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Permanent and transitory monetary shocks around the world*

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Abstract

The effects of monetary policy on output and inflation have been at the center of macroeconomic debate for decades. Uribe (2022) argues, by looking at the US, that a better characterization of these effects can be obtained by splitting monetary policy into transitory and permanent shocks. He finds that transitory monetary contractions reduce inflation and output as in traditional New Keynesian models, whereas long term increases in the inflation rate increase output in the short run. In this paper we extend the analysis to other countries in the world and show that its conclusions can roughly be extended to this larger set. We also broaden the analysis by lifting the overidentifying assumption of superneutrality. We find that although superneutrality does not strictly hold, deviations from it are very small. An increase in long run inflation can slightly improve output but this effect quickly dwindles as inflation increases and eventually becomes negative. Our results provide new evidence to the standard tenets of monetary policy: monetary policy is unable to move output and has negative side effects if it is allowed to increase beyond the range typically defended by central banks.

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1 Introduction

The study of the effects of monetary policy on output and inflation has been at the center of macroeconomic debate for decades. That money supply is neutral is one of the fundamental tenets of modern macroeconomics, and goes at least as back to David Hume and early versions of the quantity theory of money (e.g. Patinkin (2017)). Monetary superneutrality (by which steady state of output is independent of money supply growth) has been focus of debates at least since Sidrauski (1967), where superneutrality follows from a neoclassical growth framework.

From a policy standpoint, the policy debate in low-inflation economies on the optimality of the 2% inflation target also relates to whether superneutrality holds. Should the inflation target be 2% or 4%? Underlying this debate is the idea that economic performance may be different with different rates of inflation. Conversely, policy economists from high-inflation economies often argue the negative implications of high inflation. While these debates are mostly centered on the ability of implementing counter-cyclical monetary policy, empirically the benefits or drawbacks of such policies should reflect in output performance.

How does money neutrality or superneutrality interact with short run effects of monetary policy? Uribe (2022) argues, by looking at the US, that a better characterization of the effects of monetary policy can be obtained by differentiating transitory and permanent monetary shocks. In this world, monetary policy can operate through transitory shocks with no changes in the long run inflation, which coexist with permanent shocks that do increase the inflation rate in the long run. When implementing such split he finds that transitory monetary contractions reduce inflation and output very much as suggested in traditional New Keynesian models, but that changes in the long run inflation rate lead to transitory output increases.

In this paper we extend Uribe (2022) decomposition into transitory and permanent shocks to a larger set of countries. We do this not through his bayesian techniques but implementing two-step, three-variable structural VAR. This has three benefits. First, it makes estimates less reliant on prior assumptions. Second, it leads to an easier interpretation of the results. Third it avoids the use of sign restrictions for the estimation which somehow constrain the results. We show that this methodology allows to replicate Uribe´s results for the US and can easily be extended to a larger set of countries. We find that while the results broadly follow the same pattern, they are not independent of the framework of monetary policy where it is implemented. In particular, countries with a historically-higher average inflation rate display a more muted effect on output of changes in the long run inflation rate. For instance, this implies that disinflations may be costly when transitioning from 6% to 2% but not when bringing inflation down from 20%. For this second group of countries disinflation may actually *increase* output.

Uribe (2022) assumes superneutrality of money. Thus, in the second part of the paper we lift the assumption of superneutrality. We show that superneutrality does not strictly hold, but that deviations from it are small and quickly become negative as inflation increases. In low-inflation countries, an increase in long-run inflation can moderately improve output, but effects dwindle as inflation increase and soon become negative. Our results support the common view defended in central banks that monetary policy is typically unable to move long-run output and can lead to negative effects if inflation moved above the typically defended range.

This paper is related to analyses on welfare costs of inflation. A first type of analysis has focused on its role as a distortionary tax leading to inefficient levels of cash balances (e.g. Friedman (1969), Lucas (2000) and more recently Ireland (2009) and Kurlat (2019)). A second type of analysis, particularly in the context of New Keynesian models, centered on misallocation costs around price dispersion (e.g. Tommasi (1996) , Woodford (2011) Nakamura et al. (2018), Sheremirov (2020)). Empirically, Fischer (1993), Barro (1996), and Easterly (2001) also show a negative association between inflation and growth.

Closer to our approach, using a bivariate SVAR framework, Bullard and Keating (1995) find evidence of departures from superneutrality in cases of countries with low average inflation rates, where increases in inflation are associated increases in the level of output. Rapach (2003) estimates a trivariate VAR model including nominal interest rate and finds similar results, as permanent shock to inflation is associated with higher output for most countries. We expand these previous results by considering a larger set of countries, with an updated sample. Regarding Bullard and Keating (1995), our three-variable model allows us to distinguish permanent and transitory monetary shocks and observe their short-run implications. We confirm their results within this longer sample and different methodology, though by including higher inflation countries we can make stronger statements about the workings of the effects as inflation increases.

Finally, the paper is also related to discussions regarding the resurgence of the so call neo-Fisherian approach. As nominal interest rates and inflation cointegrate, the question is whether higher inflation/interest rates lead to an expansion of output or not. In this regard Valle e Azevedo et al. (2022) is also relevant for our analysis, as they found a strong long-run relationship between the nominal interest rate and inflation (near one to one), a result that we use as part of our identification strategy.

2 Empirical Model

2.1 Estimation

Our point of reference is the empirical model in Uribe (2022): a state-space model for three observed variables: nominal interest rate (i_t, log of the gross interest rate), inflation rate (π_t, log-difference of the price level) and real GDP (y_t, in logs). Despite having only three variables, the state-space structure allows identifying four orthogonal shocks: two monetary (one temporary and the other permanent) and two real or non-monetary (also one temporary and another permanent). He uses the following identification assumptions:

U.1 There are two orthogonal stochastic trends, one determining the long-run behavior of nominal variables i_t and π_t (permanent monetary shock) while the other is the stochastic trend of y_t (permanent real shock). These two trends are assumed to be integrated of order one, and thus also i_t, π_t and y_t feature this characteristic. A corollary of these assumptions is that the permanent monetary shock has no long-run impact on y_t and that the only the permanent monetary shock can affect both i_t and π_t in the long run. In other words, the permanent monetary shock is superneutral in the long-run.

U.2 The interest and inflation rates are co-intergrated, with a one-to-one relationship, such that the ex-post real rate ($r_t \equiv i_t - \pi_t$) is stationary.

U.3 The transitory monetary shock either:[1]

U.3.a has a non-negative direct effect on output and inflation.

U.3.b has a zero direct effect on output and inflation.

Assumptions U.1 and U.2 are consistent with DSGE models featuring long-run money superneutrality, where monetary policy is the sole determinant of long-run inflation (maybe through its interaction with fiscal policy). Finally, while Uribe identifies four shocks, he focuses on the consequences of the two monetary disturbances.

Our goal is to provide a simpler estimation strategy that still allows to identify both monetary shocks, which are the focus of the analysis. Consider the vector x_t collecting the following three variables $x_t \equiv [\pi_t, y_t, i_t]'$. Given the presence of one co-integration relationship with three variables, applying the results in Gonzalo and Ng (2001) the vector x_t has an $MA(\infty)$ representation that can be written as

$$\Delta x_t = \Phi^P(L)\epsilon_t^P + \Phi^T(L)\epsilon_t^T, \tag{1}$$

where Δ denotes the time-difference operator, ϵ_t^P is a 2×1 vector of permanent shocks while ϵ_t^T is a scalar disturbance with only transitory effects, all of them i.i.d. with the further property that $E(\epsilon_t^P \epsilon_t^T) = 0$ (i.e. permanent shocks are uncorrelated with the temporary one). The infinite lag polynomials $\Phi^P(L)$ (3×2) and $\Phi^T(L)$ (3×1) are such that rank$[\Phi^P(1)] = 2$,

[1] According to the results in Uribe (2022), both alternatives yield comparable results.

where $\Phi^P(1)$ indicates the cumulative effect of permanent shocks (i.e. the long-run effect on the level of x_t), while $\Phi^T(1) = 0$ indicating that the temporary shock cannot have long run effects. Imposing further constraints in $\Phi^P(1)$ (a.k.a. long-run restrictions, described below) will allow us to further split the vector ϵ_t^P into a permanent monetary shock and permanent non-monetary/real shock. Unfortunately, as ϵ_t^T is the only temporary shock, we cannot impose further short-run restrictions (as in assumption U.3.b) that will allow us to call this a temporary monetary shock, as shown by Lütkepohl (2008).[2] This means that in order to identify a transitory monetary shock we need to work in a framework that allows for more than one transitory shocks (and therefore more structural shocks than observables). Nonetheless, it is relevant to notice that this does not not affect the identification of permanent shocks, as long as we maintain the assumption that there are only two such shocks.

Given this discussion, we proceed in three steps. We first estimate a VAR on the vector $z_t \equiv [\Delta\pi_t, \Delta y_t, r_t]'$, with a SVAR representation,

$$z_t = A_1 z_{t-1} + ... + A_p z_{t-p} + B\epsilon_t, \tag{2}$$

where ϵ_t are i.i.d. shocks with a diagonal variance matrix (normalized to the identity matrix without loss of generality), A_j are the lag matrices and B contains the short-run effects of each structural shock. This VAR is the triangular representation of the equivalent co-integrated VEC model that imposes the long-run relationship U.2. Let D denote the matrix collecting the long-run accumulated effects on z_t for each structural shock.[3] In particular, the first two rows of D contain the long-run effects on the *levels* of π_t and y_t, while the third row has the accumulated effect on r_t; which has no interpretation under the assumption that r_t is

[2] Lütkepohl (2008) results imply that, in a system with n variables, n shocks and r co-integration relationships, at most r transitory shocks can be identified, and the number of short-run restriction on these shocks that can be imposed is $r-1$. In our case, $r = 1$ so no short-run restrictions can be imposed.

[3] If $A(L) = A_1 L + A_2 L^2 + ... + A_p L^p$ denotes the polynomial in the lag operator characterizing the VAR's lag structure, the cumulative long-run effect is computed as $D \equiv [I - A(1)]^{-1} B$.

stationary. We impose the following zero restrictions in the long-run matrix $\boldsymbol{D}$,[4]

$$\boldsymbol{D} = \begin{bmatrix} \cdot & 0 & 0 \\ 0 & \cdot & 0 \\ \cdot & \cdot & \cdot \end{bmatrix} \tag{3}$$

In words, the two zeros in the first row indicate that only the first shock can affect inflation in the long-run (the same holds for interest rates, following the co-integration assumption U.2). The first zero in the second row indicates that the first shock cannot affect the level of output in the long run, while the zero in the second row, third column indicates that the third shocks has no long run effect on output either. Therefore, the first element in $\boldsymbol{\epsilon}_t$ corresponds to the permanent monetary shock while the second is the non-monetary/real permanent shock. Relative to the $MA(\infty)$ representation in (1), this step gives us an estimate for $\Phi^P(L)$ and it is therefore enough to characterize the impulse responses after both permanent shocks.

Looking at the matrix $\boldsymbol{D}$, the zero element in row two, column one, represents the superneutrality assumption. However, this is an over-identifying restriction, because, given the co-integration relationship and thus only two permanent shocks, the assumption that the second shock does not affect inflation (and the nominal rate) in the long run is enough to identify the permanent monetary shock. Given this over-identification, we can estimate the model lifting this assumption, which allow us to test superneutrality as we do in section 3 below.

In the second step we apply a historical decomposition to obtain the vector $\tilde{z}_t$, defined as the path of z_t that is not explained be permanent shocks. Moreover, using the co-integration relationship and initial values, from $\tilde{z}_t$ we can compute the vector $\tilde{x}_t$: the "gap" between the three original variables and their permanent components (in terms of (1), $\Delta\tilde{x}_t = \Delta x_t - \Phi^P(L)\epsilon_t^P$). In other words, $\tilde{x}_t$ only depends on transitory shocks.

The final step consists in estimating a VAR model for $\tilde{x}_t$, imposing short-run restrictions in line with assumption U.3.b. In particular, given the order of variables in the vector $\tilde{x}_t$, we

[4]The symbol "·" indicates an unrestricted coefficient.

use a recursive/Cholesky order, where the transitory monetary shock is the third one (i.e. the one that contemporaneously does not affect inflation and output but it does move the nominal interest rate). This assumption is in line with the related SVAR literature identifying transitory monetary shocks, e.g. Christiano et al. (1999), Stock and Watson (2001), among others. Notice that we are clearly working in a partial identification framework, as we are identifying only one transitory shock; but there are other transitory shocks driving $\tilde{x}_t$ that we are not interested in exploring.

Overall, this procedure allow us to identify the two monetary shocks that are the focus of Uribe (2022), using an approach that is easier to implement. A final distinction is worth highlighting: While Uribe (2022) uses a Bayesian approach to estimate his empirical model, we rely on a frequentist approach, characterizing parametric uncertainty using bootstrap methods. The lack of informative priors in our analysis imply that wider confidence bands are expected relative to Uribe's credible sets.[5]

How does this methodology replicate Uribe's results for the US? Figures 1-2 show our results. As can be seen they follow Uribe's quite closely. In figure 1 we show that a permanent monetary shock leads to a transitory increase in output, while a negative transitory monetary shock leads to a contraction. In both cases nominal interest rates increase on impact, but notice that in the permanent monetary shock the real rate initially falls, as the rate lags the

[5] There is another subtle distinction between our VAR approach and the assumptions in Uribe (2022). The way Uribe imposes zero restrictions (although this also holds in the sign-restrictions case) to identify the transitory monetary shock implies these hold not only in the period the shock hits (as we are imposing by constraining the matrix $\boldsymbol{B}$, and as it is generally done in the related literature), but instead the restrictions are satisfied even **after** the initial period. According to equations (1) and (2) in Uribe (2022) the deviations of the three variables from their stochastic trends are affected by a set of non-observable exogenous variables (z_t) through the matrix $\boldsymbol{C}$ over which he imposes short-run restrictions. In turn, these z_t are assumed to be independent AR(1) processes driven by identified i.i.d. shocks. Thus, as long as the AR(1) coefficient for the transitory monetary shock is positive, placing restrictions on $\boldsymbol{C}$ matrix does not only constrain the contemporaneous effect of the shock but **also** on every other period afterwards; with an effect only vanishing asymptotically as the AR(1) coefficient is assumed to be less than 1 (Uribe's prior for this AR(1) parameter is a Beta distribution with a mean of 0.3 and standard deviation of 0.2, implying a probability of the parameter being greater than 0.1 equal to 82% and, as it is a continuous distribution, the probability of this coefficient being nil is equal to zero). Thus, Uribe's assumptions are much stronger that the typical constraints used in the literature, which are generally imposed only on the contemporaneous effect (e.g. Christiano et al. (1999)) or Stock and Watson (2001)). Instead, our VAR approach, by using constraints on $\boldsymbol{B}$, imposes less restrictive assumptions. This difference is also likely to result in wider confidence bands in our case.

increase in the inflation rate. The opposite occurs for the transitory monetary contraction.

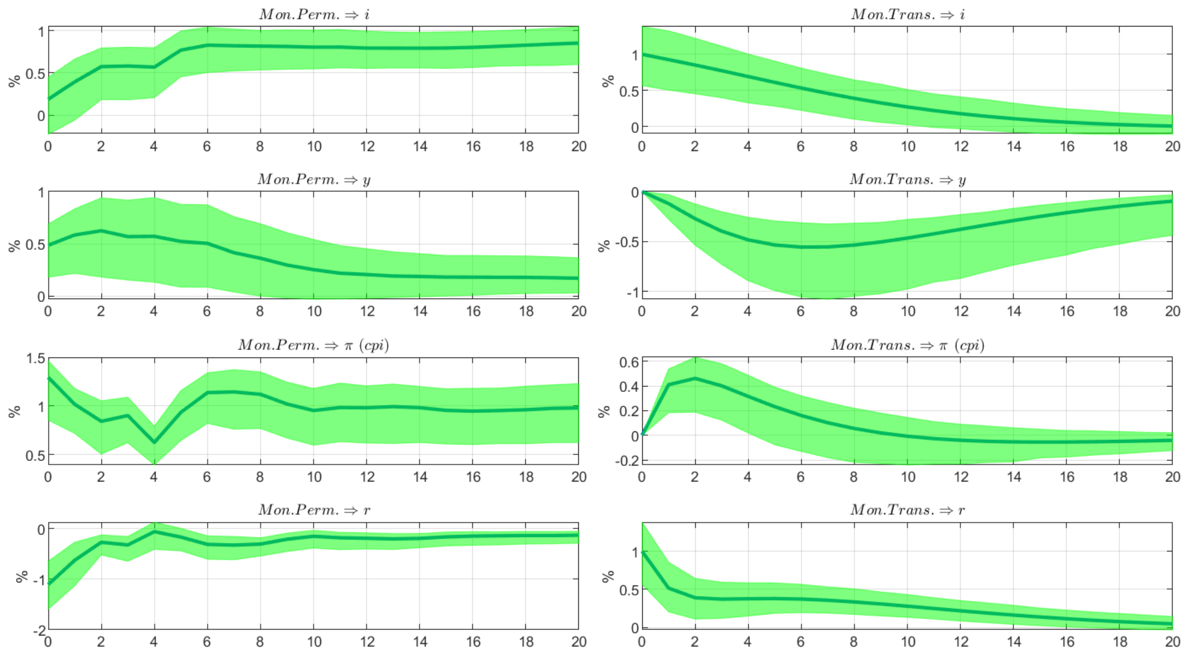

Figure 1: Effects of the permanent and transitory monetary shock: US

Figure 2 replicates a similar figure in Uribe and provides a summary of how permanent and monetary shocks operate. Permanent monetary shocks induce a reduction in the short run interest rate, whereas transitory monetary shocks do the opposite. The estimation is agnostic as to why this occurs. A plausible explanation is that permanent monetary shocks entail a period of adaptation until the new equilibrium settles in. Inflation surprises on the upside and leads in the meantime to a reduction in the real interest rate. The opposite occurs when the Central Bank decides to hike in order to reduce inflation.

2.2 Data

The empirical model is estimated using data on real GDP, inflation and interest rates for 36 countries. The Appendix contains specific data sources for each variable and for each country.

Data on nominal and real GDP is taken for most countries and time-periods from the IMF's

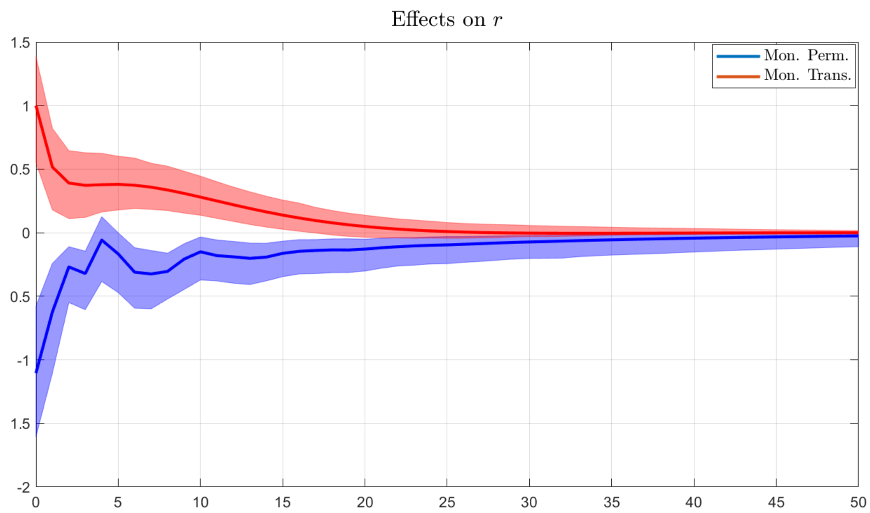

Figure 2: Effects on the real interest rate for permanent and transitory monetary shocks: US

International Finance Statistics (IFS). In the cases of Denmark, Germany and the European Union, GDP data is extended using data compiled in Benati (2021). Data for Japan is taken from Uribe (2022). When data is not originally seasonally adjusted, it is adjusted using X-13 ARIMA-SEATS seasonal filtering.

Inflation is calculated using consumer price index data from IMF's IFS when long series for inflation is available, and when it is not implicit GDP deflator is used, as is the case of European Union. Data is seasonally adjusted using X-13 ARIMA-SEATS seasonal filtering. The restriction in terms of countries is mostly given by having reliable data on nominal rates. For nominal interest rates, series with longest sample for each country is selected among monetary policy interest rates compiled by Benati (2021), monetary policy interest rates compiled in IFS, deposit rates compiled in IFS, and monetary policy rates compiled by the Bank for International Settlements.

The appendix provides a list of data sources for each country.

2.3 Results

What does our extension of Uribe's result suggest? Figure 3 and Table 1 show the effects of a permanent monetary shock (a permanent increase in the inflation rate).

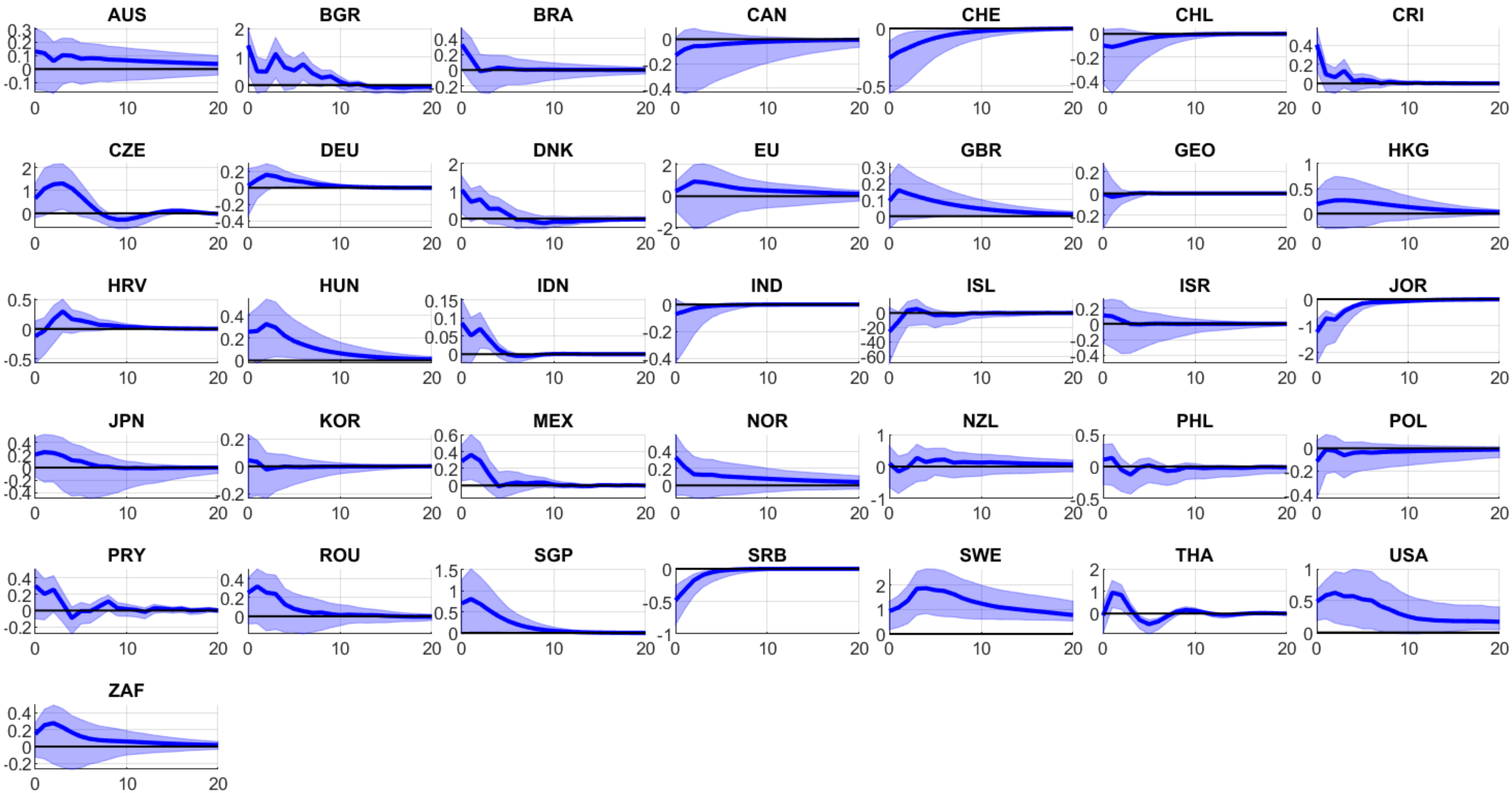

Figure 3: Effects on output of the permanent monetary shock

Table 1: Effects on Output of the Permanent Monetary Shock

Classification	$\Delta y(4)$	$\Delta y(20)$	$\Delta_c y(4)$	$\Delta_c y(20)$	**Positive**	**Negative**
US	0.57	0.17	2.83	6.87	1	0
Euro	0.78	0.15	3.50	8.55	1	0
Advanced	0.33	0.05	-0.25	0.48	13	4
Asian Emerging	-0.10	0.00	-0.30	-0.60	2	4
European Emerging	0.18	-0.01	1.05	1.60	3	2
Other Emerging	0.01	0.00	0.61	0.83	5	1

As can be seen Uribe's result that a permanent increase in the inflation rate leads to a transitory increase in output is replicated in 30 out of our 36 country sample. We have marked the horizontal axis to more appropriately assess this in the figure.

Table 1 shows a summary of results. The first two columns shows the output effect of a permanent monetary shock after a year and after five years. Remember that this estimation imposes superneutrality, so the effect is bound to converge to zero. By the fifth year most countries are there except the US and the Euro zone where the effects seem to be more long lasting. The third and fourth column shows the cumulative effect of the shock on output. Barring the US and the Euro zone, the actual gain (or loss if we are talking about disinflation) seems to be relatively mute for the average country in the included groups.[6]

Figure 4 shows the effects of a transitory monetary contraction. While, with more variability, the results in a majority of cases are broadly in line with Uribe's. A transitory monetary contraction lead to a transitory contraction in output in 24 of the 36 countries.

[6] Two notable exceptions are Sweden and Czech Republic that display somehow larger short-run effect (see also Figure 7 below).

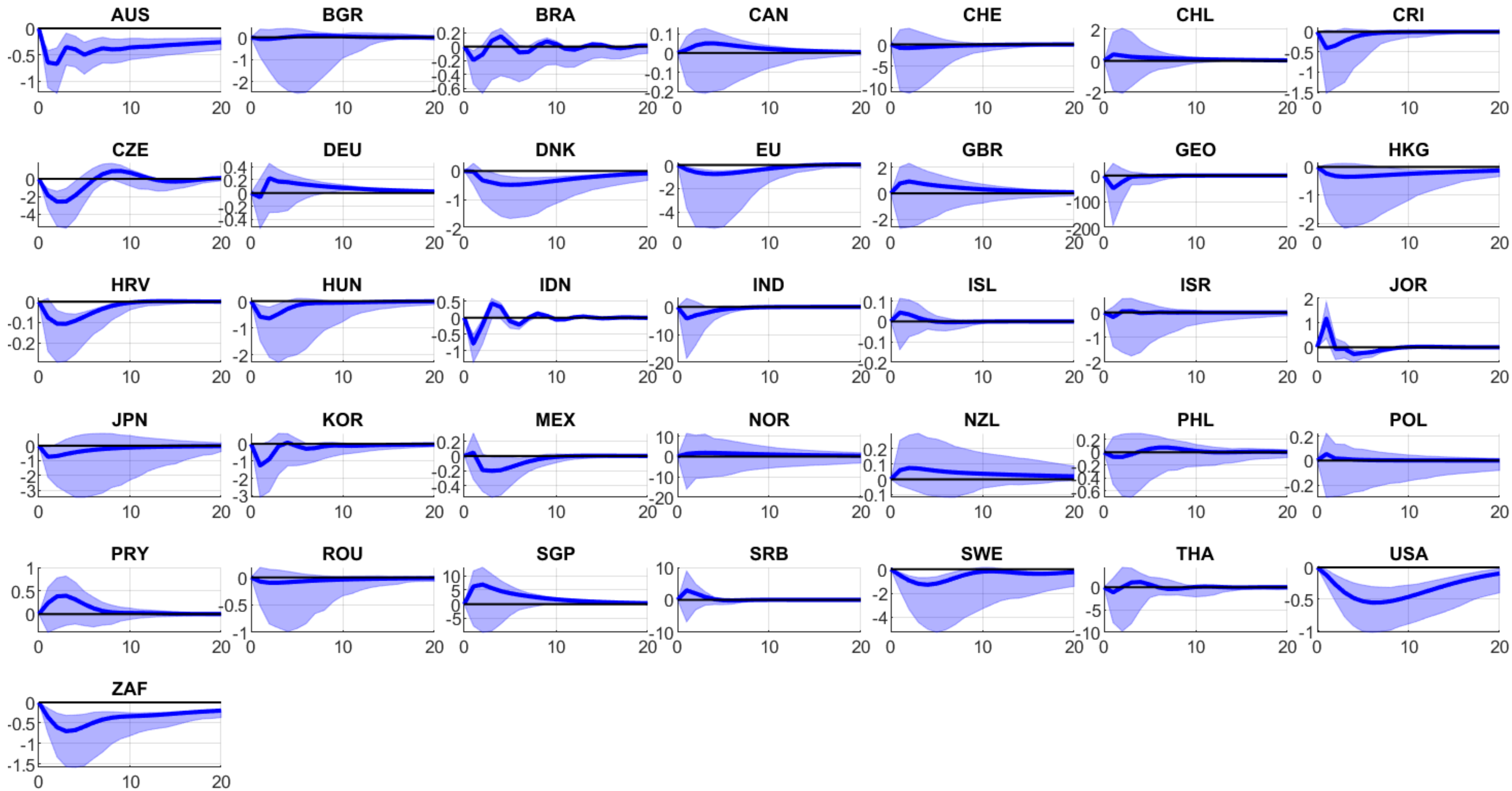

Figure 4: Effects on output of the transitory monetary shock

Table 2: Effects on Output of the Transitory Monetary Shock

Classification	$\Delta y(4)$	$\Delta y(20)$	$\Delta_c y(4)$	$\Delta_c y(20)$	**Positive**	**Negative**
US	-0.48	-0.10	-1.27	-6.84	0	1
Euro	-0.77	0.05	-2.51	-6.07	0	1
Advanced	0.10	0.01	0.50	1.62	6	11
Asian Emerging	-0.31	0.00	-14.62	-15.64	1	5
European Emerging	-0.04	0.00	0.72	0.47	2	3
Other Emerging	-0.05	-0.02	-0.25	-0.86	3	3

Table 2 provides a summary of the results. Given that this is a transitory effect most of the action is gone by 5 years. However, the cumulative effect is negative for the US, Euro zone, and emerging countries except those in Europe. We also find no cumulative negative effect for other advanced countries.

Figure 5, provides a glimpse on the mechanism behind these results. As in Uribe a permanent increase in the inflation rate leads to a transitory reduction in the real interest rate, whereas a transitory monetary shock leads to an increase in the real interest rate. This can be seen in the graph by noticing that, in general, with a few exceptions, the red line, indicating that an increase in the nominal rate associated to a transitory monetary contraction, leads to an increase in the real interest rate, whereas an increase in the nominal interest rate associated to a permanent change in the inflation rate leads to a reduction in the real interest rate.

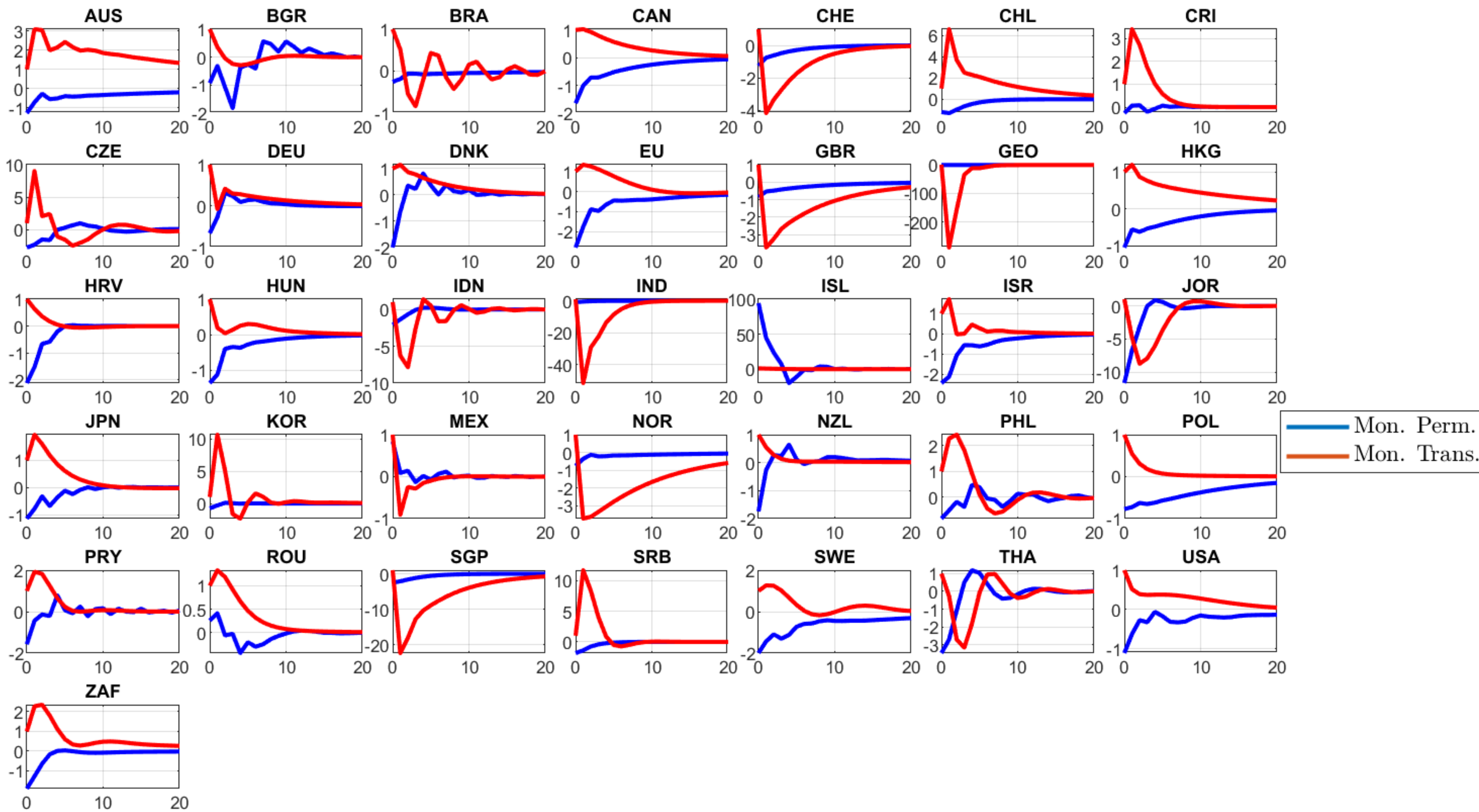

Figure 5: Effects on the real interest rate for permanent and transitory monetary shocks (no bounds)

Finally, the fisherian relationship for permanent monetary shocks can be seen in Figure 6. As can be seen in the figure, permanent increases in the inflation rate eventually lead to one to one increases in the nominal interest rates (the red and blue lines converge).

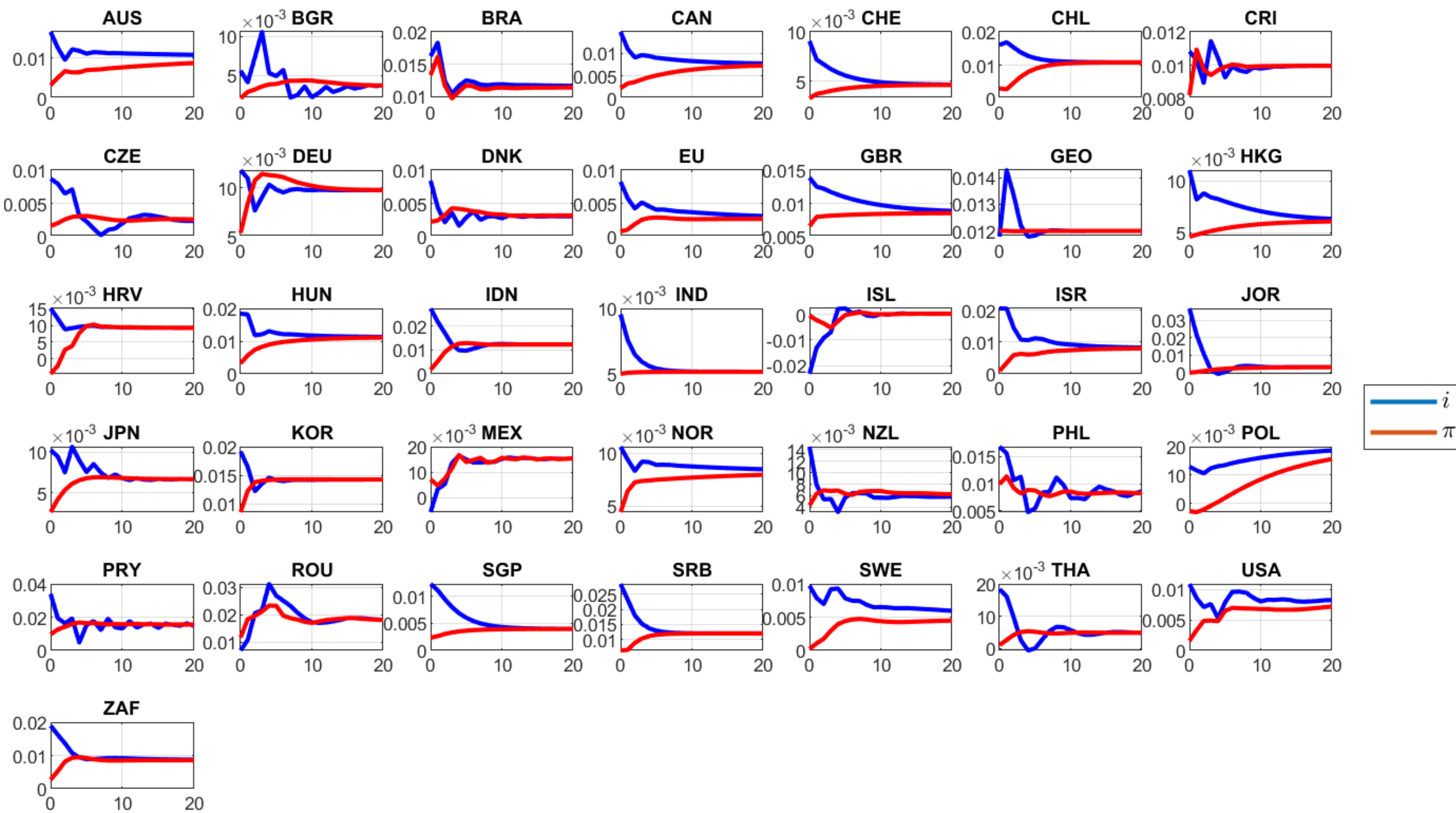

Figure 6: Effects on the nominal interest rate and inflation for permanent monetary shock (no-bounds)

To gain further intuition, figures 7 and 8 show how the effects of a permanent monetary shocks differ across countries depending on the the in-sample mean and volatility of inflation. The result is clear. We see that the higher the inflation rate or its volatility the smaller the output effect of a permanent monetary shock. In both cases there is a significant and negatively sloped relationship between these variables and the effect on output a year into the future.

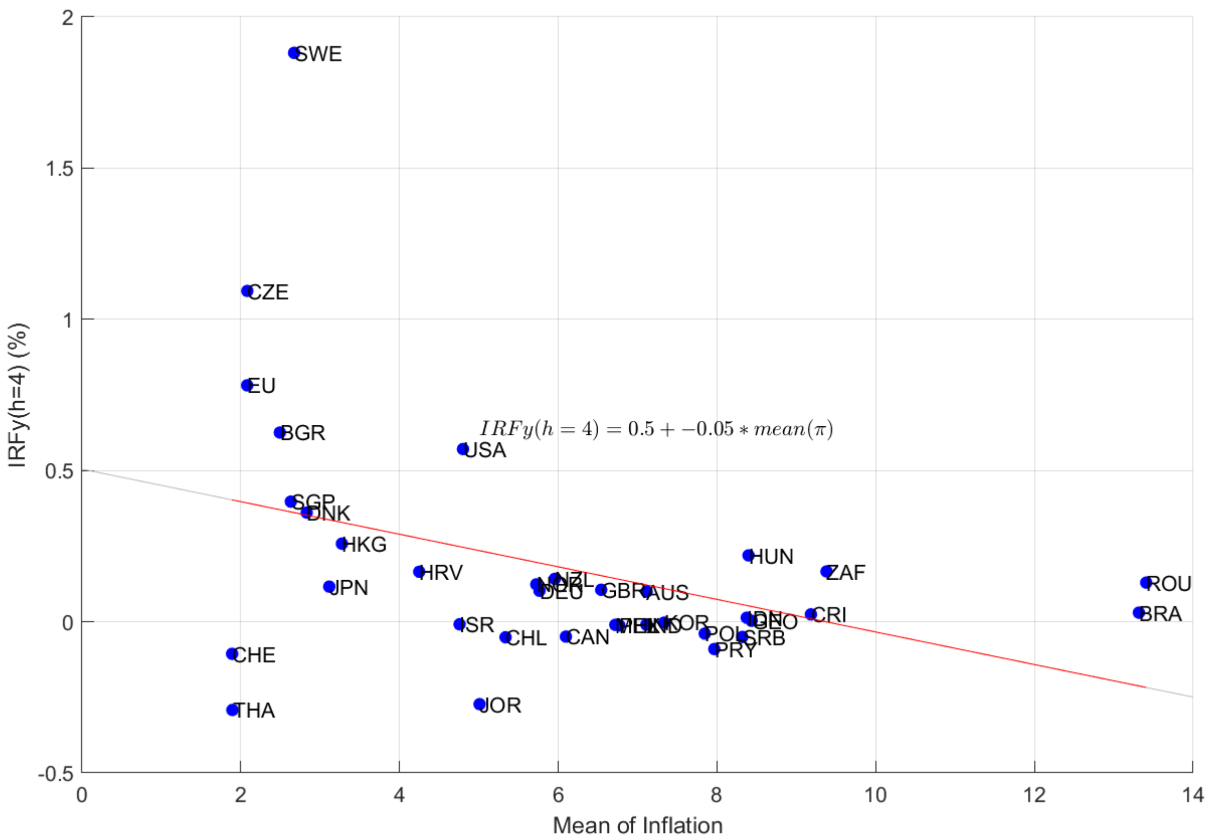

Figure 7: 1 year ahead effect of a permanent monetary shock against mean inflation

The same results do not hold when analyzing transitory shocks. In this case we find little relationship between the level or volatility of inflation and the short run effect of transitory monetary policy.

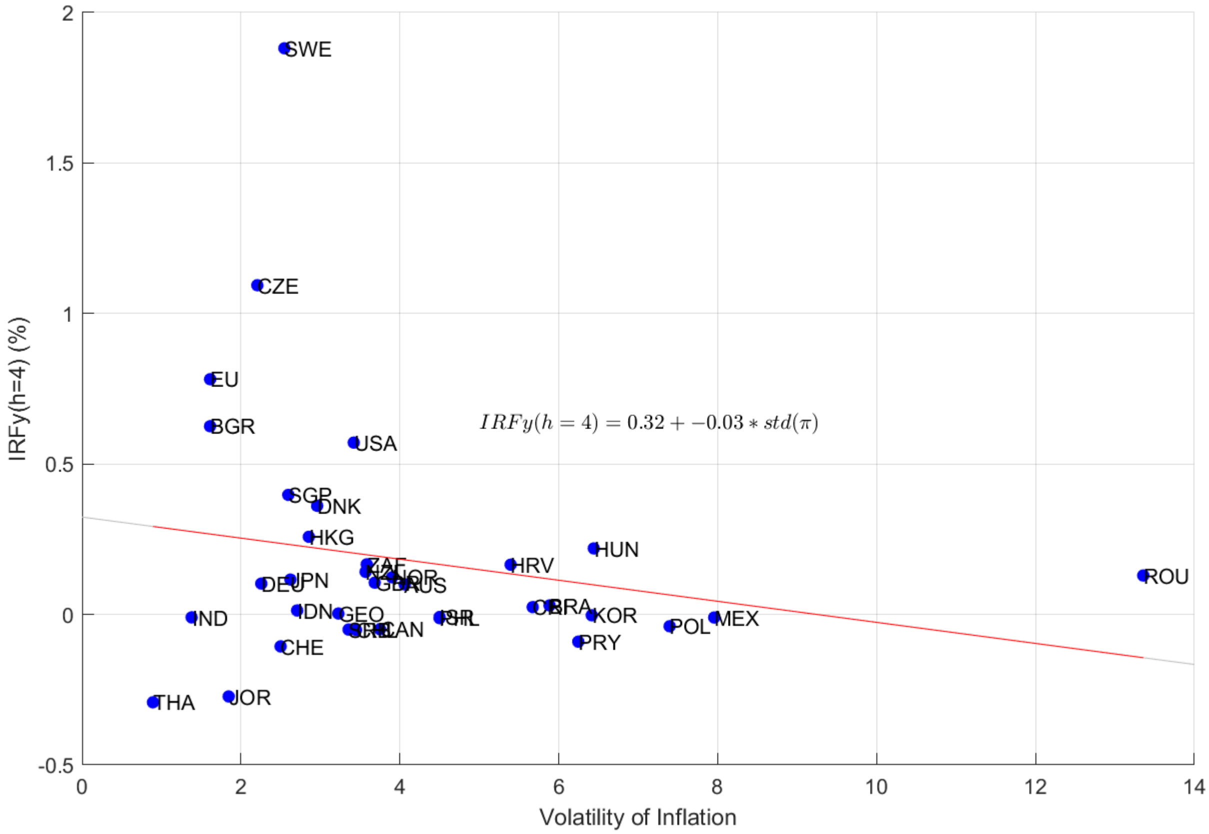

Figure 8: 1 year ahead effect of a permanent monetary shock against the volatility of inflation

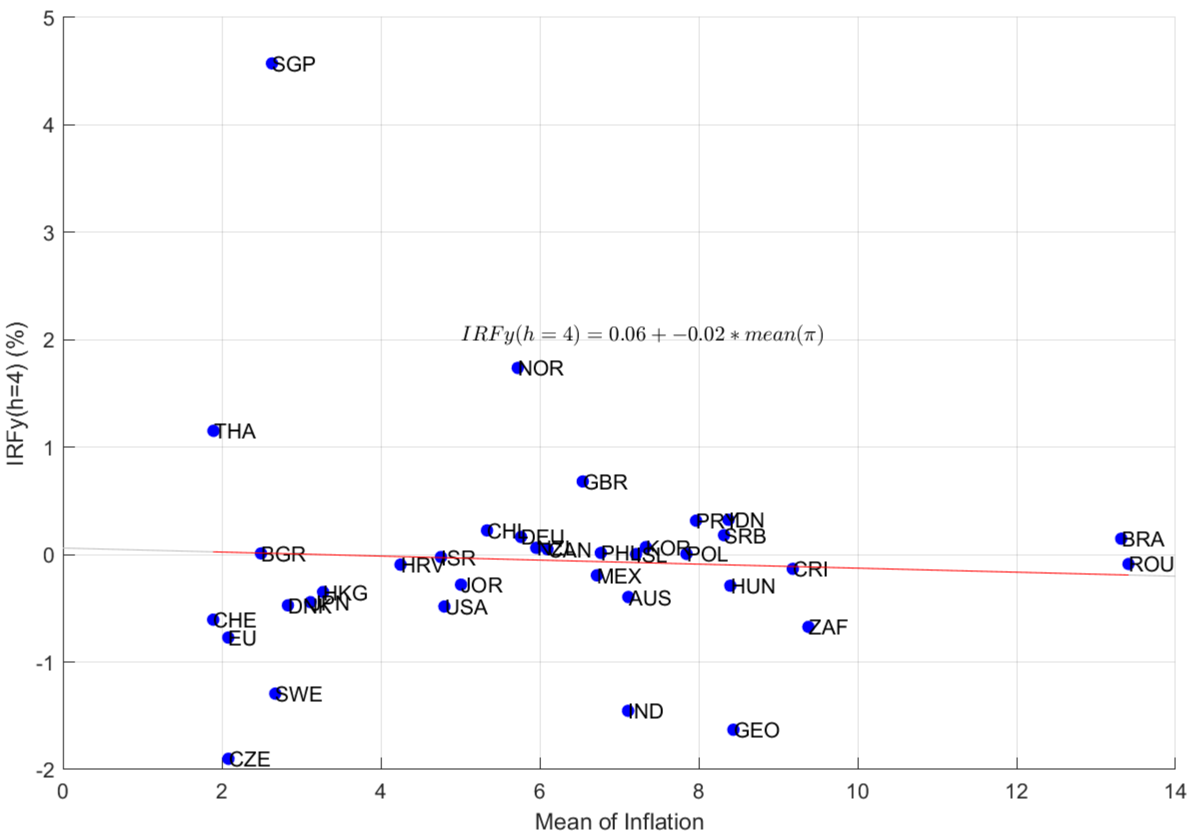

Figure 9: 1 year ahead effect of a transitory monetary shock against mean inflation

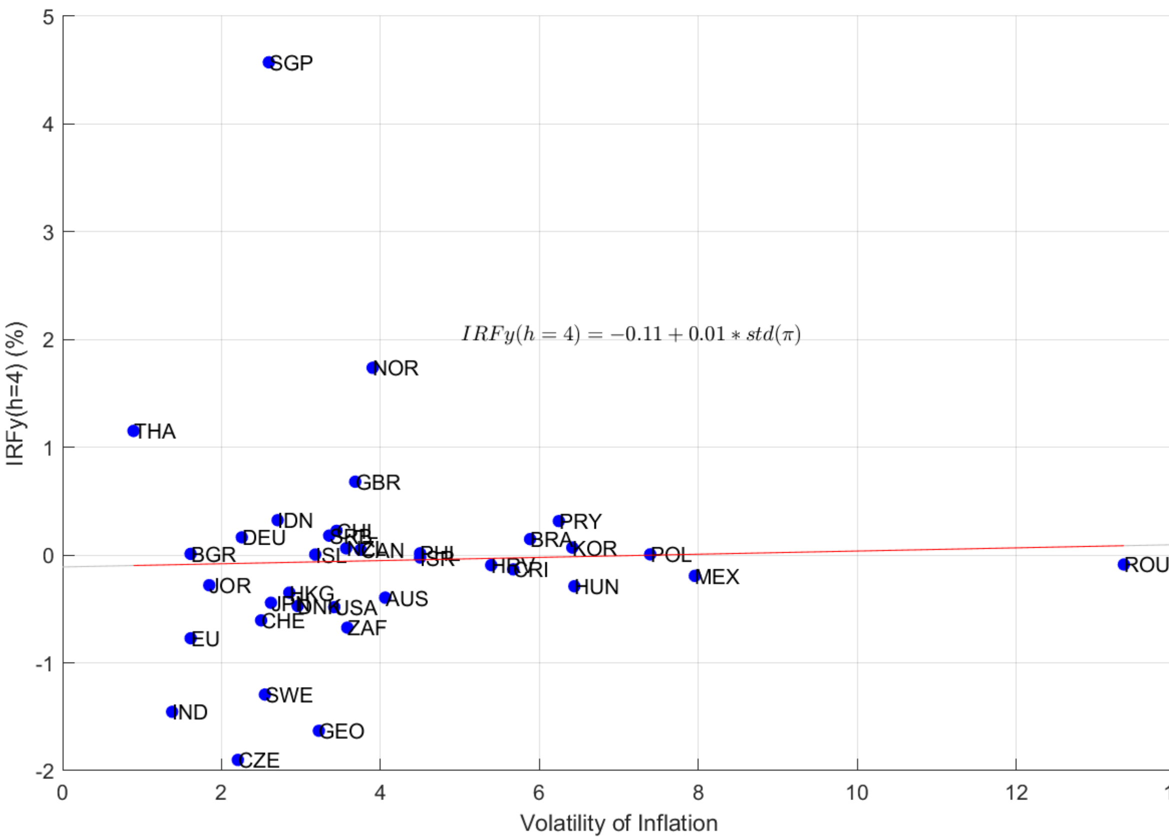

Figure 10: 1 year ahead effect of a transitory monetary shock against the volatility of inflation

3 Testing superneutrality

The previous exercise, in the spirit of Uribe's original estimation imposes the constraint of superneutrality. What happens when we lift this assumption? As explained in the methodological section, this entails leaving the element in the second row, first column of matrix $\boldsymbol{D}$ unconstrained in the estimation. We thus proceed to lift this assumption and reestimate the model.

The effects of a permanent monetary shock on output are presented in Figure 11 and summarized in Table 3. We still obtain the result that the effect is mostly positive, as before. After five years the effect stabilizes. A good way to see the different results is by contrasting Europe which shows the largest effect and where output stabilizes at around 2% above its previous level, with ”other emerging” where output stabilizes at a level .1% *below* the previous level.

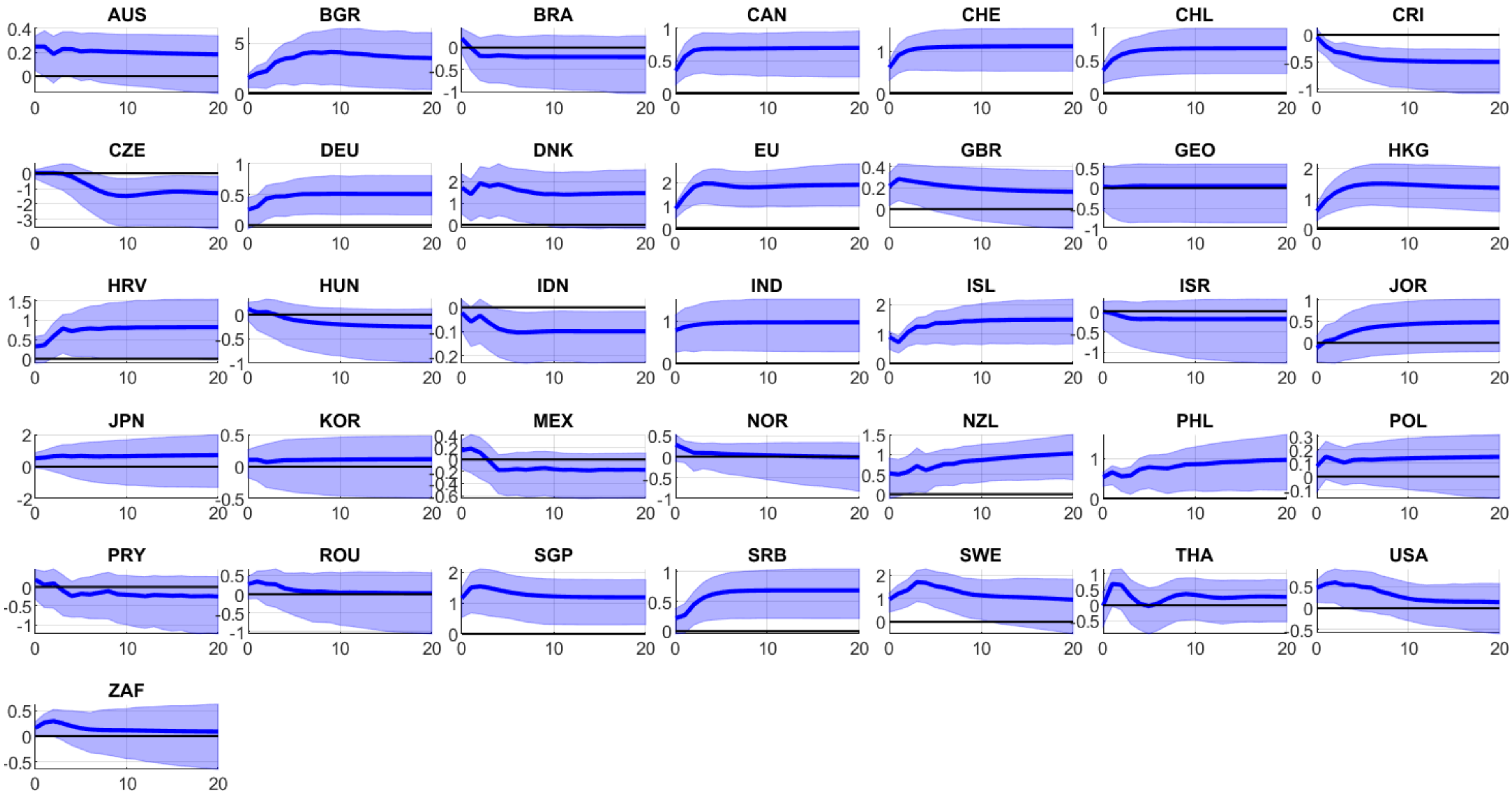

Figure 11: Effects on output of the permanent monetary shock

Table 3: Effects on Output of the Permanent Monetary Shock (non-neutrality)

Classification	$\Delta y(4)$	$\Delta y(20)$	$\Delta_c y(4)$	$\Delta_c y(20)$
Positive	**Negative**			
US	0.54	0.14	1	0
Euro	1.95	1.90	1	0
Advanced	0.71	0.61	16	1
Asian Emerging	0.32	0.44	3	3
European Emerging	0.86	0.83	5	0
Other Emerging	-0.02	-0.06	5	1

The effects of a transitory shock do not change significantly relative to our prior estimation and are summarized in Figure 3 and Table 4 with 23 out of 36 countries showing a negative response.

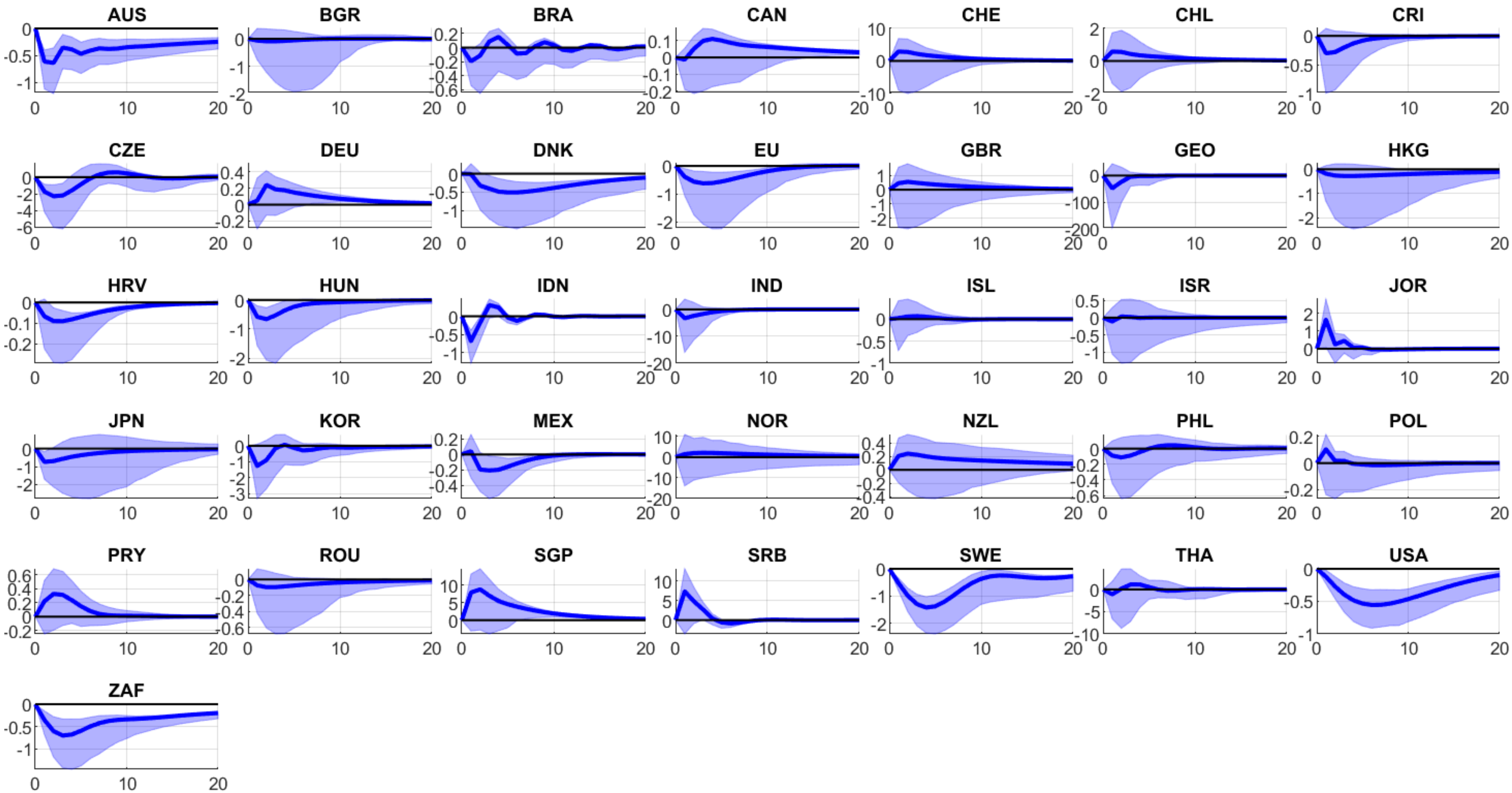

Figure 12: Effects on output of the transitory monetary shock (non-neutrality)

Table 4: Effects on Output of the Transitory Monetary Shock (non-neutrality)

Classification	$\Delta y(4)$	$\Delta y(20)$	$\Delta_c y(4)$	$\Delta_c y(20)$	**Positive**	**Negative**
US	-0.48	-0.10	-1.27	-6.83	0	1
Euro	-0.61	0.01	-2.20	-4.75	0	1
Advanced	0.33	0.02	1.69	3.67	7	10
Asian Emerging	-0.20	0.00	-13.77	-14.56	1	5
European Emerging	-0.01	0.00	2.54	1.76	2	3
Other Emerging	-0.05	-0.03	-0.15	-0.76	3	3

Finally, the effect on real interest rates in Figure 13, and of the fisherian relationship in Figure 14, follow the pattern similar to those of the model with superneutrality.

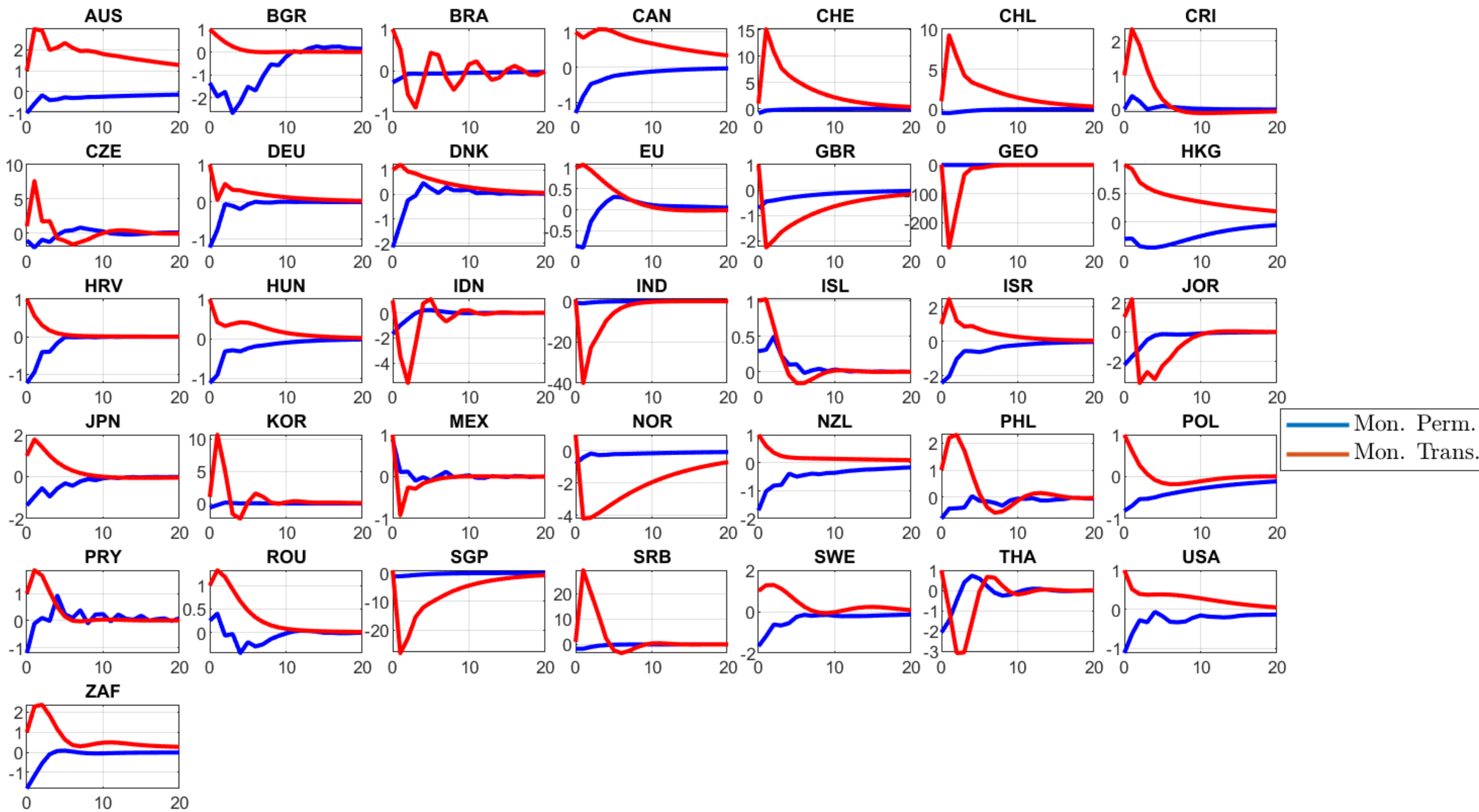

Figure 13: Effects on the real interest rate for permanent and transitory monetary shocks (no bounds and non-neutrality)

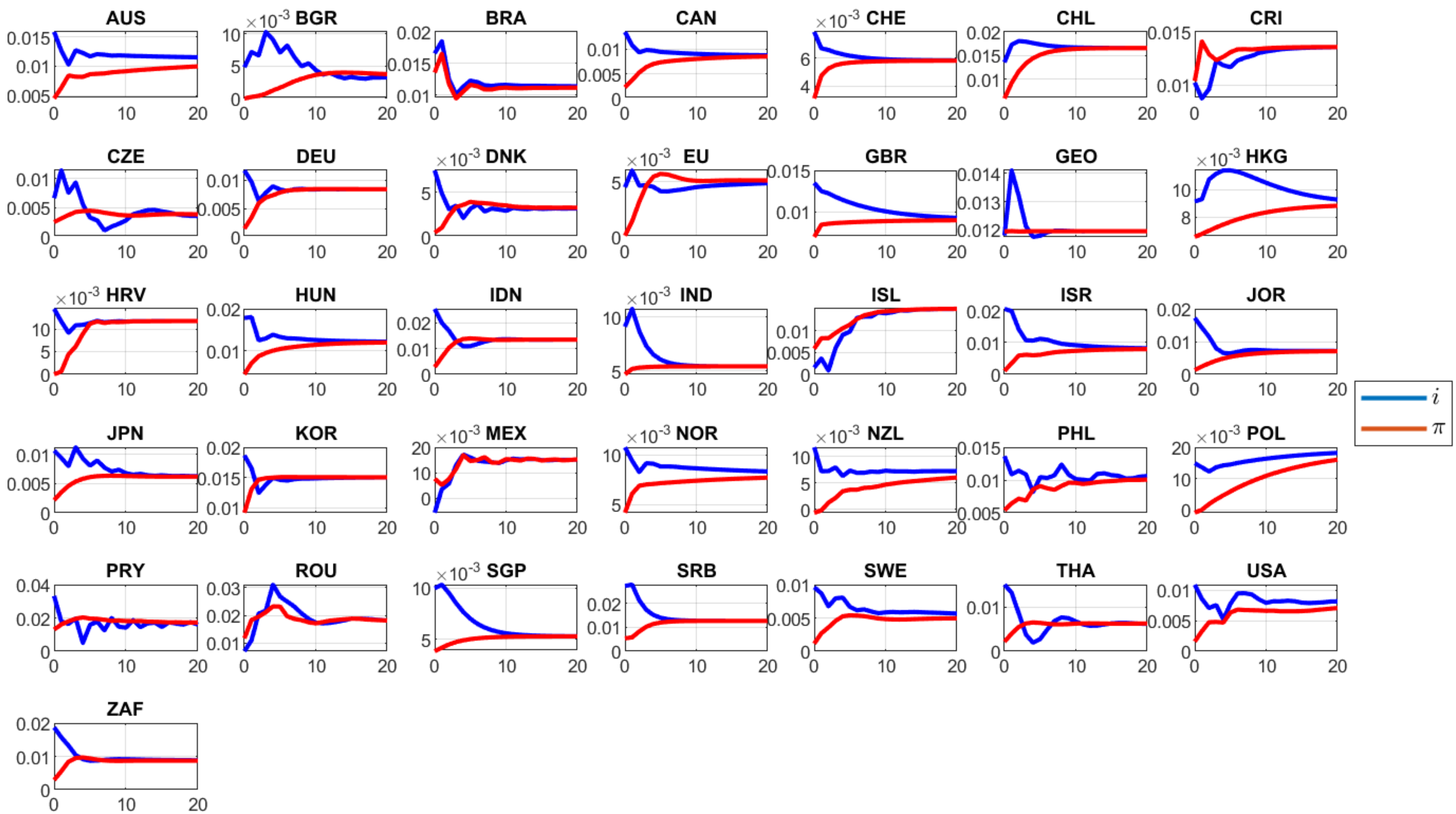

Figure 14: Effects on the nominal interest rate and inflation for permanent monetary shock (no-bounds and non-neutrality)

What do we learn from our new estimates regarding the impact of monetary policy? One way to evaluate this is by looking at figures 15 and 16.

Figure 15 shows the relationship between the long run output effect of a change in long run inflation on output, as a function of the average inflation rate in the country. Figure 16 shows the relationship between the long run output effect of a change in long run inflation on output, as a function of the volatility of the inflation rate.[7] This is an exercise we could not do in our previous exercise because the long run output effects were constrained to be zero.

Again, the results are strongly significant and negatively sloped. As inflation increases, and as the volatility of inflation increases the output effect decrease as well. These results replicate and extend those of Bullard and Keating (1995), suggesting that the scope for monetary policy affecting output is very limited in size and that it vanishes quickly as the inflation rate increases.

[7] We do not replicate the relationship between the average inflation and the volatility of inflation and the effect of transitory monetary shocks because they replicate the results of the previous section in finding no relationship between the effect of transitory monetary shocks and output.

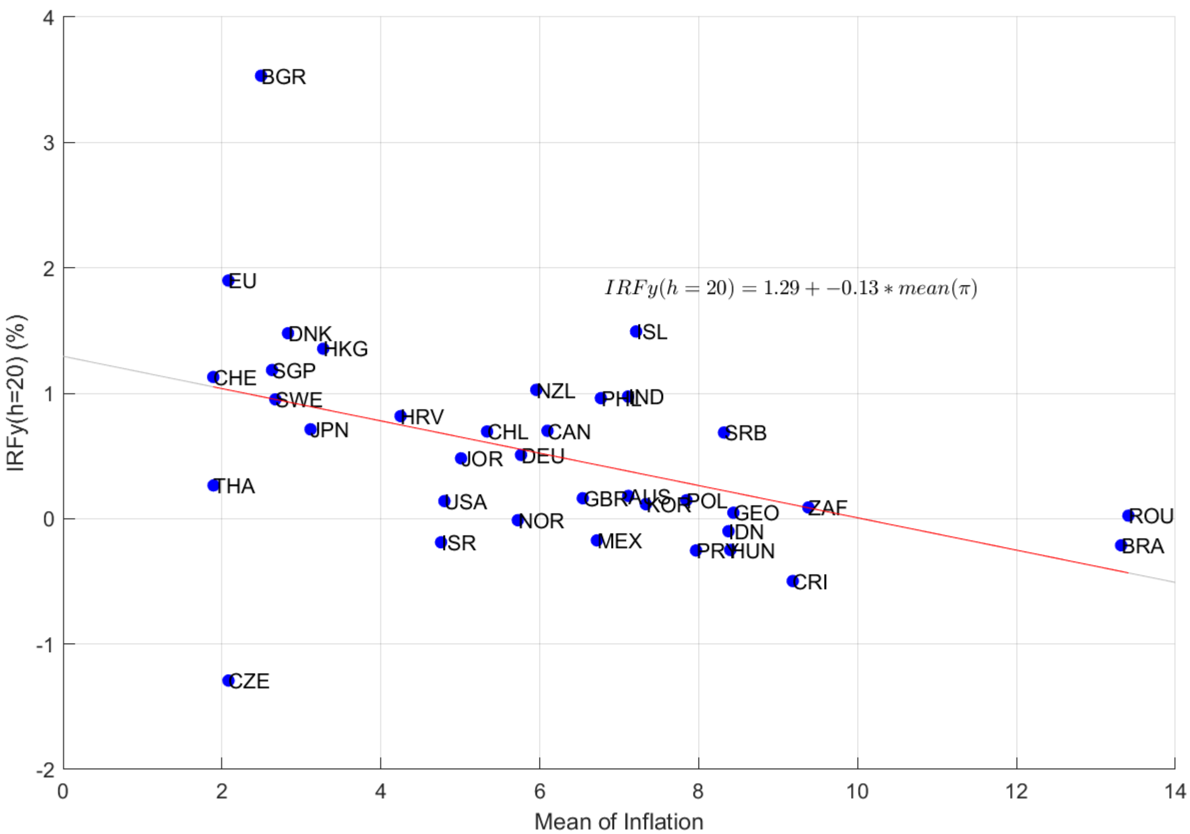

Figure 15: 5 year ahead effect of a permanent monetary shock against mean inflation

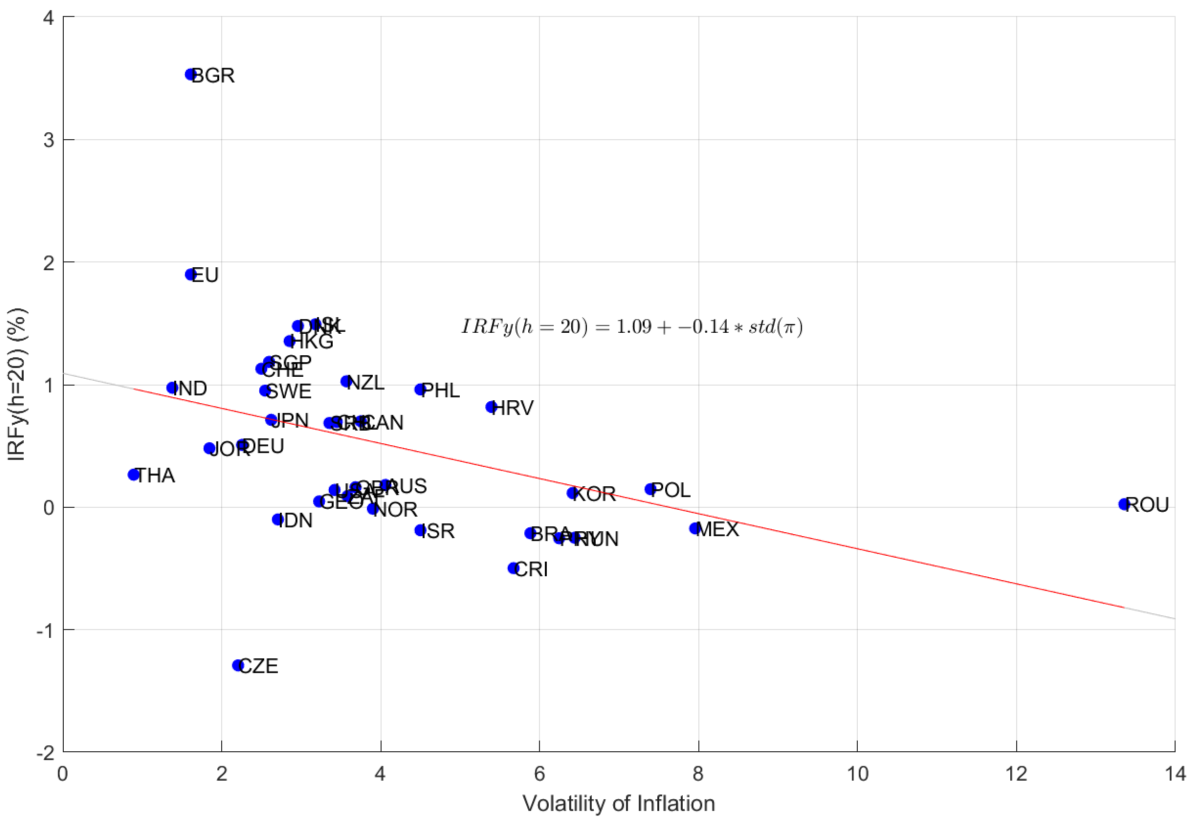

Figure 16: 5 year ahead effect of a permanent monetary shock against the volatility of inflation

4 Conclusion

In this paper we have extended Uribe (2022) decomposition of transitory and permanent monetary shocks to a larger set of countries. We show that his results broadly extend to this larger set, in spite of the different circumstances and ways monetary policy is implemented. We then lifted the assumption of superneutrality and found that the results broadly persist even though we find deviations from superneutrality.

We find however that these deviations are typically small and quickly dwindle with inflation. In short, the debate on changing monetary targets as occurs today in the US is a debate with minimal implications. For high inflation countries the best policy is to reduce inflation, and fast. Lowering inflation from high levels will lead to an output expansion, not a contraction. This paper, half a century later, continues to validate Lucas' inverted Phillips curve finding and support the general tenets of central banks: ignore output and focus on price stability.

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5 Appendix

5.1 Data Sources

Table 5: Sample and *i* Source

Country	y	π	i	Sample
AUS	IFS Seas. Adj.	IFS CPI	IFS Mon. Pol. Rate	1969Q4-2019Q4
BGR	IFS Seas. Adj.	IFS CPI	IFS Deposit Rate	2000Q2-2019Q4
BRA	IFS Seas. Adj.	IFS CPI	IFS Deposit Rate	1996Q2-2019Q4
CAN	IFS Seas. Adj.	IFS CPI	Benati (2021)	1967Q3-2017Q2
CHE	IFS Seas. Adj.	IFS CPI	Benati (2021)	1985Q3-2017Q3
CHL	IFS Seas. Adj.	IFS CPI	IFS Deposit Rate	1996Q2-2019Q4
CRI	IFS Seas. Adj.	IFS CPI	IFS Deposit Rate	1991Q2-2019Q4
CZE	IFS Seas. Adj.	IFS CPI	IFS Deposit Rate	1996Q1-2019Q4
DEU	Benati (2021)	IFS CPI	Benati (2021)	1977Q3-1999Q1
DNK	Benati (2021)	IFS CPI	BIS Mon. Pol. Rate	1991Q2-2019Q4
EU	Benati (2021)	IFS SFRED	Benati (2021)	1999Q1-2017Q1
GBR	IFS Seas. Adj.	IFS CPI	Benati (2021)	1955Q3-2017Q1
GEO	IFS Non Seas. Adj.	IFS CPI	IFS Deposit Rate	1996Q2-2009Q4
HKG	IFS Non Seas. Adj.	IFS CPI	Benati (2021)	1985Q3-2019Q4
HRV	IFS Seas. Adj.	IFS CPI	BIS Mon. Pol. Rate	1995Q2-2018Q3
HUN	IFS Seas. Adj.	IFS CPI	BIS Mon. Pol. Rate	1995Q2-2019Q4
IDN	IFS Seas. Adj.	IFS CPI	IFS Deposit Rate	2000Q1-2019Q4
IND	IFS Seas. Adj.	IFS CPI	BIS Mon. Pol. Rate	1996Q3-2019Q4
ISL	IFS Non Seas. Adj.	IFS CPI	BIS Mon. Pol. Rate	1998Q2-2019Q4
ISR	IFS Seas. Adj.	IFS CPI	IFS Mon. Pol. Rate	1995Q2-2019Q4
JOR	IFS Seas. Adj.	IFS CPI	IFS Deposit Rate	1994Q2-2019Q4
JPN	Uribe (2022)	IFS CPI	Benati (2021)	1963Q3-2017Q2
KOR	IFS Seas. Adj.	IFS CPI	Benati (2021)	1964Q3-2019Q4
MEX	IFS Seas. Adj.	IFS CPI	IFS Deposit Rate	1993Q1-2019Q4
NOR	IFS Seas. Adj.	IFS CPI	IFS Mon. Pol. Rate	1982Q2-2019Q4
NZL	IFS Seas. Adj.	IFS CPI	Benati (2021)	1987Q4-2019Q4
PHL	IFS Non Seas. Adj.	IFS CPI	IFS Deposit Rate	1987Q1-2019Q4
POL	IFS Seas. Adj.	IFS CPI	BIS Mon. Pol. Rate	1995Q2-2019Q4
PRY	IFS Non Seas. Adj.	IFS CPI	IFS Deposit Rate	1994Q2-2019Q4
ROU	IFS Seas. Adj.	IFS CPI	IFS Deposit Rate	1995Q2-2019Q4
SGP	IFS Non Seas. Adj.	IFS CPI	IFS Deposit Rate	1977Q2-2019Q4
SRB	IFS Seas. Adj.	IFS CPI	BIS Mon. Pol. Rate	2002Q1-2019Q4
SWE	IFS Seas. Adj.	IFS CPI	BIS Mon. Pol. Rate	1993Q1-2019Q4
THA	IFS Seas. Adj.	IFS CPI	IFS Deposit Rate	2004Q1-2019Q4
USA	IFS Seas. Adj.	IFS CPI	Benati (2021)	1959Q3-2019Q4
ZAF	IFS Seas. Adj.	IFS CPI	Benati (2021)	1993Q1-2019Q4

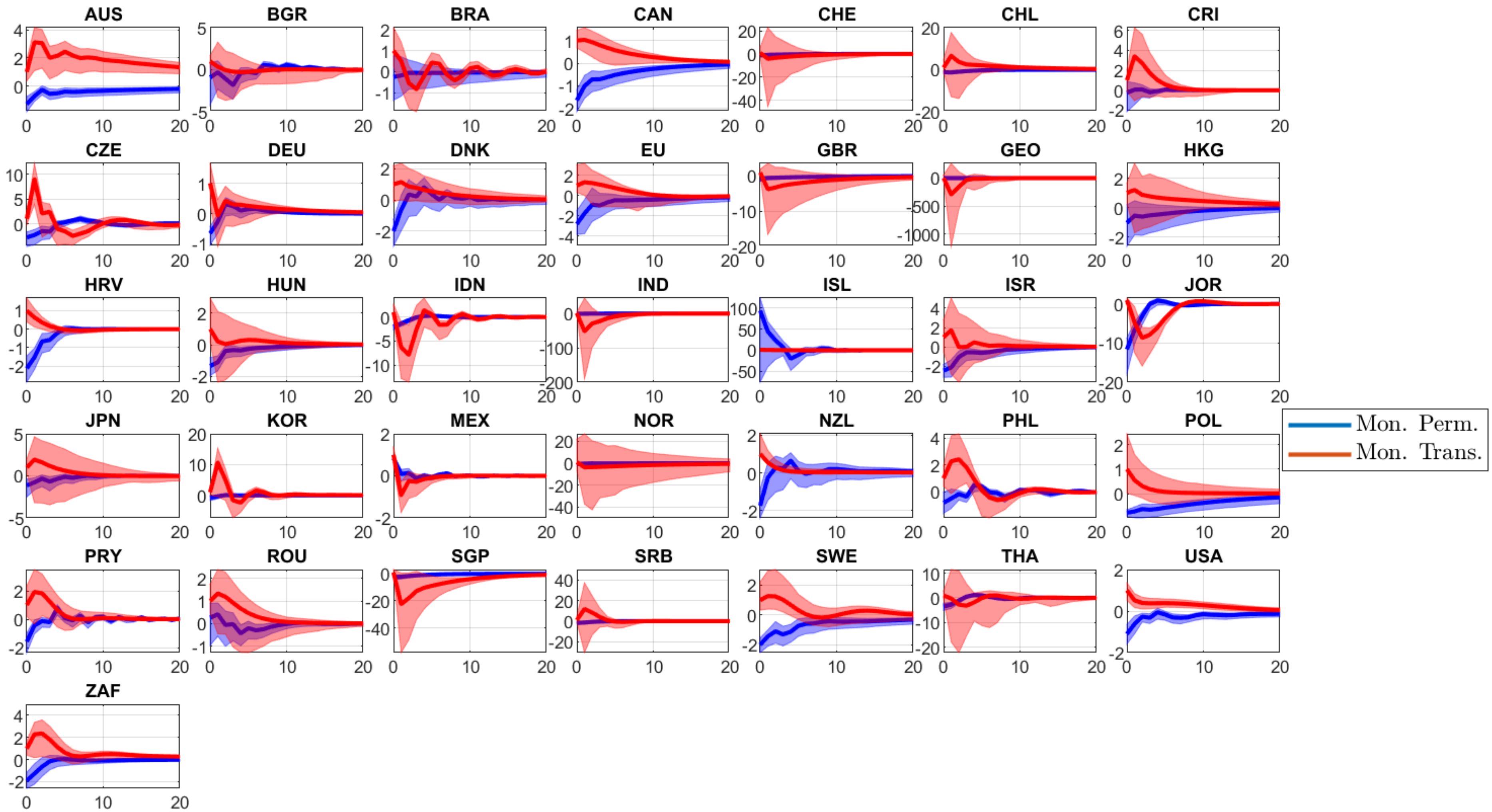

Figure 17: Effects on the real interest rate for permanent and transitory monetary shocks (bounds)

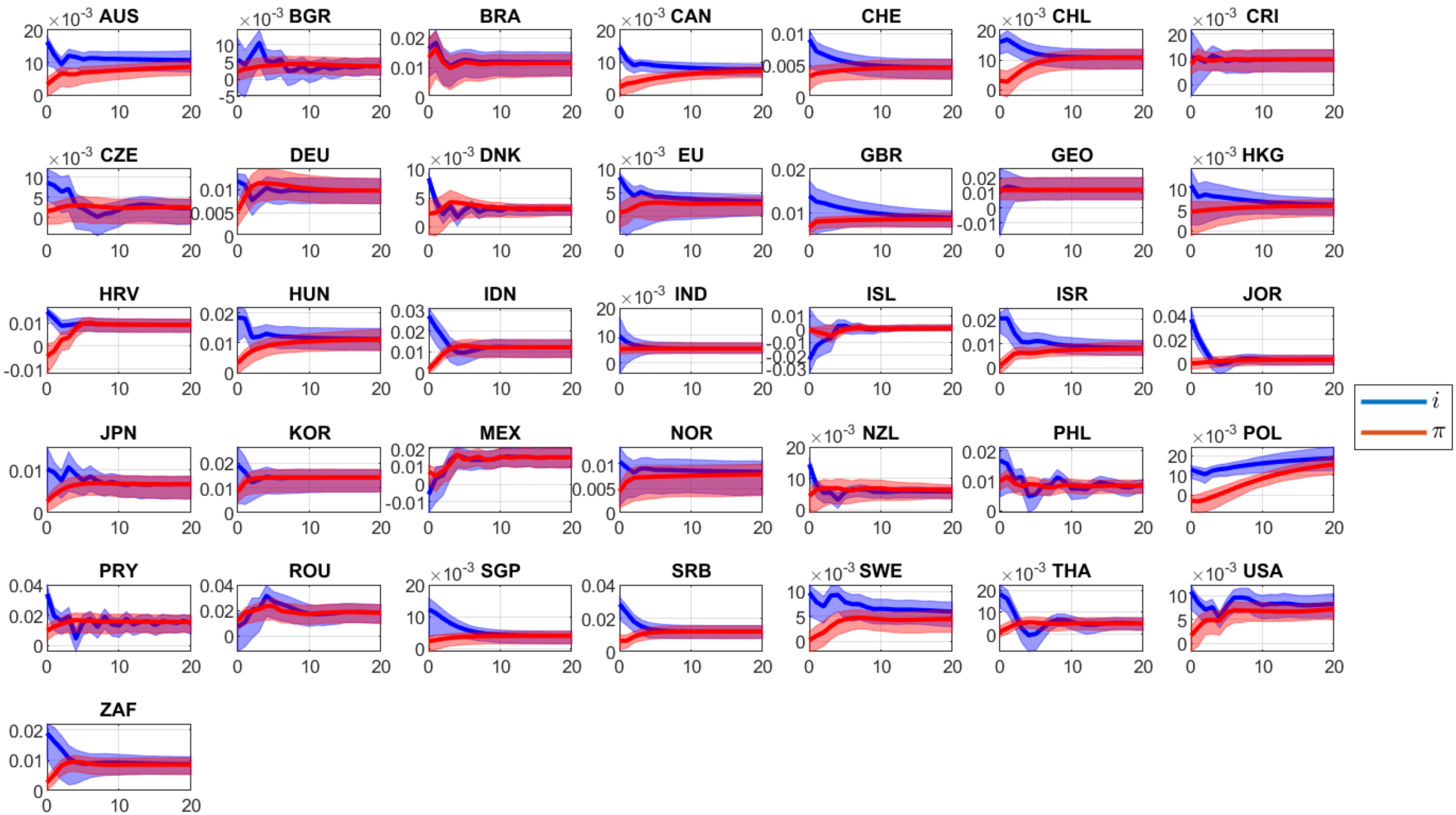

Figure 18: Effects on the nominal interest rate and inflation for permanent monetary shock (bounds)

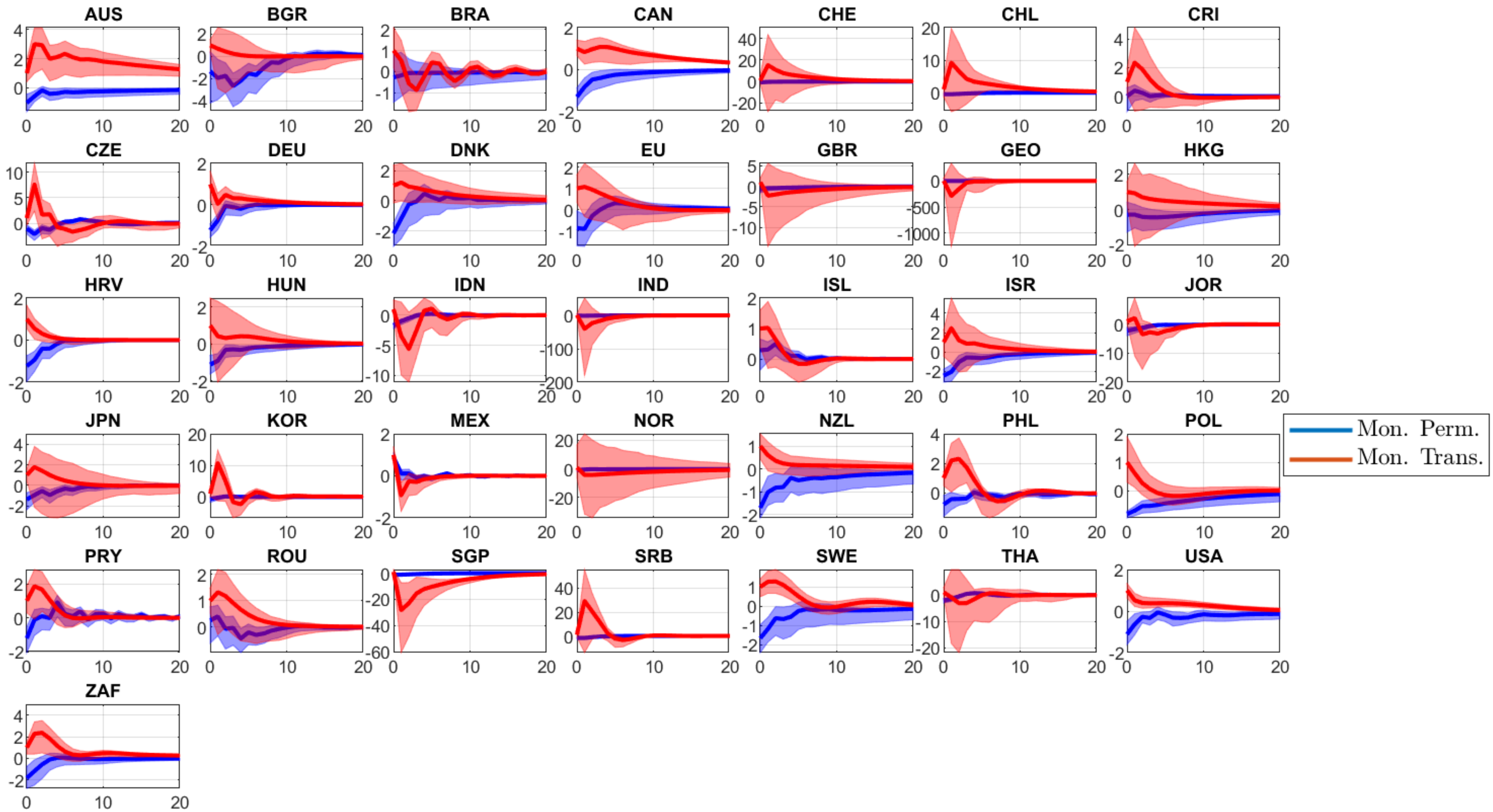

Figure 19: Effects on the real interest rate for permanent and transitory monetary shocks with no superneutrality (bounds)

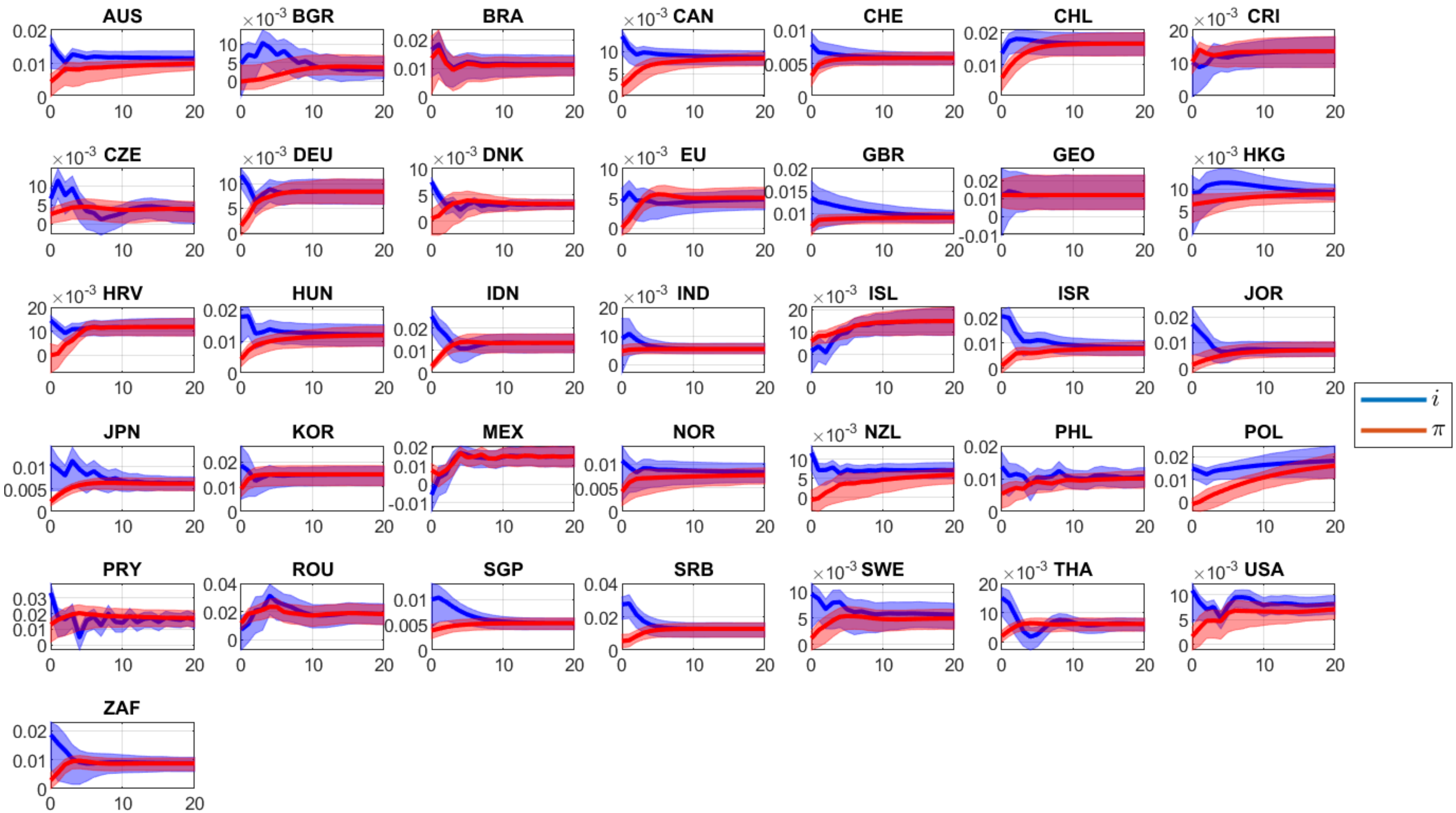

Figure 20: Effects on the nominal interest rate and inflation for permanent monetary shock with no superneutrality (bounds)