Fiscal Response to Monetary Shocks in the Euro Area

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Abstract

This paper examines the impact of monetary policy shocks on key fiscal variables: government spending, tax revenues, interest payments, deficits, and bond issuance. Understanding this relationship is crucial because the fiscal response shapes the overall effect of monetary shocks on the economy. According to HANK models, the negative effects of contractionary monetary policy are amplified in highly indebted countries, as rising debt servicing costs crowd out transfers to non-Ricardian households. This paper analyses the causal effect of the Jarociński and Karadi (2020) monetary policy shocks on fiscal variables using a VAR model on a panel of 20 Euro Area member states since the adoption of the Euro. Contrary to HANK model predictions, I find that the rise in debt servicing costs after a contractionary shock is not economically significant enough to materially constrain fiscal policy, even in countries with large short-term debt exposures. Instead, Euro Area governments generally lean against monetary shocks through spending and transfers, dampening their transmission to GDP.

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1 Introduction

In the past decade, a new paradigm for fiscal and monetary policy analysis has emerged in the form of Heterogeneous-Agent New Keynesian (HANK) models. An important implication of these models highlighted in Kaplan et al. (2018)'s seminal paper is that the consequences of monetary policy are intertwined with the fiscal side of the economy because of the failure of Ricardian equivalence. In particular, the models predict that the presence of sovereign debt amplifies the transmission of monetary policy due to changes in debt servicing costs, which in turn impact the amount of transfers and spending the government can undertake. This is referred to as the fiscal channel of monetary policy and illustrated by the following example. Assume the case of a monetary shock that reduces interest rates and thus frees resources for the government to increase transfers and spending while keeping its budget balanced. Since a portion of the households that benefit from government transfers and spending are non-Ricardian hand-to-mouth households, they spend the amount received without saving it. This in turn stimulates output more than a counterfactual scenario of a government without debt. The empirical evidence in support or disproof of this implication is, however, scarce.

This paper studies the response of fiscal variables (tax revenues, government expenditures, surpluses) to monetary shocks in the Euro Area, using local projections and VAR impulse response analysis on a panel of 20 member states over a 22-year period. My analysis is comparable to that by Bouscasse and Hong (2023), who ask the same question for the USA and find only limited effects of monetary shocks on fiscal variables. A similar study does not exist yet for the Euro Area. This paper has the advantage of analyzing the impact of one single monetary shock across a broad set of countries. This allows me to investigate the characteristics that may influence the fiscal response and thus the transmission of monetary shocks. For instance, I condition the analysis on the level and maturity structure of public debt across the Euro Area, since only the amount of debt that is refinanced becomes more or less expensive following a monetary shock. In addition, I condition the analysis on the social security system of member countries. Bayer et al. (2023) conjecture that the social security system is a key determinant of the fiscal response to monetary shocks, because households, whose consumption is insured by the government and have less of a need to save privately in government bonds, prefer a more balanced budget. Since Bouscasse and Hong (2023) focus exclusively on the USA, they are unable to offer this kind of differentiation.

For the Euro Area (EA), I find that a one standard deviation contractionary monetary policy shock results – on impact – in a decline in tax revenues of -0.2 percentage points (p.p.) below trend (about one-third of the decline of GDP, which drops -0.6 p.p. below trend), while both spending and transfers increase by 0.08 and 0.065 p.p. respectively. The government budget is balanced by an increase in deficit of 0.35 p.p. above trend, which in turn leads to an increase in outstanding government debt. The debt servicing cost reacts with a lag and increases by 0.03 p.p. above trend only 2 years after the shock. The maturity structure of government debt also react to the monetary policy shocks: governments finance the newly issued debt primarily at the long end of the maturity curve. These results, however, mask key heterogeneities in the response of single EA countries.

I single out and analyse three groups of countries among the Euro Area members: the first group is composed of countries with the lowest share of short-term debt which need to be refinanced within 1 year[1]; the second, of countries with the largest share of short-term debt[2]; finally, Germany represents its own category because it is an interesting benchmark in this comparison and because it has the largest share of transfers relative to total expenditures than any other EA country, suggesting that its citizens may have the least precautionary saving motives compared to other countries. The analysis of the impulse response functions (IRFs) of these three groups reveals the following: as one would expect, only countries which are forced to rollover a substantial amount of their debt after a contractionary shock experience a significant increase in debt servicing cost by about 0.1 p.p. above trend two and half years after the shock. This additional constraint on the government budget, however, does not affect the response of the other fiscal variables, which behave as those of the other groups. Despite preferences for a balanced budget conjectured in Bayer et al. (2023), Germany's fiscal response also does not differentiate itself from that of the other countries: both deficit and debt increase temporarily above trend to finance higher spending and transfers given lower tax revenues. It is worth nothing that uniquely for Germany, the debt servicing cost declines following contractionary monetary shock, likely as a consequence of flight to safety by bond investors.

The study offers empirical evidence for the calibration of HANK models with public debt (Kaplan et al. (2018), Auclert et al. (2025)) and underscores how the fiscal channel of monetary policy transmission is, after all, of limited magnitude. This is primarily a consequence of the fact that EA governments spend only a small fraction of their budget on interest payments – 2.5% on average – and the increase in debt servicing cost even in the most affected countries is economically insignificant (10 basis points above trend for Italy and Portugal). In contrast to the findings for the USA by Bouscasse

[1]The Netherlands, Slovakia, Slovenia, Estonia, Latvia, and Lithuania have a ratio of short-term debt to GDP of less than 6% on average, compared to the EA average of 12%.

[2]Italy and Portugal have a short-term debt to GDP ratio larger than 24%.

and Hong (2023), Euro Area governments respond more forcefully to monetary policy shocks, counteracting them through increased spending and transfers. This behaviour may reflect the role of automatic stabilisers and the broader social safety net in the EA. However, the resulting increases in deficits and debt appear less persistent than in the US case. My setting allows me to focus on countries with a high share of short-term debt – such as Italy and Portugal – that should exhibit a stronger fiscal channel of monetary policy, yet show no clear evidence of such a channel. The paper also contributes to the broader literature that estimates monetary impulse response functions in the Euro Area, such as the recent work by Altavilla et al. (2019) and Corsetti et al. (2022), by focusing on fiscal variables in addition to the usual macroeconomic variables.

The rest of the paper is structured as follows: Section 2 introduces the data and the monetary shocks used for the analysis. Section 3 presents the empirical strategy, while the results including the breakdown by country are in Section 4. Finally, Section 5 concludes.

2 Data and Data Preparation

Macroeconomic and fiscal data are obtained from Eurostat and ECB public data portals at a quarterly frequency from 2002 Q1 to 2023 Q4 (88 observations).

For the analysis, variables have been deflated using the GDP deflator, and detrended by dividing by the trend of real GDP[3]. Thus, fiscal variables are expressed in percentage of real trend GDP. The 20 Euro Area countries are Austria, Belgium, Cyprus, Germany, Estonia, Greece (EL), Spain, Finland, France, Croatia, Ireland, Italy, Latvia, Luxembourg, Lithuania, Malta, Netherlands, Portugal, Slovenia, and Slovakia. Not all of them report fiscal variables at a quarterly frequency. Therefore, I apply various methodologies to extrapolate quarterly data from yearly observations[4]. The Euro Area aggregate value for inflation is obtained weighting each country's inflation by the country's share in total household consumption – the same way the ECB does it – while the EA aggregate 10 year yield, yield spread and average residual maturity is obtained by weighting by the share of total public debt. All other aggregate values are sums across EA countries.

Figure 1 shows the detrended deflated variables of interest that also enter the vector

[3]The trend is extracted using Gordon and Krenn (2010) procedure, where the trend is the predicted value of the regression of real GDP on a polynomial of degree five.

[4]IT, EL, CY do not report quarterly tax revenues and expenditures, while AT, DE, EE, ES, IE, LV, LT, LU, MT, NL, PT, SI, SK do not report the quarterly breakdown of expenditures in transfers and interest payment. I use Chow-Lin regression method to extrapolate quarterly data from yearly fiscal observations. The debt maturity structure is also available only at yearly frequency and I use Denton-Cholette method to derive the quarterly observations.

autoregressive model. Netted Spending refers to total government expenditures without Interest Payments, Transfers and Stock Flow Adjustments[5]. Transfers are the sum of Monetary Social Transfers, Social Transfers in Kind, Capital Transfers, and Current Transfers. The Short-Term Shadow Rate is taken from Wu and Xia (2017), who use a term structure model to estimate a counterfactual short-term interest rate in Europe during the period in which the zero lower bound was binding.

In Figure 1, detrended real GDP displays business cycle fluctuations and a sharp drop, followed by a sharp recovery, during COVID-19. Inflation remained subdued for most of the sample period but spiked dramatically post-2020, coinciding with ultra-loose monetary and fiscal policy and supply chains disruptions. COVID-19 also reverses the trend of declining short-term rates and bond yields. Despite increasing deficits and debt during crisis periods (2009, 2020), average debt maturity lengthened and interest payments declined, reflecting favourable financing conditions. The ECB's role in suppressing bond yields is evident from the surge in debt held by the central bank post-2015, consistent with QE programs.

Table 1 reports time averages for fiscal variables that are key in determining the different exposure of a country to monetary shocks. Euro Area countries show wide heterogeneity in fiscal fundamentals. Debt-to-GDP ratios range from just 8% in Estonia to 146% in Greece, with interest payments as a share of GDP higher in more indebted countries (e.g. Italy, Greece, Portugal). Short-term debt exposure and average debt maturities vary, with countries like Italy and Portugal facing higher rollover risk due to elevated short-term shares and shorter maturities. Government transfers represent a significant share of GDP: they are the lowest among Baltic countries and the highest in Germany and France.

2.1 Monetary Shock

The monetary shocks for the Euro Area are taken from the up-to-date time series by Jarociński and Karadi (2020). The shocks are purged of information effects and thus

[5] Stock flow adjustments balance the difference between changes in nominal debt and reported government deficits. A positive SFA implies that reported deficits understate the increase in debt. In other words, a positive SFA leads to greater borrowing than implied by the deficit. These adjustments emerge as a consequence of the time mismatch between the accrual accounting of taxes and expenditures and actual cash flows. A positive SFA can happen for instance if a government defers taxes: on an accrual basis, the tax receivables increase and the net balance is unchanged, however, debt issuance has to increase to finance the deferral. Another example would be the receipt of a transfer from the EU. A government might decide to spend the money that might take few months to arrive. An example of negative SFA, which reduces actual debt issuance, is the incurrence of account payables by the government.

Figure 1: Descriptive Statistics for the Euro Area (the fiscal variables displayed as well as the debt variables are expressed as fraction of detrended real GDP; average residual maturity is in years; inflation, rates, yields and spreads are in percent)

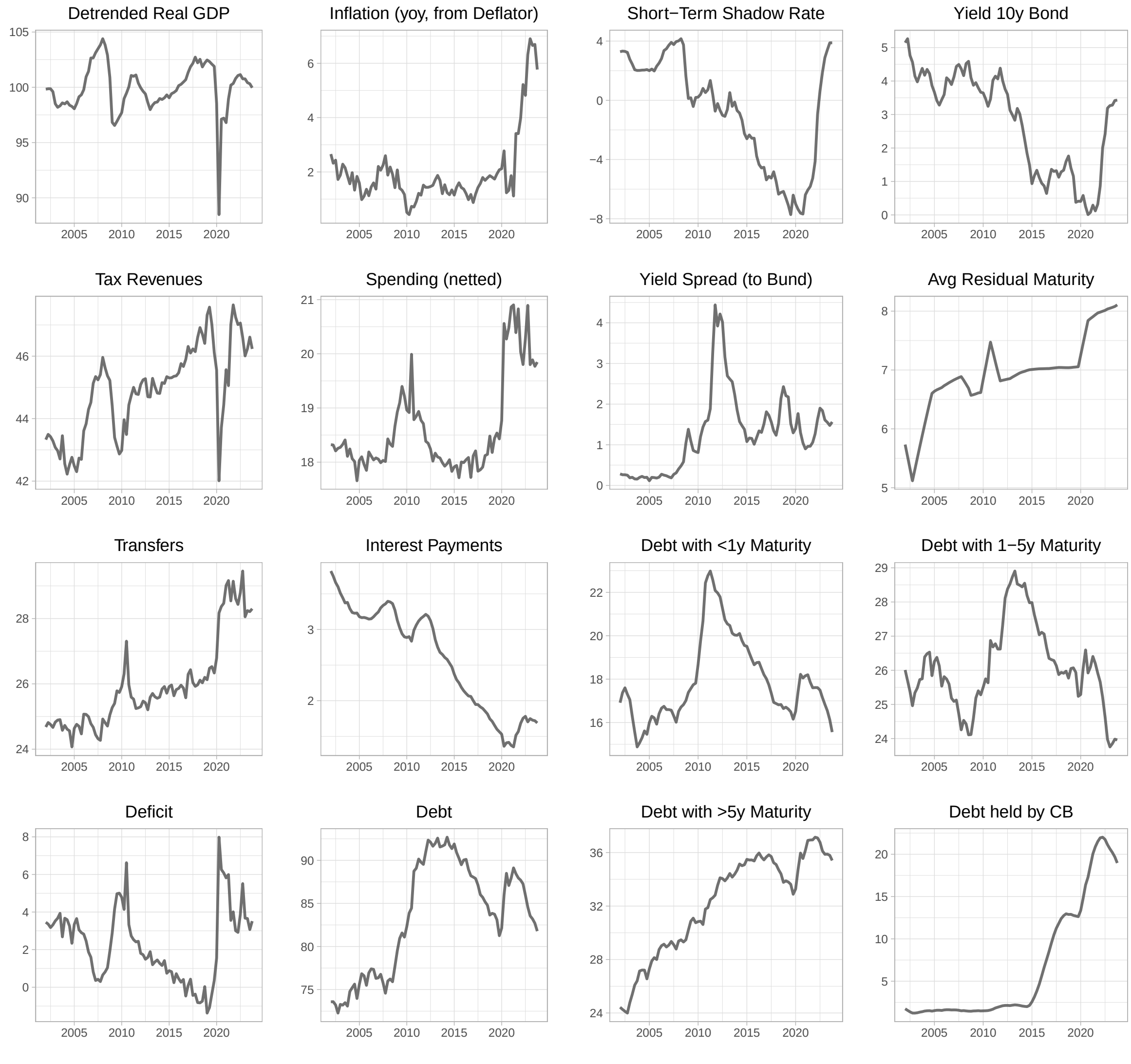


Table 1: Time averages of key fiscal variables for Euro Area countries

country	Debt/GDP	ST debt/debt	Debt matur (y)	Int pay/GDP	Transf/GDP
AT	0.76	0.12	8.24	0.02	0.27
BE	1.04	0.18	7.31	0.04	0.27
CY	0.77	0.17	6.16	0.03	0.16
DE	0.67	0.20	6.13	0.02	0.28
EE	0.08	0.07	6.66	0.001	0.15
EL	1.46	0.11	13.13	0.04	0.24
ES	0.76	0.18	6.77	0.02	0.20
FI	0.54	0.17	5.17	0.01	0.23
FR	0.85	0.21	7.10	0.02	0.29
HR	0.56	0.17	5.43	0.02	0.19
IE	0.59			0.02	0.15
IT	1.24	0.27	6.93	0.04	0.25
LT	0.30	0.13	6.11	0.01	0.16
LU	0.16			0.003	0.22
LV	0.29	0.11	7.04	0.01	0.15
MT	0.58	0.16	7.48	0.03	0.14
NL	0.54	0.08	6.67	0.02	0.23
PT	0.98	0.26	5.77	0.03	0.21
SI	0.49	0.12	6.91	0.02	0.22
SK	0.51	0.09	8.00	0.02	0.21

identify "pure" monetary innovations[6]. Note that also the implementation of non-conventional monetary policy is considered by the authors in the construction of the shocks. Figure 2 reports the monetary shocks in relation to changes to the main refinancing operation (MRO) rate of the ECB.

3 Estimation

I estimate IRFs to *structural* monetary policy shock ε_t^{MP} from a VAR identified via Cholesky decomposition, where the monetary policy shock is ordered first.

Consider a reduced-form VAR(p):

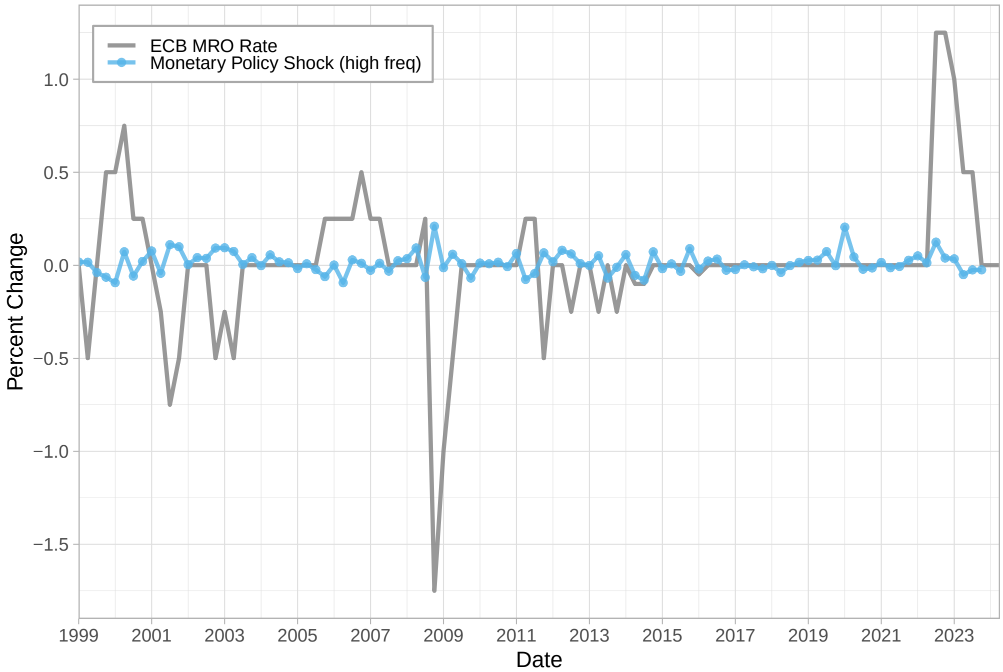
$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + u_t, \quad u_t \sim \mathcal{N}(0, \Sigma_u)$$

To identify structural shocks ε_t, assume:

$$u_t = S\varepsilon_t, \quad \text{with } \mathbb{E}[\varepsilon_t \varepsilon_t'] = I$$

[6]There is an ongoing debate in the literature about the significance of central banks information effects: Jarociński and Karadi (2025) reiterate the importance of purging information effects from monetary shocks.

Figure 2: Exogenous monetary shocks in the Euro Area



The Cholesky decomposition implies choosing S such that:

$$\Sigma_u = SS', \quad \text{with } S \text{ lower triangular}$$

The moving average (MA) representation is:

$$y_t = \sum_{i=0}^{\infty} \Psi_i u_{t-i} = \sum_{i=0}^{\infty} \Psi_i S \varepsilon_{t-i}$$

where Ψ_i is the MA coefficient matrix at horizon i. The impulse response at horizon h to the j-th structural shock is:

$$\text{IRF}_{h,j} = \Psi_h S e_j \tag{1}$$

where e_j is the j-th column of the identity matrix (i.e. the unit shock to structural innovation $\varepsilon_{j,t}$).

VAR vector y_t is constituted by the following variables: Monetary Policy Shock, Detrended Real GDP, GDP Deflator, Detrended Real Tax Revenues, Detrended Real Spending, Detrended Real Transfers, Detrended Real Interest Payments, Detrended Real Stock Flow Adjustments, Detrended Real Debt. The Cholesky decomposition imposes short-run restrictions on these variables: the first shock, ε_t^{MP}, is assumed to affect all variables contemporaneously, but is affected with a lag by shocks to the other variables.

Given the quarterly frequency of the data and the limited size of the sample, I choose a VAR of order four. The shock is scaled to a one standard deviation shock for easier interpretation and comparability. In Appendix 6, I compare VAR results to local projection (LP) results.

4 Results

Figure 3 and Figure 4 report the IRFs with their 90% confidence intervals. In Figure 3, following a one standard deviation contractionary monetary shock, real GDP drops up to about 0.6 p.p. below trend on impact until it returns to trend after about one year. The GDP deflator increases in the long run, a frequent counterfactual result in the literature that studies IRFs of monetary shocks[7]. Tax revenues behaves similarly to GDP, while government expenditures and transfer increase temporarily. Interest payments for the servicing of the debt react with a lag of about one year and peak to 0.04 p.p. above trend. This lagged response is to be expected as it takes one year for governments to rollover short-term debt (which is defined as debt with a maturity of less than one year). Public deficit and debt temporarily increase up to 0.6 p.p. above trend to pay for the drop in revenues and the increase in expenditures.

Figure 4 looks at the impact of a contractionary monetary shock on the country's bond price and quantities. While not significantly different from zero at the 10% level, the point estimate of short-term rates and 10-year bonds yields tend to increase following the shock. The increase in debt is achieved by issuing at the long end of the maturity structure, while issuance of short-term debt declines, as one would expect. Finally, the shock leaves the average residual maturity of government debt unaltered.

4.1 Breakdown by country

While the results above show IRFs for the Euro Area as a whole, the panel structure of the dataset allows for a more granular analysis. In particular, to test the presence of the fiscal channel of monetary policy, one would have to juxtapose the IRFs of countries with little short-term debt that need refinancing at higher cost against countries with a high share of short-term debt. Figure 5 plots EA countries along the dimensions of outstanding short-term debt and share of government transfers. Four clusters of countries emerge. First, the cluster of countries with the highest amount of short-term

[7]Purging the monetary shock from central banks information effects should help address this issue. In Jarociński and Karadi (2020), the IRF of the Euro Area GDP deflator is not significantly different from 0.

Figure 3: IRFs of macro aggregates and fiscal variables to 1 SD monetary policy shock in the Euro Area

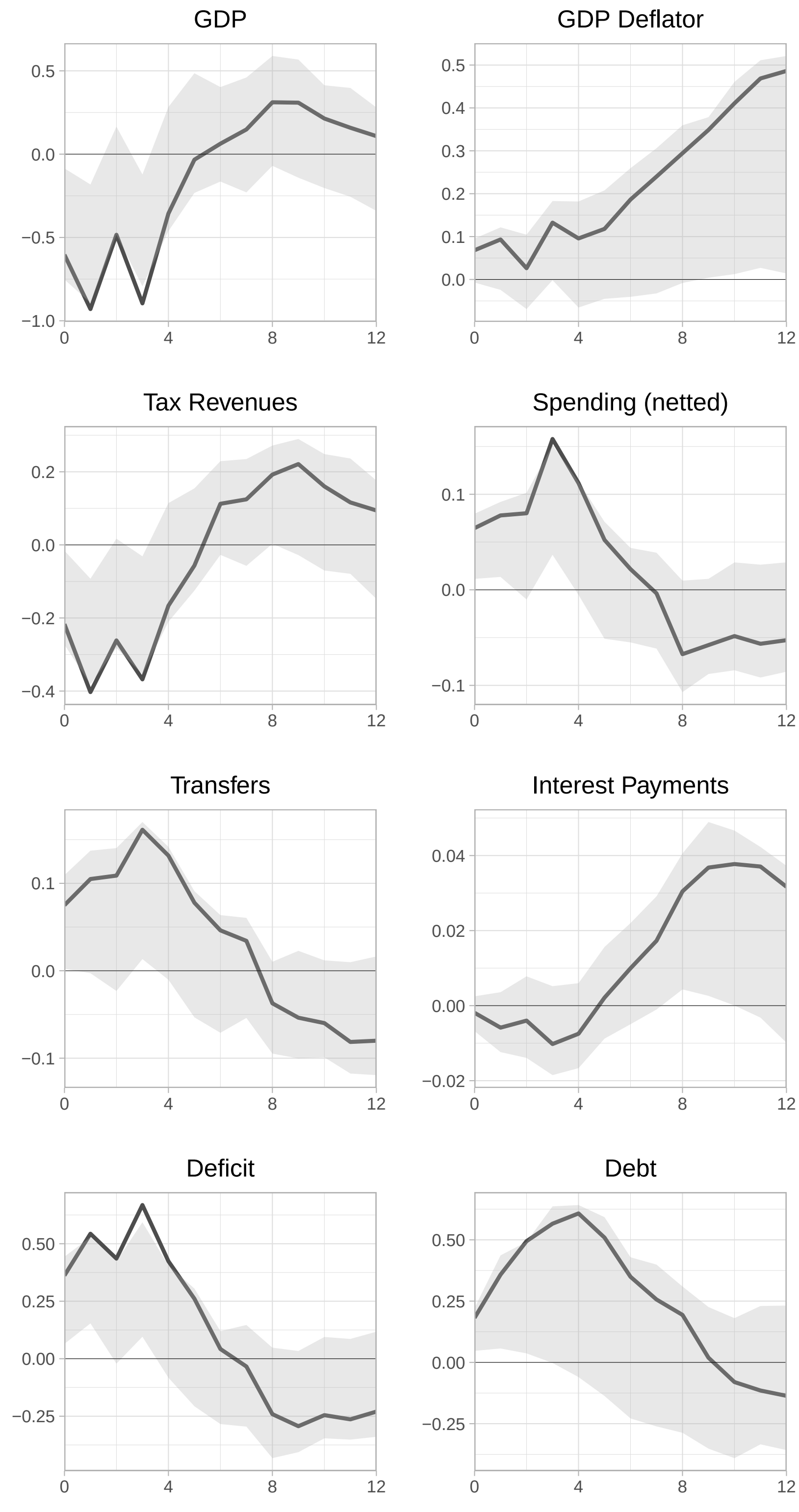
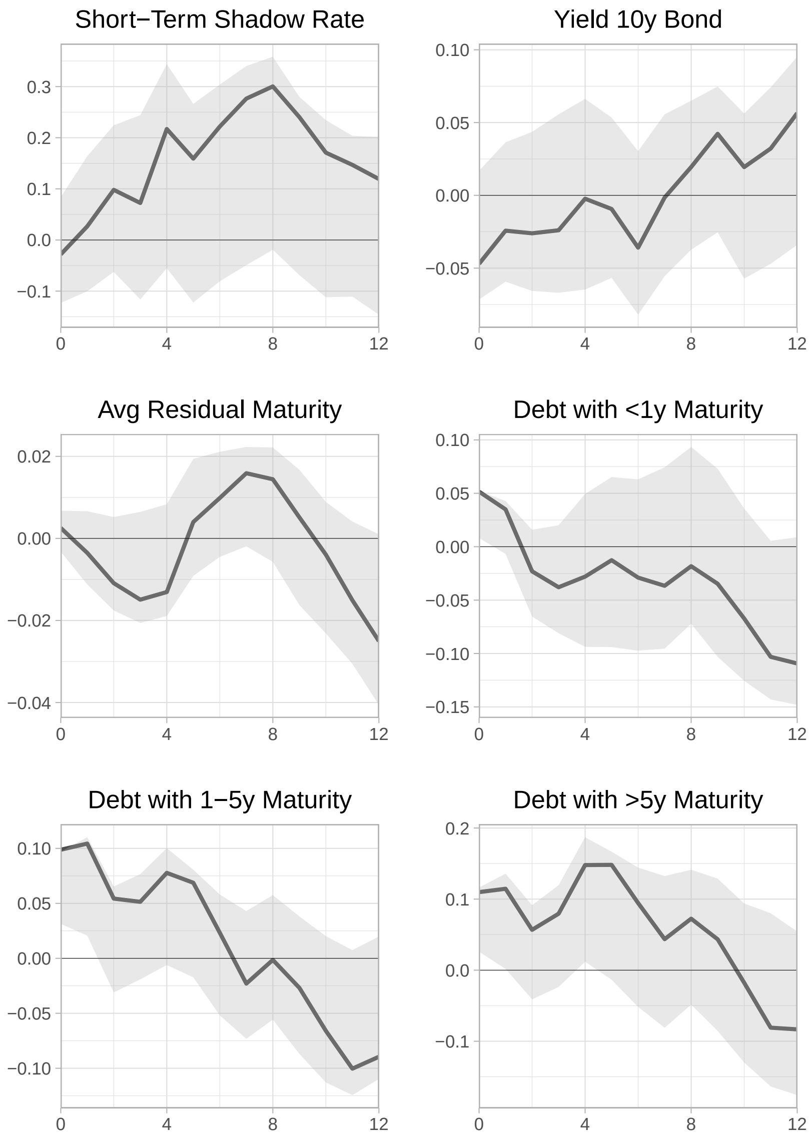


Figure 4: IRFs of bond prices, quantities, and maturities to 1 SD monetary policy shock in the Euro Area



debt, defined as debt with a maturity of less than 1 year, which are Italy and Portugal. Second, the cluster of countries with little to none short-term debt, which comprises The Netherlands, Slovakia, Slovenia and the three Baltic countries. The third cluster is composed of Germany, which stands out as the country with the largest share of transfers over its total public expenditure. The size of government transfers is of interest because it is conjectured by Bayer et al. (2023) that as long as households are insured by the government and do not have precautionary motives to save privately, they will have preferences for a balanced budget and little outstanding public debt. Moreover, Germany represents an interesting benchmark within the Euro Area. Finally, the fourth cluster is composed of all the remaining countries.

Figure 5: Country Clusters for Short-Term Debt and Transfers

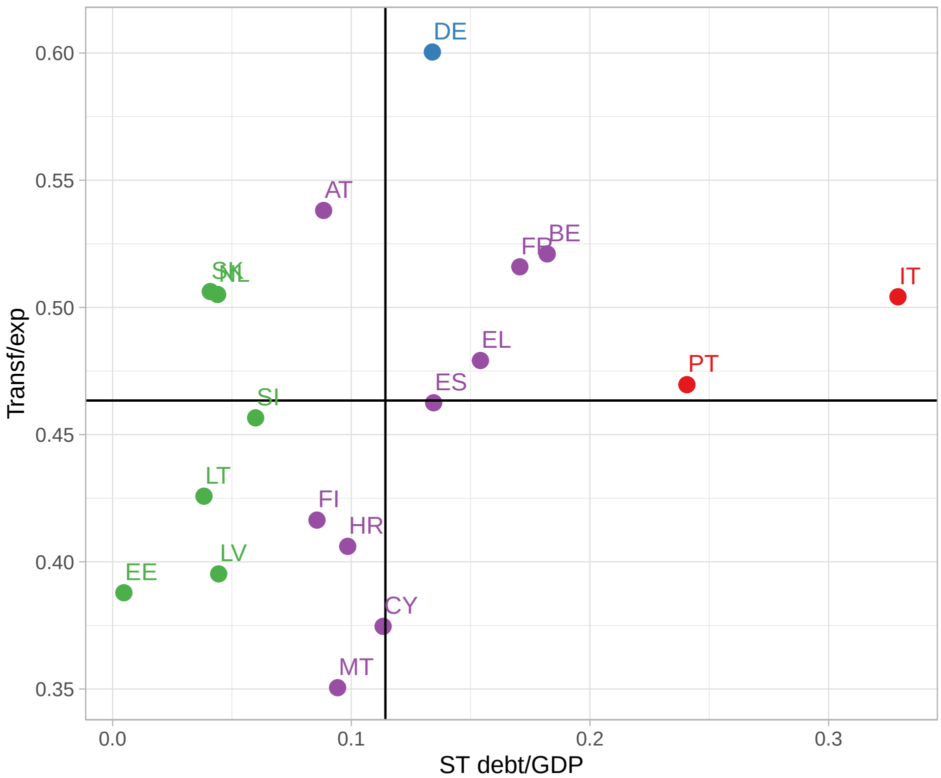


Figure 6 displays the IRFs for the three most interesting clusters: least indebted countries, most indebted countries, and Germany. Two major differences between the three groups stand out: only countries with a large share of short-term debt to rollover experience a rise in interest payment following a contractionary monetary shock. Interest payments start to rise one year after the shock and persistently remain about 0.1 p.p. above trend after two and half years. On the contrary, countries with little to none short-term debt experience no change in debt servicing cost, while Germany, if anything, experiences a decline in interest payments, most likely as a consequence of the flight to safety behaviour of investors during the sample period analysed. The second difference concern the response of the GDP deflator: in Italy, Portugal and Germany, the GDP deflator declines either on impact or with a lag following a contractionary monetary shock. For the cluster of small, fiscally conservative countries it tends to increase, albeit not in a statistically significant way. This result likely reflects the higher volatility of the GDP deflator for small open economies compared to the other clusters, which leads to a less precise estimate[8].

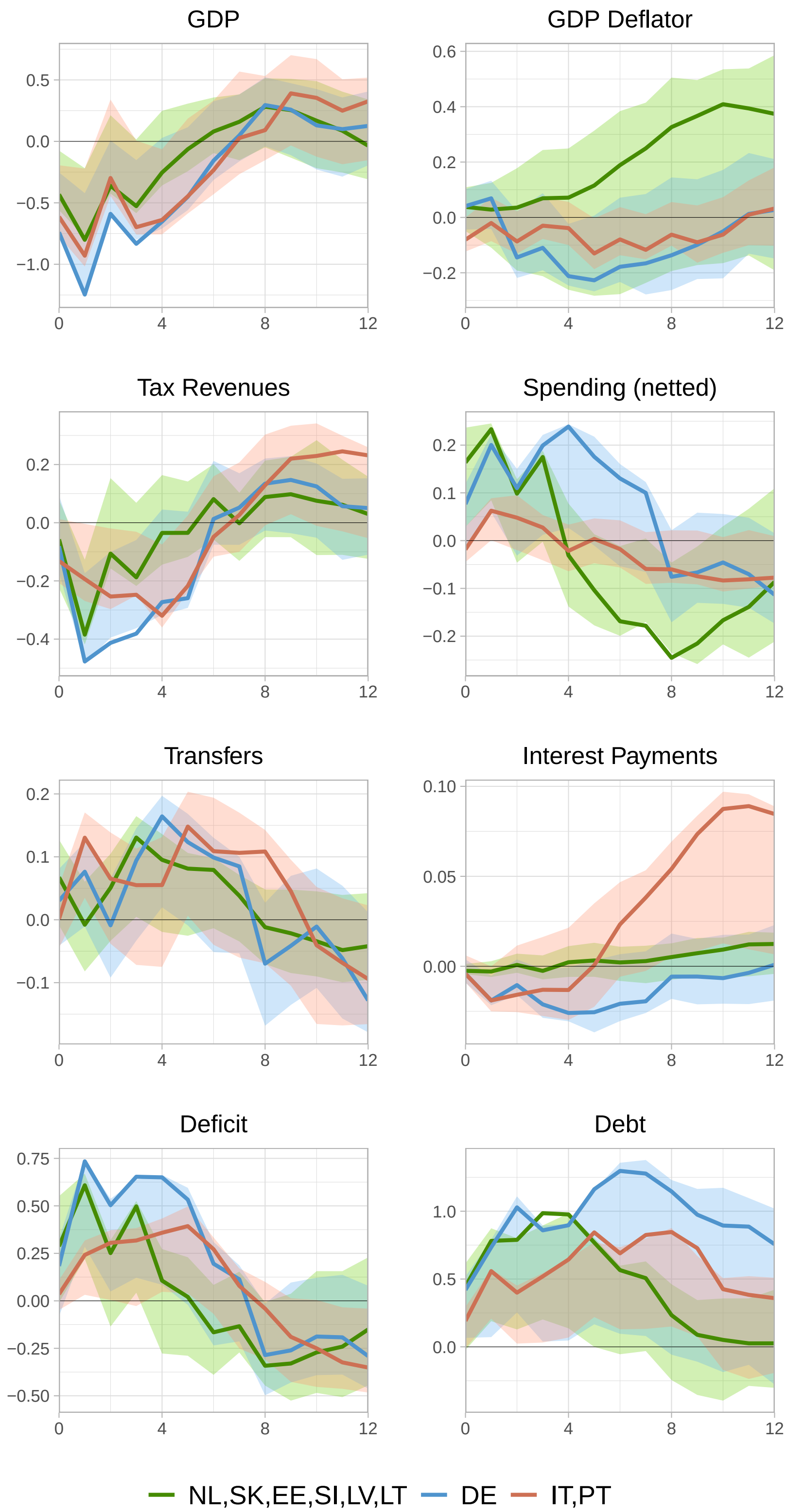
All other fiscal variables move in sync between the three clusters: in particular, the decline in real GDP for fiscally conservative countries versus Italy and Portugal are not significantly different from one another. This constitutes evidence against the importance of a fiscal channel of monetary policy, which according to HANK models should amplify the transmission of monetary shocks by impacting the government budget constraint. One possible explanation is that the impact of changes of interest payments on the government budget constraint is not economically significant: a back of the envelope calculation for Italy, which has the largest share of debt servicing cost to GDP at 4% on average, indicates that two and half years after a monetary shock the Italian government has to pay 0.4 p.p. of GDP more to servicing the debt, equivalent to EUR 6.5 bn in terms of 2019 real GDP or 0.7% of the total Italian government expenditures. The IRFs suggest, instead, that EA governments, no matter the amount of short-term debt or the size of public welfare, lean against a contractionary monetary shock, by not raising tax rates, and by increasing expenditures and transfers, which are financed by a temporary increase in deficits.

5 Conclusion

This paper provides novel empirical evidence on the fiscal response to monetary policy shocks in the Euro Area, exploiting cross-country heterogeneity in debt maturity structure and public transfer systems. Contrary to the predictions of HANK models, I find limited evidence for a strong fiscal channel of monetary transmission: while short-term debt burdens do raise interest payments post-shock in high-rollover countries like Italy and Portugal, these increases are economically small and do not constrain fiscal behaviour. Across all Euro Area members, including Germany, fiscal policy generally leans against monetary shocks: expenditures and transfers rise, while tax revenues fall, and deficits temporarily widen. These results highlight the role of automatic stabilisers and suggest that fiscal policy in the Euro Area acts more as a buffer than an amplifier of

[8]The standard deviation of the GDP deflator for NL, SK, EE, SI, LV, LT is 13, for IT, PT is 10, and for DE is 12.

Figure 6: Response to monetary shock of maturity composition (Euro Area)



monetary shocks. This has important implications for the calibration of HANK models and for understanding the transmission of monetary policy within the Euro Area[9].

[9] A common limitation of the high-frequency identification methodology is lack of power of the identified shocks, a concern that may also affects this paper. Such concern could be addressed by implementing the VAR-IV approach described in Bilbiie and Känzig (2023), which has been shown to deliver more power, and which consists in using the high-frequency monetary policy surprises as instruments in a VAR model.

6 Appendix

6.1 VAR and LP comparison

Plagborg-Møller and Wolf (2021) show that LPs and VARs estimate the same IRFs in population, while in finite samples, the choice between depends on the traditional bias-variance trade-off. Figure 7 and 8 below show the comparison of LP and VAR IRFs with their respective 90% confidence intervals. Due to the short sample and the substantially larger variance of LP at intermediate and long horizon, VARs may be preferable.

6.2 Country Clusters in 3D

Figure 7: Response to monetary shock of macro aggregates and fiscal variables (Euro Area)

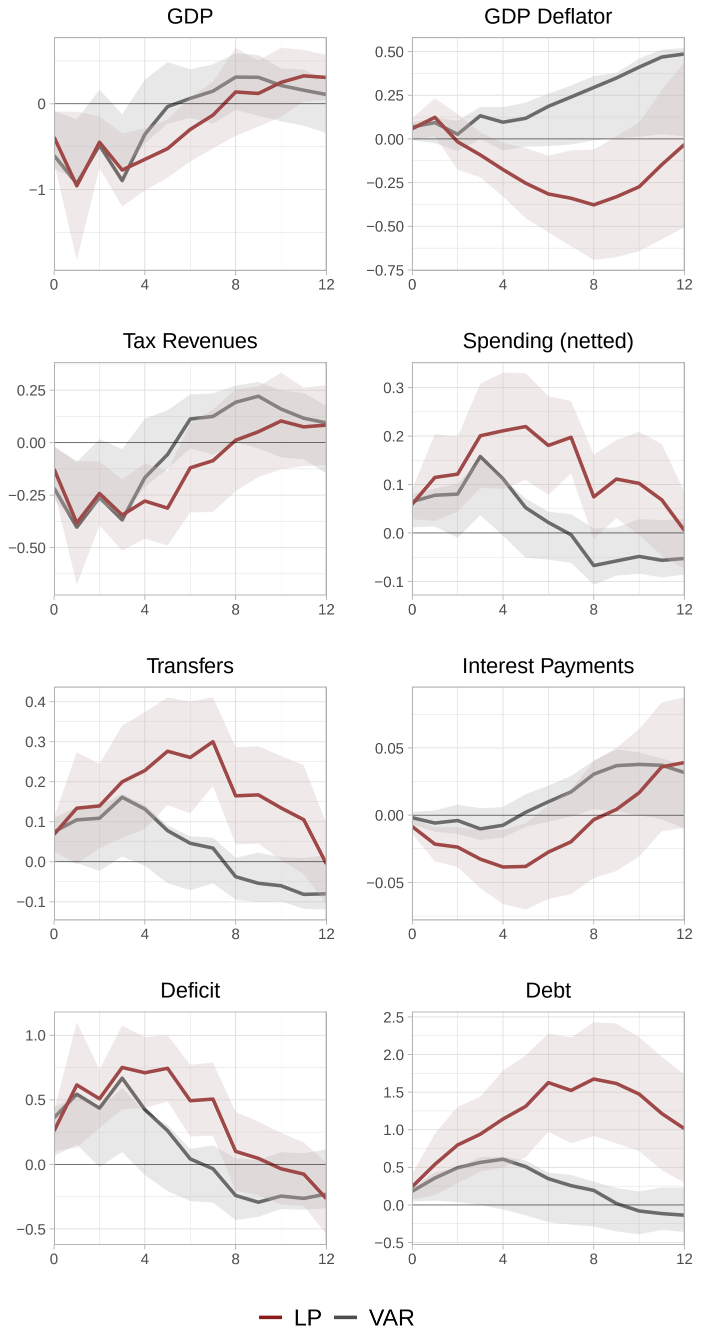


Figure 8: Response to monetary shock of maturity composition (Euro Area)

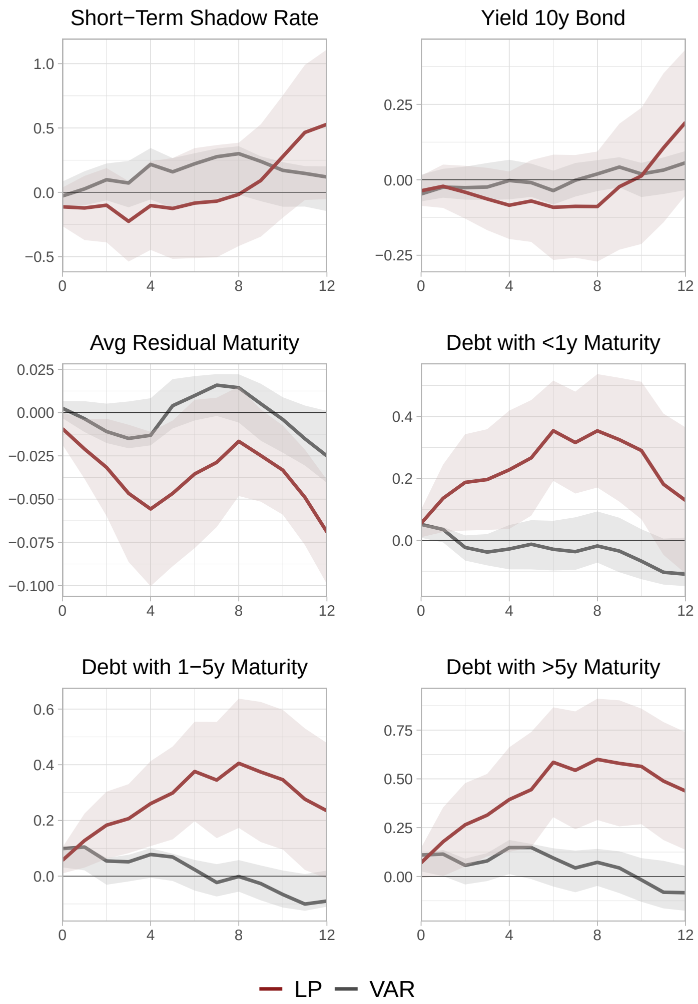
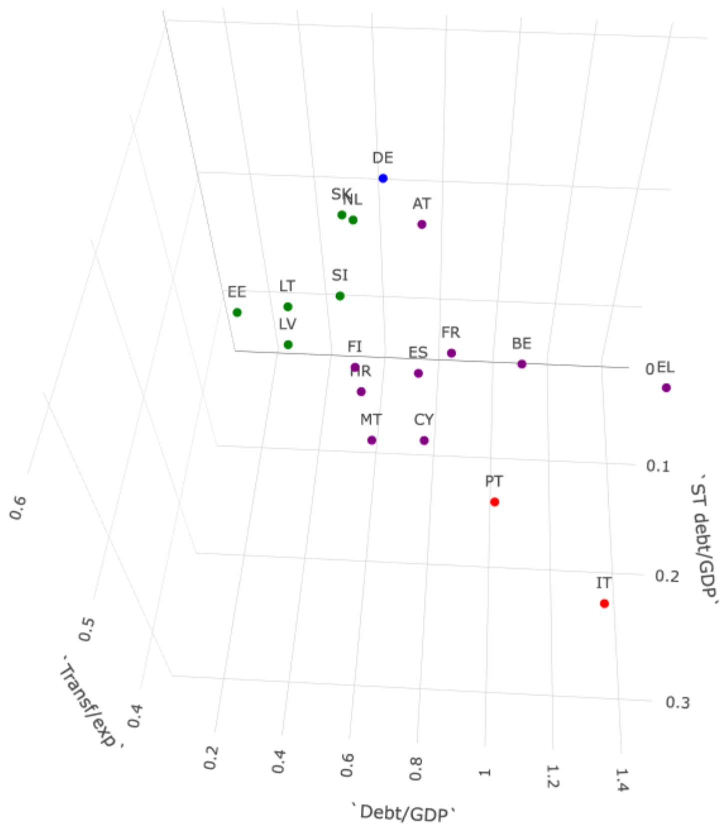


Figure 9: Country Clusters for Debt, Short-Term Debt, and Transfers in 3D



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