NARODOWY
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NBP Working Paper No. 359

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Narodowy Bank Polski
Warsaw 2023

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The views expressed in this article are those of the author. I would like to thank Dorota Ścibisz, Ewa Wróbel and the Referee for their useful comments. Any errors are mine.

Published by:
Narodowy Bank Polski
Education & Publishing Department
ul. Świętokrzyska 11/21
00-919 Warszawa, Poland
nbp.pl

ISSN 2084-624X

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Abstract

In this research note I provide updated estimates of the role of the bank lending channel in monetary policy transmission in Poland. Previous estimates were described in Kapuściński (2017). The bank lending channel is defined following Disyatat (2011), as the amplification of the effect of monetary policy on bank lending, due to its impact on bank balance sheet strength. As before, the estimates are based on counterfactual impulse response functions from panel vector autoregressive models. Differences include not only the longer time series dimension of available data, but also enhancements in terms of the number of banks covered, data processing and coefficient uncertainty coverage. I find the bank lending channel to operate differently in cooperative and commercial banks. Nevertheless, estimates for the latter, significantly larger part of the banking sector are broadly in line with previous ones. 18 percent of a decline in bank lending after the tightening of monetary policy can be attributed to the bank lending channel.

JEL codes: E52, G21.

Keywords: transmission mechanism of monetary policy, bank lending channel.

1 Introduction

In their seminal study, Bernanke and Blinder (1988) put forward a bank lending channel of the transmission mechanism of monetary policy. Under that channel, the tightening of monetary policy reduces reserves, deposits and the ability of banks to make loans. However, with the enhanced understanding of monetary policy implementation, and credit and money creation in recent years (see, for example, Disyatat, 2008; McLeay et al., 2014), the operation of such a mechanism appears unlikely.

Disyatat (2011) proposed an alternative formulation of the bank lending channel. Here, the monetary policy tightening reduces bank loan supply through its impact on bank balance sheet strength. Such a mechanism would operate on top of any negative effect of the tightening of monetary policy on, for example, demand for bank loans caused by their higher cost.

At this point it appears to be worth noting that, a priori, the net effect of monetary policy on the supply of bank loans through the bank lending channel is not obvious. Among the measures of bank balance sheet strength, while the tightening of monetary policy might raise the share of impaired loans (and hence increase loan write-offs), and lower the valuation of fixed income securities, the effect on the net interest margin could be in the opposite direction (see Abadi et al., 2022). Furthermore, any effect on bank profitability (reflecting mainly a net of the effects on loan write-offs, on the valuation of fixed income securities and on the net interest margin) might not end up being reflected in bank capital (an important mechanism in the theoretical considerations in Disyatat, 2011), if there is scope for banks to adjust their dividend pay-out ratios. On the other hand, in principle, the deterioration in the quality of loans and bank profitability could lower bank loan supply independently of whether they are reflected in a decrease in bank capital or not (similarly as the quality of loans could affect the supply of bank loans independently of whether it is reflected in bank profits or not).

Kapuściński (2017) suggested using counterfactual exercises based on panel vector autoregressive models (PVAR) to identify the bank lending channel, as formulated by Disyatat (2011). For different purposes, a similar approach was used by Carpenter and Demiralp (2012), Bluwstein and Canova (2016), and Bishop and Tulip (2017). Kapuściński (2017) applied it to Polish data, estimating that the bank lending channel accounts for about a 23% of a decline in bank lending after the tightening of monetary policy. The same study provides a broad literature review on both the original and the reformulated bank lending channel. Therefore, it is not repeated in this research note.

In this study I update the estimates of Kapuściński (2017). The study is meant less to make use of new data, available since the end of the sample previously used (i.e. to the first quarter of 2015), and more to see whether the original results are robust to several methodical enhancements.

First, not only is the sample lengthened so that it ends in the third quarter of 2022, but also it includes as many as 660 banks, of which 600 were cooperative and 60 commercial. Previously 42 banks were covered, of which all were commercial. While commercial banks prevail in terms of their share in assets or lending (93% versus 7% of loans on average in the sample), it appeared interesting to see if there are any differences as far as the effects of monetary policy are concerned. There are few studies modelling cooperative banks in Poland (exceptions being Godlewski et al., 2019; Kowalska et al., 2019).

The second difference concerns the treatment of mergers and acquisitions. Kapuściński (2017) treated a bank after a merger/an acquisition as a new bank. While safe in terms of potential distortions, when accompanied with a limit on the minimum number of observations for a cross-section, this results in a further reduction in sample coverage. Kapuściński (2017) covered 65% of bank lending on average. In this study an average of 94% is covered. This is because the effects of mergers/acquisitions were removed from bank lending by using auxiliary regressions with M&A dummies. For the remaining variables, they were not removed, as they could make up an important factor in affecting bank lending.

Third, in Kapuściński (2017) any seasonality was removed by using seasonal dummies. While easy to implement even in the case of discontinuities, such an approach misses potential differences in seasonality between banks. Therefore, in this study series were seasonally adjusted using the Census X13 method for banks without discontinuities and the STL decomposition (seasonal-trend decomposition using LOESS, locally estimated scatterplot smoothing) method for banks with discontinuities.

Fourth, Kapuściński (2017) removes the effects of exchange rate fluctuations for the value of foreign currency loans by using aggregate currency weights. Here banks-specific weights were used.

Fifth, in the original study the user-written Stata *pvar* package was used to obtain the estimates (Abrigo and Love, 2016). However, Sigmund and Ferstl (2021) show the package to fail in recovering parameters of a known data-generating process. Taking this into account, and having a reasonably long time series dimension of the data, in this study the instrumental variable-type estimator was replaced with a fixed effects estimator.

Finally, the study appears to be unique in providing confidence intervals for the estimates of the role of the bank lending channel. Together with the previous points, this is its contribution of the literature.

I find the bank lending channel to operate differently in cooperative and commercial banks. Nevertheless, estimates for the latter, significantly larger part of the banking sector are broadly in line with previous ones. 18 percent of the decline in bank lending after the tightening of monetary policy can be attributed to the bank lending channel.

The rest of the study is structured as follows. In the next two sections, models and data are described. In the fourth section results are presented. The last section concludes.

2 Models

Similarly as Kapuściński (2017), I estimated the parameters of PVAR models in the following form:

$$y_{it} = A_{0i} + \sum_{j=1}^{p} A_j y_{it-j} + e_{it},$$

where i and t are unit and time subscripts, respectively, j denotes lag length (where $j = 1 \dots p$), y is a vector of endogenous variables, e is a vector of error terms, A_0 is a vector of fixed effects (or, bank-specific intercept terms), and A_j are matrices of other parameters.

As noted in the introduction, having a reasonably long time series dimension of the data (i.e. 87 quarters of data, or 83 quarters after accounting for lag length), I estimated the parameters of the models by using the fixed effects estimator (or, the ordinary least squares estimator after the within transformation). The available number of periods matters, since the bias in estimates, due to the correlation between the within-transformed dependent variable and error term, dies out with the size of that dimension.

The vector of endogenous variables included GDP, a measure of monetary policy, a return on assets (ROA), a share of impaired loans, a minimum regulatory capital ratio, an actual regulatory capital ratio and bank lending. The ordering of the variables above is as in the Cholesky decomposition.

As a measure of monetary policy I used a monetary policy shock identified outside the models, utilising the high-frequency identification method of Swanson (2021). In Kapuściński (2017), the method of Gürkaynak et al. (2005) was used. The difference is that the former method allows to separate an additional dimension of monetary policy, asset purchases (on top of measures of current interest rate policy and communication, including forward guidance). Asset purchases were conducted in Poland in 2020-2021. However, only the measure of current interest rate policy was used in the PVAR models.[1] The measure of monetary policy was placed after GDP in the Cholesky decomposition to 'mop up' any remaining endogeneity. It was normalised so that it has the same mean as changes in WIBOR 1M around monetary policy meetings and the standard deviation so that it affects WIBOR 1M one-to-one.

[1] In order to compute the measures of monetary policy, data from short (in this case, due to the data characteristics, 2-day) windows around monetary policy meetings are used. In this case, as there were some changes in monetary policy measures used and communication since the start of the coronavirus pandemic, additional dates were included. They were the following: the day of the press release of the Management Board on the 16th of March 2020, the days of press conferences (separated from the days of releases of monetary policy decisions), the days of releases of monetary policy operation schedules (containing information regarding the number of asset purchase operations) and the dates of asset purchases themselves (as only then the offered volumes were announced, potentially having a signaling effect). Estimated monetary policy shocks are available in the Online Appendix, at: https://doi.org/10.6084/m9.figshare.22316818.

In contrast to Kapuściński (2017), I replaced the Economic Sentiment Indicator with GDP. Also, the excess capital was decomposed into the minimum and actual regulatory capital ratio.

The models used data of quarterly frequency and therefore the lag length was set to four periods. Such a lag length was required, in particular, to fully identify an effect on the share of impaired loans, which should be expected to occur with some delay.

After estimating the parameters of the PVAR models, actual responses to a monetary policy impulse were compared with counterfactual ones, switching-off the bank lending channel. The latter assumed no response of ROA, the share of impaired loans, and the minimum and actual regulatory capital ratio (or, the measures of bank balance sheet strength). GDP and bank lending were allowed to respond, and monetary policy was allowed to adjust further.

In order to establish whether the differences in impulse response functions are statistically significant, they were bootstrapped (with 1000 draws). For each bootstrap draw, the actual response, the counterfactual response and their difference were computed. Then, I constructed medians and 95% confidence intervals. The focus was on the difference in the impulse responses of bank lending.

Kapuściński (2017) reported also the results of an intermediate step in the procedure, the results of an equation for bank lending. In this study it was omitted as not critical (they are available on request).

3 Data

To the models described in the previous section I applied data for an unbalanced panel of banks operating in Poland. The sample starts in the first quarter of 2001 and ends in the third quarter of 2022. I used data for 660 banks, of which 600 were cooperative and 60 were commercial. The following were removed: the branches of foreign credit institutions (not holding, and hence not reporting capital in Poland), banks not conducting operating activity and banks with less than three years of data (necessary for the seasonal adjustment). Also, a state-owned bank was removed, as well as observations for two banks with an activity significantly scaled-down after a portfolio sell-out, for the post-sell-out period. This still resulted in a 94-percent coverage of aggregate bank lending (Figure 3).

As a regulatory capital ratio, the total capital ratio – or, before its introduction, the solvency ratio – was used. Regarding its minimum level, it was defined as the level allowing for a dividend pay-out – full, or to the largest possible extent. For periods when a dividend was not allowed to be paid-out, a level (or a rule) for the last period for which it was allowed was assumed. Before the introduction of explicit dividend policy, I assumed the minimum legally binding level – 8% or higher, depending on the time since the bank was set up.

For bank lending, not only loans to non-financial corporations and households were taken into account (as in Kapuściński, 2017), but also those to the local government sector. This matters particularly for cooperative banks, where they make up a significant share of the portfolio (i.e. 7.6% on average in the sample, versus 2.8% for commercial banks).

All variables except ROA were first differenced for comparability with the original study. GDP and bank lending were taken in logarithms first (resulting in log-differences). For regulatory capital ratios, the first differencing was a substitute for removing any stochastic trend in the actual ratio by removing the minimum ratio previously (to obtain the excess capital).

Data on GDP were from Eurostat. The computation of the measure of monetary policy required the use of data on the WIBOR 1M rate, FRA 1x2, 2x3, 3x6, 6x9 and 9x12 rates, and 2-, 5- and 10-year government bond yields. They were taken from Refinitiv. Bank-level data were from (publicly unavailable) monetary/prudential reporting. The main component of the minimum regulatory capital ratio was from reports and press releases of the Financial Supervision Authority; the bank-specific component required the use of the monetary/prudential reporting. The computation of weights for the exchange-rate adjustment of foreign currency bank lending (see below) required the use of exchange rates, which were from Eurostat; the foreign currency shares – from monetary/prudential reporting.

Besides inducing stationarity, data required a number of adjustments. First, as mentioned, foreign currency bank lending was adjusted for exchange rate fluctuations. To this end, period- and bank-specific foreign currency shares were used. The adjustment was performed so that foreign currency loans could be interpreted as corresponding to sample mean exchange rates. After the adjustment, they were added to domestic currency loans, and the sum was used as a single variable. The adjustment was to remove accounting effects from the data, so that behavioural effects could be identified with better precision.

Second, bank-level data, except for the minimum regulatory capital ratio, were winsorised. It was in order to limit the influence of outliers on results. Having a large number of observations in each period, only those below the 0.5th percentile and above the 99.5th percentile were replaced with these percentiles. The winsorising procedure used accounted for seasonality by applying different thresholds for each quarter.

Third, data on bank lending were adjusted for mergers and acquisitions. For each bank with a merger/an acquisition in the sample the parameters of an AR (autoregressive) model for a loan log-difference were estimated. They included seasonal and M&A dummies. Then, the parameter estimates on M&A dummies, if statistically significant, were removed from the original data (for periods after respective mergers/acquisitions).

Finally, bank-level data, except for the minimum regulatory capital ratio, were seasonally adjusted. In the case of banks without discontinuities, the Census X13 method was used; for banks with discontinuities, the STL decomposition method was used. GDP was taken already seasonally and calendar adjusted.

Using the above-described set of data, I estimated the parameters of two models. In the first one data for both cooperative and commercial banks were used. In the second one – data for commercial banks only. I also estimated the parameters of a model in which data for cooperative banks only were used. Expectedly (given the dominance of cooperative banks in terms of their number), the results were qualitatively and quantitatively very similar to those for the sample of both cooperative and commercial banks. They are available in the Online Appendix.

4 Results

Figures 4-5 present responses to a monetary policy impulse in two variants. In the first one, parameter estimates are based on the sample of both commercial and cooperative banks. In the second variant, only data for commercial banks are used. For both variants, actual impulse response functions are compared with counterfactual ones, in which the bank lending channel is switched-off. This is apparent in the lack of response of the measures of bank balance sheet strength (i.e. ROA, share of impaired loans, and minimum and actual regulatory capital ratios). In these figures, the responses of respective variables are in the form the variables are used in the models. For example, for GDP, the response is of the log-difference.

For both variants, after the tightening of monetary policy the share of impaired loans increases with a lag. As a result, the initial net effect on bank profitability is positive. Then it drops below zero.

Interestingly, there appears to be no negative effect on the capital position of banks, except perhaps for some decrease in the actual regulatory capital ratio on impact. In the longer term, the effect is even positive. However, the response of the actual regulatory capital ratio to some extent mirrors that of the minimum regulatory capital ratio. The response of capital regulations to a monetary policy impulse could be interpreted as a sign of monetary-prudential policy interaction. However, taking into account the source of a large share of variability of the minimum regulatory capital ratio in the sample, namely, the implementation of supernational regulations, it seems that such an interpretation would be premature. This result might reflect sample-specific conditions, rather than systematic interactions. In any case, this result differs from that of Kapuściński (2017), where the excess capital initially (and more persistently) decreased, to increase only in the longer term.

The tightening of monetary policy results in a decrease in bank lending. This contributes to a decrease in GDP (compared to a no policy change scenario).

At this point, three important differences between the two variants of the model (i.e. with and without cooperative banks) are worth noting (on top of the apparent fact that for the sample dominated by cooperative banks, coefficient uncertainty, reflected in confidence intervals, might be underestimated, due to the very large number of observations). First, in the sample with cooperative banks the response of the share of impaired loans is smaller in absolute terms. Second, in the same case (i.e. in the sample with cooperative banks) the initial increase in bank profitability is more persistent and the effect turns negative later. Third, and most importantly, this is reflected in a larger, rather than smaller decrease in bank lending in the counterfactual scenario (i.e. in a scenario with the bank lending switched-off) in the sample dominated by cooperative banks. For commercial banks, however, it is the opposite, and hence similar as in Kapuściński (2017).

The latter result could be due to the different composition of the effect of the tightening of monetary policy on the profit and loss account, depending on whether cooperative or commercial banks are concerned. For cooperative banks, a positive effect on the net interest margin might be dominating. For commercial banks, the opposite could be the case and dominating might be a negative effect through different channels (for example, an increase in the share of impaired loans).

The remaining figures are based on the same impulse responses functions, but present them in a different manner. In Figures 6-7 are cumulated impulse response functions (except for the ROA). Figures 8-9 present differences in non-cumulative impulse responses. In Figures 10-11 differences in cumulative responses are presented.

The headline result of Kapuściński (2017) is based on differences in cumulative impulse response functions of bank lending, after 20 quarters. For the sample of commercial banks, the difference is of 18%, as compared to 23% percent reported in the original study. The point estimate of the 18-percent difference is borderline statistically significant. For the sample dominated by cooperative banks the bank lending channel does not appear to be operative, in the sense that without the effect of monetary policy on cooperative bank balance sheet strength the overall effect of monetary policy on bank lending would not have been weaker.

5 Conclusion

In this research note I provide updated estimates of the role of the bank lending channel in monetary policy transmission in Poland. Previous estimates were described in Kapuściński (2017). I find the bank lending channel to operate differently in cooperative and commercial banks. Nevertheless, estimates for the latter, significantly larger part of the banking sector are broadly in line with previous ones. 18 percent of the decline in bank lending after the tightening of monetary policy can be attributed to the bank lending channel.

For the sample dominated by cooperative banks, the bank lending channel does not appear to be operative, in the sense that without the effect of monetary policy on cooperative bank balance sheet strength the overall effect of monetary policy on bank lending would not have been weaker.

This result could be due to the different composition of the effect of the tightening of monetary policy on the profit and loss account, depending on whether cooperative or commercial banks are concerned. For cooperative banks, a positive effect on the net interest margin might be dominating. For commercial banks, the opposite could be the case and dominating might be a negative effect through different channels (for example, an increase in the share of impaired loans). The exact mechanism leading to this result requires further research, however.

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Appendix

Figure 1: Macroeconomic data, and distribution of microeconomic data for commercial and cooperative banks

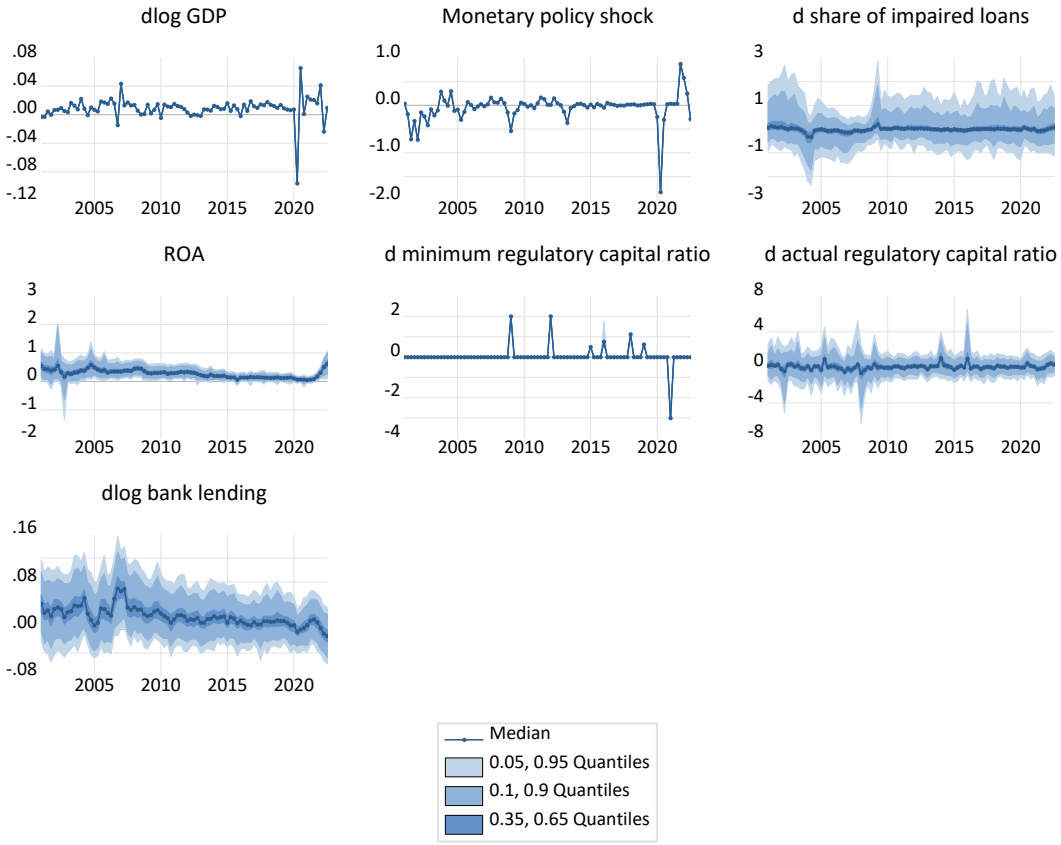

Figure 2: Distribution of microeconomic data for commercial banks

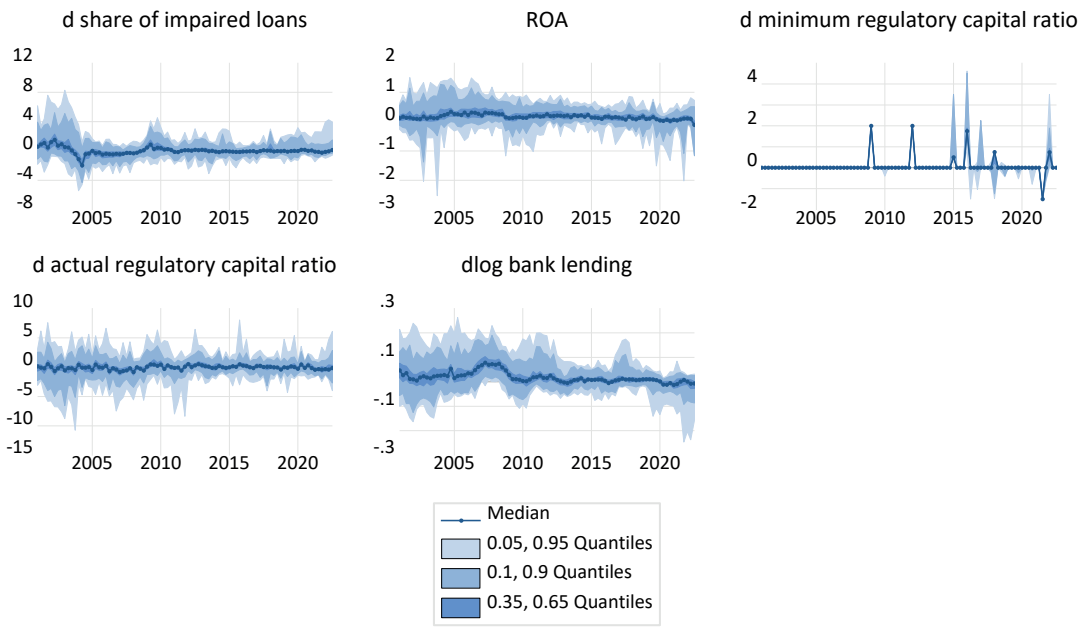

Figure 3: Coverage of aggregate bank lending (%)

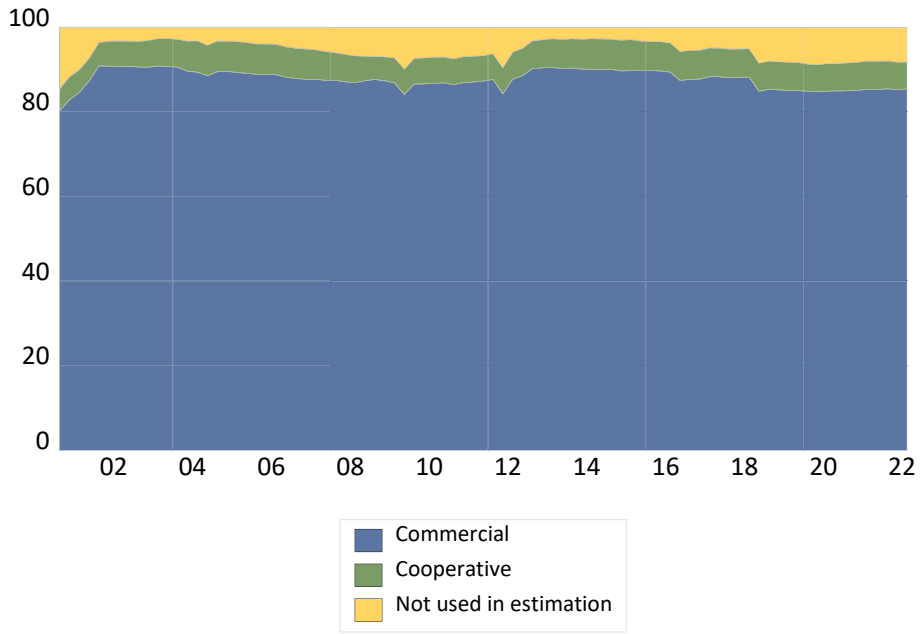

Figure 4: Responses to a monetary policy impulse, commercial and cooperative banks

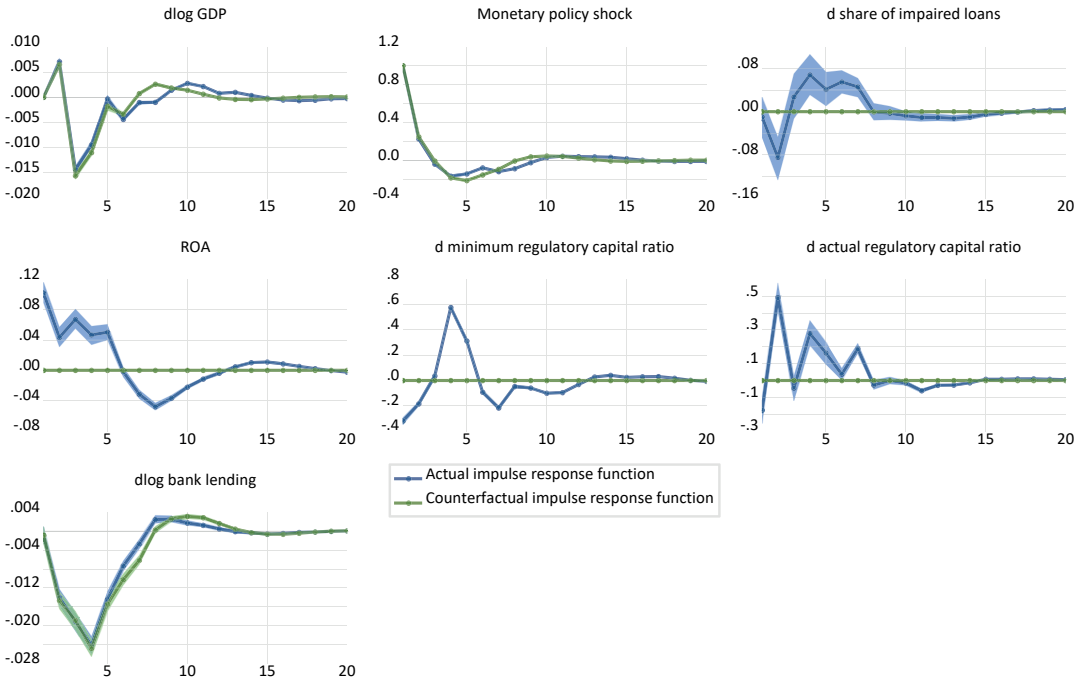

Figure 5: Responses to a monetary policy impulse, commercial banks

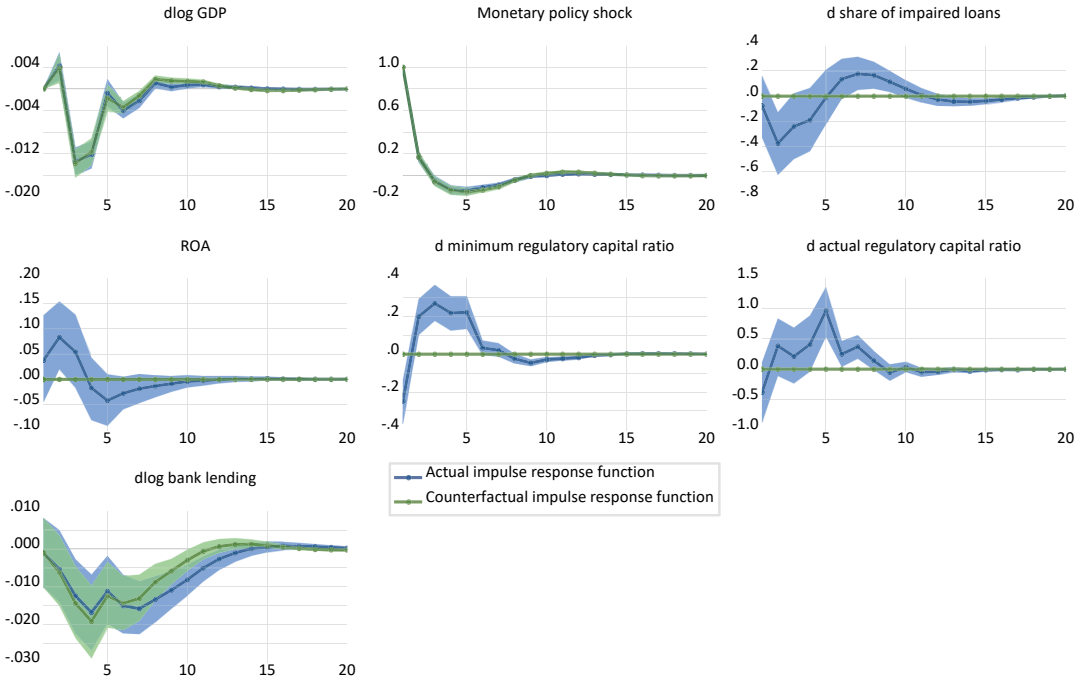

Figure 6: Responses to a monetary policy impulse, commercial and cooperative banks, accumulated

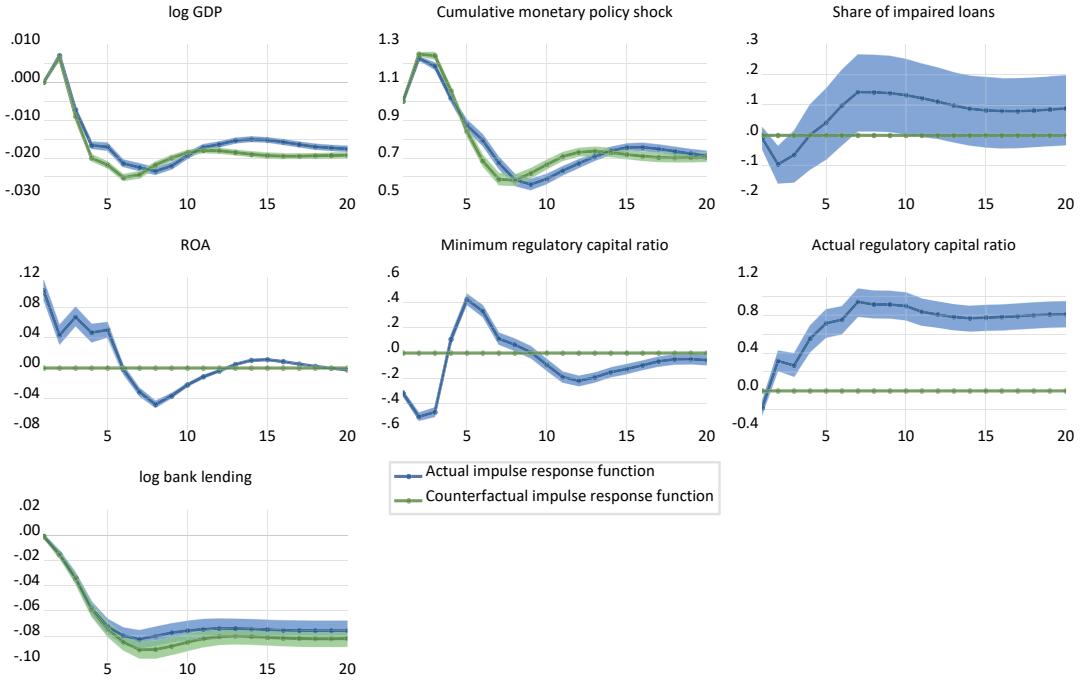

Figure 7: Responses to a monetary policy impulse, commercial banks, accumulated

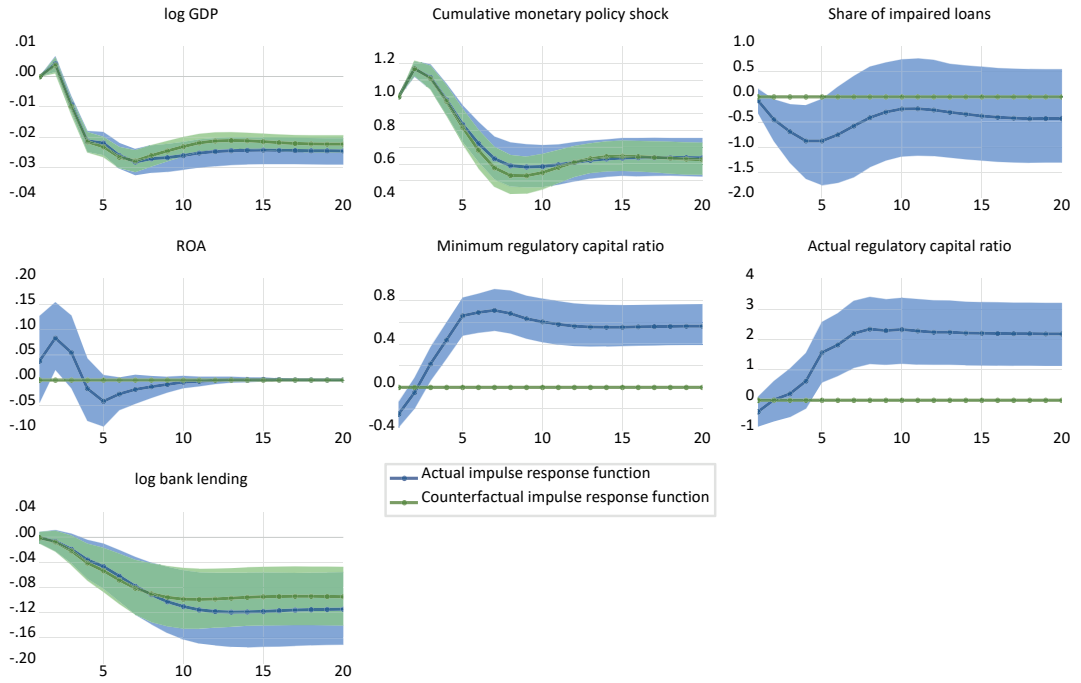

Figure 8: Differences between actual and counterfactual responses to a monetary policy impulse, commercial and cooperative banks

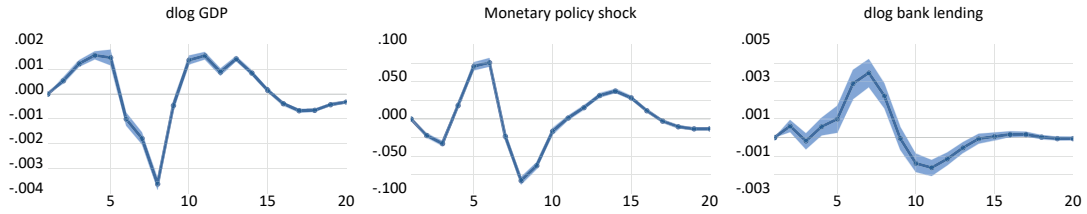

Figure 9: Differences between actual and counterfactual responses to a monetary policy impulse, commercial banks

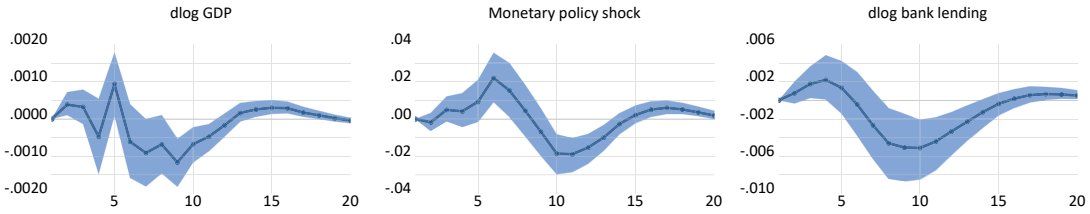

Figure 10: Differences between actual and counterfactual responses to a monetary policy impulse, commercial and cooperative banks, accumulated

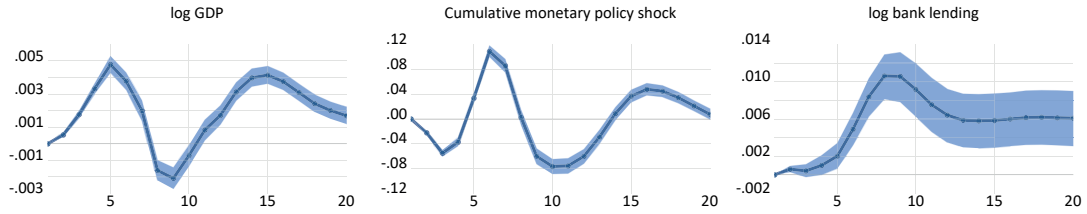

Figure 11: Differences between actual and counterfactual responses to a monetary policy impulse, commercial banks, accumulated