper, I identify fiscal policy news as the difference between actual and forecast of growth in government expenditure (the forecast error approach used in Ramey (2011)). Section 2.1 describes the construction of my news variable in detail. Consumer sentiments in the analysis is measured using the data published by the European Commission on economic sentiments in Europe since 1985. The construction of sentiments index is described in more detail in Section 2.2.

In the first part of this paper, I ask the following questions: Does confidence play a role in transmission of fiscal policy in the Euro area? How does the confidence channel of transmission of fiscal policy differ across core and peripheral European economies? To answer the first question, I use a five variable VAR model with government spending news ordered first for

each country in my sample. The VAR also includes an interaction term between consumer sentiments and government spending news. The interaction term allows us to capture the relationship between fiscal policy news and output at different levels of confidence. To answer the second question, I introduce a counterfactual analysis that switches the sentiments in each country with sentiments in Germany. The empirical strategy used in the paper is described in more detail in Section 2.3.

Result from my main analysis suggests that fiscal policy is highly effective at stimulating the economy in Italy, Spain, and Finland. The response of output in these economies is also very persistent. In contrast, there is a small positive impact of fiscal policy on output in Germany and Portugal, while the response is insignificant in Belgium and France. The shape of the impulse responses of output are driven by the response of confidence to fiscal policy shock. Confidence in all peripheral countries rises significantly on impact and is highly persistent in Spain, Italy, and Finland. Confidence also rises in Netherlands, and Portugal but reverts to zero within two years. The results also show that the positive effect of fiscal policy on consumer confidence is much stronger in periphery than in core countries. The results from the baseline model are presented in Section 3.

The next part of the analysis focuses on the nonlinear effects of fiscal policy during periods of fiscal consolidation and normal times. The consolidation measures adopted by the European Commission during the European debt crisis were criticized to be too costly in terms of loss of output. However, many papers have argued that fiscal consolidation can also raise confidence by reducing the probability of default in high debt countries which translates into smaller and milder contractions and potentially result in expansion of the economy (Afonso (2010), Giavazzi et al. (2000), Fazzari et al. (2015)). I use a panel Threshold VAR model to study how consumer sentiments and output respond to a contractionary fiscal policy shock during periods of fiscal consolidation. I find that while fiscal contraction during periods of consolidation raised consumer sentiments for core countries, sentiments in peripheral countries significantly declined and remained below zero for 20 quarters. The impact on output of a contractionary government spending shock is also significantly negative and persistent for peripheral countries during periods of consolidation, but only marginally negative on impact during normal times. For core countries, the response of sentiments and output is largely indistinguishable during normal

times and periods of consolidation. While the effect is negative on impact, both sentiments and output rise significantly above zero within a year. I find evidence of expansionary effects of fiscal contraction for core countries during both normal times and consolidation. On the other hand, the output cost of fiscal consolidation is high in peripheral countries (more details in Section 3.1).

The last part of the paper presents a New Keynesian DSGE model of currency union and draw inferences under non-rational expectations. The model incorporates sentiments correlated with government spending. Households exhibit misspecified forecasting behavior where they do not observe government spending but do observe the sentiments shock process which evolves with government spending but independent of other fundamental variables in the economy. The objective of the model is to generate the empirically observed persistence in response of output to government spending shocks due to an increase in consumer sentiments. The model suggests that fiscal policy can have a stronger impact on output in economies where sentiments evolve more closely with government spending.

With the current uncertainty surrounding the macroeconomic conditions, understanding the influence of macroeconomic policy on sentiments takes an even greater importance. This paper aims to contribute by analyzing how interaction between sentiments and macroeconomic policy can affect real economic activity.

1.1 Literature Review

A growing literature incorporates empirical measures of consumers sentiments to estimate its impact on the real economy. Bachmann and Sims (2012) is one of the first papers to use sentiments to understand the effect of fiscal policy on output in a VAR for the U.S. economy. They find that, in the U.S., the impact of fiscal policy increases sentiments during recessions but has no effect during normal times, suggesting that the increase in sentiments can explain larger fiscal multipliers during recessions. Consumer sentiments have also been incorporated in empirical studies of fiscal policy for European countries. Konstantinou and Tagkalakis (2011) study the effect of different components of government spending on consumer and business sentiments in a panel of 9 OECD countries. They find that non-wage government consumption expenditure increases sentiments while higher government wages and investments decrease

sentiments. Similarly, Beetsma et al. (2015) show how fiscal consolidations impact consumer and business sentiments in a event study of 17 OECD countries. They find that consolidation of government expenditure negatively impacts consumer sentiments, especially in European countries.

The role of sentiments in transmission of fiscal policy has also been studied in macroeconomic models with heterogeneous expectations and bounded rationality. De Grauwe and Foresti (2020) uses a model with two types of agents, one of which uses a simple forecasting rule to form expectations using past information. Their model generates waves of optimism and pessimism and shows that fiscal multiplier is highest in periods of extreme optimism and pessimism. They also find that the impact of fiscal policy is stronger the less the monetary policy focus on output gap stabilization. Hommes et al. (2018) use a similar model to compare between expenditure and tax based fiscal consolidations and find that tax based consolidations are less costly in their model. Other papers that have incorporated features of bounded rationality to study fiscal policy include Mitra et al. (2013) and Mitra et al. (2019). They find that diverging from rational expectations and allowing learning significantly increases fiscal multiplier in a RBC model to empirically plausible estimates. Similarly, Gabaix (2020) shows that introducing cognitive discounting in a New Keynesian model generates a failure of Ricardian Equivalence. Since agents cannot fully anticipate future tax increases, they respond positively and significantly to a tax cut in the current period. Incorporating sentiments in a RBC model, Angeletos and Lian (2022) show that fiscal policy can be significantly more stimulative when the assumption of common knowledge is relaxed.

This paper also relates to the literature studying fiscal policy in a currency union. Two prominent papers in this literature are Farhi and Werning (2016) which study fiscal multiplier under different closed and open economy New Keynesian models. They show that fiscal multipliers are larger in a currency union due to the constraint on monetary policy in responding to a fiscal shock. Similarly, Nakamura and Steinsson (2014) calculate the open economy relative multiplier in a model of currency union and show that the constraints on monetary policy can generate multipliers greater than 1. Finally, the analysis here closely fits with the literature combining bounded rationality with models of currency union to study the impact of country-specific shocks on the economy. Bonam and Goy (2019) show that allowing for home bias in

expectations formation results in greater and prolonged impact of country-specific shocks on macroeconomic imbalances.

2 Data and Methodology

I use data for eight Euro area countries. The Euro area countries include Belgium, Finland, France, Germany, Italy, Netherlands, Portugal, and Spain. These countries are selected based on the availability of all data. I do not include Austria and Greece in the analysis due to large gaps in time series and forecast data. I use quarterly time series data on real government consumption expenditure, real GDP, 3 month interest rate on government bonds from OECD. All time series data is converted to per capita values. To identify fiscal policy shock I use the quarterly economic projections made by the OECD, released bi-annually. The data on consumer sentiments indicator is sourced from the European Commission. The sample period for each country varies according to the data availability (refer to Table 1). I restrict the data for France and Portugal to start in 1999 due to the weak explanatory power of forecasts in these countries before the Treaty of 1999. The sample period ends in 2019Q4 for all countries.

2.1 Construction of News Variable

Many changes to fiscal policy are anticipated by the public much before the implementation of the policy. Ramey (2011) raised this issue of identification of fiscal policy shock in a reduced form VAR. She argued that it is important to measure the anticipation of the shock to correctly determine the impact of shock on economic activity. She suggests using the forecast error from professional forecasts to measure the unanticipated component of fiscal policy. A similar method has also been used by Cavallari and Romano (2017) in the context of Europe using the European Commission annual forecasts (ECF). The ECF forecasts are only available in annual frequency and cannot be used for this analysis.

To construct an unanticipated measure of fiscal policy shock, I use the OECD Economic Outlook and Projections data which releases bi-annual forecast reports for all OECD countries for a series of economic variables since 1960. The earliest available forecasts for Belgium, Finland, Netherlands, Portugal, and Spain starts in 1996 edition 2 of the OECD report. The

Table 1: Summary Statistics

	(1)	(2)	(3)	(4)
	Sample Size		**Explanatory Power of Forecast**	
	Sample Beginning	**Observations**	**R-squared**	**F-statistics**
Belgium	1997Q1	92	0.73	38.87***
Germany	1991Q1	116	0.69	15.54***
Finland	1997Q1	92	0.98	917.55***
France	1999Q1	84	0.64	26.25***
Netherlands	1997Q1	92	0.52	4.46***
Italy	1995Q1	100	0.79	32.74***
Spain	1997Q1	92	0.57	18.10***
Portugal	1999Q1	84	0.35	4.31***

Column (3) and (4) of the above table shows the explanatory power of the forecast of fiscal policy news variable. Column (3) and (4) report the R-squared and F-statistics respectively for each country from regression of current and two lags of the government spending news variable on actual growth in government spending. *, **, and *** indicate significance at 10%, 5% and 1% significance level.

reports use information up to mid May and November for each year and provides forecast for next 2 years in annual and semiannual frequency until 2003, and annual and quarterly frequency starting from the second (November) edition of 2003.

The OECD forecast is a fixed event forecast which implies that the forecast horizon changes in each edition. The first edition of forecast in each year uses data until mid of quarter 2 (mid-May) to make a forecast for next two years. Similarly, the second edition of forecast each year uses data until mid of quarter 4 (mid-November) to make a forecast for next two years. As the forecast reports are only generated twice a year, the forecasts for quarters 1 and 2 in my data is taken from the first edition of the report, and the forecast for quarter 1 and 3 is taken from the second edition of the report. This implies that the forecast is made using information up to period t for quarters 2 and 4, and using information up to period t-1 for quarter 1 and 3.

Dealing with mixed frequency: The forecast data is available in semi-annual frequency until 2003Q3 and quarterly frequency starting from 2003Q4. To handle different frequency in the data, I consider the semi-annual data as quarterly estimates and use Kalman Filter to

get a continuous series of forecasts in quarterly frequency. This implies that the forecast of government expenditure for S1 and S2, taken from edition 1 of each year, is divided by 2 and considered as the current and next period forecast for Q2. Similarly, the forecast for S2 and S1 of next year, taken from edition 2, is divided by 2 and considered as the current and future period forecast for Q4. The forecast values for Q1 and Q3 are missing as no reports are released for these quarters. The data is then passed through Kalman Filter using an ARMA(1,0) model with time trend. The model is selected among competing models based on the log likelihood. The Kalman Filter predicts values for missing observations and gives estimates of current latent states. I use the predicted forecasts given by Kalman Filter to compute the fiscal policy news shock. The forecast growth is computed using the predicted forecast for period t and $t+1$.[2]

Following Ramey (2011), I construct the forecast of quarterly growth of real government expenditure as follows-

$$\text{Forecast growth}_t = L.\left(\frac{f_t(d_{t+1}) - f_t(d_t)}{f_t(d_t)}\right)$$

The news shock variable then equals the forecast error of growth of government expenditure.

$$\text{News shock}_t = \text{Actual growth}_t - \text{Forecasted growth}_t$$

Table 1 shows the explanatory power of the news variable for each country. Column (3) and Column (4) shows the R squared and the F-statistic respectively from a regression of actual growth of government expenditure on the current and four lags of the news shocks. On average, the news variable is a strong predictor of actual government spending in all countries.

2.2 Sentiments Indicator

The European Commission conducts a monthly and quarterly climate survey in multiple sectors for each country across Europe. For the baseline analysis I use the data from the survey

[2]To test the robustness of the results to data imputation and information asymmetry, Section A.2 runs baseline specification with semi-annual data for each country.

of consumer sentiments. Using sentiments from only the consumer sector makes the European sentiments index comparable to the Michigan Survey of Consumer Sentiments index in the US. and the results more comparable to the research using U.S. data.

Table 2: Forward-looking Consumer Sentiments Questions

Q2	How do you expect the financial position of your household to change over the next 12 months?
Q4	How do you expect the general economic situation in this country to develop over the next 12 months?
Q7	How do you expect the number of people unemployed in this country to change over the next 12 months?
Q9	Compared to the past 12 months, do you expect to spend more or less money on major purchases (furniture, electrical/electronic devices, etc.) over the next 12 months?

Note that a positive balance in response to Q2, Q4, and Q9 implies a positive outlook for the economy, while a positive balance in response to Q7 implies a negative outlook. When calculating the average, I add the negative of the balance of Q7 to the balance of the other three questions.

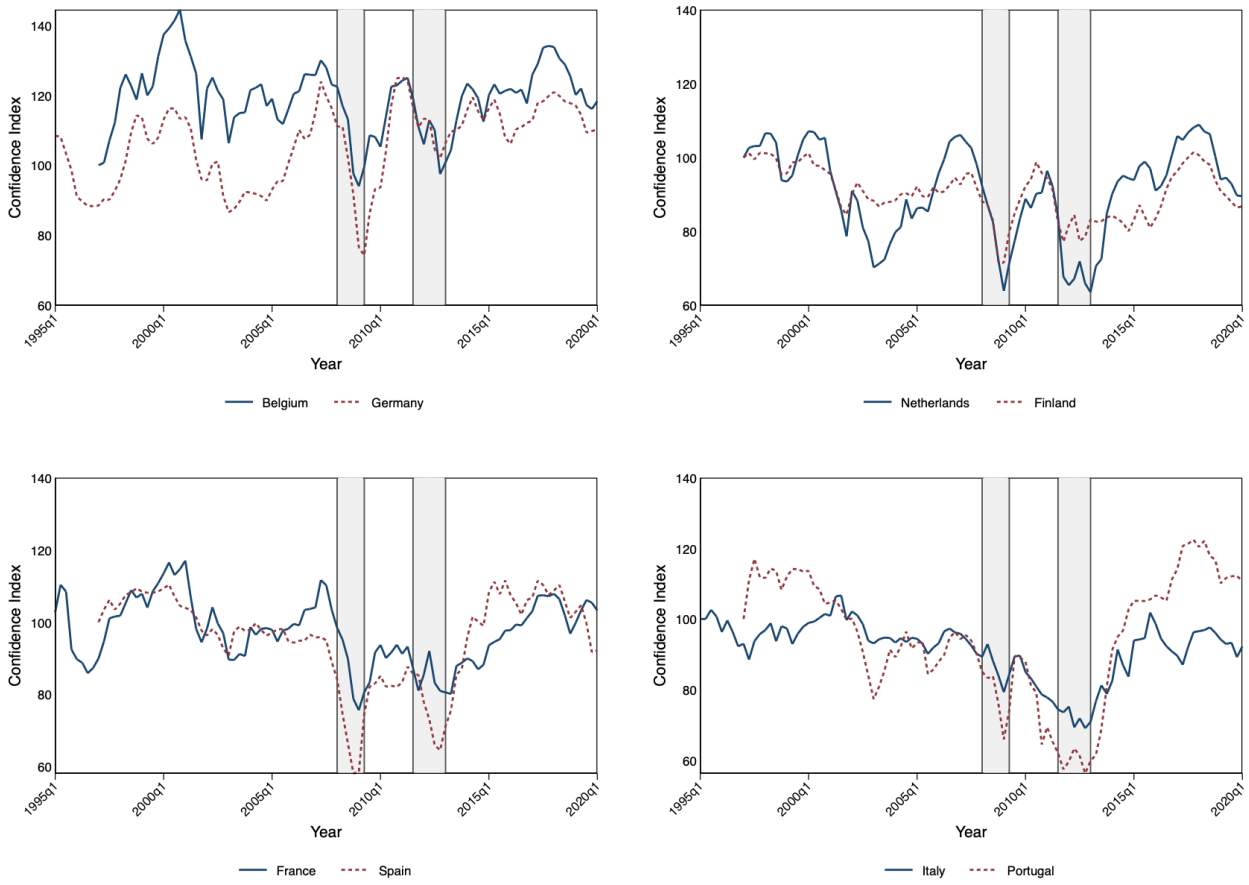
Construction of confidence index: Barsky and Sims (2012b) find that the forward looking questions of the Michigan survey contain information about the future productivity of the economy. Thus, by limiting the confidence index to expectations component of the sentiments survey helps us capture how the economic agents expect the income and productivity growth to evolve, following a fiscal policy shock. Table 2 lists the questions that reflect the expectations component of the European Commission's survey of consumer sentiments. The data reports the balance of all positive and negative responses for each question. To construct the confidence index used in the paper I average the balance of all four questions and add 100. The starting value of the average balance for each country is normalized to 100 to create the index with reference to the beginning of the sample.

Table 3: Sentiments correlation with Germany

	Belgium	**Finland**	**France**	**Netherlands**	**Ireland**	**Italy**	**Spain**	**Portugal**
Correlation with Germany	0.62	0.24	0.48	0.48	0.25	-0.1	0.27	0.19

Consumer sentiments fell sharply in all European countries at the beginning of the 2008 financial crisis. While confidence in low debt countries, Germany, Netherlands, and Belgium, recovered to their pre-crisis levels, confidence in most high debt countries remained low with the looming threat of a fiscal crisis. The fall and rise in sentiments preceded the onset and end of crisis.

Figure 1: Consumer Sentiments Indicator



Note: Shaded regions are quarters identified as periods of recession in Europe by CEPR.

Table 3 shows the correlation of the consumer confidence index in each country vis-*á*-vis confidence in Germany. Consumer confidence in Belgium, France, and Netherlands are particularly highly correlated with that in Germany. Aside from being two of the smallest countries in the sample, both Belgium and Netherlands also have high economic and cultural integration

with their neighbor, which can explain the high correlation in consumer sentiments. Confidence in all peripheral countries in the sample move independently of confidence in Germany. The high correlation of sentiments among core countries but the lack of it in peripheral countries suggests that agents perceive economic conditions differently between core and peripheral countries.

2.3 Empirical Analysis

For the baseline model I use a VAR with first order interaction term between confidence and government spending news. The interaction term allows us to capture the non linear effects of fiscal policy due to different levels of confidence. The interacted VAR has been used to capture the non linear effects in Bachmann and Sims (2012) and Caggiano et al. (2017).

Consider the baseline specification-

$$Y_t = \alpha + \sum_{k=1}^{L} A_k Y_{t-k} + \sum_{k=1}^{L} b_k (Confidence_{t-k} \times News_{t-k}) + u_t \tag{1}$$

$$E(u_t u_t') = \Omega_t$$

where Y_t is a vector of five variables in the baseline estimation: government spending news, log real government expenditure per capita, consumer confidence, log real GDP per capita, and real short term interest rate as a measure of monetary policy in the model[3], with the government spending news variable ordered first. The news variable is constructed to account only for the unanticipated component of fiscal policy in period t and thus, does not respond contemporaneously to shocks to other variables. The sample period for each country varies with France having the longest time series data starting from 1985Q1 (see Table 1). I use two lags for baseline estimation based on the lowest information criterion for lag length selection for a maximum length of eight lags.

[3]Real interest rate = Interest rate - CPI inflation

Counter-factual Exercise: The baseline hypothesis is that sentiments in peripheral economies respond more significantly to a fiscal policy shock than sentiments in the core economies. To see how sentiments differ across different European economies and how it affects the response of output to a fiscal policy shock, I introduce a counter-factual exercise. Using Germany as the benchmark core economy, I replace the sentiments index in each country with the sentiments index in Germany. Table 3 shows the correlation between the sentiments in Germany with all other countries. As sentiments in peripheral countries evolve independently of sentiments in Germany, we should expect a muted response of sentiments to fiscal policy in the counter factual scenario. If sentiments is important for transmission of fiscal policy to output, the counterfactual exercise should result in a muted response of output to fiscal policy.

Threshold VAR: There has been a growing body of fiscal policy literature focused on heterogeneity in government expenditure multipliers across different states of the economy. Auerbach and Gorodnichenko (2012), Fazzari et al. (2015), and Ramey and Zubairy (2018) all study the difference in fiscal multipliers across expansionary and recessionary regimes. The threshold VAR (TVAR) models are one of the most popular estimation techniques to study this non linearity when the shift in regimes are exogenous. In the second part of the paper I apply the threshold model to study the effect of fiscal policy under two states: Fiscal consolidation vs normal times.

Many studies have shown that the effect of a contractionary fiscal policy shock under fiscal consolidation is significantly less contractionary than Keynesian estimates, when used to bring stability in high debt countries. In the second part of the paper, I test the response of sentiments and output to fiscal policy under normal times and times of fiscal consolidation using the following TVAR model-

$$\begin{aligned} Y_t = (1 - I_{t-1})[\alpha_A + \sum_{k=1}^{L} \psi_{A,k} Y_{t-k} + \sum_{k=1}^{L} \phi_{A,k}(Confidence_{t-k} \times News_{t-k})] \\ + (I_{t-1})[\alpha_B + \sum_{k=1}^{L} \psi_{B,k} Y_{t-k} + \sum_{k=1}^{L} \phi_{B,k}(Confidence_{t-k} \times News_{t-k})] + u_t \end{aligned} \tag{2}$$

I_t is the indicator variable which takes the value 1 or 0 depending on the state of the economy.

Generalized Impulse Response Functions: In a linear VAR, the traditional impulse response functions are symmetric, i.e. positive and negative shock have symmetric responses, linear in shocks, and history independent, i.e., past realizations does not affect the responses to the shock. Koop et al. (1996) show that introducing non-linearity in a VAR model makes the impulse responses dependent on the choice of history and shocks. As an alternative, they suggest the algorithm to compute history independent impulse response functions i.e. the Generalized Impulse Response functions (GIRFs). GIRFs are calculated as the difference in conditional expectations given the history and shock. The impulse responses for each horizon is then averaged over all the histories. The computation of GIRFs can be summarized by the following equation:

$$GIRF_y(n, \nu_t, \omega_{t-1}) = E[Y_{t+n}|\nu_t, \omega_{t-1}] - E[Y_{t+n}|\omega_{t-1}] \tag{3}$$

Briefly describing the computation steps: For a given history of data, draw a sequence of shocks using the residuals of the VAR. The impulse responses for each history and sequence of shock are then given by the difference between forecast of value of a variable with and without a one standard deviation fiscal news shock in period t. The impulse responses are calculated for period $t+1$ to $t+H$. Repeat the process for N draws of shocks for each history of the data.[4] The impulse response for each history is the average response over all draws of shocks. The Generalized impulse response is then the average of impulse responses for all histories for all horizons 1 to H.[5] The issue of history dependence of impulse responses in the Threshold VAR model can also be addressed by calculating GIRFs over all histories in a given state of the economy.

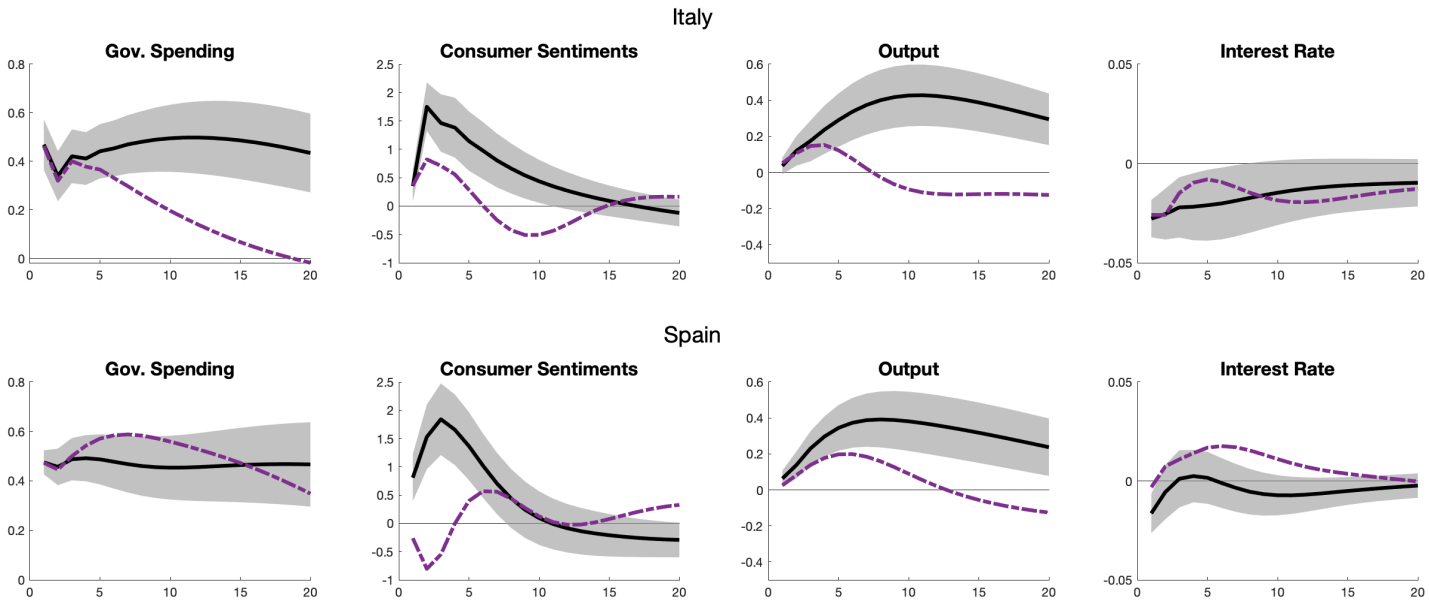
[4]For the simulation, I set N=500 and H=16.

[5]For more details on construction of GIRF, refer to Koop et al. (1996), Fazzari et al. (2015), and Caggiano et al. (2017).

3 Empirical Findings

Figure 2 presents the result for the baseline VAR with forward looking component of consumer sentiments. The IRFs plotted are Generalized Impulse Response of government spending, consumer sentiments, output, and real interest rate, to a one standard deviation government spending news shock. The solid lines are the baseline IRFs and the dashed lines are the IRFs for the counterfactual where sentiments in each country is replaced with consumer sentiments in Germany. The shaded grey regions are one standard error confidence bands calculated through a bootstrap procedure with 500 simulations. The results below are for two countries: Italy and Spain, to illustrate the mechanism in play. Figure 3 then presents the baseline results for rest of the countries in the sample.

Figure 2: Results from the Baseline VAR model



The solid lines gives the Generalized impulse responses (GIRFs) for a positive one standard deviation shock to government spending news in the baseline model. The dashed line is the impulse responses for the counterfactual discussed in Section 2.3. Shaded region is the one standard error bands around the GIRFs for the baseline model.

Looking at the baseline responses (solid line) for Italy and Spain, an expansionary fiscal news shock increases government spending, consumer sentiments, and output on impact. The response for government expenditure and output is also significantly persistent for over 20 quar-

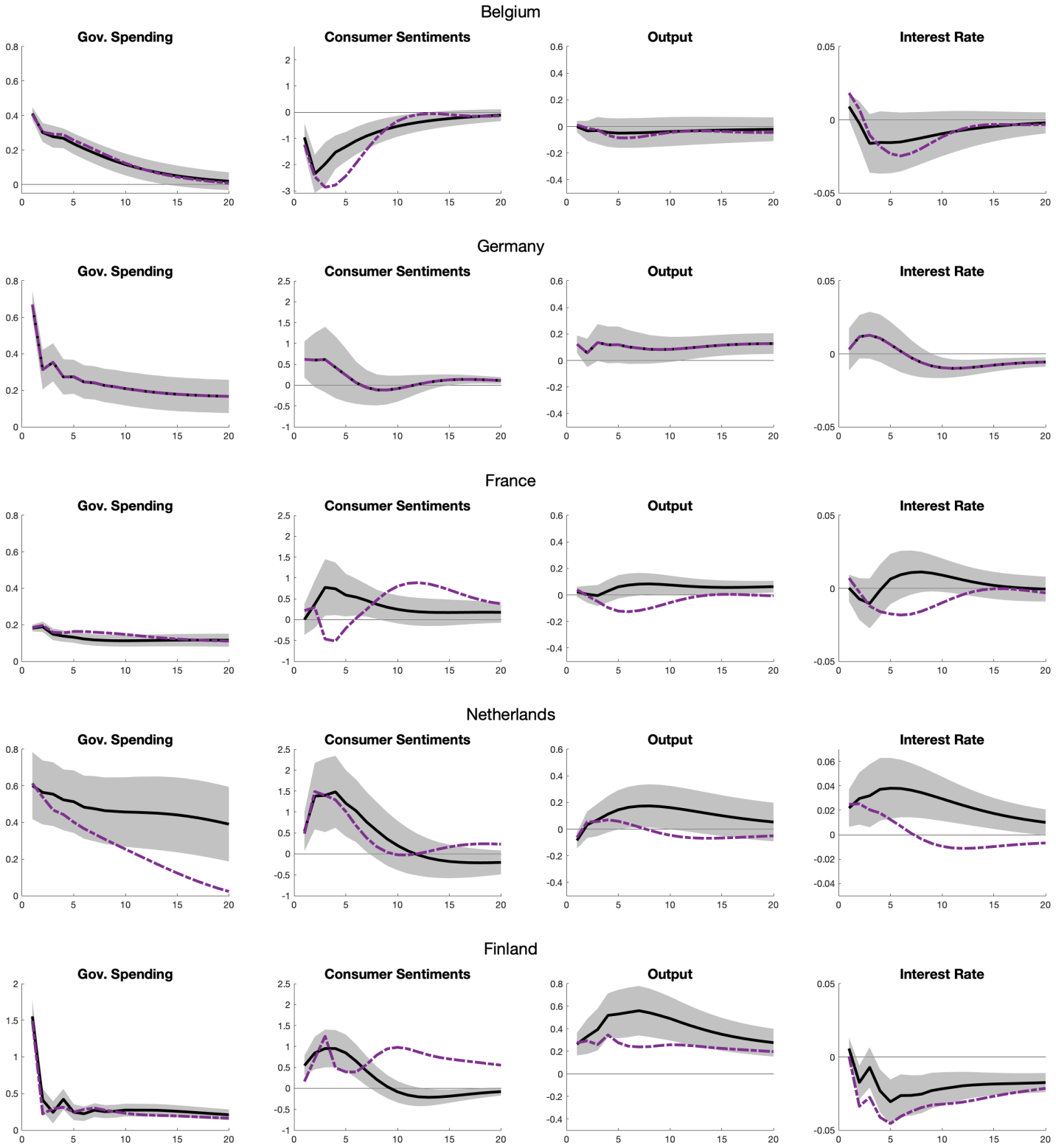
ters while the response for consumer sentiments stays positive for approximately 10 quarters. It is important to note that fiscal policy impacts output through two effects: direct Keynesian effect of government expenditure, and through lagged interaction between sentiments and fiscal policy news. Therefore, an increase in sentiments in response to fiscal policy shock feeds into the impulse response for output.

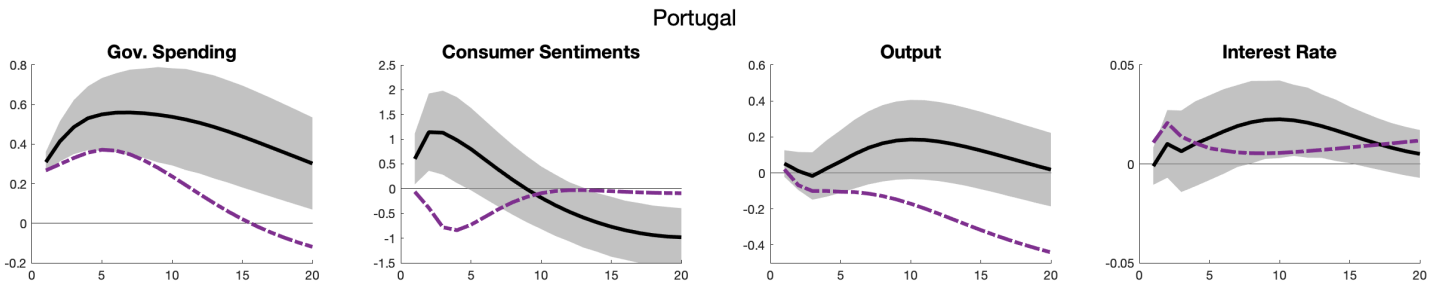
In the counter-factual exercise, the sentiments in Italy and Spain are replaced with the consumer sentiments index in Germany. Therefore, sentiments in each country are no longer moving with domestic macroeconomic news but rather to the economic conditions in Germany, our benchmark Euro economy. This is akin to shutting down the sentiments channel in each country. The lower is the correlation of sentiments in Spain and Italy to the sentiments index in Germany, more dampened will be the response of sentiments to domestic fiscal policy shock. A dampened response of sentiments should weaken the response of output to fiscal policy news.

The above hypothesis is confirmed in the counter-factual impulse responses (dashed line) for Italy and Spain in Figure 2. A one standard deviation expansionary fiscal policy news shock has the same impact on sentiments in Italy but the response of sentiments is significantly below the baseline for 15 quarters. It is interesting to note that the response of government spending itself to fiscal news shock in Italy is significantly lower in the counterfactual analysis. The combination of lower response of consumer sentiments and significantly less persistence in response of government spending is reflected in lower medium and longer horizon response of output. For Spain, the response of government spending is statistically same in the baseline and counterfactual. However, the response of sentiments is lower on impact and stays significantly lower over one year. The lower response of sentiments in reflected in persistently lower response of output in medium and long horizon.

Note that the response of output to fiscal policy news is same on impact under both baseline and counter-factual exercise. The divergence in output multiplier happens after the impact where output increases significantly less in response to the fiscal news shock and the small positive impact dies down around two years. This result is similar to Bachmann and Sims (2012) who also find that the dampened impact of consumer sentiments reflects on medium and long-run multiplier, and not the impact.

Figure 3: Results from the Baseline VAR model - All Countries





The solid lines gives the Generalized impulse responses (GIRFs) for a positive one standard deviation shock to government spending news in the baseline model. The dashed line is the impulse responses for the counterfactual discussed in Section 2.3. Shaded region is the one standard error bands around the GIRFs for the baseline model.

Figure 3 presents the results for rest of the countries in the sample. For most countries, a higher government consumption spending news shock increases output, akin to the effects in the New Keynesian model. The shock also increases consumer sentiments on impact in all countries with the exception of Belgium. In Belgium, sentiments decreases significantly on impact before converging to zero. The strongest response of consumer sentiments to fiscal policy news is in Italy, Portugal, and Spain. The strongest response of output to fiscal policy news is in Finland, Italy, and Spain. The response of output to fiscal policy shock is much smaller compared to the response in peripheral countries.

These findings are supported by other country-level studies in the Euro area. Wolff et al. (2006) find mixed evidence for impact of government spending shock in Germany. An increase in personnel expenditure results in contraction of the output while an increase in the consumption expenditure is approximately zero. The response is positive for an increase in the government investment expenditure. On the other hand, Giordano et al. (2007) find a hump shaped response of private GDP to government expenditure in Italy. The response is persistent for roughly 2 years. Both these papers identify fiscal policy shock based on Blanchard and Perotti (2002), and hence are not directly comparable to the analysis in this paper. Ramey (2011) shows that identifying fiscal policy shock following Blanchard and Perotti (2002) can overestimate the fiscal multiplier.

When the sentiments channel are shut down in the counter-factual, consumer sentiments in Belgium and France are slightly lower in the medium horizon. In Portugal, another peripheral country, the response on sentiments becomes negative in the short run before converging to zero within two years. In Netherlands, the response of sentiments is statistically indistinguish-

able from the baseline and in Finland sentiments is higher and more persistent in response to an expansionary fiscal news shock. Looking at output, the impact multiplier is same under baseline and counterfactual for all countries. Only France and Portugal, is the response of output significantly different in the counterfactual. In both countries, the response of output falls below zero after impact although the magnitudes are much larger in Portugal than France.

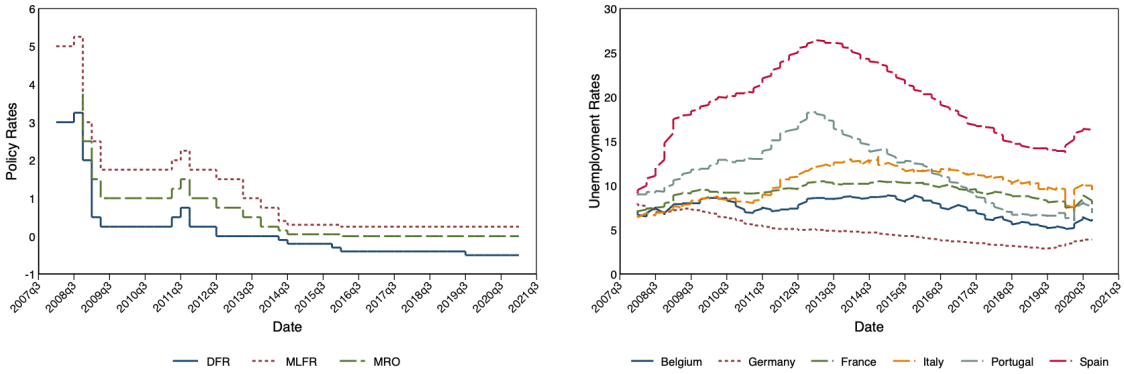
Table 4: Maximum Difference in Response of Sentiments and Output to Fiscal Policy Shock

	Belgium	Germany	Finland	France	Netherlands	Italy	Portugal	Spain
Confidence	1.26	0	**-1.11**	1.25	0.45	**1.9**	**1.86**	**2.39**
Output	0.04	0	0.32	**0.2**	0.21	**0.54**	**0.43**	**0.38**

The impulse responses show that consumer sentiments increases in response to a government expenditure shock for all countries. However, when response of sentiments is dampened in the counterfactual, the response of output is dampened. In particular, while the impact of fiscal policy on sentiments and output was statistically same for most countries on impact, the persistence of impact is most significantly reduced in Italy, Portugal and Spain. Table 4 shows the maximum difference in response of consumer sentiments and output under baseline vs the counterfactual. Due to the high correlation of sentiments between core countries (Table 3), the difference in response for core countries is largely insignificant, except for France. However, the difference is positive and significant for all peripheral countries in the sample. The results suggest that higher consumer sentiments about future economic conditions raises persistence of government spending multiplier and not the impact.

Role of Monetary Policy: The high degree of trade and macroeconomic linkages between countries of Euro area makes the heterogeneity in findings of the VAR puzzling. Households in relatively higher debt economies like Italy and Spain display stronger sentiments in response to fiscal policy than households in lower debt economies like Germany. One potential explanation of this heterogeneity is that economic agents in core and peripheral countries perceive monetary policy differently. Agents in peripheral countries might view monetary policy as less counter-cyclical for domestic shocks resulting in a stronger co-movement of sentiments with expansionary fiscal measures.

Figure 5: Monetary Policy and Economic Activity



(a) Policy rate set by ECB

(b) Unemployment Rate

Panel (a) of Figure 5 plots the European Central Bank's key policy rates during the period of 2007Q4 to 2021Q2 and Panel (b) plots the unemployment rate in six Euro area countries. The figure draws attention to the heterogeneity in economic conditions among Euro area countries in the aftermath of the 2008 financial crisis and the challenges of setting a uniform monetary policy. As unemployment rates in Germany, France, and Belgium stabilized, the ECB raised policy rates twice in the mid of 2011 citing the end of recession and signs of economic recovery. However, as evident from Panel (b) the unemployment rate continued to increase in many peripheral countries, including Italy, Portugal, and Spain, through 2011. The central bank in a currency union has limited capacity in responding to asymmetric shocks making fiscal policy the main counter-cyclical policy tool.

One natural extension to the above question is whether the firms' and investors' sentiments generate the similar heightening in response of output to fiscal policy shock in high debt countries. An increase in government expenditure in countries with very high levels of debt exposes a country to an increase in the risk of sovereign default and high borrowing cost (Bianchi et al., 2021). In the Appendix Section A.1 I repeat the baseline analysis with business sentiments. I find that the response of business sentiments to a government spending shock is zero (France and Italy), positive on impact but not persistent (Spain, Netherlands, Germany), or even negative on impact (Portugal, Belgium). In the counterfactual where sentiments for each country is replaced with sentiments in Germany, the impact on output is not statistically

differentiable from baseline for any of the countries.[6]

3.1 Sentiments under Fiscal Consolidation

Fiscal expansions in many peripheral European economies are coupled with higher risk of default (Bianchi et al., 2021), resulting in higher borrowing cost and lower confidence. The literature on austerity in Europe shows that exogenous fiscal consolidation can potentially have zero or positive effects on output by raising economic sentiments of agents. This section of the paper looks at the response of sentiment and output to fiscal policy during fiscal consolidation vs normal times.

Table 5: Periods of Fiscal Consolidation

Country	**Fiscal Consolidation**	**Total observations**
Belgium	32	92
Germany	68	116
Finland	32	92
France	44	84
Italy	66	100
Spain	32	92
Portugal	44	84

I use the Threshold VAR model presented in Section 2.3 to test the effect of a contractionary fiscal shock during fiscal consolidation and expansion. The VAR consists of five variables: Government spending news, log real government expenditure per capita, consumer sentiments, log real GDP per capita, and real long term interest rate to capture the borrowing cost. I include 4 lags in the estimation. Four out of eight countries in the sample were under fiscal consolidation for only 32 quarters. The small sample size of fiscal consolidation state for individual countries results in an issue of insufficient power when estimating the VAR. To address the small sample size issue, I run a Panel TVAR model with core and peripheral countries. The

[6]Note that the business sentiments results are not directly comparable to the consumer sentiments results as the expectations horizon is not same between the surveys. For consumer sentiments, the data captures the expectations one year ahead, while for industry sentiments, the expectations are formed for three months ahead. However, the analysis still offers an insight into studying evolution of firms' sentiments with fiscal policy.

panel of core countries consists of- Germany, France, Belgium, and Finland, and the panel of periphery countries include- Spain, Portugal, and Italy. I drop Netherlands from the analysis due to lack of data on consolidation episodes.

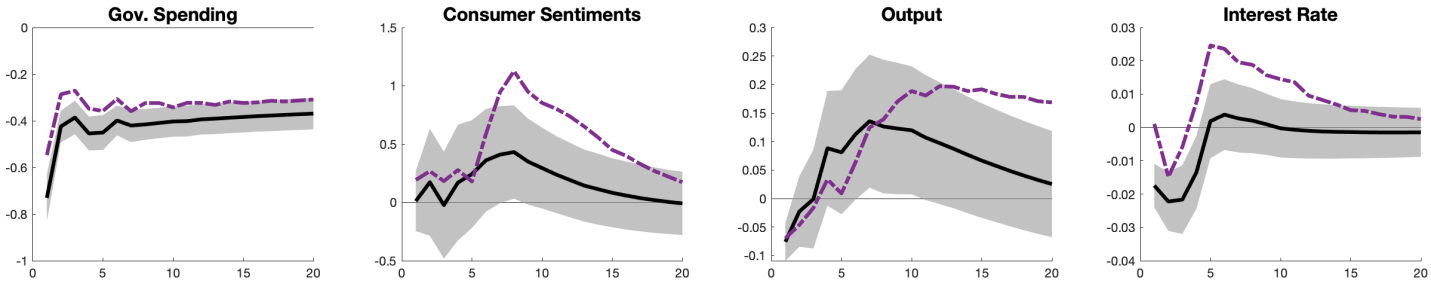
Identifying fiscal consolidation: For identifying the periods of fiscal consolidation I use the data constructed by Alesina et al. (2019b). They use narrative approach to identify fiscal consolidation as the year in which the general government tightens expenditure or increases tax exogenously for the purpose of correcting its primary deficit, and reducing debt. They exclude periods in which the reduction in expenditure or increase in tax revenue is endogenous to the state of the economy. Their dataset expands for the years 1970-2014. I use their methodology to identify the years for which a country in my sample enters fiscal consolidation for the years 2015-2019. I classify a given quarter as period of consolidation if the country was under consolidation in that financial year. Table 5 shows the number of quarters for which a country undergoes expenditure or tax based fiscal consolidation.

Figure 6 shows the Generalized impulse response of government spending, sentiments, output, and long term real interest rate to a one standard deviation fiscal policy news shock. The solid line shows the response during normal times while the dashed line shows the response during fiscal consolidation. The shaded region is the one standard error bands around the GIRFs for normal times.

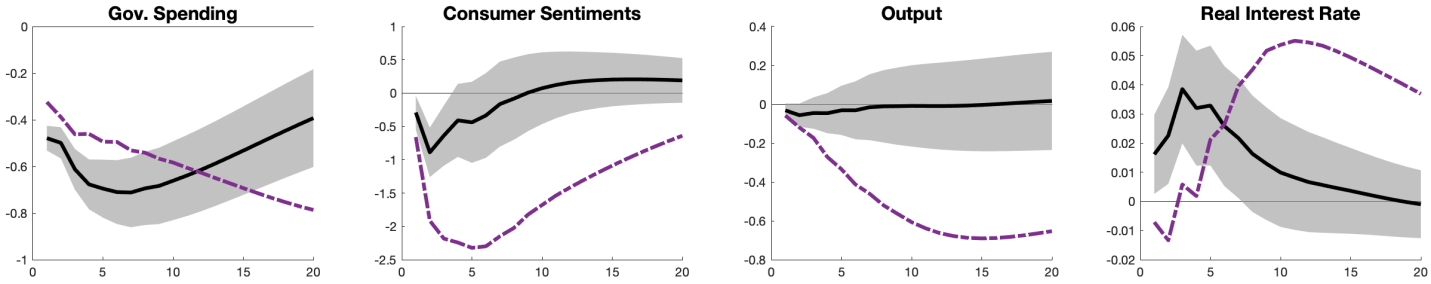
In core countries, an unanticipated contraction in fiscal policy results in a negative but insignificant response of consumer sentiments on impact in both normal and consolidation periods. The response of sentiments is positive and significant in medium run before converging to zero. At the end of one year, the increase in sentiments is higher during periods of consolidation. The response of output is negative and insignificant on impact during both, normal times and consolidation. Under normal times, output increases in the medium run before converging to zero, mimicking the response of consumer sentiments. Under consolidation, output rises positively and significantly in the medium run and stays persistently high in the long run. The results suggest that fiscal contraction is not very costly for Core countries and can be expansionary in the long run alongwith a positive response of sentiments.

Figure 6: Fiscal Consolidation: Non-linear effects of fiscal policy

(a) Core Economies



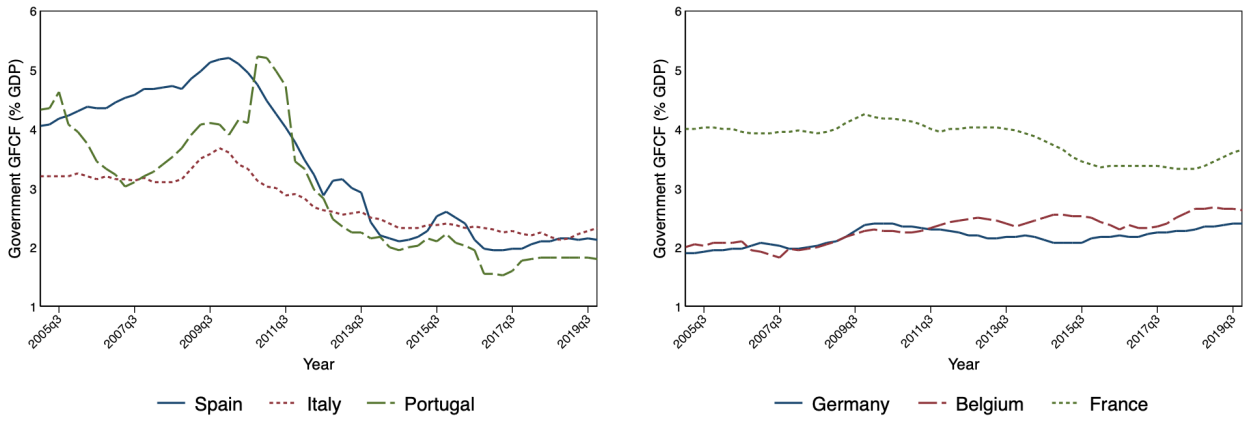
(b) Peripheral Economies



The solid lines gives the Generalized impulse responses for a one standard deviation contractionary shock to government spending news under normal times. The dashed line is the impulse responses during periods of fiscal consolidation. Shaded region is the one standard error bands around the GIRFs for normal times. Core countries comprises of Germany, France, Belgium, and Finland. Peripheral countries include Spain, Portugal, and Italy.

In peripheral countries, an unanticipated contraction in fiscal policy reduces consumer sentiments under both normal times and consolidation. While sentiments converges to zero quickly under normal times, the response remains negative and significant under consolidation. The response of output mimics the response of sentiments. Output is negative and significant on impact but converges quickly to zero during normal times while remaining significantly below zero during periods of consolidation. The response of government expenditure to a contractionary fiscal policy shock is also more negative and persistent during consolidation than in normal times. The above results suggest that consolidation is not very costly for the core countries. On the other hand, fiscal contraction during consolidation significantly reduces consumer sentiments and output for peripheral countries. This contradicts the argument that fiscal consolidation is less costly for high debt countries due to increase in sentiments.

Figure 7: Government Investment Expenditure (% of GDP)



(a) Peripheral Countries

(b) Core Countries

The figure plots the moving average of government gross fixed capital formation (unadjusted values) as percentage of GDP, for six European countries. The data is obtained from Eurostat.

One possible explanation for the significant fall in sentiments during consolidation is the reduction in government investment expenditure, along with the consumption expenditure, in peripheral countries. On the other hand, the government investment expenditure remained largely stable for all core countries. Figure 7 shows the moving average of government fixed capital formation as percentage of GDP for select peripheral and core countries between 2005 and 2019. Panel (a) shows the GFCF for Spain, Italy, and Portugal. Government investment in Spain and Portugal fell by roughly 3% between 2011 and 2016. Panel (a) shows the GFCF for core countries, Germany, Belgium, and France. Only France shows a slight decline in government investment expenditure ($\approx 0.5\%$) while the value is largely stable across time for Belgium and Germany. Erceg and Linde (2013) study the effect of fiscal consolidation in a New Keynesian model of currency union and show that under limited monetary accommodation in a currency union, fiscal consolidation is contractionary, more so under spending-based consolidation. We can argue that if cut in government consumption expenditure is coupled with large cut in government investment expenditure it can increase pessimism in the economy about the prospects for future economic growth. A fall in investments can then explain the large and statistically significant decline in sentiments and output for peripheral countries, but the lack of it in core countries.

An alternative explanation for the high cost of consolidation in the peripheral countries is the lack of credibility in the government's promise of enhanced fiscal responsibility. Section A.3 incoporates the long term yield spread of each country to Germany in the baseline VAR as a measure of credibility. If fiscal consolidation measures are perceived to be credible by the financial markets, the yield spread should decrease in response to a contractionary government spending shock under consolidation. Figure 13 presents the results with yield spreads. On impact, the yield spread in peripheral countries drop under consolidation. However, the spreads increase significantly within a year and stay persistently high. In contrary, the yield spread for core countries decrease in the first year then increase slightly before quickly converging to zero. The results suggest that the high cost of fiscal consolidation can be ascribed, at least in part, to the lack of believe by economic agents of achieving higher fiscal discipline and lower cost of borrowing.

4 Generating role for sentiments in a model of currency union

In this section, I present a theoretical model to replicate the patterns observed in the empirical analysis. I use a standard two country model which are part of a currency union, similar to the one presented in Nakamura and Steinsson (2014) and Bonam and Goy (2019). The key equations of the model are described below.

There are two country: Home and Foreign, which are part of a monetary union. Time is discrete. The population of the entire union is normalized to one. The population of the home region is given by n which makes the population of foreign region $(1 - n)$. The union is characterized by use of common currency, complete financial markets, and no trade barriers. The assumption of Law of One Price holds.

4.0.1 Households

Each country is characterized by a continuum of households denoted by k each of which have identical preferences and face identical budget constraints. Households face a consumption-

leisure trade-off in a standard CRRA utility function.

$$\hat{E}_0^j \sum_{t=0}^{\infty} \beta^t \left[\frac{(C_t^j)^{1-\sigma^{-1}}}{1-\sigma^{-1}} - \chi \frac{(N_t^j)^{1+\nu^{-1}}}{1+\nu^{-1}} \right] \tag{4}$$

where C_t^j is the consumption of the composite good, N_t^j is the labor supply by household j, β is the discount factor, $\sigma > 0$ is the coefficient of relative risk aversion, and $\nu > 0$ is the inverse of Frisch elasticity of labor supply. $\hat{E}_0^j$ is the subjective expectation of household j. How households form their expectations is the key feature of the model and is described in detail in Section 4.0.4.

Consumption is a composite of domestically produced goods C_{Ht} and imported foreign goods C_{Ft} given by the CES aggregator:

$$C_t^j = \left(\phi_h^{\frac{1}{\eta}} C_{Ht}^{\frac{\eta-1}{\eta}} + \phi_f^{\frac{1}{\eta}} C_{Ft}^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}} \tag{5}$$

where $\eta > 0$ is the elasticity of substitution between home and foreign produced goods. The degree of home bias in household consumption basket is given by ϕ_h which makes ϕ_f the share of foreign consumption. For analytical convenience, it is conventional to assume that $\phi_h + \phi_f = 1$. Define $\phi_h^* = \left(\frac{n}{1-n}\right) \phi_f$ where ϕ_h^* is the degree of home bias in the foreign economy and n is the size of home region. By assumption, $\phi_f^* = 1 - \phi_h^*$. If $\phi_h = n$, there is no home bias i.e. share of consumption in home and foreign goods equals the size of the respective economy. For all values of $\phi_h > n$ the economy exhibits a home bias in consumption. The demand for aggregate home and foreign goods is a CES aggregator of differentiated goods produced by firms in each country. Assuming that there is a continuum measure one of differentiated goods produced in home and foreign, the demand for each good by home consumers is given by:

$$C_{H,t} = \left[\int_0^1 c_{ht}(z)^{\frac{\theta-1}{\theta}} dz \right]^{\frac{\theta}{\theta-1}} \qquad \textit{and} \qquad C_{H,t} = \left[\int_0^1 c_{ft}(z)^{\frac{\theta-1}{\theta}} dz \right]^{\frac{\theta}{\theta-1}} \tag{6}$$

Households choose their demand for home and foreign goods to minimize their cost of attaining consumption C_t given the elasticity of substitution, η and θ, the degree of home bias ϕ_h, and the share of population n. Hence, the aggregate demand for home and foreign

produced goods, and for each differentiated goods are given by:

$$C_{Ht} = \phi_h \left(\frac{P_{Ht}}{P_t} \right)^{-\eta} C_t \qquad ; \qquad C_{Ft} = \phi_f \left(\frac{P_{Ft}}{P_t} \right)^{-\eta} C_t \tag{7}$$

$$c_{ht}(z) = \left(\frac{p_{ht}(z)}{P_{Ht}} \right)^{-\theta} C_{Ht} \qquad ; \qquad c_{ft}(z) = \left(\frac{p_{ft}(z)}{P_{Ft}} \right)^{-\theta} C_{Ft} \tag{8}$$

where P_t is the aggregate price index faced by households in home, P_{Ht} is the CES aggregator of price of differentiated goods produced in each country i, and $p_{it}(z)$ is the price of each differentiated good in country i.

$$P_t = [\phi_h (P_{Ht})^{1-\eta} + \phi_f (P_{Ft})^{1-\eta}]^{\frac{1}{1-\eta}} \tag{9}$$

$$P_{Ht} = \left[\int_0^1 p_{ht}(z)^{1-\theta} dz \right]^{\frac{1}{1-\theta}} \qquad and \qquad P_{Ft} = \left[\int_0^1 p_{ft}(z)^{1-\theta} dz \right]^{\frac{1}{1-\theta}} \tag{10}$$

Since the economy is characterized by no trade barriers and only one currency, prices will be homogeneous across both countries. This implies that $P_{Ht} = P^*_{Ht}$ and $P_{Ft} = P^*_{Ft}$. Define the terms of trade for home as $q_t = \frac{P_{Ft}}{P_{Ht}}$. Under perfect risk sharing, the Backus-Smith condition holds such that the ratio of marginal utility of consumption across two countries equals the real exchange rate between foreign and home produced goods:

$$\left(\frac{C^*_t}{C_t} \right)^{-\sigma^{-1}} = q_t \quad = \frac{P_{Ft}}{P_{Ht}} \tag{11}$$

Households at home maximize their infinite stream of lifetime utility with respect to the following budget constraint:

$$P_t C^j_t + (1 + i_t)^{-1} B^j_{t+1} = W_t N^j_t + \int_0^1 d_t(z) dz + B^j_t - T^j_t \tag{12}$$

where B_t is a one period government bond traded locally which pays the union-wide nominal interest rate i_t at the end of the period. Financial markets are complete and there is perfect risk sharing. The households own equal shares of profits in all monopolistically competitive firms in their respective countries. $d_t(z)$ is the dividend paid by firm z operating in home. W_t is the wage earned and T_t is the lump-sum transfers. The foreign block is modeled exactly like

the home bloc and the details are omitted to avoid repetition.

Finally, solving the household's utility maximization problem renders the first order condition for labor supply and the consumption Euler equation, given by:

$$C_t^{\sigma^{-1}} = \beta(1+i_t)\hat{E}^j \left[C_{t+1}^{\sigma^{-1}} \frac{P_t}{P_{t+1}} \right] \tag{13}$$

$$\chi (N_t^j)^{\nu^{-1}} (C_t^j)^{\sigma^{-1}} = \frac{W_t}{P_t} \tag{14}$$

4.0.2 Firms

Each country is characterized by a continuum $z \in [0,1]$ of monopolistic competitive firms each producing differentiated goods. Each good is tradable and is produced for final domestic and foreign consumption. Labor is the only input of production and is not tradable across countries i.e. home firms only use domestic labor. Firms have a constant returns of scale production function.

$$y_{ht}(z) = n_{ht}(z) \tag{15}$$

When setting prices, firms face a Calvo styled price rigidity. Each period, a fraction $1-\alpha$ of firms can reoptimize their prices while the remaining fraction α keep their prices same as last period's prices. Let $\bar{p}_t^h(z)$ denote the optimal price set by a firm z. The price setting problem of the firm is then given by:

$$\max_{p_{ht(z)}} \quad \hat{E}_t \sum_{k=0}^{\infty} (\alpha\beta)^k \lambda_{t,t+k} \left[p_{ht+k}(z) y_{ht+k}(z) - W_{H,t+k} y_{ht+k}(z) \right] \tag{16}$$

subject to the demand function for each firm:

$$y_{ht}(z) = \left(\frac{p_{ht}(z)}{P_{Ht}} \right)^{-\theta} (nC_{Ht} + (1-n)C_{Ht}^* + nG_{Ht}) \tag{17}$$

The aggregate price index domestically produced goods is a weighted average of firms who are unable to re-optimize their prices in the current period and firms who do re-optimize:

$$P_{Ht} = [\alpha (P_{Ht-1})^{(1-\theta)} + (1-\alpha) p_{Ht}(z)^{(1-\theta)}]^{\frac{1}{1-\theta}} \tag{18}$$

Solving the firm's optimization problem (Eq. 16) and combining it with the aggregate price index yields the New Keynesian Phillips curve for domestically produced goods. The firms are modeled identically in home and foreign.

4.0.3 Government

Monetary policy is governed by a central bank which sets the nominal interest rate for the entire union. The central bank follows a Taylor rule and aims to stabilize union-wide inflation weighted by the population in each country where π_t is the inflation rate at home and π_t^* is the inflation rate in foreign, both expressed in log deviations.

$$i_t = \phi_\pi[n\pi_t + (1-n)\pi_t^*] \tag{19}$$

Fiscal policy in each country is set domestically and independently in each country. The government only consumes domestically produced goods which is financed through a lump-sum tax T_{it}. The government's consumption demand for differentiated goods at home is given by: $g_{Ht}(z) = \left(\frac{p_{ht}(z)}{P_{Ht}}\right)^{-\theta} G_t$ and at foreign is given by: $g_{Ft}(z) = \left(\frac{p_{ft}(z)}{P_{Ft}}\right)^{-\theta} G_t^*$ where G_t and G_t^* denote per capita government spending in home and foreign, respectively. There are no distortionary taxes in the model and government expenditure is financed using lump-sum taxes. I assume that government balances its budget in each period.

The log linearized equations of the model around the non-stochastic steady state are given by:

$$c_t = \hat{E}_t^i c_{t+1} - \sigma(i_t - \hat{E}_t \pi_{t+1}) \tag{20}$$

$$c_t - c_t^* = \sigma\lambda P_{Ht} \tag{21}$$

$$y_t = \frac{C}{Y}\phi_h c_t + \frac{C}{Y}\left(\frac{1-n}{n}\right)\phi_h^* c_t^* - \eta\frac{C}{Y}\left(\phi_h + \frac{1-n}{n}\phi_h^*(1-\lambda)\right)P_{Ht} + g_t \tag{22}$$

$$y_t^* = \frac{C}{Y}\left(\frac{n}{1-n}\right)\phi_f c_t + \frac{C}{Y}\phi_f^* c_t^* + \eta\frac{C}{Y}\left(\phi_h\frac{n}{1-n} + \phi_f^*\left(\frac{\phi_h}{\phi_f} + \lambda\right)\right)P_{Ht} + g_t^* \tag{23}$$

$$\pi_{H,t} = \beta\hat{E}_t^i\pi_{Ht+1} + \kappa(\sigma^{-1}c_t + \nu^{-1}y_t - P_{Ht}) \tag{24}$$

$$\pi_{F,t} = \beta\hat{E}_t^i\pi_{Ft+1} + \kappa\left(\sigma^{-1}c_t^* + \nu^{-1}y_t^* + \left(\frac{\phi_h}{\phi_f} + \lambda\right)P_{Ht}\right) \tag{25}$$

$$\pi_t = \phi_h\pi_{Ht} + \phi_f\pi_{Ft} \tag{26}$$

$$\pi_t^* = \phi_h^*\pi_{Ht} + \phi_f^*\pi_{Ft} \tag{27}$$

$$P_{Ht} = P_{Ht-1} + \pi_{Ht} - \pi_t \tag{28}$$

$$i_t = \phi_\pi(n\pi_t + (1-n)\pi_t^*) \tag{29}$$

where $\lambda = \left(\phi_h^* - \frac{\phi_h}{\phi_f}\phi_f^*\right)$ and $\kappa = \frac{(1-\alpha)(1-\alpha\beta)}{\alpha}$.

4.0.4 Shocks and Expectations Formation:

The model intentionally abstracts from all other shocks and frictions to focus exclusively on the fiscal policy shock. The government expenditure in both home and foreign follows an AR(1) process: $g_t = \rho_g g_{t-1} + \epsilon_t^g$ where g_t is the government expenditure presented in log deviation from steady state. I assume that the agents cannot observe the home fiscal policy variable when forming expectations. Instead they observe a serially correlated variable z_t which also depends on the past realizations of fiscal policy.

$$z_t = g_{t-1} + \rho_z z_{t-1} + \epsilon_t^z$$

where the shocks ϵ_t^g and ϵ_t^z are iid with mean 0 and variance σ_g^2 and σ_z^2, respectively. z_t can be interpreted as a signal that agents receive on fiscal policy. This kind of noisy signal is common in the literature and is incorporated in different forms in Barsky and Sims (2012a), Benhabib et al. (2015). z_t evolves independently of fundamentals in the economy where ϵ_t^z can be interpreted as the animal spirits shock. Furthermore, I assume that this animal spirits shock is correlated with the fiscal policy shock ϵ_t^g, i.e. $E(\epsilon_t^g, \epsilon_t^z) = \Sigma_{gz} \neq 0$.

Re-writing the model in the state-space form:

$$AX_t = BE_tX_{t+1} + CX_{t-1} + DS_t \tag{30}$$

$$S_t = PS_{t-1} + \epsilon_t \tag{31}$$

where $X_t = \{c_t, c_t^*, y_t, y_t^*, \pi_{Ht}, \pi_{Ft}, \pi_t, \pi_t^*, P_{Ht}, i_t\}$ is the vector of endogenous variables and $S_t = \{g_t, g_t^*, z_t\}$ is the vector of shocks. Assuming Rational Expectations Equilibrium (REE), the solution to the above VAR will be of the form: $X_t = FX_{t-1} + GS_t$.

Restricted Perceptions Equilibrium:

Under the Rational Expectations assumption, agents observe the correct structural model when forming their forecasts. An alternative way to model expectations is to allow agents to have alternative forecasting rules which does not impose the condition of perfect foresight of all variables in the model. The key behavioral assumption made in this paper is that agents have misspecified beliefs when forecasting a linear VAR, resulting in deviations from rational expectations. The misspecification implies that agents underparameterize by omitting the home fiscal policy variable, g_t, from their forecasting model. Instead, agents condition their forecasts on their observed shock, z_t, which evolves with lagged observation of fiscal policy but independently of other fundamental variables in the economy.

The assumption of allowing agents to only observe a noisy measure of sentiments can be defended as follows. In democratic countries, fiscal expenditure is subject to intense political debates, take longer to be implemented, and are frequently diluted in their final implementation. It is therefore, not unreasonable to assume that agents may not be able to perfectly observe the shock but instead base their forecasts on noisy signals. Literature on political

economy shows that agents' belief about the effectiveness of government policy is biased by their political leanings. Benhabib and Spiegel (2019) use political partisanship as an instrument for economic sentiments and that this instrumented measure of sentiments is significantly associated with output growth. One way to then interpret the sentiments in our model, z_t, is as a measure of political bias, which is correlated with the government expenditure shock but does not depend on other economic variables.

The assumption of constraint on agent's forecasting model allows us to generate a role for sentiments correlated with fiscal policy. Under the misspecification assumption, agents' linear forecasting model (or Perceived Law of Motion) takes the following form:

$$X_t = \tau_1 X_{t-1} + \tau_2 \tilde{S}_{t-1}$$

$$\implies E_t X_{t+1} = \tau_1 X_t + \tau_2 \tilde{S}_t$$

where $\tilde{S}_t = \{g_t^*, z_t\}$. Expectations are homogeneous across all agents in home and foreign. Substituting the above equation in the VAR (Eq 30) renders the Restricted Perceptions Equilibrium (RPE) solution of the form:

$$X_t = (A - B\tau_1)^{-1} C X_{t-1} + (A - B\tau_1)^{-1} B\tau_2 \tilde{S}_t + (A - B\tau_1)^{-1} D S_t \tag{32}$$

Under RPE, the agents' least square coefficients τ_1 and τ_2 will satisfy the following orthogonality conditions[7]-

$$E\left[X_t - \tau_1 X_{t-1} - \tau_2 \tilde{S}_t\right] \begin{bmatrix} X_{t-1} \\ \tilde{S}_t \end{bmatrix}' = 0 \tag{33}$$

4.0.5 Calibration

The Impulse responses are computed to a one standard deviation fiscal policy shock in home for differing levels of correlation with the sentiments shock. I assume that the household discount factor, β is 0.99. Similar to Nakamura and Steinsson (2014) I set the inverse of Frish elasticity

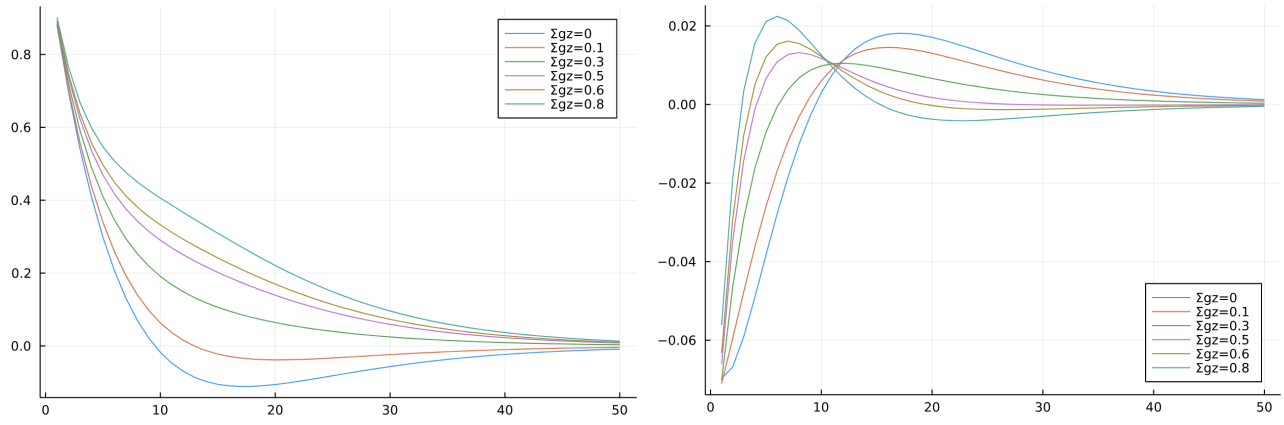
[7]For more details, refer to Branch (2006), Branch and Gasteiger (2020).

of labor supply, ν, and the inter-temporal elasticity of substitution, σ, equal to 1. The value for the trade elasticity parameter, η, is set at 2. The Calvo parameter α is set at 0.65 which is within the range assumed in the literature. The home bias parameter ϕ_h is set as 0.64. It is calculated as one minus the average import share in GDP in 2019 across all countries in our sample except Belgium and Netherlands, which have significantly higher degree of openness due to the small size of their economy. Increasing (decreasing) the home bias parameter increases (decreases) the impact effect of the government spending shock but does not alter our main conclusion with respect to the impact of sentiments. The steady-state share of consumption is set at 0.75, approximately equal to the share of consumption expenditure in Euro area GDP. The size of the economy n is set at 0.1 which implies that monetary policy puts a smaller weight on home inflation for asymmetric shocks. Changing the values of n changes the impact effect of government spending on output with a larger n resulting in a larger response of real interest rate and a smaller impact on output. The response of monetary policy to inflation, ϕ_π is assumed to be 1.5 to satisfy the Taylor principle. Finally, the persistence coefficient of fiscal policy shock ρ_g is assumed to be 0.9 in both countries. The persistence coefficient of sentiments ρ_z is set to be 0.8. While this is an arbitrary choice, it is approximate to the persistence of sentiments estimated in Angeletos et al. (2018). The results presented are also consistent for a range of values for ρ_z. All structural and persistence parameters are assumed to be same across both countries.

4.0.6 Implications for Fiscal Policy

Figure 8 shows the impulse response functions to a one standard deviation domestic fiscal policy shock ϵ_t^g under the Misspecified equilibrium. Each color coded lines represent the IRFs with different levels of correlation between sentiments and the home government spending shock. Panel (a) plots the response of domestic output (Y_t) and Panel (b) plots the response of domestic real interest rate ($r_t = i_t - \pi_t$).

Figure 8: Impulse Response to fiscal policy shock



(a) Output (b) Real Interest Rate

The figure plots the response of output and real interest rate to a one standard deviation fiscal policy shock for different levels of correlation between fiscal policy and sentiments shock.

On impact, the response of output to home government spending shock is same for all levels of correlation with the sentiments shock. However, the stronger the correlation of fiscal policy with the sentiments shock of agents, the more persistent is the response of output. While with no correlation, the response of output to fiscal policy decreases below zero by 10 quarters, sentiments co-move strongly with fiscal policy ($\Sigma_{gz} = 0.8$), the response in 10 quarters is still strongly positive. We can look at the response of the real interest rate to understand why fiscal policy has a more persistent impact on output. The response of real interest rate is negative on impact which happens due to the presence of price rigidity in the model. In a New Keynesian model with price stickiness, prices only gradually respond to the government spending shock resulting in a decrease in real interest rate and a boost to private spending and output. As prices adjust to the new levels, real interest rate rises slightly before converging back to zero. With no correlation between government spending and sentiments, the real interest rate is negative in the short run but rises above zero and stays higher for longer, crowding out private spending. However, for higher levels of correlation between sentiments and fiscal policy, the increase in real interest rate is lower and less persistent, thus, reducing the effect of crowding out.

5 Conclusion

This paper hypothesizes that movements in consumer sentiments can determine the efficacy of macroeconomic policy in stimulating the economy. I analyze the interaction between fiscal policy and sentiments using data on the countries in the European economic and monetary union. The results show that in the absence of complete access to monetary policy in combating domestic shocks, fiscal policy strongly influences consumer sentiments. I find that consumer sentiments respond positively for most countries to an expansionary fiscal policy shock. Countries with a larger response of consumer sentiments also experience a larger expansion of output to a fiscal policy shock. Fiscal policy in peripheral European countries have a larger impact on output than in core countries. The effect is also more persistent.

I extend the analysis to then understand how the response to fiscal policy differs between core and periphery countries during different states of fiscal consolidation. Fiscal contraction during periods of fiscal consolidation is not very costly for core countries in the short run and is expansionary in the medium run. On the other hand, fiscal contraction during fiscal consolidation is very costly for peripheral countries. The results suggest that fiscal policy is strongly correlated with consumer sentiments in peripheral countries. Therefore, constraints imposed on fiscal policy under consolidation measures significantly dampens sentiments.

Lastly, allowing for a stronger correlation of agents sentiments with fiscal policy allows us to generate a more persistent response of output, as observed in the data. The paper concludes that, for countries in a monetary union, fiscal policy can have substantially higher impact on the level of economic activity through its impact on consumer sentiments.

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A Appendix

A.1 Do Businesses feel the same? Fiscal Policy and Business Sentiments

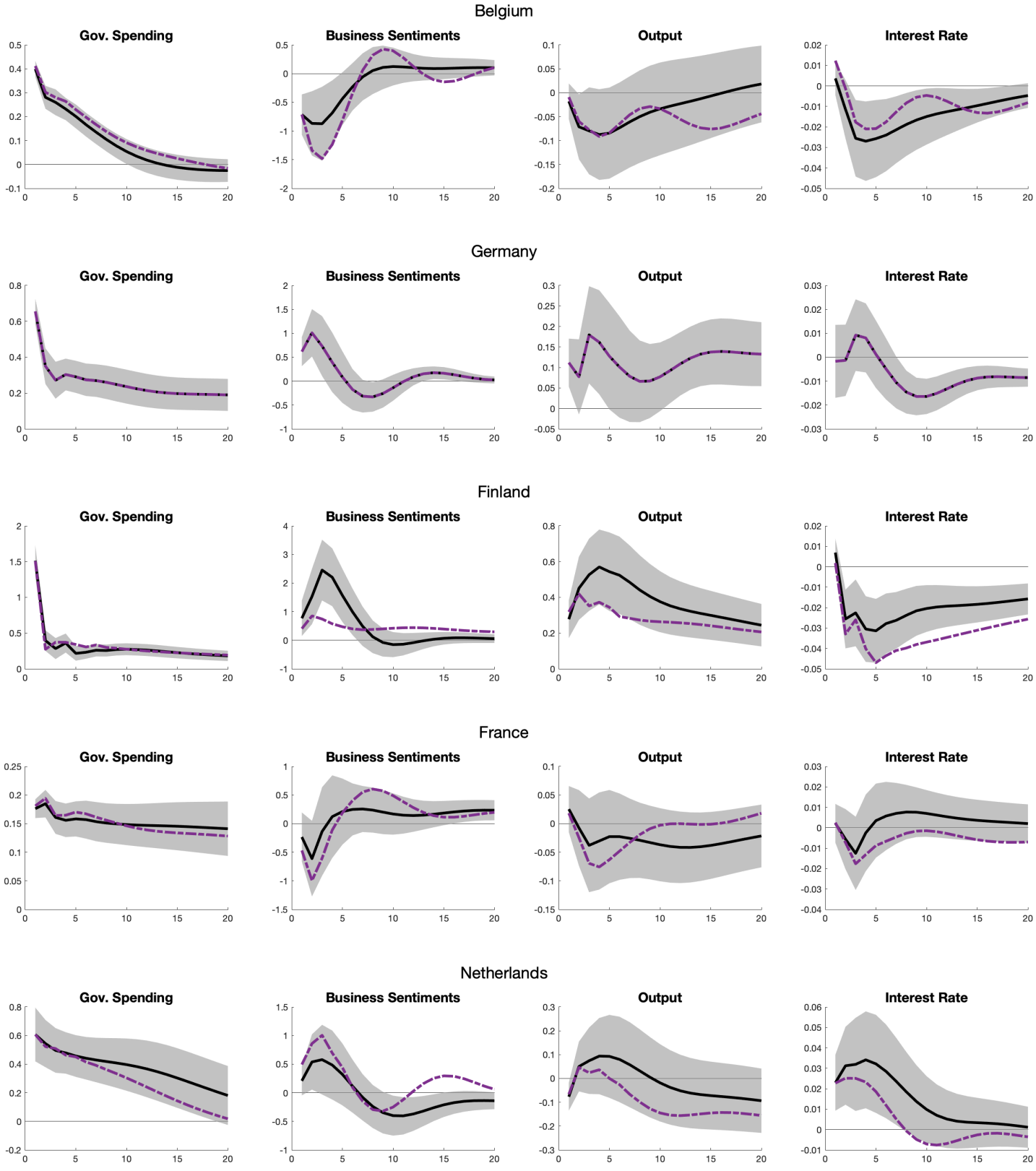
An expansionary fiscal policy shock increases household's future economic outlook reflected in the response of consumer sentiments to a fiscal policy shock (Figure **??**). However, the increase in government expenditure also increases the probability of default in higher debt countries. This should be factored into the sentiments of firms who may fear higher cost of investment, lower access to financial markets, and more expensive imports. Repeating the baseline exercise with business sentiments, the response of sentiments to an expansionary government expenditure news shock should be weaker relative to the response of consumer sentiments, in countries with higher levels of government debt. Table 6 shows the questions used from the industry survey by European Commission to create the expected components of the business sentiments index.

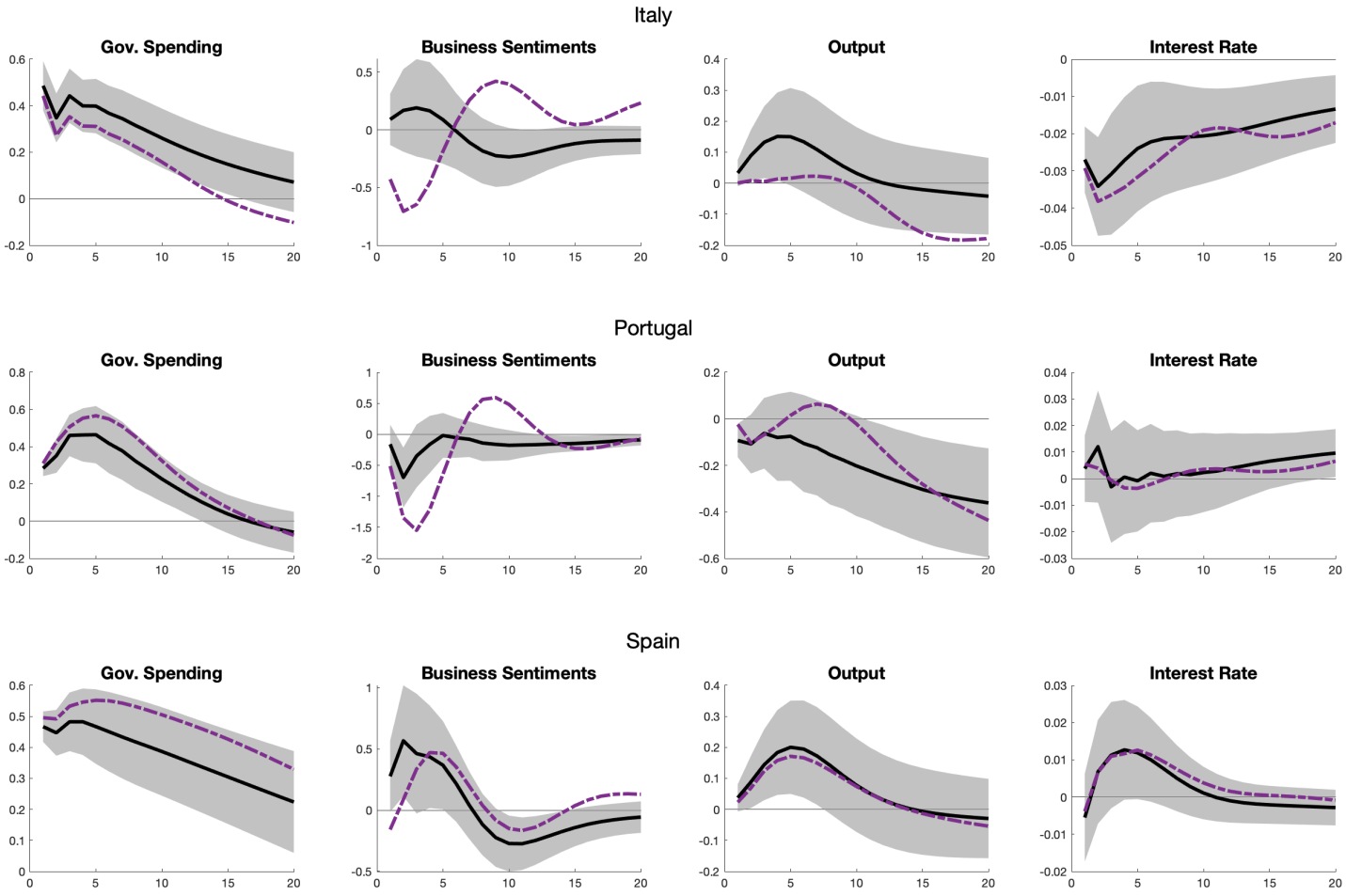
Table 6: Forward-looking Industry Sentiments Questions

Q5	How do you expect your production to develop over the next 3 months?
Q6	How do you expect your selling prices to change over the next 3 months?
Q7	How do you expect your firm's total employment to change over the next 3 months?

Figure 9 shows the response of government spending, business sentiment, output, and interest rate to a one standard deviation fiscal news shock. The solid line is the baseline GIRF and the dashed line is the response under the counterfactual analysis where sentiments of all countries is replaced by that of Germany (see Section 2.3).

Figure 9: Results from the Baseline VAR model with Business Sentiments





The solid lines gives the Generalized impulse responses (GIRFs) for a positive one standard deviation shock to government spending news in the baseline model. The dashed line is the impulse responses for the counterfactual discussed in Section 2.3. Shaded region is the one standard error bands around the GIRFs for the baseline model.

A.2 Robustness: Using Semi-Annual Data

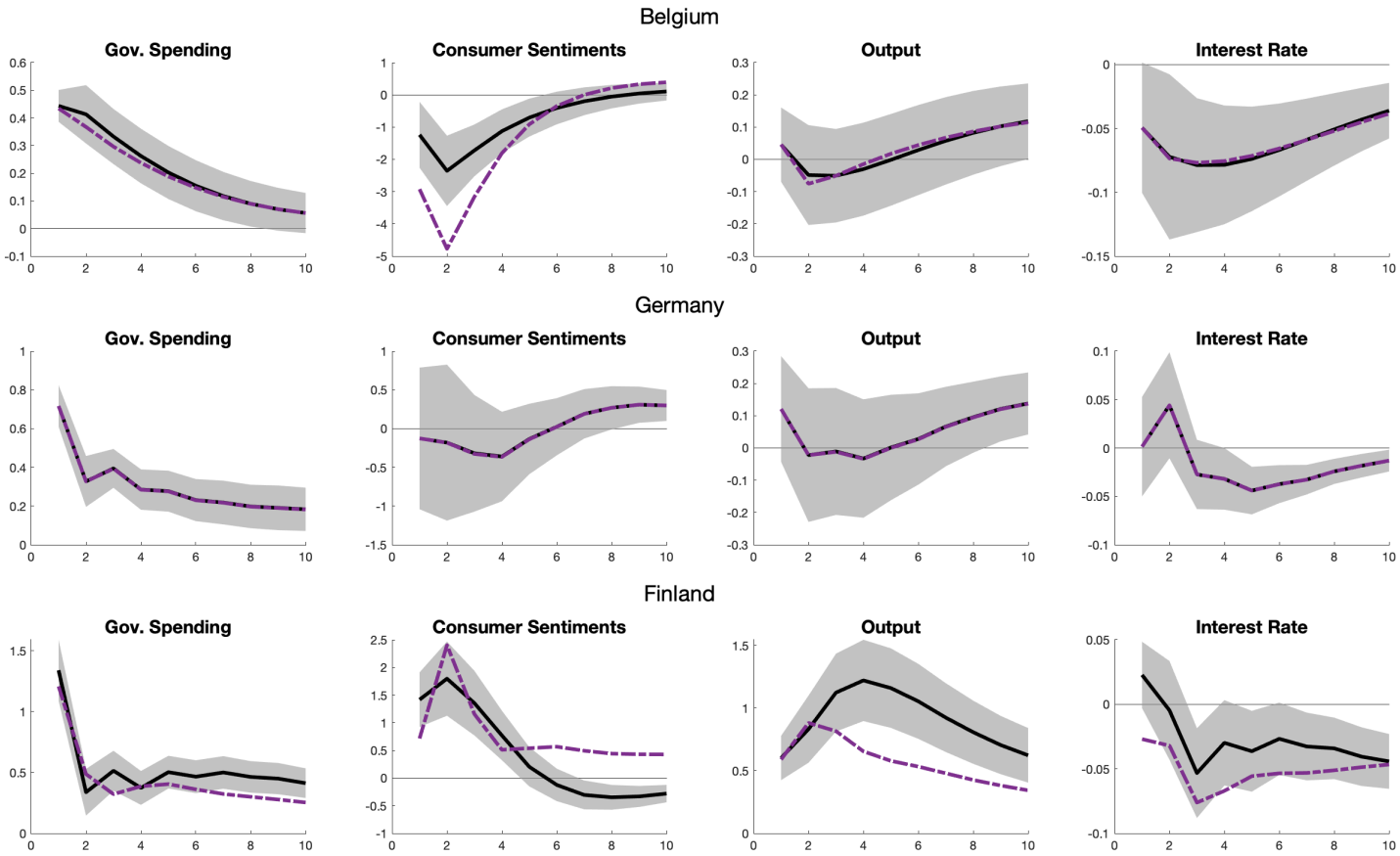
The forecast data used to compute fiscal policy news variable is only available in semi-annual frequency until 2003. Moreover, the forecasts are generated only twice a year and thus result in changing horizon for two out of the four quarters.[8]. Conducting the baseline analysis in semi-annual frequency solves the issue of mixed frequency data and information asymmetry in two consecutive forecasts. In this section, I test the robustness of the baseline results by using semi-annual data. All variables except consumer sentiments is converted from quarterly to semi-annual frequency by summing the values for two quarters. For example, the government

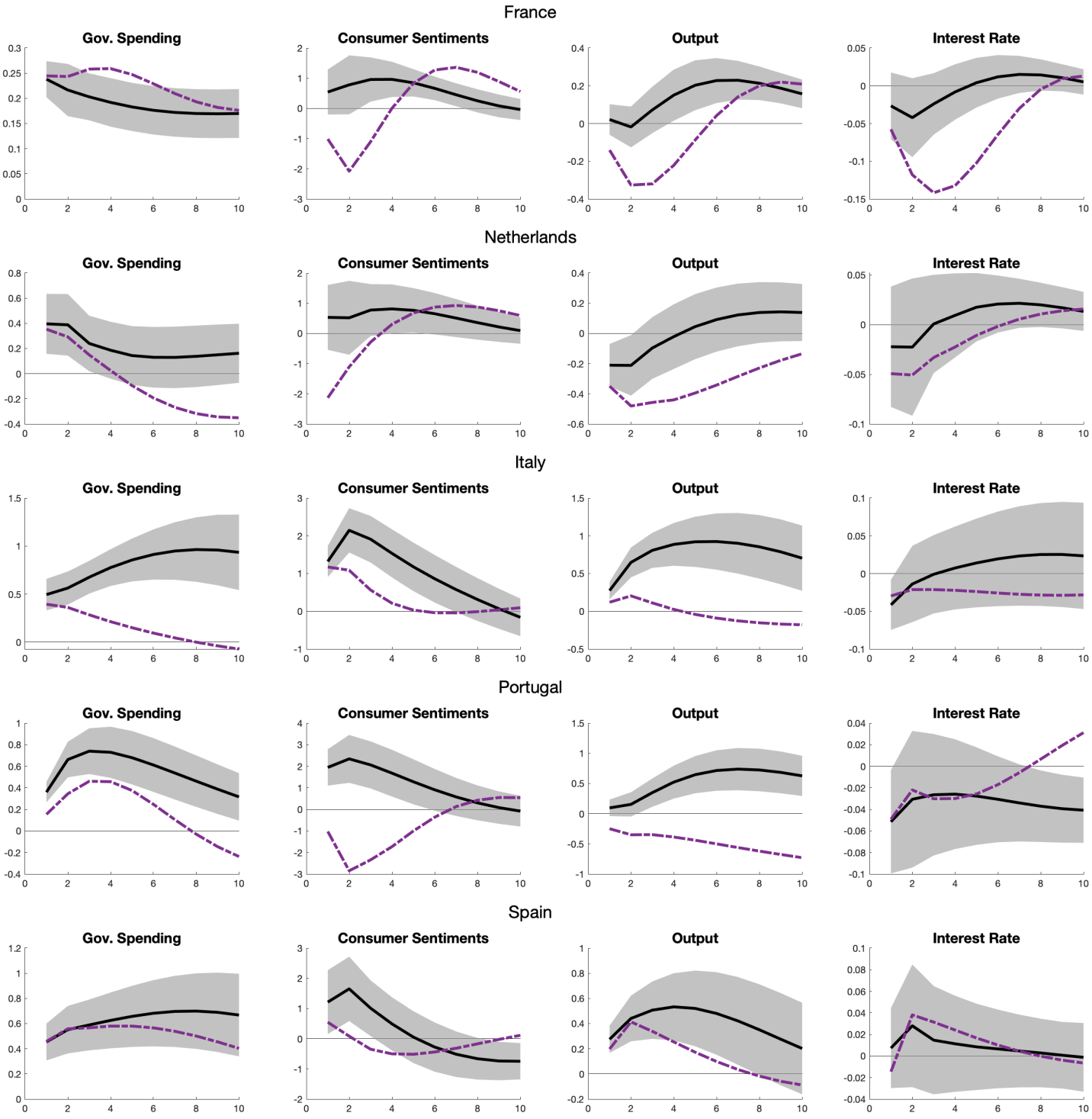
[8]The data is discussed in more detail in Section 2.1

consumption expenditure for the first half year is equal to the sum of government consumption expenditure in Q1 and Q2. For sentiments indicator, I calculate the mean sentiments index at semi-annual frequency. The lag length for all countries is one, as picked by the information criterion.

Figure 11 shows the impulse response from the baseline model discussed in Section 2.3 with the semi-annual data frequency. The solid line shows the impulse response of real government spending, consumer sentiments, real GDP, and real interest rate to a one standard deviation expansionary shock to the fiscal policy news. The dashed line shows the response for a one standard deviation shock in the counterfactual analysis where consumer sentiments for all countries is replaced with the sentiments in Germany. The shaded area is the one standard error bands around the GIRFs. The results for the baseline hypothesis is largely robust with the lower frequency data.

Figure 11: Results from the Baseline VAR model with Semi-Annual Data



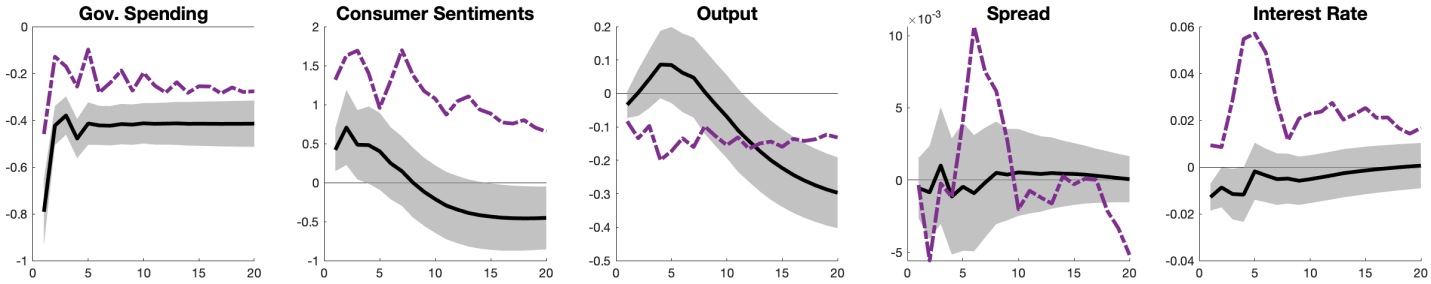


The solid lines gives the Generalized impulse responses for a positive one standard deviation shock to government spending news in the baseline model. The dashed line is the impulse responses for the counterfactual discussed in Section 2.3. Shaded region is the one standard error bands around the GIRFs for the baseline model.

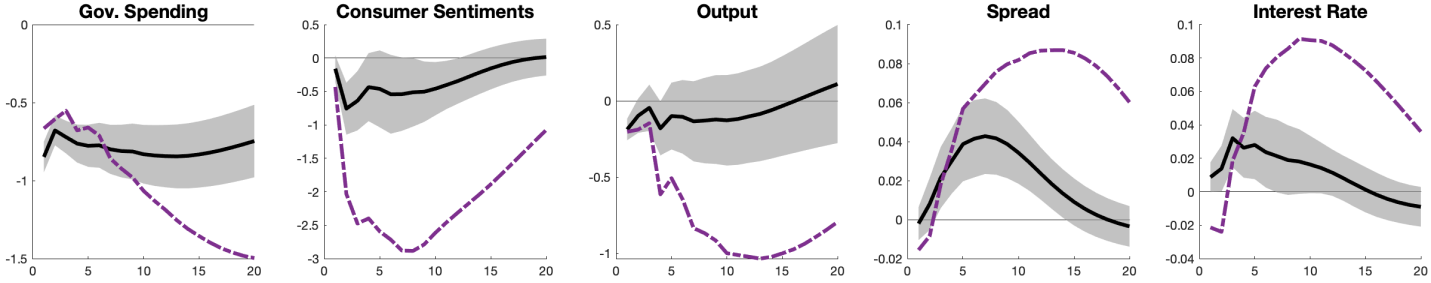
A.3 Robustness: Including Interest Rate Spreads

Figure 13: Fiscal Consolidation: Non-linear effects of fiscal policy

(a) Core Economies



(b) Peripheral Economies



The solid lines gives the Generalized impulse responses for a one standard deviation contractionary shock to government spending news under normal times. The dashed line is the impulse responses during periods of fiscal consolidation. Shaded region is the one standard error bands around the GIRFs for normal times. Core countries comprises of Germany, France, Belgium, and Finland. Peripheral countries include Spain, Portugal, and Italy.

While the consolidation measures enacted after the financial crisis were largely successful in reducing the debt levels in core countries and restoring market confidence, they were not as successful in peripheral countries like Italy or Spain which continue to struggle with higher debt levels. Consolidation measures can be viewed as counterproductive by the economic agents if they are not believed to have long term reduction in public debt. This section incorporates the long-term yield spread of each country with Germany to analyze whether the high cost of consolidation in peripheral countries could be explained by the lack of commitment of peripheral governments towards fiscal consolidations. The results are shown in Figure 13. I also drop Germany from the panel of Core countries.