

NBP Working Paper No. 329

Monetary policy transmission mechanism in Poland

What do we know in 2019?

Tomasz Chmielewski, Andrzej Kocięcki, Tomasz Łyziak, Jan Przystupa,
Ewa Stanisławska, Małgorzata Walerych, Ewa Wróbel



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Summary

The monetary policy of Narodowy Bank Polski (NBP)—pursued in accordance with the assumptions of the inflation targeting strategy—remains conventional. The Polish central bank has the capacity to change the basic monetary policy instrument, i.e. the short-term interest rate, in both directions. Therefore, the aim of this report—similarly to its previous editions—is to analyse the transmission mechanism of the conventional monetary policy.¹

However, this does not mean that the analysis of the monetary policy transmission mechanism faces no limitations. The main problem constraining modelling in this area is related to the lack of variability of the NBP reference rate, very low volatility of monetary policy shocks identified with various methods, full predictability of monetary policy decisions in recent years and well-established expectations of private sector concerning stability of the NBP reference rate in the near future. Under these circumstances, drawing conclusions on the strength and delays of the mechanism through which potential changes in the short-term interest rate would affect the economy is more difficult and more uncertain than before. Thus, the hypothesis seems likely that economic agents used to stable interest rates and expecting their maintenance at the current level, can respond to potential changes in monetary policy parameters in another way than in the past. This is illustrated by the high uncertainty of the current response functions of various variables to monetary policy shocks, obtained from models with time-varying parameters.

For the above reasons, our view of the monetary policy transmission mechanism in Poland is multi-faceted in this report. Although we show the results of standard models estimated on long samples, we attach greater importance to models with time-varying coefficients and we extend studies of the transmission mechanism at the microeconomic level, taking into account the heterogeneity of entities and their response to monetary policy decisions. In addition, we analyse the importance of various forms of central bank communication, including the text content (tone) of decision-makers' documents, enabling the central bank to influence the expectations of private sector entities even if short-term interest rates do not change.



The results presented in the report show that—apart from increased uncertainty of our estimates—decisions on the NBP short-term interest rates have an impact on a number of macroeconomic variables and through them—on the economic activity and inflation processes.

Structural factors affecting the monetary policy transmission mechanism

The results of empirical studies are ambiguous with regard to the extent to which the strength of the monetary policy transmission mechanism in Poland is weaker than in more advanced countries. The factor undermining the impact of the NBP monetary policy impulses but at the same time reducing transmission lags, is the lower level of development of the financial system than in more advanced countries and the limited importance of bank credit among the sources of financing for Polish enterprises. On the other hand, the degree of price and wage rigidities in the Polish economy seems to be lower than in more advanced countries. Combined with a stronger impact of the exchange rate on prices, this should increase the impact of monetary policy on inflation. However, the analysis of labour market rigidities is a complex issue. The report shows

¹ Demchuk *et al.* (2012), Kapuściński *et al.* (2014), Kapuściński *et al.* (2016), Chmielewski *et al.* (2018).

that flexibility in working hours does not necessarily reduce the impact of monetary policy on employment and increase its impact on wages and prices. The results of our studies suggest that in European countries, in periods of economic downturn enterprises get rid of less productive employees and increase the intensity of work of the remaining employees. Thus, larger flexibility of working time leads to a stronger decline in output and a weaker response of wages and prices after monetary policy tightening.

The analysis of structural factors influencing the transmission mechanism indicates that the main channels analysed in this report should be active in the Polish economy. We describe factors that enhance functioning of each channel as well as those that hinder it. The interest rate channel is supported by the development of the financial intermediation system and the high level of competition in the commercial bank sector, while it is undermined by the low importance of bank credit in financing investment, the high level of the total capital adequacy ratio and large portfolios of liquid assets in banks. The latter factors also undermine the functioning of the credit channel which, on the other hand, is strengthened by the significant contribution of small and medium-sized enterprises to total production. This effect is, however, not large — admittedly small and medium-sized enterprises do not have alternative source of external financing, but they rely mainly on internal sources of financing. The exchange rate channel is supported by an increase in openness of the Polish economy and growing role of imports in consumption, whereas it is undermined by the fact that the majority of foreign trade takes place within global value chains. A factor strengthening the household cash-flow channel is the prevalence of bank loans with a floating interest rate, whereas a factor undermining this channel is the relatively low share of indebted households.

Strength and lags of the monetary policy transmission mechanism

Empirical models with time-invariant parameters show that monetary policy tightening is followed by exchange rate appreciation, a decline in credit and various measures of economic activity, and inflation. Models with time-varying parameters generally confirm these results; however, they also show that the volatility of short-term interest rate shocks has recently decreased dramatically. It means that the estimated responses of main macroeconomic aggregates to typical monetary policy decisions are subject to considerable uncertainty. In the case of inflation response this uncertainty may additionally arise from the weakening of the impact of domestic demand pressure on price developments. This is consistent with recent studies showing the increased importance of global factors for domestic inflation.

Bearing the above caveats in mind, in the report we also present estimates of the strength and lags of the monetary policy transmission mechanism obtained on the basis of structural models. They show that the maximum decrease in the GDP growth rate resulting from an unexpected increase in the short-term interest rate by 1 perc. point for a period of one quarter ranges from approx. 0.2 to 0.4 perc. points and occurs not later than 3 quarters after the interest rate change. The CPI inflation response to this impulse is the strongest in the second year after the interest rate change and amounts to approx. -0.2 perc. points. The core inflation response, occurring with a similar lag, is slightly stronger than the CPI inflation response. The effects of the exchange rate channel and the interest rate channel contribute the most to the fall in CPI inflation after the monetary policy impulse.

Interest rate transmission

Models estimated on a sample including episodes of monetary policy easing and tightening show that money market rates adjust to changes in the NBP reference rate either entirely or almost entirely and these adjustments take place quickly. The pass-through from money market interest rates to lending and deposit rates in commercial banks is fast, although not always complete. The government bond yields follow the trend of the NBP reference rate; however, by their very nature they demonstrate much higher volatility.

Credit in the monetary policy transmission mechanism

As the share of bank credit in GDP increases and the importance of foreign currency loans decreases, the role of credit in the monetary policy transmission mechanism in Poland grows. The responses of the volume of loans to households, especially housing loans denominated in Polish zloty (PLN), to unexpected changes in short-term interest rates are quite strong—stronger than responses of the volume of corporate loans. However, the latter category is not homogeneous in terms of monetary policy impact. In the case of loans for financing working capital and loans in current account, a direct response of their volumes to monetary policy shocks occurs. On the other hand, the NBP monetary policy has an indirect impact on investment loans, by affecting the risk factors perceived by banks—related to the financial situation of enterprises, banks and the quality of the loan portfolio—and the lending policy of commercial banks (changes in credit standards and terms). It is worth noting that after an unexpected change in the interest rate, banks more strongly adjust their lending policy towards small and medium-sized enterprises than for large entities, especially in the segment of long-term loans, which are subject to higher risk than short-term loans. These results suggest that in Poland we are dealing with the functioning of the credit channel: credit terms and standards react to monetary policy decisions. In other words, monetary policy affects not only credit demand (interest rate channel), but also credit supply (credit channel). However, our estimates indicate that the effects of the credit channel are clearly weaker than those of the interest rate channel.

Not every change in lending standards and conditions means an increase or decrease in the stringency of the lending policy of commercial banks. Some of these changes are endogenous, depending on the macroeconomic situation and the macro- and micro-economic risk factors perceived by banks. For this reason, an important part of our work was to introduce a model-based measure of lending policy stance of commercial banks. Thus far such indicators have been developed for various types of corporate loans. Our results show that, in 2007 and for a major part of 2008, banks conducted a loose (expansionary) lending policy. During the acute phase of the global financial crisis and the second phase of the crisis, i.e. in the period of the European sovereign debt crisis, banks clearly, albeit for a short time, tightened this policy. Since 2014, the lending policy of banks has been consistent with fundamental factors, although there have been isolated observations where standards were too loose or too strict. However, no long periods of loose lending policy dangerous for the stability of the sector occurred.

Another study concerning the lending policy of commercial banks, the results of which we present in the report, is the study on the risk-taking channel in the Polish economy. Our results show that at the level of the entire loan portfolio as well as the portfolio of large corporate loans, a negative relationship exists between the level of nominal interest rates and the change in risk taken by banks. This relationship is non-linear: the specific change in the level of interest rates has a stronger impact on the risk taken by banks at lower levels of rates than at higher rates. However, the above relationships result both from the effects of changes in demand for loans and changes

in their supply. The functioning of the risk-taking channel, related to the supply of loans, is confirmed only with respect to the part of the banks' loan portfolio which consists of large corporate loans. However, the strength of functioning of this channel in relation to the typical volatility of risk measures is not large.

The analyses with the use of granular data represent a new dimension of studies on the role of credit in the transmission mechanism. They concern the impact of monetary policy on the consumption of already indebted households, associated with a change in interest payments. This impact mainly affects households with relatively high income as they account for the prevailing part of the household sector expenditure on debt service. Such households demonstrate a higher level of consumption than households comparable in terms of income with no credit debt. Expenditure on servicing debt—especially due to loans for the purchase of real estate—incurred by high-income households is systematically higher in relation to consumption expenditure and disposable income than in the case of lower-income indebted households.

We estimate that the change in debt service expenses after an increase in interest rates by 1 perc. point would be equivalent to approx. 1.9% of consumer spending in the group of households with a PLN housing loan and about 0.3% of consumer spending in the case of indebted households that are not burdened with housing loans. On an aggregate level, i.e. taking into account both households with credit and without credit, we estimate that changes in interest expenses for domestic currency loans after a 1 perc. point increase in interest rates would be equivalent to approx. 0.25% of all households consumption expenditure. If the increase in the domestic interest rate were to occur in parallel with changes in foreign interest rates affecting the interest rates of foreign currency loans, the total effect would increase to approx. 0.35% of consumer spending.

Exchange rate channel

The exchange rate channel of the monetary policy transmission mechanism in Poland remains quite significant. Although the impact of the exchange rate on export volumes and consumer prices is dampened by firms' participation in global value chains, the intensity of such participation is still quite moderate. The export of goods with a medium degree of processing (cars and their parts) and technologically advanced goods (RTV, electronic devices, optical articles), i.e. in sections with a high share of foreign value added, producing for export, is the least sensitive to exchange rate fluctuations. On the other hand, exports of low-processed, labour- and material-intensive products (agricultural products, food and beverages, textiles, steel and steel products) and services (transport and construction) respond most intensively to exchange rate changes.

The impact of the exchange rate on consumer prices has remained stable over recent years—an appreciation of the nominal effective exchange rate of the zloty by 1% results in a decrease in consumer prices by approx. 0.06-0.08%. This impact is higher than in the euro area countries, which mainly results from the high production import intensity and the high share of imported goods in private consumption.

Private sector expectations and central bank communication

Medium and long-term inflation expectations of private sector experts demonstrate a high degree of anchoring. Among the inflation expectations of various groups of agents formed in a shorter term horizon, the inflation expectations of enterprises seem most important for the monetary policy transmission mechanism in Poland. They respond more strongly than the inflation

expectations of financial sector analysts to monetary policy decisions, although they are less anchored to the NBP inflation target and more sensitive to food and energy price shocks. Since the outbreak of the financial crisis, the importance of inflation projections published by the NBP in shaping the opinions of firms on the expected price changes has increased. At the same time, these expectations have recently begun to respond more strongly to changes in wages.

The central bank communication uses various tools, such as minutes, macroeconomic projections or forward guidance. The results of the study in which we analysed the combined importance of monetary authority decisions and central bank communication show that both elements complement each other, supporting the central bank's management of financial sector analysts' expectations regarding the NBP reference rate and CPI inflation. In general terms, the text content of the minutes of the Monetary Policy Council (MPC) affects the experts' expectations formulated in the shortest horizons (current and next quarter), whereas the GDP and inflation projections published by the central bank are relevant to the expectations formulated in longer term horizons. Surprises in the scope of the NBP reference rate affect the entire expected interest rate path in the future.

Introductory remarks

This study is the fifth comprehensive description of the state of knowledge about the mechanism of monetary policy transmission in Poland.² It contains both an update of information on the strength and delays of this mechanism and the functioning of its fundamental relationships, as well as a synthesis of the results of new research regarding transmission areas that have not until now been analysed extensively.

Our new research concerns in particular the role of bank credit in the monetary policy transmission mechanism. We analyse in detail the importance of commercial banks' lending policy in explaining adjustments in the volume of bank loans to changes in short-term interest rates. We present new results regarding the impact of monetary policy on the quality of the loan portfolio, in particular in the environment of low nominal interest rates (the so-called risk-taking channel). We also inspect how monetary policy decisions affect the consumption of previously indebted households. An important and a useful effect of our research on the importance of credit in the monetary policy transmission mechanism is to propose index of commercial banks' lending policy stance, which might be useful in the future for analysing monetary policy effects as well as financial stability. In addition, a new area of our research focuses on the effects of central bank communication, which we assess as fully as possible—taking into account the textual content (tone) of minutes of NBP MPC and central bank macroeconomic projections, while controlling the effects of decisions on short-term interest rates and macroeconomic surprises. What distinguishes this report from the previous ones is also a wider use of granular data—in particular in research on the credit market, as well as in studying the impact of the exchange rate on the volume of exports.

The results of our research show that MPC decisions affect macroeconomic processes in Poland, including economic activity and inflation, to a degree comparable to the one we showed in previous editions of the report. Nevertheless, assessment of changes in the monetary policy transmission mechanism over time clearly shows that at present the uncertainty of model estimates regarding the effects of monetary policy is much larger than in the past. This result seems intuitive, because in the environment of a long period of stable interest rates and predictability of monetary authorities' decisions, economic entities can naturally ignore the possibility of unexpected changes in monetary policy decisions. This means that possible changes in interest rates in the future may cause reactions not necessarily consistent with the results of our current analyses, based on observations from a longer period in which short-term interest rates were much more volatile than in 2015-2019.

In line with previous routines, the first part of the report contains a theoretical introduction and an analysis of the structural factors affecting the monetary policy transmission mechanism. In this part of the report, it is worth paying special attention to considerations regarding the determinants of heterogeneity of the monetary policy transmission mechanism between countries

² Earlier editions of this report include Demchuk *et al.* (2012), Kapuściński *et al.* (2014), Kapuściński *et al.* (2016) and Chmielewski *et al.* (2018).

(section 1.2.1), the extensive description of the impact of labour market institutions on the effects of monetary policy decisions (section 1.2.3), as well as the description of factors affecting monetary policy transmission mechanism from the perspective of microeconomic data (section 1.2.5).

The second part of the report contains an update of the results regarding the strength and lags of the monetary policy transmission mechanism and its basic relationships, i.e. interest rate pass-through, the impact of the exchange rate on the economic activity and prices, as well as the formation of inflation expectations by various types of entities and the degree of their anchoring. An important feature of this part of the report are considerations on changes in response to monetary policy shocks over time (section 2.1), as well as a disaggregated analysis of the impact of exchange rate changes on exports (section 2.4.1).

The third part of the report is dedicated to special topics related to the latest, detailed research. Most of these topics concern the credit market, in particular the lending policy of commercial banks and its stance (sections 3.1.2 and 3.1.3) and risk taking by banks in the environment of low nominal interest rates (section 3.1.4). In addition, we analyse the importance of the textual content of MPC minutes for the expectations of private sector entities (section 3.2).

The report closes with the Conclusions, in which we emphasize the new elements of analyses of the monetary policy transmission mechanism area undertaken in this report.

1 Structural factors affecting the monetary policy transmission mechanism

In this part of the report we consider the structural features of the economy, which—in the light of theoretical premises and empirical studies—should influence the strength and lags of the monetary policy transmission mechanism in Poland and the functioning of its individual channels.

1.1 Theoretical introduction

The monetary policy transmission mechanism is a network of relationships through which monetary policy decisions affect the economy, especially output and inflation. These relationships are classified in different ways, covering in particular various channels and stages of the monetary policy transmission mechanism. In previous editions of the report (Demchuk *et al.*, 2012; Kapuściński *et al.*, 2014; Kapuściński *et al.*, 2016; Chmielewski *et al.*, 2018) we presented in detail various classifications of the monetary policy transmission mechanism channels and stages. Therefore, this report presents this issue in a synthetic way, focusing attention on those channels whose relationships are analysed in the empirical part of the report. They include the interest rate channel, the exchange rate channel, the credit channel, the risk-taking channel and—for the first time—the cash-flow channel.

The interest rate channel takes into account the impact of interest rates on investment (through changes in the cost of capital) and consumption (due to the effect of inter-temporal substitution) and, consequently, on output and inflation.

The functioning of **the exchange rate channel** is related to the response of the exchange rate to the change in the interest rate, explained within the concept of the uncovered interest rate parity. The change in the exchange rate affects the price competitiveness of exports³ and import prices. The impact of exchange rate changes on inflation is therefore both direct—through changes in import prices—and indirect, resulting from changes in demand pressure and, as a consequence, changes in net exports.

The credit channel operates because of imperfections in market mechanisms (information asymmetry, segmentation), as a result of which changes in monetary policy may affect not only the demand for bank credit (interest rate channel) but also the supply of bank credit. In accordance with the concept of the *balance sheet channel*, a rise in the interest rate causes a decrease in economic agents' net worth, undermining their creditworthiness and increasing the external finance premium. On the other hand, in the framework of *the bank lending channel*, the tightening of monetary policy translates into a deterioration of banks' balance sheets (a decrease in their capital through the negative impact of higher interest rates on the quality and valuation of assets),

³ The adverse effect of exchange rate appreciation on price competitiveness of exports may be partially offset by the balance sheet effect of exchange rate movements (Krugman, 1999).

an increase in their external financing premiums and interest rates on loans to the non-financial sector.⁴

Within the **risk-taking channel**, changes in interest rates affect risk perception and tolerance (and consequently, the level of portfolio risk), the pricing of assets as well as conditions and criteria for provision of financing by financial intermediaries. This may result, for example, from the fact that some institutions have fixed targets for nominal rates of return. When lower interest rates prevail, it may be necessary to take on more risk in order to attain a given rate of return. Borio and Zhu (2008) find that in similarity to the balance sheet channel, probably most of the time the risk-taking channel only enhances the effect of monetary policy. This means that any interest rate cuts may lead to an additional decline in credit spreads and/or a rise in credit level, and hence also an increase in GDP and/or inflation. Sometimes the build-up of excessive risk caused by insufficient monetary policy tightening may, however, be conducive to financial crises.

The cash-flow channel, usually referring to households (household cash-flow channel), focuses on the impact of monetary policy decisions on income and interest payments due to financial instruments with a floating interest rate (La Cava *et al.*, 2016). In the case of the credit market, the focus here is on households that have already taken out loans with a floating interest rate. The change in the interest rates controlled by the central bank, through influencing interest rates in the money market, results in the adjustment of the interest rates on existing loans and, as a consequence, to a change in the amounts that borrowers have to spend on servicing their previously incurred debt. Assuming that income levels remain unchanged, this means that after monetary policy tightening, indebted households have less free funds which may be allocated for consumption or saving.

1.2 Structural features of the Polish economy important for the monetary policy transmission mechanism

1.2.1 Differences in the monetary policy transmission mechanism among countries

International analyses of the monetary policy transmission mechanism suggest that the responses of economies to monetary shocks are quite diversified among countries. However, probably due to various methodological dilemmas, there are few such studies and the comparability of the results obtained is quite limited.⁵

⁴ The traditional argument about the functioning of the bank lending channel has been that a tightening of monetary policy reduces bank reserves and deposits, subsequently decreasing credit supply. Yet, Disyatat (2010) and Kapuściński (2017) show that such a description is inconsistent with contemporary institutional conditions.

⁵ The above-mentioned problems include in particular the difficulties in choosing the appropriate model specification (the same specification for all analysed countries or models taking into account the specific features of particular economies), lack of robustness of the results to the method of identifying monetary policy shocks or unclear criteria for assessing the degree of heterogeneity of the responses to monetary shocks (comparison of point responses in specific horizons after the monetary impulse or analysis of differences in confidence intervals around obtained estimates). Preliminary results of the NBP studies on the diversity of the monetary transmission mechanism in the group of 40 OECD and/or EU countries confirm these difficulties.

Table 1 and Table 2 show the response of prices and output to monetary policy impulses presented in Georgiadis (2014), illustrating the heterogeneity of monetary policy effects in 20 developed economies.⁶ Compared to other countries, the impact of monetary policy in Poland seems relatively weak. The maximum output response in our economy turns out to be the weakest of all the analysed countries. Monetary policy impulses seem to translate slightly more strongly into price level changes: the maximum decrease of this variable in Poland, although lower than the average in the group of all analysed countries, was similar to the decline estimated for such highly developed economies as the United Kingdom and the United States. In accordance with Georgiadis' (2014) results, relatively weak monetary policy effects were typical not only for the Polish economy, but also for other countries of Central and Eastern Europe. The strength of output and price response in the Czech Republic and Hungary turned out only slightly higher than in Poland.

It should be noted that the conclusions of Georgiadis (2014) are based on the comparison of point estimates of price and output response to monetary shocks. Jarociński (2010) stresses, however, the need to take into account uncertainties around the obtained estimates in the analysis. In his study, he did not find significant differences in this respect between a group of five euro area countries (Finland, France, Italy, Portugal and Spain) and a group of four new EU member states (Poland, Hungary, the Czech Republic and Slovenia). The confidence intervals of estimates for our region turned out to be significantly wider than for the euro area countries and did not exclude the possibility that the price response in our region is stronger than in the euro area economies (Figure 1). As Jarociński (2010) notes, although the structural characteristics of the new member states are significantly different than those of more developed countries, not all of them undermine the impact of monetary policy. For example, the less developed financial sector in the countries of our region undermined the effectiveness of monetary policy; however, the higher levels of average inflation and the related more frequent price adjustments (lower price rigidity) have been pushing towards larger price responsiveness to monetary policy shocks.

Heterogeneity in the effects of monetary policy is not limited to the strength of reaction. Equally important differences concern lags in responses to the monetary policy shocks. The meta-analysis by Havranek and Rusnak (2013) indicated that post-transition countries, including Poland, respond much faster to monetary policy shocks than highly developed economies. This may be related both to more frequent price changes than in more advanced economies and to stronger effects of the exchange rate channel, which is the fastest channel of the monetary policy transmission mechanism.

⁶ For example, the maximum decline in price levels after a 1 perc. point increase in interest rates ranges from 0.2% in New Zealand to 1.0% in Belgium and Spain. Still higher diversification is visible in output response. After the monetary policy tightening, output in Ireland decreases by as much as 1.9%, while in Poland it falls by only 0.3%. This heterogeneity does not disappear over time and persists even 48 months after the monetary impulse.

Table 1. Differences in the monetary transmission mechanism between countries: response of output

Maximum response		Average response		Response after 48 months	
Poland	-0.003	Poland	-0.001	Italy	0.001
Czech Republic	-0.004	Czech Republic	-0.001	Germany	-0.000
Hungary	-0.005	United States	-0.002	United States	-0.000
Australia	-0.005	Australia	-0.003	Hungary	-0.001
Great Britain	-0.005	Hungary	-0.003	Czech Republic	-0.002
Canada	-0.005	Great Britain	-0.004	Poland	-0.002
New Zealand	-0.005	New Zealand	-0.004	Australia	-0.003
United States	-0.006	Canada	-0.004	Denmark	-0.003
Germany	-0.008	Germany	-0.004	France	-0.004
Switzerland	-0.008	Switzerland	-0.005	New Zealand	-0.004
France	-0.009	Italy	-0.005	Great Britain	-0.005
Italy	-0.011	France	-0.006	Canada	-0.005
Portugal	-0.012	Portugal	-0.008	Portugal	-0.005
Denmark	-0.014	Denmark	-0.009	Switzerland	-0.007
Sweden	-0.016	Korea	-0.009	Korea	-0.007
Austria	-0.016	Sweden	-0.011	Belgium	-0.010
Spain	-0.016	Belgium	-0.011	Spain	-0.012
Korea	-0.017	Belgium	-0.011	Sweden	-0.012
Belgium	-0.017	Austria	-0.011	Austria	-0.012
Ireland	-0.019	Ireland	-0.013	Ireland	-0.014
Average	-0.010	Average	-0.006	Average	-0.005

Notes: Responses of the logarithm of output to an increase in interest rate by 100 basis points.

Source: Georgiadis (2014).

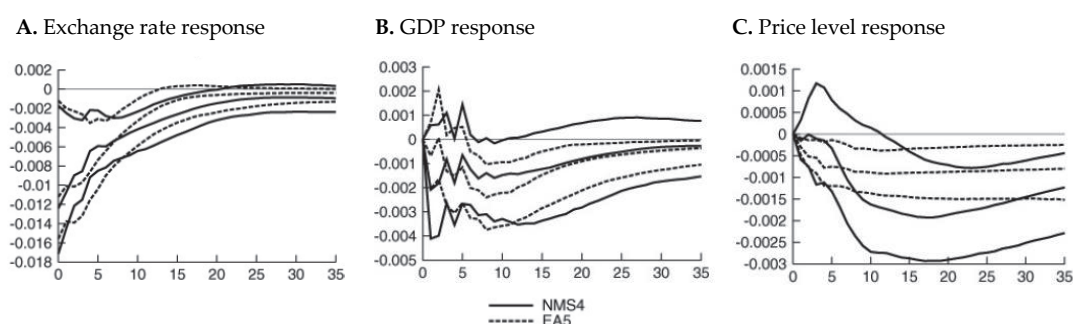
Table 2. Differences in the monetary transmission mechanism between countries: response of prices

Maximum response		Average response		Response after 48 months	
New Zealand	-0.002	Austria	0.000	New Zealand	-0.002
Australia	-0.002	Sweden	-0.000	Australia	-0.002
Sweden	-0.002	New Zealand	-0.001	Sweden	-0.002
Switzerland	-0.003	Italy	-0.001	Poland	-0.003
Poland	-0.003	Poland	-0.001	United States	-0.003
Great Britain	-0.003	Switzerland	-0.001	Switzerland	-0.003
United States	-0.003	France	-0.001	Great Britain	-0.003
Hungary	-0.003	United States	-0.001	Czech Republic	-0.003
Germany	-0.004	Great Britain	-0.002	Hungary	-0.003
France	-0.004	Hungary	-0.002	Canada	-0.003
Czech Republic	-0.004	Germany	-0.002	France	-0.004
Korea	-0.005	Austria	-0.003	Germany	-0.004
Austria	-0.005	Ireland	-0.003	Korea	-0.004
Italy	-0.005	Korea	-0.003	Austria	-0.005
Denmark	-0.007	Czech Republic	-0.003	Italy	-0.005
Ireland	-0.007	Canada	-0.004	Denmark	-0.006
Canada	-0.008	Denmark	-0.005	Ireland	-0.007
Portugal	-0.008	Portugal	-0.005	Portugal	-0.008
Spain	-0.010	Spain	-0.006	Belgium	-0.010
Belgium	-0.010	Belgium	-0.007	Spain	-0.010
Average	-0.005	Average	-0.002	Average	-0.004

Notes: Responses of the logarithm of price index to an increase in interest rate by 100 basis points.

Source: Georgiadis (2014).

Figure 1. Monetary policy transmission mechanism in 4 new EU member states and 5 euro area economies



Notes: The above charts illustrate: the median, 5th and the 95th centile of the *a posteriori* distribution of the response of exchange rate (decline – appreciation), GDP and price levels to the monetary policy shock in the 4 new EU member states (NMS4: the Czech Republic, Hungary, Poland and Slovenia) and in 5 euro area countries (EA5: Finland, France, Italy, Portugal and Spain). The horizontal axis: quarters after the shock.

Source: Jarociński (2010).

The overview of the empirical studies presented above shows that there is no consensus in the literature in the comparative assessment of the monetary policy transmission mechanism in various economies and the results of different approaches may lead to some discrepancies. Therefore, in model-based analyses, it is necessary to assess the consistency of results of these models with the structural features of the economy which, in the light of the theory, empirical studies and intuition, should influence the overall shape of the monetary policy transmission mechanism and the effectiveness of the transmission of monetary impulses through various channels of that mechanism. We have performed such an assessment in the subsequent sections of this part of the report.

1.2.2 Major structural factors influencing the strength and lags in the monetary policy transmission mechanism in Poland

According to the empirical studies (Mateju, 2014; Georgiadis, 2014; Havranek and Rusnak, 2013), the major factors influencing the strength and lags in the monetary policy transmission mechanism include the degree of the financial system development, the level of competition in the banking sector, the labour market rigidities, the structure of output and the openness of the economy.

Poland's financial development, measured by financial sector assets and private non-financial sector debt, although steadily improving, remains clearly lower than in the Western European countries. It is a factor potentially undermining the monetary policy transmission mechanism but, simultaneously, reducing its lags.⁷ Another factor that may reduce lags in the transmission mechanism in Poland is the larger importance of the exchange rate channel than in more advanced economies, in particular the impact of the exchange rate on consumer prices (see section 2.4.2 of the report).

⁷ Havranek and Rusnak (2013) indicate that the underdeveloped financial sector is associated with limited possibilities of financial institutions to protect themselves against monetary shocks, which leads to smaller lags in the monetary policy transmission.

On the other hand, interest rate transmission in Poland is supported by relatively high competition in the banking sector: the share of the five largest banks in the banking sector assets in Poland is much lower than in the euro area (in 2018: 49.5% against a median for the euro area countries amounting to 73.4%; ECB data). To similar conclusions leads the Herfindahl concentration index, which in 2018 amounted to 0.07 in Poland compared to the median in the euro area countries of over 0.12 (ECB data).

In line with the standard New Keynesian model, the main determinant of the strength of monetary policy impact on the real economy is the degree of price rigidity. In economies where prices are rarely changed, monetary policy strongly affects real quantities. In the opposite case, monetary shocks result in weaker adjustments of real variables and a stronger response of prices. Macias and Makarski (2013)⁸ indicate that the frequency of price changes in Poland is higher than in the euro area which, in accordance with the above intuition and the studies by Jarociński (2010) referred to above, should translate into relatively stronger price adjustments and weaker responses of the output to monetary policy shocks. This result is consistent with Georgiadis (2014), suggesting that the limited effectiveness of the monetary policy transmission mechanism in Poland concerns economic activity rather than prices.

As Bertola (2014) points out, for the transmission of macroeconomic shocks, labour market rigidity is equally important as price rigidity. In line with a common belief, a more flexible labour market should support the effectiveness of monetary policy transmission. For the measurement of the degree of labour market flexibility, the employment protection index is often used which, according to OECD data, is significantly lower in Poland than in the Western European countries. However, the results of existing studies suggest that such a simplified, one-dimensional view of labour market institutions may lead to misleading conclusions about their role in the monetary transmission mechanism. Therefore, in section 1.2.3, we present a brief summary of the results derived from the literature and the latest NBP research in this respect.

Since the beginning of the transformation, the Polish economy has been systematically becoming more open in terms of international trade. The degree of openness, measured by the ratio of total international trade turnover to GDP, is currently higher than in the euro area (in 2018: 107.8% against 91.7%; Eurostat data) which should be associated with a relatively stronger price response to monetary impulses, resulting from a stronger impact of the exchange rate channel (Mateju, 2014). However, it should be noted that a considerable part of Polish trade takes place within global value chains, which in turn reduces price sensitivity to exchange rate fluctuations (Ahmed *et al.*, 2015). In addition, increasing openness should, according to the results of the Havranek and Rusnak (2013), lead to shorter lags in the transmission mechanism.

To sum up, although some empirical studies indicate that the impact of monetary policy in Poland is weaker than in more developed economies, the changes in structural features observed over

⁸ The latest research (Macias and Makarski, 2020) shows that prices in Poland behave similarly to prices in France. In particular, about 20% of prices change every month, the average size of the price change is relatively large, while many price changes are relatively small. The study does not confirm downward price rigidity, as much as 40% of price changes are declines. With the increase in inflation (in the sample, inflation does not exceed 10%), the average frequency and magnitude of price changes do not change, while the percentage of price falls declines.

recent years, i.e., among others, the systematic development of the financial intermediation system, relatively low price rigidity or growing trade openness of the economy, suggest that these studies, using shorter time samples, may underestimate the effects of monetary policy.

1.2.3 Labour market institutions and the monetary policy transmission mechanism

The studies carried out so far indicate that labour market institutions should not be perceived in a one-dimensional way and, in order to understand their importance for the impact of monetary policy, it is crucial to distinguish between the factors restricting the adjustment on the employment side and the factors affecting the rigidity of real wages. The first group of rigidities, which includes a high degree of employment protection or a high level of trade union membership, strengthens responses of inflation and weakens responses of unemployment and output to macroeconomic shocks (e.g. Thomas and Zanetti, 2009; Cacciatore and Fiori, 2016). On the other hand, institutions that contribute to wage rigidity, i.e. the generous unemployment benefit system or the high wage tax wedge, act in the opposite direction, reducing price responsiveness and increasing the impact on economic activity (e.g. Christoffel *et al.*, 2009; Campolmi and Faia, 2011). As Abbritti and Weber (2018) emphasise, the transmission of shocks in economies with high levels of rigidities in both these dimensions may be very similar to the transmission in countries with a flexible labour market. Compared with other European economies, the degree of labour market rigidities in Poland, both in terms of employment and wage adjustments, is minor, which hinders an unambiguous assessment of the role of labour market institution structure for the monetary policy transmission.

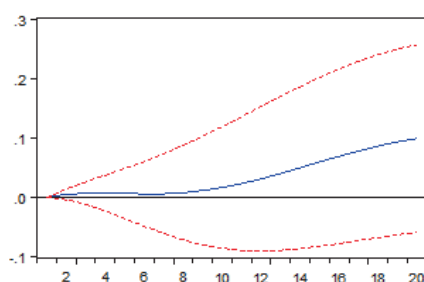
The majority of the literature to date, focusing on the rigidity of wage and employment adjustments, has omitted the importance of the flexible working time. This issue becomes particularly important in periods of strong slowdown in economic activity and the accompanying fears of rising unemployment. Some economists suggested that making working time more flexible would enable companies facing a decline in demand for their products to shorten the working time, which could prevent them from firing part of their workforce and hence limit a rise in the unemployment rate. The study conducted by Kolasa *et al.* (2019) has shown, however, that such intuition is not necessarily adequate in the European context. It turns out that, average hours worked per worker in European countries are much less procyclical than in the US economy, and in some European economies the correlation between hours worked and output is even negative. This observation is clearly strengthened if the analysis excludes periods of subsidised short-time work programmes, which was part of the stabilisation measures taken during the recent financial crisis, for example, in Germany. Similar conclusions can be drawn from the analysis of the economy response to monetary shocks: following the monetary policy tightening in the euro area, the average hours worked per worker increase rather than decrease as in the case of the US economy. These differences between Europe and the US might boil down to differences in the relative strength of the response of labour demand and supply to macroeconomic shocks, which in turn is related to the strongly counter-cyclical nature of the separation rate in Europe (strong growth during the recession) and its acyclical nature in the US economy (i.e. no significant changes over the business cycle). As the authors explain, in Europe companies use the period of economic downturn to get rid of less productive workers and increase the intensity of work of the others (which the latter accept since unemployment is rising). Flexible working hours facilitate this

process and lead (under the European conditions) to stronger adjustments of unemployment. In addition, the results of the study indicate that introducing flexible working time leads to a stronger decline in output and a weaker response of wages and inflation after monetary policy tightening.

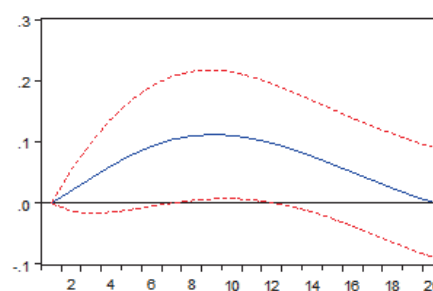
It is worth noting that the analysis of the cyclical nature of average hours worked and their response to the monetary shock in Poland shows strong similarities to the euro area, therefore the conclusions from the presented study by Kolasa *et al.* (2019) can be generalised for our economy. The correlation between the cyclical components of GDP and the average hours worked is close to zero, while the estimates of the vector autoregression model indicate that after monetary tightening there is no clear decline in the number of hours worked per employee which was visible in the case of the US economy. The impulse response functions (Figure 2) indicate that the impact of the monetary shock on the Polish labour market is rather limited. After the tightening of monetary policy, the unemployment rate increases with a lag but its response is not statistically significant. Real wages also rise, which means that the fall in prices after the monetary policy shock is stronger than the decrease of nominal wages. The details concerning the estimates of the model are presented in Annex 1.

Figure 2. Functions of response of the unemployment rate, real wages and average hours worked to the monetary policy shock (interest rate increase)

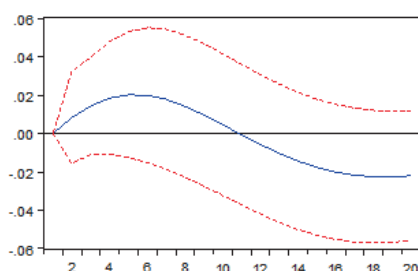
A. Response of the unemployment rate



B. Response of real wages



C. Response of the number of hours worked



Source: Own calculations, details included in Annex 1.

1.2.4 Structural factors affecting individual channels of the monetary policy transmission mechanism in Poland

Tables 3-6 present structural indicators which may influence the functioning of individual transmission mechanism channels in Poland.⁹ The importance of the presented characteristics was explained in detail in previous editions of the report (Kapuściński *et al.*, 2016; Chmielewski *et al.*, 2018). Recently most of the indicators continued to evolve in line with the trends observed earlier.

In short, the functioning of the interest rate channel in Poland is strengthened by the predominant role of the banking sector in the financial system, the high level of competition in the banking sector and the prevalence of floating rate loans, whereas it is undermined by the still relatively low loan-to-GDP ratio, the excessive liquidity of the banking sector and the relatively high solvency ratios of commercial banks. The effectiveness of the exchange rate channel is supported by Poland's growing trade and financial openness and the high and growing share of imports in consumption and limited by the high share of foreign value added in exports and low inflation. The strength of the credit channel is increased by the high share of small and medium-sized enterprises, which have limited opportunities to acquire external financing other than bank credit, and reduced by the minor role of bank credit in investment financing. On the other hand, the asset price channel, treated as part of the interest rate channel, is weakened by the considerable share of cash and deposits in household assets.

Over recent years, several noteworthy changes in the indicators presented took place. The role of foreign currency loans has clearly decreased, which should translate into strengthening of the interest rate channel. On the other hand, the share of banks with a majority share of state capital in the assets has increased and the total capital ratio has increased, which in turn has an influence on weakening this channel. The functioning of the exchange rate channel should be supported by an observed systematic growth in the share of imports in private consumption and an increase in the share of imports of unprocessed goods in total imports.¹⁰ On the other hand, decreasing returns on assets of banks may lead to a strengthening of the risk-taking channel. At the same time, it is worth emphasising that the decline in the profitability of the domestic banking sector over the recent years was only to a small extent caused by the decreases in net interest margin and was rather the result of growing tax burdens imposed on banks (see NBP, 2019, Box 2.2).

⁹ Choice of the indicators is in line with Egert and MacDonald (2009).

¹⁰ In accordance with the empirical studies (see e.g. Campa and Goldberg, 2002; Forbes *et al.*, 2017).

Table 3. Factors affecting the interest rate channel

	2006	2008	2010	2012	2014	2016	2018
NFS deposits at banks (% of GDP)^{1, 2}	35.0	38.4	42.3	43.6	48.7	54.1	53.6
- Household and NPISH deposits at banks (% of GDP) ^{1, 2}	23.2	26.6	29.6	32.0	35.5	39.6	39.9
- NFC deposits at banks (% of GDP) ^{1, 2}	11.8	11.7	12.7	11.7	13.2	14.5	13.6
NFS loans at banks (% of GDP)^{1, 2}	29.9	46.3	47.6	48.4	50.3	52.6	51.2
- Household and NPISH loans at banks (% of GDP) ^{1, 2}	17.3	28.9	32.8	32.6	34.3	35.7	34.2
- NFC loans at banks (% of GDP) ^{1, 2}	13.1	17.4	14.8	15.8	16.0	16.9	17.0
Bonds in NFS assets (% of GDP)^{1, 2}	2.3	1.9	1.5	1.1	0.9	1.1	0.8
- Bonds in household and NPISH assets (% GDP) ²	0.8	0.7	0.5	0.6	0.3	0.5	0.5
- Bonds in NFC assets (% GDP) ²	1.5	1.2	1.0	0.5	0.6	0.6	0.3
Household and NPISH deposits in credit unions (% GDP)^{2, 3}	0.5	0.7	0.9	1.0	0.7	0.6	0.4
Household and NPISH loans in credit unions (% GDP)^{2, 3}	0.4	0.5	0.7	0.7	0.5	0.4	0.3
NFC bonds (% GDP)²	2.0	1.9	2.3	3.4	5.0	4.9	3.5
NFC shares (% GDP)²	19.3	9.8	19.4	17.1	16.1	15.8	14.1
Short-term NFS deposits (%)¹	97.3	95.8	96.7	96.5	92.2	93.4	95.1
- Short-term household and NPISH deposits (%) ¹	96.3	94.2	95.7	95.8	89.5	91.3	93.6
- Short-term NFC deposits (%) ¹	99.3	99.5	99.1	98.7	99.6	99.4	99.6
Short-term NFS loans (%)¹	24.5	19.8	17.2	16.2	15.1	14.0	12.9
- Short-term household and NPISH loans (%) ¹	16.9	11.9	10.8	9.1	8.5	7.9	6.9
- Short-term NFC loans (%) ¹	34.9	33.2	31.4	31.4	29.3	27.1	25.0
Central bank and Treasury securities in bank assets (%)¹	17.5	15.3	18.2	16.1	17.4	20.0	18.3
Share of banks with major state shareholding (%)¹	19.7	17.3	21.5	23.0	24.2	28.9	39.6
Share of banks with majority foreign capital (%)¹	65.9	68.2	66.2	63.6	61.5	56.6	46.4
Non-performing loans/impaired loans (%)¹	7.4	4.6	8.8	8.8	8.1	7.1	6.9
Commercial bank ROA (%)¹	1.6	1.4	1.0	1.1	1.0	0.8	0.7
Capital adequacy ratio/total capital ratio (%)³	13.2	11.2	13.8	14.7	14.7	17.7	19.1
Share of households with a housing loans (%)¹	7.0	9.7	10.7	12.7	13.7	14.6	15.7
Share of foreign financing of NFC (debt, estimate, %)¹	32.3	36.9	41.1	42.2	41.4	40.8	38.5
Share of 5 biggest banks in banking sector assets (%)	46.1	44.2	43.4	44.4	48.3	47.7	49.5

Notes: NPISH – non-profit institutions serving households, NFC – non-financial corporations, NFS – non-financial sector.

Source: 1 - NBP, 2 - Eurostat, 3 – KNF (Polish Financial Supervision Authority).

Table 4. Factors affecting the exchange rate channel

	2006	2008	2010	2012	2014	2016	2018
Inflation level (5-year average, %)³	2.0	2.7	2.8	3.6	2.3	0.6	0.4
Inflation volatility (standard deviation over 5 years, perc. points)³	1.3	1.4	1.2	0.8	1.7	1.8	1.3
Unprocessed goods imports (% of total imports)²	11.0	12.0	12.3	15.3	13.0	8.9	11.0
Imports of goods and services (% of GDP)²	39.9	42.9	42.1	44.9	46.1	48.2	52.2
Exports of goods and services (% of GDP)²	37.9	37.9	40.1	44.4	47.6	52.2	55.6
Share of imports in private consumption (%)²	9.0	10.3	11.2	11.2	13.2	16.0	16.8
Share of indirect imports in industry sold output (%)^{3,4,5}	18.5	18.8	20.0	22.0	21.5	23.8	23.5*
Participation in global value chains, GVC⁴	49.6	50.7	51.0	53.0	52.3	49.7	49.0
- Foreign value added in exports (%) ⁴	25.8	27.2	27.8	30.5	29.8	28.7	29.1
- Domestic value added in foreign exports (%) ⁴	23.8	23.6	23.2	23.5	22.5	21.1	19.9
NFS foreign currency deposits (%)¹	15.8	10.7	9.3	10.0	9.1	10.8	11.7
- Household and NPISH foreign currency deposits (%) ¹	13.2	8.7	7.2	7.4	7.3	8.1	9.3
- NFC foreign currency deposits (%) ¹	21.0	15.2	14.2	17.3	14.2	18.3	19.0
NFS foreign currency loans (%)¹	27.2	33.8	33.3	31.0	28.4	26.4	21.4
- Household and NPISH foreign currency loans (%) ¹	30.9	39.4	37.4	34.6	29.1	25.8	18.8
- NFC foreign currency loans (%) ¹	22.1	24.3	23.9	23.2	27.0	27.8	26.5

Notes: NPISH – non-profit institutions serving households, NFC – non-financial corporations, NFS – non-financial sector.

Source: 1 - NBP, 2 - Eurostat, 3 - GUS, 4 - UNCTAD5 - COMTRADE (* - 2017).

Table 5. Factors affecting the credit channel

	2006	2008	2010	2012	2014	2016	2018
Share of SMEs in total number of companies (%)²	99.9	99.8	99.8	99.9	99.8	99.8	99.8*
Share of SMEs in production (%)²	59.3	58.7	56.9	55.8	56.7	56.1	57.0*
Share of NFS bank loans in PLN in investment financing (%)²	13.0	13.3	11.3	10.1	11.6	11.1	11.1*
NFC trade credit (% GDP)¹	21.2	22.3	22.0	20.0	19.7	20.8	20.5

Notes: NFC - non-financial corporations, SME – small and medium-sized enterprises, NFS – non-financial sectors.

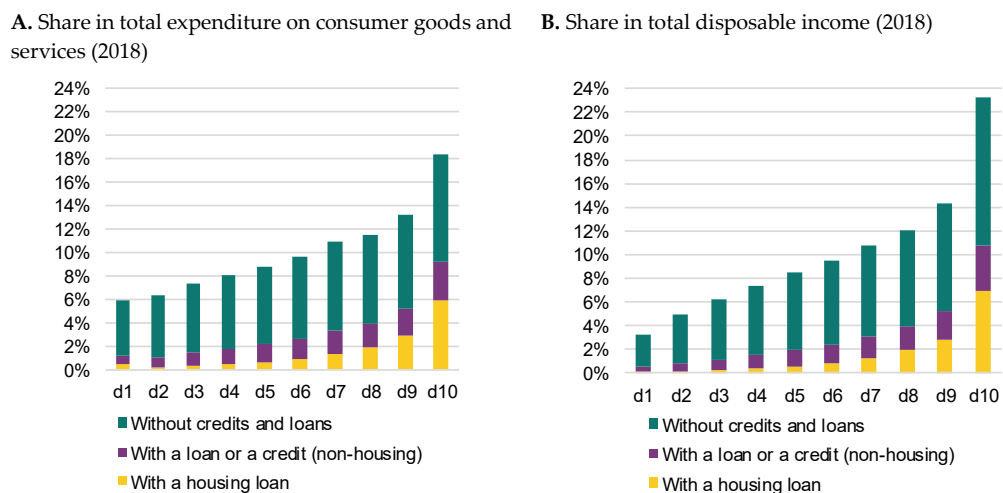
Source: 1 - NBP, 2 - GUS (* - 2017).

1.2.5 Selected factors affecting the monetary policy transmission mechanism from the perspective of micro-economic data

A more comprehensive assessment of the functioning of the interest rate channel is possible when aggregated data are supplemented with granular information concerning individual entities. Indeed, various entities may demonstrate different flexibility in their expenditure in relation to monetary policy shocks, depending on the scale and structure of external financing. Importantly, the central bank's decisions have a direct impact not only on entities which are only considering raising external financing—especially in the form of loans—but also on the debt servicing of entities which had previously taken out loans, through the cash-flow channel.

The analysis of structural features of households classified by the status on the credit market (whether indebted, and if so—what type of debt—see section 3.1.5) indicates that the impact of monetary policy on individuals in the Polish economy may be strongly diversified. The impact of monetary policy shocks on consumption through the free cash-flow channel is determined, among others, by the distribution of debt and the ratio of debt servicing expenditure to disposable income and consumer spending. In Poland, the outstanding debt of households is strongly correlated with their consumer spending and income (Figure 3). As we will show in detail in section 3.1.5, borrowers with higher income are accountable for the majority of the household sector expenditure on debt servicing—more than half of this expenditure is recorded in households with the three upper income deciles.

Figure 3. Share of individual groups of households in the total consumption and income



Note: the symbols d1 to d10 indicate the successive deciles of the distribution of households according to disposable income per equivalent unit (see section 3.1.5), d1 – lowest income, d10 – highest income.

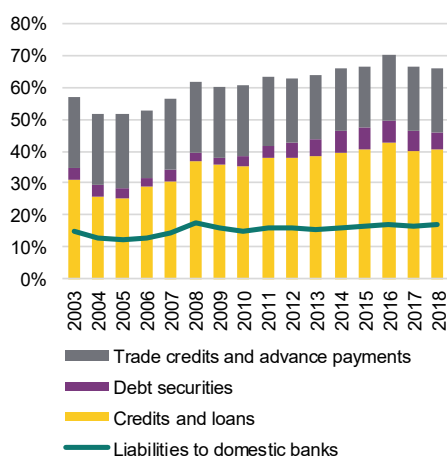
Source: Own calculations based on GUS (Household Budget Survey).

Non-financial corporations are able to raise funding from various sources. It is worth noting that loans extended by the domestic banking sector do not account for the majority of the financing of the non-financial corporate sector (Figure 4.A). Not only funding generated within the domestic non-financial sector but also funding in various forms received from abroad play an important role (Figure 4.B). Not all enterprises have equal access to various sources of funding. Obviously,

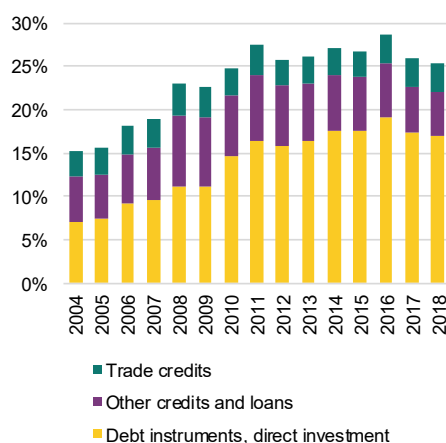
companies with non-resident (co-)owners and very large enterprises have easier access to foreign financing. On the other hand, it can be expected that small companies will be more likely to use financing in the form of trade credit, due to problems related to obtaining a bank credit. At the same time, such heterogeneity of financing sources means that the possibility of monetary policy affecting various categories of companies is diversified. In particular, the terms and conditions of financing received from abroad, especially granted within the capital group and related to the functioning of global value chains, demonstrate limited sensitivity to changes in the domestic monetary policy parameters. It is not possible to obtain more precise information on the type of enterprises that can potentially respond to changes in NBP instruments to a greater extent unless disaggregated information is used.

Figure 4. Selected funding sources of non-financial corporations

A. Selected sources of funding non-financial corporations (in relation to GDP)



B. Structure of selected sources of foreign funding of non-financial corporations (in relation to GDP)



Source: NBP own calculations based on GUS and NBP data.

Table 6 presents the structure of selected financing sources depending on the institutional sector to which the dominant group of shareholders belongs. Attention is drawn to the fact that companies controlled by domestic private entities use bank loans, especially extended by domestic banks, to the relatively largest extent. For non-resident controlled companies, the most important sources of debt financing include trade credit¹¹, loans from non-residents (which may reflect the acquisition of financing within international capital groups) and bank loans (including, to a large extent, loans taken from domestic banks). The data presented suggest that domestic monetary policy has limited potential to influence the behaviour of indebted enterprises.

¹¹ The available data do not allow the identification of the extent to which these liabilities are broken down into debt to residents and non-residents.

Table 6. Structure of selected sources of corporate funding (in per cent of the balance sheet total)

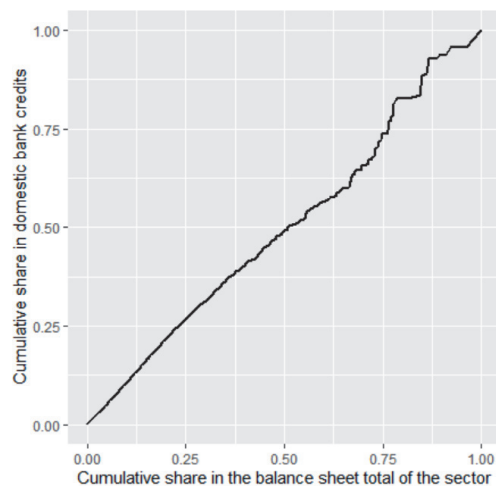
	Dominant owner		
	Domestic private sector	Domestic public sector	Non-residents
Bank loans	13.2%	7.2%	8.6%
including: domestic	12.1%	5.9%	6.3%
foreign	1.1%	1.3%	2.3%
Trade credit	13.8%	3.7%	16.6%
Other loans	4.2%	2.2%	11.0%
including: domestic	3.2%	1.1%	1.4%
foreign	1.0%	1.0%	9.6%
Debt securities	3.5%	5.5%	1.6%

Source: Own calculations based on GUS data.

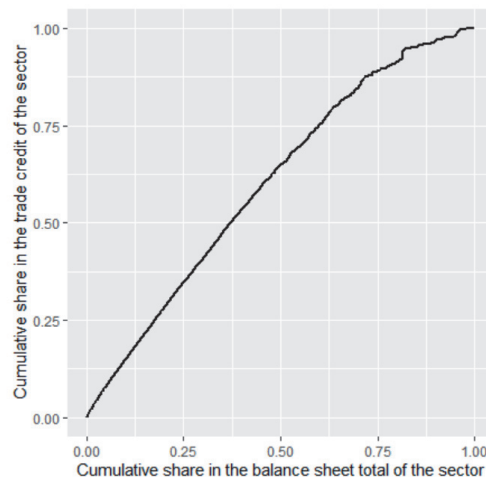
Figure 5 summarizes the relationships between the distributions of different variables related to corporate finance, depending on the size of companies. For the larger part of the distribution of enterprises by their size, the increase in loans taken out in the domestic banking sector is proportional to the increase in the size of companies. On the other hand, the intensified use of bank loans is visible in the case of companies located on the border of the 3rd and 4th quartile of distribution against the size of assets (Figure 5.A). The use of trade credit (merchant credit) is primarily the domain of smaller companies—in the low part of the distribution the cumulative value of liabilities due to such debt increases faster than the cumulative share of these companies' assets in the total assets of the analysed enterprises (Figure 5.B). On the other hand, small enterprises use short- rather than long-term loans taken in the domestic banking sector (Figure 5.C). This means that indebted smaller companies may not only be influenced by the traditional interest rate channel but may also experience changes in banks' propensity to take risks (as banks can easily limit their exposures in relation to these customers by limiting the roll-over of short-term loans granted). It is also worth noting that the analysed data do not show strong signals of increased interest costs incurred by smaller companies—the share of companies of a given size in the financial interest costs incurred by the sector is similar to the share of these companies in the sector's liabilities due to credits and loans (Figure 5.D).

Figure 5. Comparison of distributions of cumulative values of individual variables for enterprises sorted according to the balance sheet total

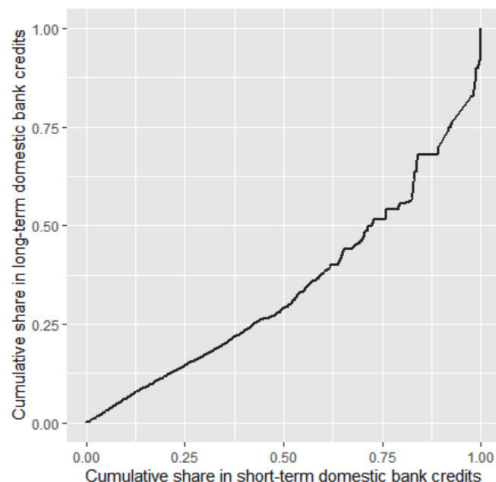
A. Share in the balance sheet total of the sector vs. share in loans



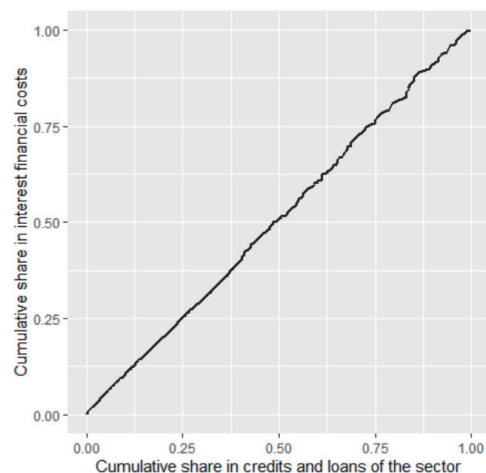
B. Share in the balance sheet total vs. share in trade credits



C. Share in short-term loans vs. share in long-term loans



D. Share in incurred financial costs due to interest and share in total credits and loans



Note: The charts show the relationship between the cumulative values of individual variables for enterprises sorted in an ascending order according to the size of their balance sheet total and the sum of the relevant variable for the entire sector.

Source: Own calculations based on GUS data.

2 Monetary policy transmission mechanism in Poland – main quantitative results

This part of the report presents an analysis of the general features of the monetary policy transmission mechanism in Poland, especially its strength and lags and the so-called stylized facts¹² related to the transmission. We use various types of vector autoregression models (section 2.1) as well as structural empirical models, based on the New-Keynesian economic paradigm (section 2.2). In the following sections, we analyse selected parts of the monetary transmission mechanism, i.e. the transmission of interest rates (section 2.3), the functioning of the exchange rate channel (section 2.4) as well as the formation of inflation expectations and their degree of anchoring (section 2.5).

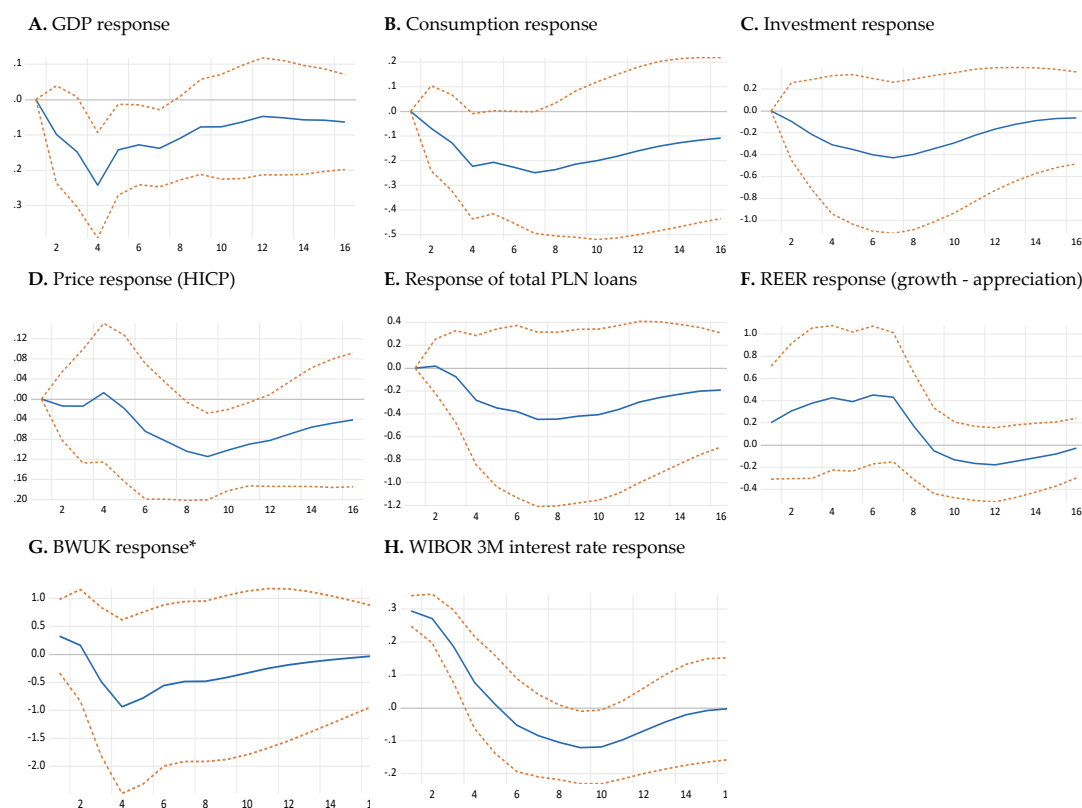
2.1 Stylized facts and changes in transmission over time

In order to examine the basic regularities of the monetary policy transmission mechanism, we use standard tools in this respect, i.e. structural vector autoregression models. Figure 6 presents the response of selected variables to the tightening of monetary policy, defined as an exogenous increase in the WIBOR 3M interest rate. The average size of such a shock for the whole sample, i.e. from 1999 to 2019, was estimated at approx. 0.3 perc. points. Monetary policy tightening leads to exchange rate appreciation, a decline in various measures of economic activity (GDP, investment, private consumption) and a fall in the price level (HICP¹³). However, given the confidence intervals (uncertainty), the response of many variables proves statistically insignificant. It may either result from changes in the monetary policy transmission over time, resulting in the lack of stable estimates for the entire non-homogeneous sample or may be due to certain model constraints, e.g. the omission of some potentially important variables. For example, although the investment response obtained from the basic version of the structural vector autoregression model (SVAR) is statistically insignificant, the additional models in which we take into account survey measures of banks' lending policies show that it cannot be excluded that investments respond to monetary policy shocks in a statistically significant way (see section 3.1.2). Similarly, SVAR models taking into account a larger range of labour market variables—including the number of hours worked and the level of real wages—show a statistically significant response of HICP inflation to interest rate shocks (see Annex 1).

¹² According to Kaldor (1961), stylized facts are a simplified (generalised) description of empirical regularities.

¹³ The rationale for using HICP consumer prices was to ensure comparability of the price indices used to deflate the nominal rate.

Figure 6. Responses of selected variables to unexpected tightening of monetary policy in structural vector autoregression models with time-invariant parameters



Notes: Dashed lines refer to 95% confidence intervals. Details of the model specifications are presented in Annex 2. Horizontal axes – quarters after the shock, vertical axes – changes in percentage, except for the interest rate, which is expressed in perc. points. *BWUK – Current Consumer Confidence Index.

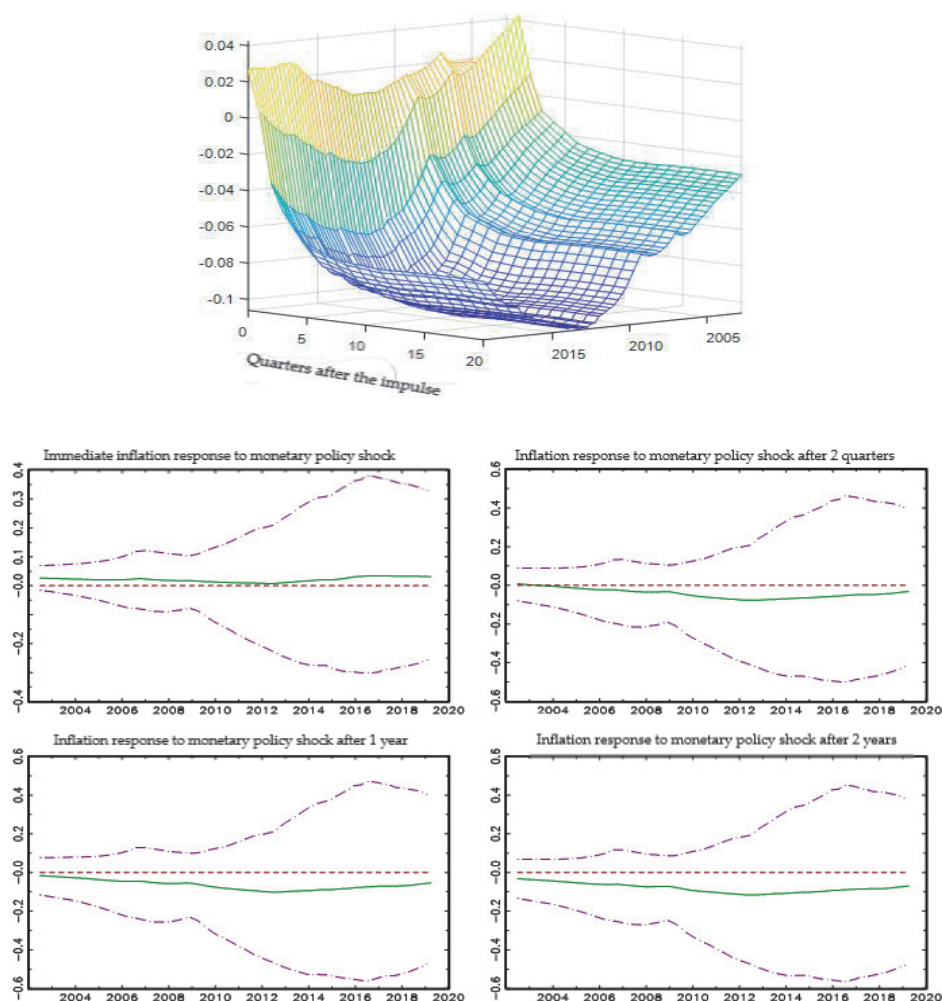
Source: own calculations.

However, we find another interesting explanation for the lack of statistical significance of some of the responses, indicating the possible instability of the monetary policy transmission mechanism over time. The responses described above were derived from models which assume the stability of parameters over time. Since the economic processes evolve, the assumption of stability of relationships between economic variables over time can be challenged. As a natural generalisation, we have thus estimated structural vector autoregression models with time-varying parameters (TVP SVAR).¹⁴ Since these models allow the WIBOR 3M rate response to the monetary policy shock and the variance of the average monetary policy shock itself to evolve over time, it is necessary to normalise the size of the shock. Otherwise, it is difficult to interpret the responses of the other variables. To this end, we have normalised the monetary policy shock to 0.25 perc. points, which approximately corresponds to the average in the entire sample (see above). It should be stressed, however, that this procedure has its adverse consequences since—as shown later in the analysis—changes of interest rate of this magnitude are not typical in the current situation (as described below). This is reflected in increased uncertainty of estimates of the impact of a monetary policy shock on other variables.

¹⁴ For details of the modelling methodology see Annex 3.

Until about 2010, the tightening of the monetary policy by 0.25 perc. points resulted in a decrease in the level of prices (HICP) by about 0.05% (Figure 7). At present, this relatively large shock would cause a decline of the price level by about 0.1%, which corresponds well with the result from the SVAR model with time-invariant parameters (Figure 6).¹⁵ However, the uncertainty of this estimate has clearly increased, as we have not seen monetary policy shocks of a similar magnitude recently. Interestingly, the response of GDP to an interest rate shock of 0.25 perc. points, at least until 2012, was statistically significant¹⁶ (Figure 8), as was the response of volumes of loans (Figure 9).

Figure 7. Changes in HICP response over time to the monetary policy shock equal to 0.25 perc. points



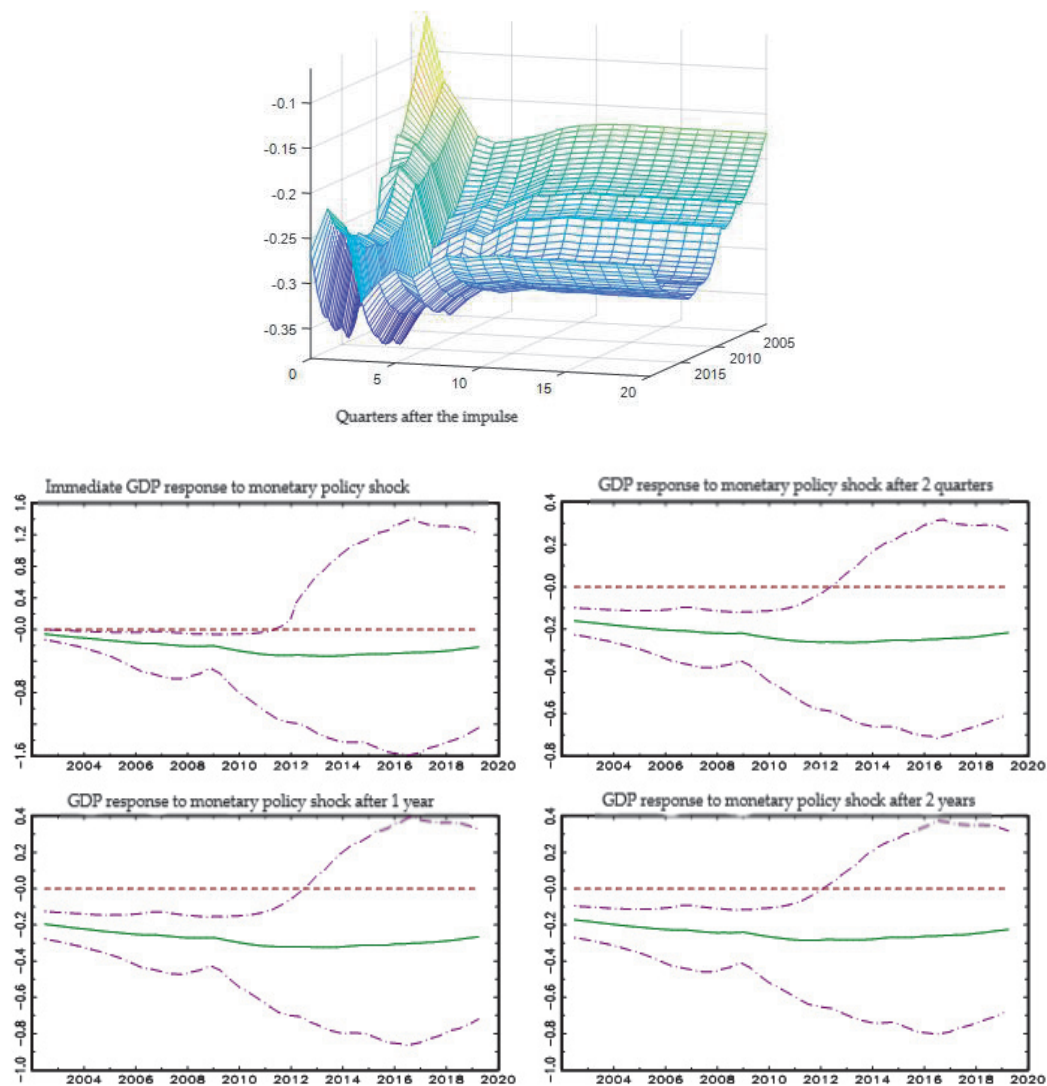
Notes: The dashed lines in the two-dimensional charts refer to a 68% error band.

Source: own calculations.

¹⁵ It should be noted that even before 2010, the response of the price level was statistically insignificant, which is also consistent with the result obtained from the SVAR model with time-invariant parameters.

¹⁶ As in the SVAR model with time-invariant parameters, see Figure 6.

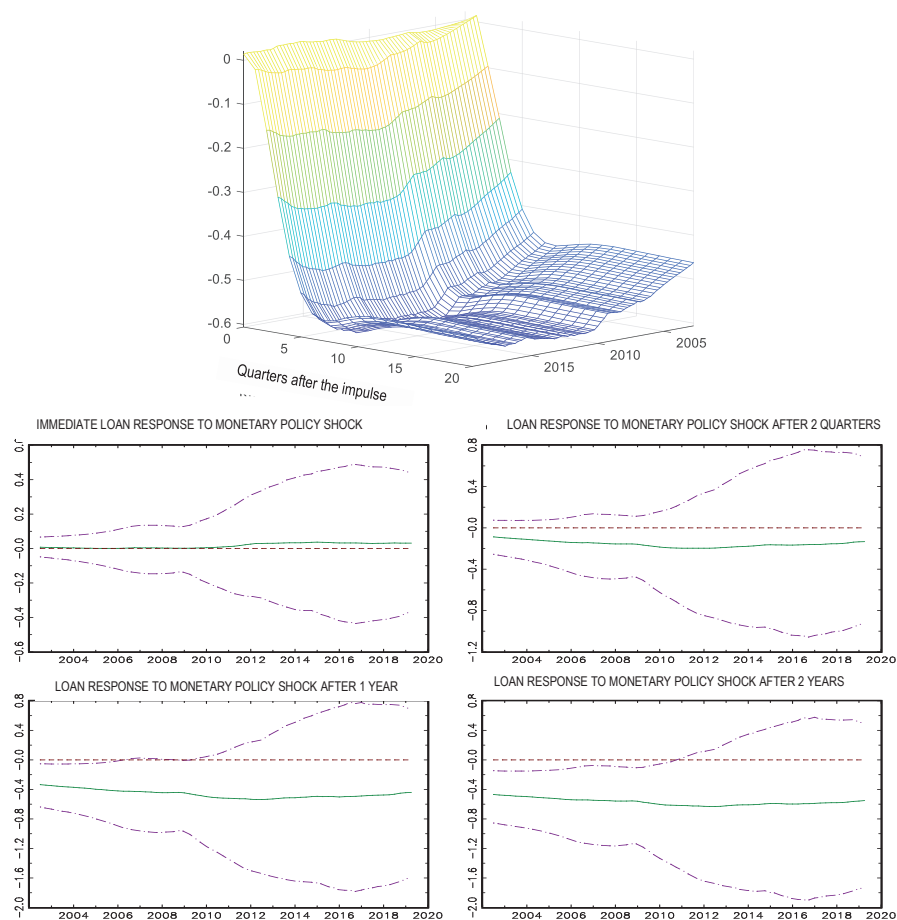
Figure 8. Changes in GDP response over time to the monetary policy shock equal to 0.25 perc. points



Notes: The dashed lines in the two-dimensional charts refer to a 68% error band.

Source: own calculations.

Figure 9. Changes in the response over time of the volume of loans to the monetary policy shock equal to 0.25 perc. points



Notes: The dashed lines in the two-dimensional charts refer to a 68% error band.

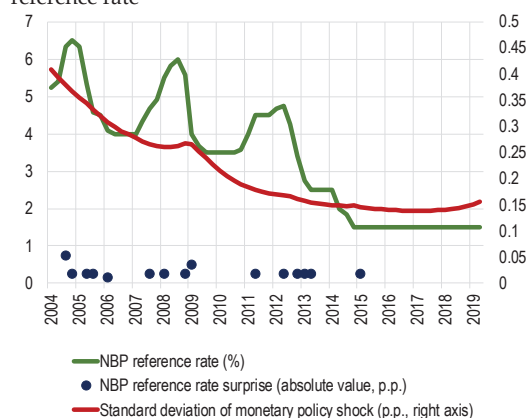
Source: own calculations.

We therefore assume that the uncertain effect of monetary policy on inflation may be associated with two factors. The first of them—also affecting the response of other macroeconomic categories—is the uncertainty related to the effects of monetary policy in conditions when the volatility of policy shocks remains low for a long time, the NBP reference rate has not been changed since 2015 and monetary authorities' decisions are well anticipated (Figure 10.A). Considering the foregoing, it seems plausible that when the NBP reference rate changes, consumers and enterprises who got out of habit to take this parameter into account in their decisions and in setting expectations may respond to that decision in a different way than in the past. The second factor explaining the uncertainty related to the inflation response to monetary shocks may be a change in the nature of the inflation processes, resulting in muted response of inflation to domestic demand shocks. Such a reduction, shown in empirical literature for various economies (e.g. Riggi and Santoro, 2015; Bullard, 2018), including Poland (see Szafranek, 2017), is probably linked to the growing importance of global factors in the domestic inflation processes (see e.g. Benigno and Faia, 2016). The hypothesis of diminished significance of changes in the domestic demand for inflation in Poland is confirmed by the analysis of the price response function

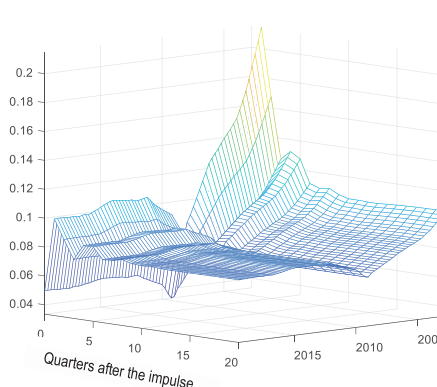
to the domestic demand shock, obtained from a model with time-varying parameters (Figure 10. B).

Figure 10. Potential explanations of the statistically insignificant response of HICP prices to the monetary policy shock

A. Standard deviation of the monetary policy shock in the TVP-SVAR model and the surprise in the NBP reference rate



B. HICP response to the unexpected increase in GDP growth by 0.5 perc. points



Note: The surprise in the NBP reference rate is the deviation of the median NBP reference rate expected by financial sector analysts (Bloomberg survey) from the realized value.

Source: own calculations.

2.2 Strength and lags in transmission and the relative importance of individual transmission channels

In this part of the report we refer to structural models rooted deeper in economic theory than SVAR models, in order to analyse the strength and lags of the transmission mechanism, as well as to determine the relative importance of individual transmission channels on inflation. The results presented are quite similar to those described in the previous edition of the report (Chmielewski *et al.*, 2018). However, they should be interpreted in terms of the effects of monetary policy studied over a longer period of time which, as we have shown in the section 2.1, may now show a substantially higher uncertainty.

2.2.1 Structural models used to analyse the monetary policy transmission mechanism

In the simulations we use two models of the monetary policy transmission mechanism, i.e. the Small Model of Monetary Transmission and the Small Monetary Policy Model. Both models use the paradigm of New Keynesian economics and are built around four fundamental macroeconomic relationships: the aggregate demand curve, the Phillips curve, the exchange rate equation referring to the concept of the uncovered interest rate parity and the monetary policy rule. However, these models put emphasis on different stages of the process of monetary policy transmission, using a different set of macroeconomic variables.

The Small Model of Monetary Transmission (MMT) is consistent in terms of specification with its version used in the previous report (Chmielewski *et al.*, 2018). In this model the block describing the transmission of monetary policy impulse in the financial sector is enlarged. It is achieved by the inclusion of two interest rates, i.e. the money market rate and the loan rate as well as the standards for granting loans. The core HICP inflation excluding food and energy prices is the main measure of inflation used in the model. The underlying reason for the replacement of CPI inflation by HICP inflation was to ensure comparability between domestic and foreign variables (in this way, the real exchange rate and the real external interest rate are deflated with the same type of price index).¹⁷ For a detailed description of the MMT model, see Annex 4.

The Small Monetary Policy Model (MMPP) is similar to the MMT model in terms of construction; however, it has a more developed nominal block (prices and inflation expectations).¹⁸ It contains four consumer price indicators, i.e. CPI inflation, core inflation excluding food and energy prices, and also food price and energy price indices. In the current version of the model inflation expectations of enterprises, financial sector analysts and consumers are taken into account, measured on the basis of survey data. They are characterised by limited, but various degrees of forward-lookingness and interdependence. For a detailed description of the MMPP model, see Annex 5.

2.2.2 Main characteristics of monetary policy transmission mechanism

To assess the strength and lags of the transmission of monetary policy impulses, we have conducted a simulation in which the short-term interest rate (WIBOR 3M) was increased by 1 perc. point for a period of one quarter and then allowed to develop according to the monetary policy rule. We assume that in the period under analysis no other shocks occur, which means that the obtained responses of selected macroeconomic variables (Figure 11, Table 7) show the effect related only to the change in the interest rate.

The simulation results obtained from both models display considerable similarity both in qualitative and quantitative terms. Differences in terms of strength of response to the monetary policy impulse occur only in the case of economic activity (output gap, GDP). A tightening of monetary policy causes an immediate appreciation of the domestic currency and an increase in interest rates on loans at commercial banks. The maximum response of annual GDP growth occurs no later than three quarters after the change in interest rate. At that time, the fall in the GDP growth rate, depending on the model, stands at between 0.2 and 0.4 perc. points. Differences in the impulse responses of core inflation excluding food and energy prices are definitely smaller than in the case of economic activity. The maximum fall in core inflation amounts to approx. 0.2-0.3 perc. points, and occurs with a lag no longer than 7 quarters. The impulse response of overall CPI inflation, obtained from the MMPP model, is slightly weaker than the response of core inflation.

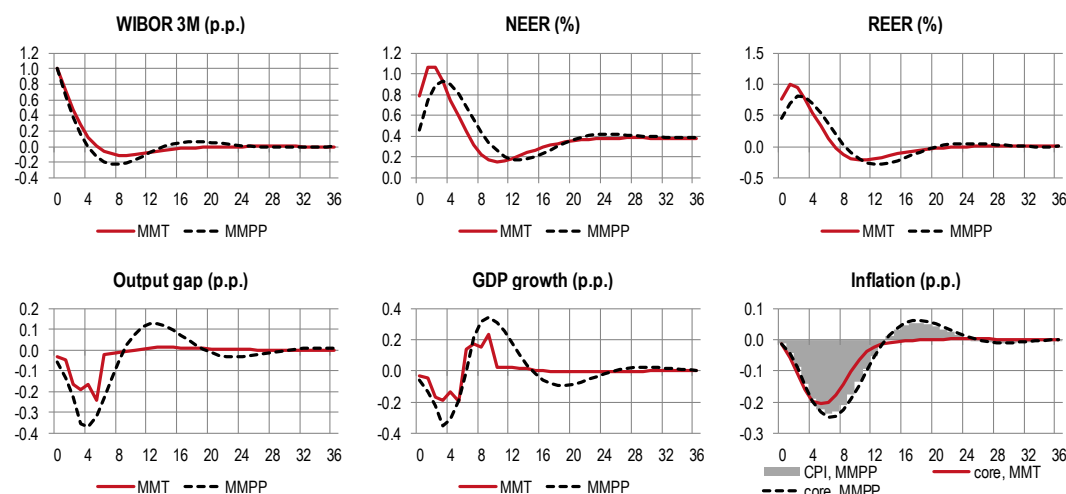
¹⁷ The correlation between year-on-year core measures of CPI and HICP inflation amounted to 0.9 for the period in which the models were estimated.

¹⁸ The MMPP model was used in the context of analyses of the importance of inflation expectations of various groups of agents in the transmission mechanism of monetary policy impulses (Łyziak, 2016a).

Its maximum amounts to approx. -0.2 perc. points. and occurs in the second year after the interest rate change.

Due to the fact that after the first quarter, the interest rate rule, where the deviation of inflation from the NBP inflation target and the output gap are assumed to affect the interest rate, begins to operate in both models, falls in inflation and economic activity result in a corresponding monetary policy easing.

Figure 11. Monetary policy transmission mechanism – results from structural models



Notes: Horizontal axes – quarters after the shock.

Source: own calculations.

Table 7. Monetary transmission mechanism – synthesis of results from structural models

	MMT	MMPP
Lending interest rate		
strength of maximum response (in p.p.)	0.6	0.6
lag of maximum response (quarter)	1	2
Nominal effective exchange rate (increase – appreciation)		
strength of maximum response (in %)	1.1	0.9
lag of maximum response (quarter)	2	2-4
GDP growth y/y		
strength of maximum response (in p.p.)	-0.2	-0.4
lag of maximum response (quarter)	2-3	3
Core inflation y/y		
strength of maximum response (in p.p.)	-0.2 ⁽¹⁾	-0.3 ⁽²⁾
lag of maximum response (quarter)	3-7	6
CPI inflation y/y		
strength of maximum response (in p.p.)	x	-0.2
lag of maximum response (quarter)	x	4-9

Notes: ⁽¹⁾ – HICP core inflation; ⁽²⁾ – CPI core inflation. The lag of maximum response is defined as the quarter or quarters in which the response of the given variable is equal to the maximum, accurate to one decimal place.

Source: own calculations.

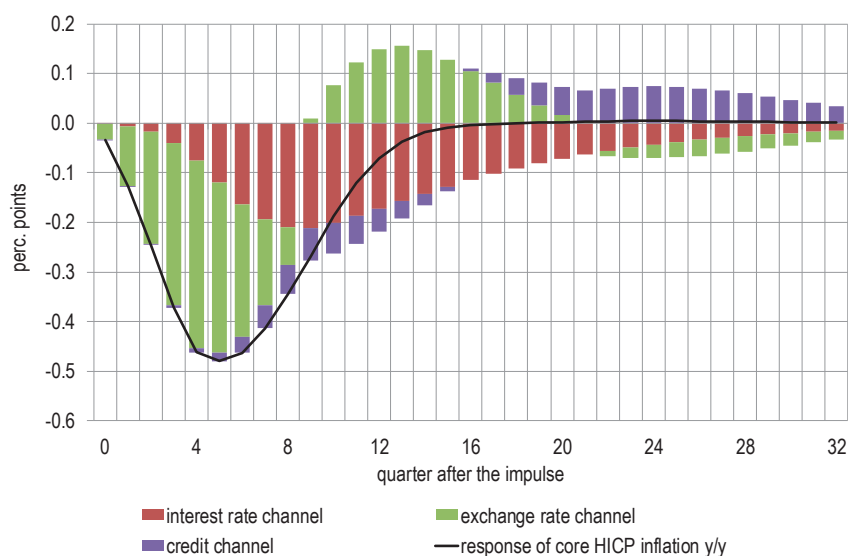
2.2.3 Assessment of the relative strength of respective channels of the transmission mechanism

The response of inflation to the monetary policy impulse presented in the previous part of the report contains the effects of various transmission channels. As in the previous reports, we evaluate the relative strength of the main channels, using for this purpose the MMT structural model, in which the following channels are represented: the interest rate channel, the exchange rate channel and the credit channel.

The simulation exercise was run in three steps. In the first step, the response of inflation to an increase of 1 perc. point in the short-term interest rate for a period of four quarters was calculated. This period is longer than in the simulations of the transmission mechanism described in section 2.2.2, which makes the effects of individual transmission channels more visible. Next, in an analogous simulation, the nominal effective exchange rate was fixed, thus rendering an approximation of the effect of interest rates on inflation through channels other than the exchange rate channel. In the last step, the variable representing the credit channel, i.e. the standards for granting loans, was fixed, thus obtaining the approximated magnitude of the effects of this channel.

The results of simulation with all the model's feedbacks (Figure 12), show that the maximum response of inflation to a 1 perc. point rise in the short-term interest rate for a period of four quarters occurs with a 6-quarter lag after the interest rate change and amounts to approx. -0.5 perc. points. In the first quarters following the interest rate impulse, the decline in inflation is predominantly related to the effects of the exchange rate channel. Starting from the seventh quarter following the monetary policy impulse, the interest rate channel and the credit channel become stronger than the exchange rate channel. In this horizon, the strength of the interest rate channel is, however, almost three times bigger than in the case of the credit channel.¹⁹

¹⁹ The results of an analogical decomposition of the response of inflation to a monetary policy impulse lasting one quarter indicate a stronger significance of the interest rate channel and smaller significance of the exchange rate and credit channels.

Figure 12. Strength of respective channels of the monetary transmission

Source: own calculations.

2.3 Interest rate transmission

In this part of the report we present the results of empirical studies concerning the interest rate channel. We analyse how the central bank interest rate affects, directly or indirectly, through money market rates, other interest rates in the economy. For the assessment of each transmission stage, we use a uniform model approach, the detailed results of estimations are presented in Annex 6.²⁰

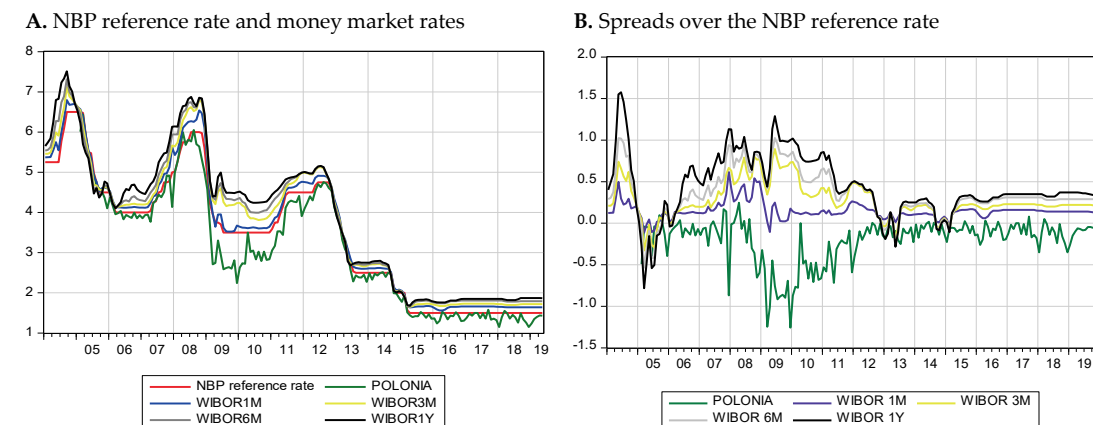
2.3.1 Transmission in the money market

There exists a long-term relationship (equilibrium) between the NBP reference rate and the money market rates, from which transitory deviations can arise (Figure 13). Most money market rates fully adjust to changes in the NBP reference rate, i.e. the increase in the NBP rate is followed in the long term by an increase of the same value in money market rates (Table 8). Although for WIBOR 1M and WIBOR 1Y the formal test rejects the hypothesis of full adjustment, the adjustment coefficient is very close to one.

Money market interest rates adjust quickly to changes in policy rate. The shortest rates, POLONIA and WIBOR 1M, are the fastest to return to the long-term equilibrium, absorbing more than 70% of the deviation in the first month following the NBP reference rate change and the whole deviation after two months. The remaining money market rates, with maturity of 3 months to 1 year, absorb slightly more than 50% of the deviation in the first month and about 75% of the deviation after two months.

²⁰ The results presented are not directly comparable with those demonstrated in previous reports (e.g. Chmielewski *et al.*, 2018), due to a different research methodology. In particular, this has influenced the estimates of short-term parameters describing the speed of interest rate adjustment.

Figure 13. Transmission in the money market



Source: Own calculations based on NBP data.

Table 8. Adjustment of POLONIA and WIBOR rates (in p.p.) following the 1 p.p. change in the NBP reference rate

Interest rate response:	POLONIA	WIBOR 1M	WIBOR 3M	WIBOR 6M	WIBOR 9M	WIBOR 1Y
after 1 month	0.70	0.77	0.60	0.56	0.53	0.52
after 2 months	1.17 ⁽¹⁾	0.99	0.86	0.74	0.74	0.74
after 3 months	1.18	0.94	0.93	0.81	0.83	0.84
in the long term	0.93	1.02	0.96	0.92	0.92	0.90
Is the transmission full?	yes	no	yes	yes	yes	no

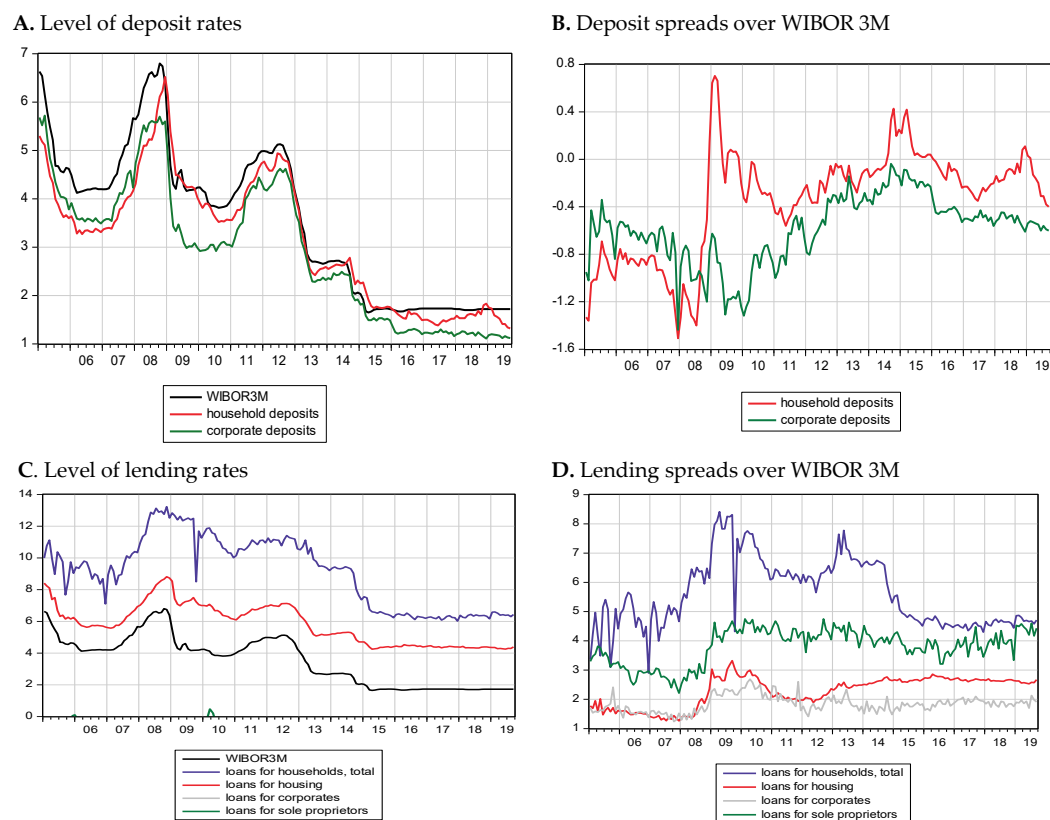
Notes: The table shows the estimated change in the money market rate (in perc. points) following a 1 perc. point. increase in the NBP reference rate in the first month after the change, the cumulative change after two and three months and the long-term response. In the case of a long-term response, we additionally check whether the adjustment is full (the long-term response is not statistically different from 1). ⁽¹⁾ For certain rates, e.g. POLONIA, the model shows an overreaction in the short term, followed by a return to equilibrium, which is associated with the inclusion of lags of the interest rate analysed in the model.

Source: own calculations.

2.3.2 Transmission to retail deposit and lending rates

The second stage of transmission we analyse is transmission of changes in money market rates (WIBOR 3M) to the deposit and lending rates in commercial banks. For this purpose, we use aggregated data, i.e. the average weighted interest rates on these instruments from the statistics of interest rates submitted by banks to NBP (interest rates on new or re-negotiated business).

The surge in uncertainty following the collapse of Lehman Brothers and the European debt crisis disrupted the adjustment of retail interest rates in Poland. Spreads between deposit rates and the WIBOR rate still remain at an elevated level compared to the pre-crisis period. Recently, another increase in spreads (observed in 2017-2018) resulted, on the one hand, from the outflow of term deposits from the banking sector, triggered by the relatively low profitability of deposits, and, on the other hand, from the financial difficulties of two banks which raised interest rates to prevent the outflow of their customers (Figure 14).

Figure 14. Interbank market rate and retail deposit and lending rates

Source: NBP data

The pass-through from money market interest rates to the deposit and lending rates in commercial banks is relatively fast, although not always full. The average interest rate on deposits of both households and non-financial corporations adjusts to WIBOR less than proportionally (the long-term adjustment coefficient is below one, approx. 0.85) (Table 9). This is due to the incomplete adjustment of interest rates on deposits with the shortest (up to 1 month) and longest (over 12 months) maturity. The interest rates on deposits with maturity of over 1 month and up to 3 months and over 3 months and up to 6 months fully adjust to changes in the money market rate. The interest rate on household deposits adjusts at a slightly slower pace than the interest rate on corporate deposits.

The magnitude of pass-through to interest rates on loans for households is diversified (Table 10). The pass-through is full in the case of loans for sole proprietors and the annual percentage rate of charge (APRC)²¹ on consumer loans, but lower than one for the interest rate on housing loans (APRC). On the other hand, the average interest rate on total loans to enterprises adjusts fully. The adjustment of interest rates on corporate loans to changes in the money market rate is very fast: as early as in the first month following the change in the WIBOR rate, full adjustment (total loans and loans above PLN 4 million) or almost full adjustment (loans up to PLN 4 million) takes place. In the case of loans for households, in the first month of the adjustment process, the pass-

²¹ The annual percentage rate of charge (APRC) takes into account the total cost of the loan incurred by the consumer expressed as a percentage of the total amount of loan on an annual basis.

through of approx. 50% of the change in the WIBOR rate takes place and after three months approx. 80% of adjustment.

Table 9. Adjustment of interest rate on deposits (in p.p.) following the 1 p.p. change in the WIBOR rate

Interest rate response:	Household deposits					Corporate deposits		
	Total	Up to 1 month	1-3 months	3-6 months	6-12 months	Total	Up to 1 month	1-3 months
after 1 month	0.42	0.27	0.59	0.51	0.53	0.52	0.43	0.79
after 3 months	0.78	0.63	0.85	0.94	0.71	0.91	0.80	0.93
after 6 months	0.87	0.70	1.00	1.00	0.74	0.88	0.79	1.07
in the long term	0.88	0.81	0.99	1.00	0.74	0.83	0.77	1.03
Is the transmission full?	no	yes	yes	yes	no	no	no	yes

Notes: The table presents the estimated change in the interest rate on deposits (in perc. points) following a 1 perc. point increase in the money market rate in the first month after the change, the cumulative change after three and six months and the long-term response. In the case of a long-term response, we additionally check whether the adjustment is full (the long-term response is not statistically different from 1).

Source: own calculations.

Table 10. Adjustment of interest rate on lending (in p.p.) following the 1 p.p. change in the WIBOR rate

Interest rate response:	Household loans				Corporate loans		
	Total	Consumer loans	Housing loans	Loans for sole proprietors	Total	Up to PLN 4 million	Over PLN 4 million
after 1 month	0.65	0.46	0.52	0.62	1.00	1.10	0.81
after 3 months	0.87	0.87	0.83	0.81	0.90	0.93	0.85
after 6 months	1.03	1.29	0.81	0.82	0.93	0.92	0.94
in the long term	1.30	1.50	0.79	0.99	0.97	1.00	0.93
Is the transmission full?	no	yes	no	yes	yes	yes	no

Notes: The table presents the estimated change in the interest rate on deposits (in perc. points) following a 1 perc. point increase in the money market rate in the first month after the change, the cumulative change after three and six months and the long-term response. In the case of a long-term response, we additionally check whether the adjustment is full (the long-term response is not statistically different from 1).

Source: own calculations.

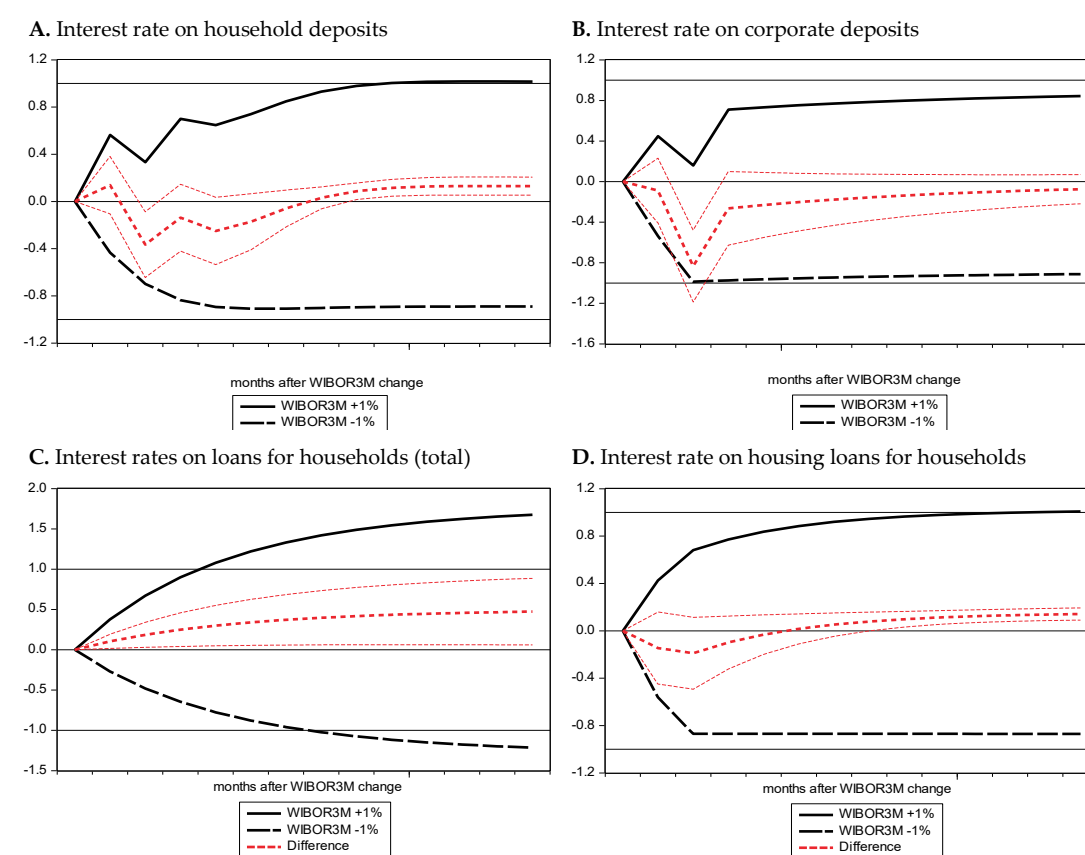
Besides the interbank market rate, the risk of the banking sector approximated by the spread between the WIBOR and OIS rate has an impact on the level of the interest rate on housing loans for households, loans for sole proprietors and corporate loans. Additionally, we checked whether the interest rate on deposits and loans is affected by the tax on assets introduced in January 2016.²² The results of the model with a dummy variable corresponding to the period of validity of this tax indicate that the tax on assets significantly decreased the interest rates on corporate deposits (in total and on deposits up to 1 month and from 1 up to 3 months) and on household deposits (in total, including mainly 12-month deposits). The tax may have also increased the interest rate

²² From December 2015 to December 2016, the fall in interest rate on household deposits was from 0.15 perc. points (deposits with the maturity from 3 months to 6 months) to 0.4 perc. points (deposits up to 1 month), while the WIBOR 3M rate remained practically unchanged (it showed slight oscillations in the order of 0.05 perc. points). The interest rates on most categories of loans for households and corporate loans changed only to a minor extent (the exceptions included consumer loans, which became cheaper by approx. 0.5 perc. points and corporate loans with a value of PLN 1 to 4 million, for which the interest rate increased by 0.14 perc. points). Thus, there were premises to believe that the decline in interest rates on deposits was at least partly triggered by the introduction of the tax on assets, while in the case of loans the potential impact of the tax was not so evident.

on loans for sole proprietors and on corporate loans above PLN 4 million. The detailed results are presented in Annex 6.

Further analysis of the adjustment of retail interest rates at banks has shown that total household deposit rates show negative short-term asymmetry and a slight positive long-term asymmetry (Figure 15). This means that in the short term the adjustment of interest rates on household deposits is stronger in terms of response to the decline in the money market interest rate than to its increase while in the long term, the adjustment is slightly stronger in the case of the increase in the WIBOR 3M interest rate. Interest rates on corporate deposits show negative asymmetry both in the short and long term. In the case of loans, the situation is the opposite, i.e. positive asymmetry in the short term (total loans for households, housing loans) and in the long term (housing loans).

Figure 15. Asymmetry in adjustments of interest rates on deposits and loans to changes in WIBOR 3M



Source: Own calculations based on NBP data.

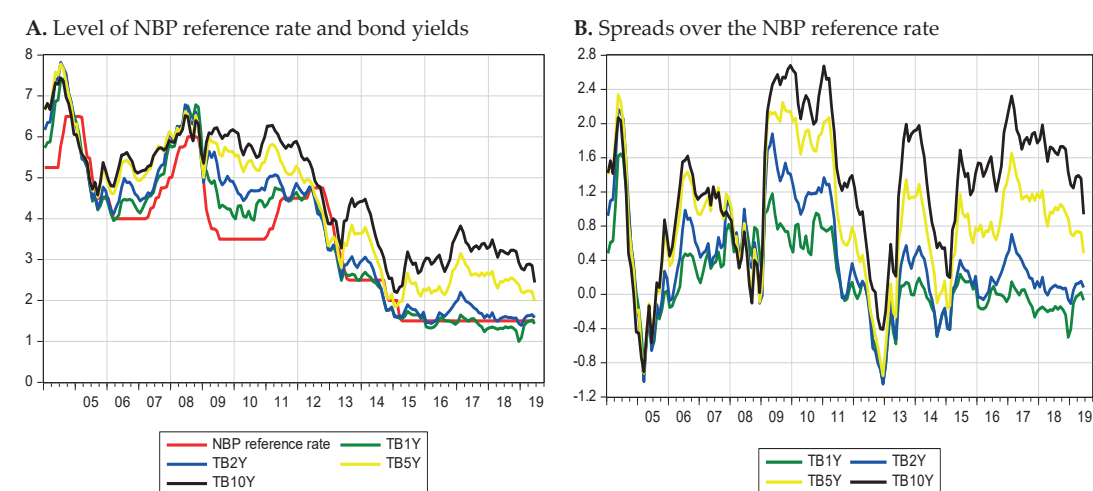
2.3.3 Transmission to government bond yields

Although the government bond yields basically follow the long-term trend of the NBP reference rate, by their very nature they demonstrate much higher volatility (Figure 16). They respond to a number of risk factors, such as current account balance, gross international investment position (see Kujawski, Mrzygłód and Zamojska, 2015) or inflation and industrial production surprises (see Chmielewski *et al.* 2018). Since WIBOR rates also respond at least to some of these

factors and display higher volatility than the NBP reference rate, we show the relationship between WIBOR 3M and bond yields.²³ Given that the WIBOR 3M rate fully adjusts to changes in the reference rate, the existence of the long-term relationship between the WIBOR 3M rate and government bond yields means that the NBP monetary policy indirectly affects yields of Treasury securities.

The WIBOR 3M rate has an impact on yields of 1-, 2- and 5-year bonds, while there is no long-term relationship between WIBOR 3M and 10-year securities. Formal tests show that only 1-year bonds fully adjust to the WIBOR 3M rate, while yields of other securities adjust to a lesser extent (in the long term, about 80% in the case of 2-year bonds and about 60% in the case of 5-year bonds).

Figure 16. NBP reference rate and government bond yields



Source: NBP data

2.4 Exchange rate in the monetary policy transmission mechanism

2.4.1 Impact of exchange rate on the real economy

The last thirty years is the period of an intensification of the direct capital relationship between enterprises, triggering an increase in the share of foreign value added (FVA) in exports and integration within the so-called global value chains (GVC). The effect of these processes is the decrease of the impact of changes in the exchange rate on foreign trade volumes (see IMF, 2015; Swarnali *et al.*, 2015). This is because, in the case of production within global value chains, the depreciation of the domestic currency acts as a supply shock, raising the prices of imports of intermediate goods (in domestic currency) and, consequently, marginal costs, proportionally to the share of intermediate goods in the final product. The competitiveness of exports declines and ultimately the impact of the depreciation on exports is lower than in traditional trade.

²³ The relationship between bond yields and the reference rate, which has remained fixed over long periods of time, is problematic, as confirmed by formal tests (see Annex 6). It is much easier to find the relationship between bond yields and the WIBOR 3M rate.

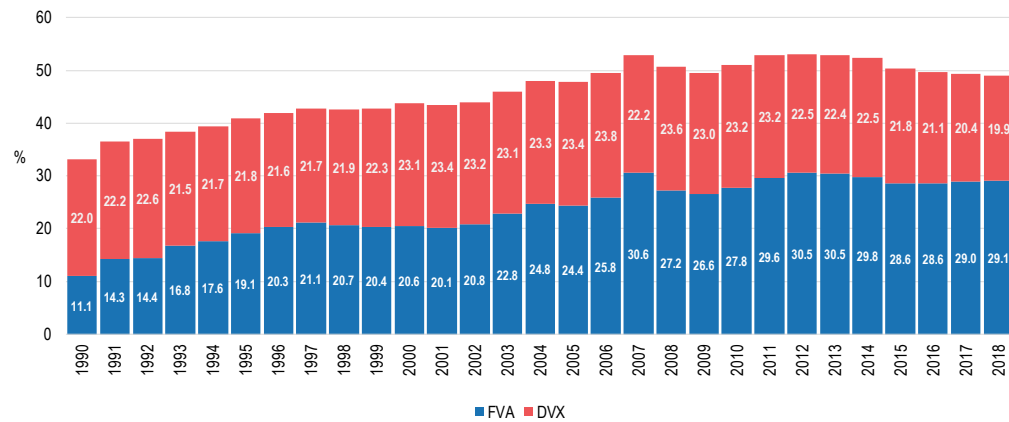
A safeguard against a decline in competitiveness is a change in the invoicing currency, transferring part of the costs to the partner or the reduction of unit labour costs.²⁴

The Polish economy shows a relatively low degree of integration within global value chains (Figure 17.A). Foreign value added in domestic exports (FVA) and domestic value added supplied to other countries' exports (DVX) oscillates around 50% of the total export value, whereas the average for countries of the European Union is almost 15 perc. points higher. While the over 29% share of foreign value added in Polish exports in the last ten years does not deviate from the average for developed countries (in the EU, it amounts to 38%), the share of domestic value added supplied to other countries' exports (22%) is one of the lowest among the world economies (the average is 31%). It should be noted that this indicator has different meaning for developed countries, where it determines the degree of innovation of the economy and still different for raw material countries, where it is an indicator of demand for raw materials. In Poland, DVX amounts to 54.3% for mining and quarrying products, 32% for base metal products and 30% for agricultural products. On the other hand, for audio/video equipment, household appliances, electronic and optical articles it does not exceed 8.4%, and for means of transport and their parts – 9.4% (Figure 17.C). By overlaying this picture with the share of foreign value added in domestic exports (Figure 17.B), with the dominant position of means of transport and their parts (43.0%) and consumer electronics, household appliances, electronic and optical articles (included in the category: other industrial products) with the share of 29.6%, a picture emerges of a non-innovative, medium-technologically advanced economy, which adds domestic value added to intermediate goods or puts intermediate goods together into a final product. The innovation process takes place outside the domestic economy.

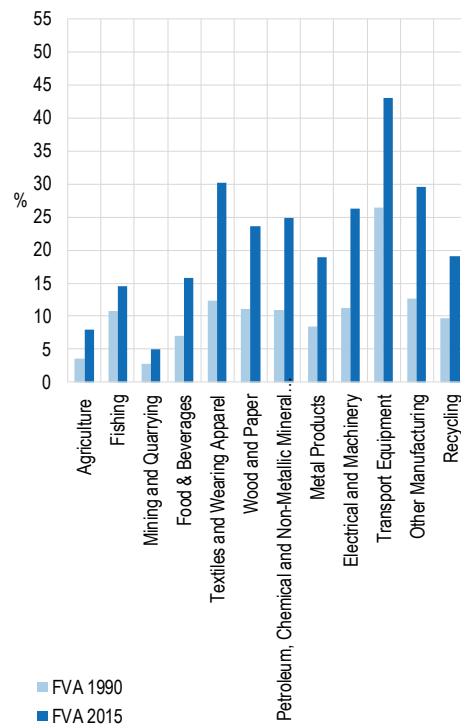
²⁴ The mechanism presented indicates that the relevant indicator describing the impact of the exchange rate on the exports volume is not the nominal rate but the real rate, i.e. the rate adjusted by relative unit labour costs or production costs (see Borin and Mancini, 2019).

Figure 17. Poland's participation in global value chains (GVC) and the importance of GVC in sections

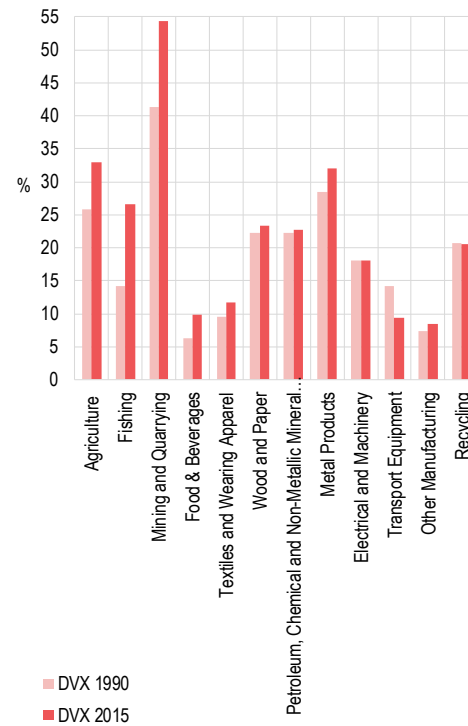
A. Poland's participation in global value chains



B. Foreign value added in exports (FVA)



C. Domestic value added supplied to other countries' exports (DVX)



Notes: The participation in global value chains is calculated according to the formula: $GVC = [(FVA + DVX) / (FVA + DVX + DVA)] * 100$, where FVA is the foreign value added in exports, DVX is the domestic value added supplied to other countries' exports and DVA is the domestic value added in exports.

Source: Own calculations based on UNCTAD Eora26 and UNCTAD ComTrade data, converted as in Aslam *et al.* (2017), using the authors' modified software.

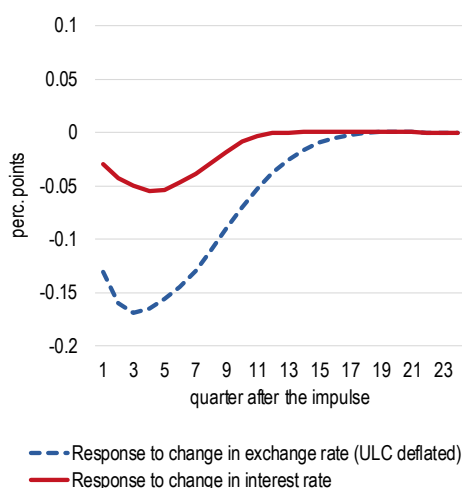
Estimates of the degree of involvement of Polish enterprises in global value chains (GVC and FVA indicators) were used to estimate the relationship between the PLN exchange rate, the degree of GVC integration and total exports volume and in 26 sections of goods and services. The SVAR

model with zero restrictions and sign restrictions was used, as in the study by Arias *et al.* (2018). The estimation method and detailed results are presented in Annex 7.

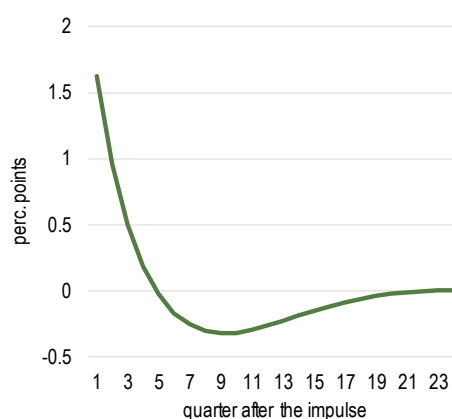
Figure 18 shows the response of the exports volume growth to the three impulses. The first one is the appreciation of the real exchange rate, deflated by unit labour costs. The impulse persists for 4 quarters, during which the exchange rate deviates by 1% from the base path. The second impulse is an increase in the short-term interest rate by 1 perc. point for a period of 4 quarters. The last impulse considered is a 4-quarterly increase in the share of foreign value added in domestic exports by 1 perc. point. In accordance with the results of previous studies (e.g. Chmielewski *et al.*, 2018), the impact of the exchange rate appreciation and monetary policy decisions on the exports volume growth rate turns out to be minor, amounting to approx. -0.15 perc. points in the third and fourth quarter after the impulse and approx. -0.05 perc. points in the fifth quarter after the impulse. The response to the FVA indicator growth is fast and strong (1.6 perc. points already in the first quarter); however, it becomes slightly negative immediately after the impulse expires.

Figure 18. Response of exports growth to changes in selected variables

A. Response of exports growth to the 4-quarterly real exchange rate appreciation by 1% and the 4-quarterly interest rate increase by 1 p.p.



B. Response of exports growth to the 4-quarterly increase in foreign value added in exports (FVA) by 1%



Source: own calculations.

The estimated share of individual shocks in explaining the increase in exports volume is well aligned with the above results (Table 11). Six shocks are analysed, related to the domestic monetary policy, the real exchange rate, integration within GVC and the global supply and demand and global market prices. The importance of monetary policy shocks is the weakest among them and it has also been decreasing over recent years. This is particularly evident in sections with a large share of plants privatized with the foreign capital, manufacturing final products with a relatively small but rapidly growing contribution of imports of intermediate goods (mechanical and electrical machinery and equipment, food and beverages). In addition, in enterprises established as green-field and brownfield investment, manufacturing products for exports and containing a high input of imported intermediate goods (assembly plants for means of transport, consumer electronics and household appliances), the impact of monetary policy on exports remains limited

(approx. 5%). On the other hand, low-processed, labour- and material-intensive products (agricultural products, food and beverages, textiles, steel and steel products) remain most sensitive to changes in the exchange rate deflated by unit labour costs—in this case the exchange rate explains about 20% of changes in the volume of exports, regardless of the share of foreign value added in exports. At the same time, the volume of exports of these products is most exposed to external shocks (shocks of global supply, demand and global market prices). In the exports of services (transport and construction²⁵), the real exchange rate explains as much as approx. 30% of changes in exports. The high share of exchange rate shocks can be explained by the competitiveness of Polish transport and construction companies on the European market (from this point of view, the real rate component associated with unit labour costs is important) and the dependence of these firms' income on changes in the nominal exchange rate (the component associated with the nominal exchange rate).

The impact of the real exchange rate on the volume of exports after the financial crisis has decreased significantly—in 2011-2018 it is twice as low as in the whole period of 2000-2018. This decline concerns mainly goods with a medium degree of processing (cars and their parts) and technologically advanced goods (consumer electronics, electronic devices, optical articles), i.e. in sections with a high share (approx. 40%) of foreign value added, producing for export.

²⁵ A slump in the share of construction in the total exports is a result of the relocation of operations of construction companies from Poland to other EU countries.

Table 11. Share of various shocks in explaining the growth of total exports volume and according to selected sections

		Share in exports [1]	Monetary Policy	Real exchange rate	GVC (FVA) [2]	Global factors [3]
Labour- and material-intensive products [4]	2000-2018	27.9	5.7	21.6	26.5	46.1
	2011-2018	15.9	4.9	20.3	23.2	51.6
Goods with low level of processing (low technological level)	2000-2018	16.1	3.6	15.7	39.3	41.4
	2011-2018	10.7	5.2	21.9	30.8	42.1
Goods with medium level of processing (medium technological level)	2000-2018	16.8	5.5	20.5	25.8	48.2
	2011-2018	34.5	3.8	9.7	29.5	57.1
Goods with high level of innovativeness (high technological level)	2000-2018	11.1	4.4	16.7	36.0	42.9
	2011-2018	18.8	4.9	8.8	39.8	46.5
Agricultural products	2000-2018	2.7	13.0	19.2	12.9	54.8
	2011-2018	2.3	11.8	17.1	9.2	61.9
Food and beverages	2000-2018	12.7	12.5	20.9	18.6	48.0
	2011-2018	12.6	8.2	18.6	8.3	65.0
Textiles and clothing	2000-2018	18.3	4.2	22.4	24.8	48.6
	2011-2018	13.9	5.5	19.6	33.3	41.6
Mechanic and electrical machines and equipment	2000-2018	15.7	14.8	11.3	32.2	41.6
	2011-2018	17.0	5.3	9.5	34.1	51.1
Means of transport and their parts	2000-2018	19.2	4.4	16.1	37.1	42.5
	2011-2018	23.1	5.0	4.8	39.4	50.8
Other industrial products	2000-2018	6.4	5.7	18.0	31.1	45.2
	2011-2018	6.2	6.2	6.9	37.9	48.9
Transport	2000-2018	7.9	4.8	31.0	22.2	42.0
	2011-2018	8.0	5.2	32.1	13.8	48.9
Construction	2000-2018	15.8	4.3	24.9	27.6	43.3
	2011-2018	1.5	3.7	29.8	22.6	43.9
Total	2000-2018	100	8.1	15.1	26.4	50.4
	2011-2018	100	6.8	8.7	32.6	52.0

Notes: The table presents the share of monetary policy shocks (WIBOR 3M), the real exchange rate (nominal effective exchange rate deflated by relative unit labour costs), participation in global value chains (GVC) and global shocks in explaining changes in the volume of exports. [1] Share of groups of goods in exports—according to the Lall (2000) technological classification and SITC section. [2] In the estimations, FVA and GVC were used interchangeably (the interpretation is the same). [3] Global factors include global supply and demand and product group prices on the international market. [4] This category includes: agricultural products, food and beverages, textiles, steel and steel products.

Source: Own calculations based on UNCTAD Eora 26 data.

2.4.2 Exchange rate pass-through effect

In line with the regularities observed in various economies, the impact of the exchange rate on prices (the exchange rate pass-through) decreases along the price chain—its strongest effect is observed in the case of import prices, weaker effect for manufacturer prices, and the weakest effect is recorded in the case of consumer prices. This is illustrated by Figure 19, presenting the results of estimates obtained from two models: the SVAR model containing all the aforementioned price indices but not covering the monetary policy (McCarthy, 1999) and the SVAR model which includes import and consumer prices and the monetary policy (Forbes *et al.*, 2017; Forbes *et al.*, 2018). The trends in the estimated exchange rate pass-through effect on consumer prices are similar. Larger differences relate to the estimated scale of the exchange rate pass-through effect on import prices.²⁶

The impact of the exchange rate on consumer prices in Poland remains close to the average in the European Union countries but is lower than in the euro area countries. More substantial differences of this type occur in the case of import prices.²⁷ In the euro area countries, this impact fell significantly after the introduction of the single currency—for imports from countries outside the euro area from 0.8 to approx. 0.2, for imports within the euro area it does not differ significantly from zero (Comunale and Kunovac, 2017). The relatively strong transfer of the exchange rate to prices in Poland results from the high production import-intensiveness (a large share of indirect imports in the final product), as well as from an over twofold—compared to the euro area—share of imports in private consumption. The aforementioned currency structure of imports invoicing also plays a role here—while in Poland the share of contracts in zloty is insignificant (9%), in the euro area countries contracts in euro relate to 45% of imports of goods from outside the euro area and 55% of imports of services from outside the euro area.

Since 2013, the exchange rate pass-through effect on prices has remained quite stable—the appreciation of the nominal effective exchange rate of the zloty by 1% currently reduces the level of consumer prices by about 0.06-0.08%.²⁸ The stability of the exchange rate pass-through effect on consumer prices is supported by the relatively stable level of involvement of Polish enterprises in global value chains over recent years.²⁹ The fact that the zloty exchange rate volatility

²⁶ The differences between these models may result from their specifications. In McCarthy's model (1999), on the one hand, a more complete picture of price adjustments is presented than in Forbes *et al.* (2017, 2018), on the other hand, in the latter model, the monetary policy is included which is absent in the former model. Relying solely on the assessment of the model's adjustment in relation to import prices, we would attach more importance to McCarthy's model (1999).

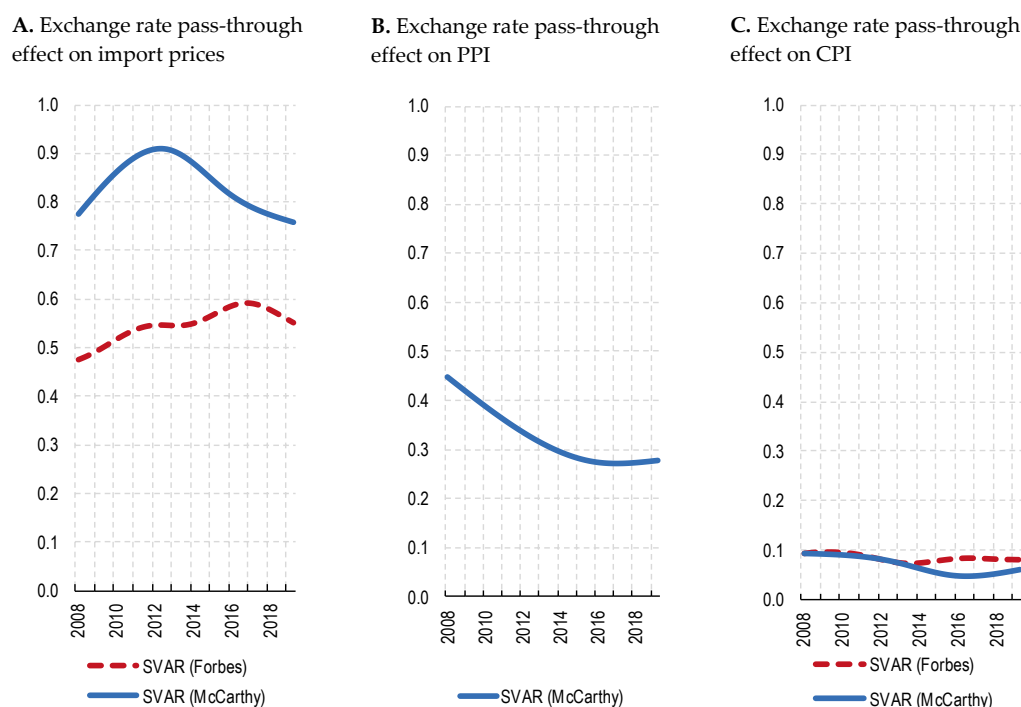
²⁷ The latest results of studies in this respect, comparable between the European Union countries, will soon be published in a report by the *WGEM Expert Group on Exchange Rate Pass-Through*.

²⁸ Let us recall that in the initial years of the direct inflation targeting strategy in Poland, the impact of exchange rate changes on consumer prices was significantly stronger. Poland's accession to the European Union, the accompanying structural changes in the economy (e.g. trade within global value chains) and the growing credibility of the monetary policy resulted in a drop in the exchange rate pass-through to the CPI from over 0.2 before 2004 to below 0.1 since 2008.

²⁹ The fragmentation of global value chains causes an increase in the share of intermediate goods in the total trade. The data show that trade in intermediate goods and services currently accounts for 56% and 73% of total global trade, respectively. The increase of the participation in GVC reduces the exchange rate pass-through, especially to import prices. The lower impact of the exchange rate on import prices partly isolates the domestic economy from foreign monetary policy shocks, but at the same time weakens the exchange rate channel of domestic monetary policy.

was negligible during this period is also significant while, according to studies for various countries (see e.g. Caselli and Roitman, 2019), the pass-through effect is clearly stronger in the case of large price changes. The currency structure of import invoicing also remains stable: the zloty represents only 9%, the euro – 28%, while the US dollar represents 60%.³⁰ On the other hand, an increase in the share of imports in consumption may foster an increase in the consumer price response to exchange rate changes.

Figure 19. Exchange rate pass-through effect on various price indices



Source: own calculations.

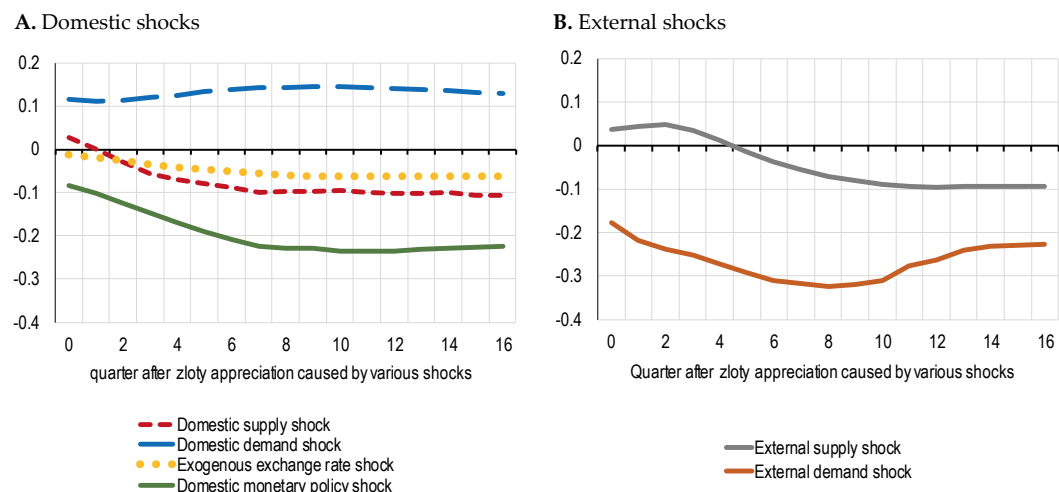
The most recent studies on the exchange rate impact on prices move away from considering only the effects of exogenous exchange rate changes, analysing price sensitivity to exchange rate changes depending on the nature of the shock causing a given exchange rate change (Forbes *et al.*, 2017). In these studies, it is taken into account that individual shocks influencing the exchange rate also affect economic activity, margins, productivity, inflation expectations and inflation. This means that exchange rate pass-through estimates, understood as the relationship between the change in the price level and the change in the exchange rate level, containing all these effects, can vary significantly depending on the shock that triggers the particular exchange rate change.

In Poland, as in other countries (see Forbes *et al.*, 2017; Ha *et al.*, 2019), the strongest price responses take place if the change in the exchange rate occurs due to external demand shocks or monetary policy shocks (Figure 20). These shocks play the most important role in the developments of the zloty exchange rate, which particularly relates to external demand shocks, whose significance has increased strongly over recent years (Figure 21). This means that in the case of the majority

³⁰ Eurostat data.

of exchange rate changes, the perceived strength of impact of these changes on consumer prices may be greater than the effects of exogenous exchange rate shocks.

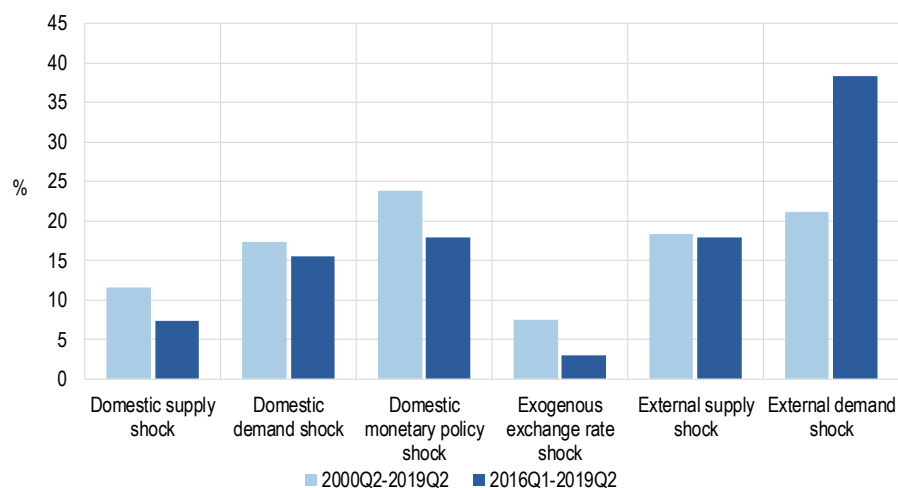
Figure 20. Exchange rate pass-through effect on consumer prices associated with various shocks



Notes: The charts show the exchange rate pass-through effect on consumer prices measured as a relation of price change to exchange rate change. For each of the shocks it was introduced into the SVAR model so as to lead to a 1% appreciation in the nominal effective exchange rate of the zloty. A non-intuitive pass-through effect sign for domestic demand shocks stems from the fact that exchange rate appreciation effects on consumer prices turn out to be smaller than the impact of domestic demand shocks on inflation through standard channels.

Source: own calculations.

Figure 21. The significance of individual types of shocks for the exchange rate in Poland



Source: own calculations.

2.5 Inflation expectations in the monetary policy transmission mechanism

Contemporary central banks aim to manage private sector expectations, mainly the inflation expectations. While long-term inflation expectations are an indicator of the central bank's credibility (section 2.5.2), short-term expectations are an important component of the monetary policy transmission mechanism due to their impact on inflation processes (section 2.5.1).

2.5.1 Determinants of short-term inflation expectations of various types of agents and their compatibility with the communication and preferences of the central bank

The measures of short-term inflation expectations of consumers, businesses and financial sector analysts used in this section are presented in Figure 22. Most of these measures were used in previous editions of the report. Only the quantitative inflation expectations of consumers, used in the report for the first time, require a separate comment. They are calculated as the average value provided by consumers in response to the question of how much the prices will change in percentage over the next 12 months.³¹ The positive bias of expected inflation declared quantitatively which also occurs in other European countries³², can be partly explained by the fact that respondents can provide any value (the responses are not limited to any interval and respondents are not asked any confirmatory questions in the case of declaring a very high or a very low value) and their propensity to provide rounded figures (0, 5, 10, 15, etc.). Moreover, consumers might use subjective scale to express their expectations. Therefore, the quantitative measure of inflation expectations is not directly comparable with official statistics, although strongly correlated with them.³³

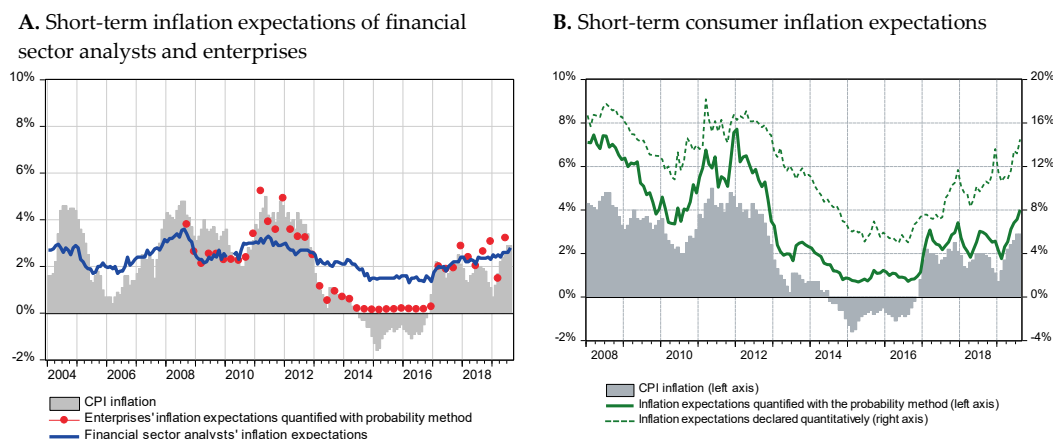
We use two approaches to analyse the process of forming these expectations. Firstly, similarly as in the previous editions of the report (e.g. Chmielewski *et al.*, 2018), we estimate single-equation models in the spirit of Cerisol and Gelos (2009). These models were estimated on a sample covering the period of 2001-2019 (in the case of enterprises: 2002-2019) and as rolling regression, in 72-month estimation windows. Secondly, we estimate structural vector autoregression models (SVAR) which take into account the feedbacks between inflation expectations and other macroeconomic variables. The SVARs contain five variables: inflation expectations, CPI inflation, output gap, exchange rate and monetary policy shock. In these models, we employ quantitative measure of consumer expectations. Details of both model types are shown in Annex 8.

³¹ Such a question, apart from the question formulated qualitatively, is asked in a survey conducted in Poland by GfK, on behalf of the European Commission (European Commission Consumer Survey) and in GUS survey. The advantage of the quantitative inflation expectations is that, contrary to qualitative opinions, it does not require transformation into balance statistics (with arbitrary weights) or quantifying (which involves making assumptions about the type of distribution of expectations and consumer perception of current inflation).

³² In 2004-2015, a positive bias of the quantitative measure of consumer inflation expectations occurred in all EU countries, ranging from approx. 1 perc. point in Sweden and Finland to approx. 15 perc. points in Bulgaria. The average bias in the EU countries amounted to approx. 6 perc. points and in Poland to approx. 10 perc. points (see Arioli *et al.*, 2016).

³³ Earlier analyses of the formation of consumer inflation expectations using the quantitative measure indicate similar features of these expectations as in the case of the quantified measure (Stanisławska, 2018).

Figure 22. Short-term (1-year-ahead) inflation expectations in Poland



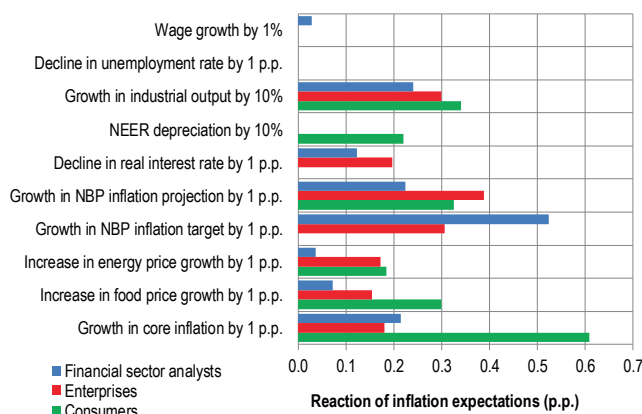
Notes: Inflation expectations of consumers and enterprises were quantified using the probabilistic method on the basis of qualitative survey data of GUS and NBP (Quick Monitoring), respectively. Details on quantification and suitable references might be found in section 3.2.1 of the previous edition of the report of 2016 (Kapuściński *et al.*, 2016). The quantitative measure of inflation expectations of consumers is calculated as an average of individual expectations declared in the European Commission Consumer Survey (data source: GfK). The inflation expectations of financial sector analysts are derived from Thomson Reuters' surveys.

Source: own calculations.

2.5.1.1 Comparison of expectation formation by various groups of agents

The results of single-equation model estimated on a full sample (Figure 23) show that changes in current price growth have the strongest impact on inflation expectations of consumers³⁴ and enterprises and a much weaker on inflation expectations of financial sector analysts. The expectations of the latter group are to a larger degree anchored in the NBP inflation target, adapting also to the NBP inflation projections and responding to monetary policy decisions. Although enterprises attach less importance to the NBP inflation target than financial sector analysts, their response to monetary authorities' decisions and central bank inflation projections is stronger than in the case of financial sector analysts. The central bank's inflation target is not of great significance for consumer inflation expectations; however, the central bank's inflation projections published by the central bank seem to play a certain role. When considering the impact of other variables on inflation expectations, it turns out that all groups of agents respond to changes in industrial production growth. In addition, consumers adjust their expectations to the observed changes in the exchange rate and financial sector analysts to the developments in wages.

³⁴ Consumers do not represent a homogenous group in terms of forming inflation expectations. Differences in consumer inflation expectations and determinants of these differences—both socio-demographic and macroeconomic—were analysed by Stanisławska (2018) and Stanisławska *et al.* (2019). As far as the importance of the first factors is concerned, it appears that inflation expectations decrease with an increase in consumers' income and level of education. On the other hand, age and gender do not have an impact on the expected inflation if we control consumers' individual perception of inflation in the model (see Stanisławska *et al.*, 2019). Moreover, consumers differ in terms of the macroeconomic variables they take into consideration while forming inflation expectations. Those whose expectations are close to the centre of distribution (the median) respond strongly to current (perceived) inflation and to the unemployment rate and nominal wages. Consumers whose expectations are at the lower end of the distribution only change their expectations under the influence of current inflation, with a lower impact than for other consumer groups. On the other hand, inflation expectations of consumers expecting high price growth, apart from the current (perceived) inflation, are affected by the exchange rate, nominal wages and oil prices.

Figure 23. Contemporaneous response of short-term inflation expectations to various impulses

Notes: The above estimates were obtained from single-equation models inspired by the work of Cerisol and Gelos (2009) and Łyziak (2016b). The specifications of these models and results of the estimates are included in Annex 8.

Source: own calculations.

Results from multi-equation models (see Annex 8) confirm that inflation expectations of analysts, enterprises and consumers are rising along an increase in CPI inflation and economic activity and show differences in the process of forming expectations of various groups of agents, especially in terms of speed and strength of adjustments. In addition, the response functions indicate that analysts' inflation expectations decrease after the monetary policy becomes more restrictive.³⁵ However, in this approach we do not find any significant impact of the exchange rate on the inflation expectations of any group of agents, which may be related to a lower frequency of data used for the estimation of SVAR models than that of the single-equation model (quarterly and monthly respectively).

2.5.1.2 Changes in the process of forming expectations over time

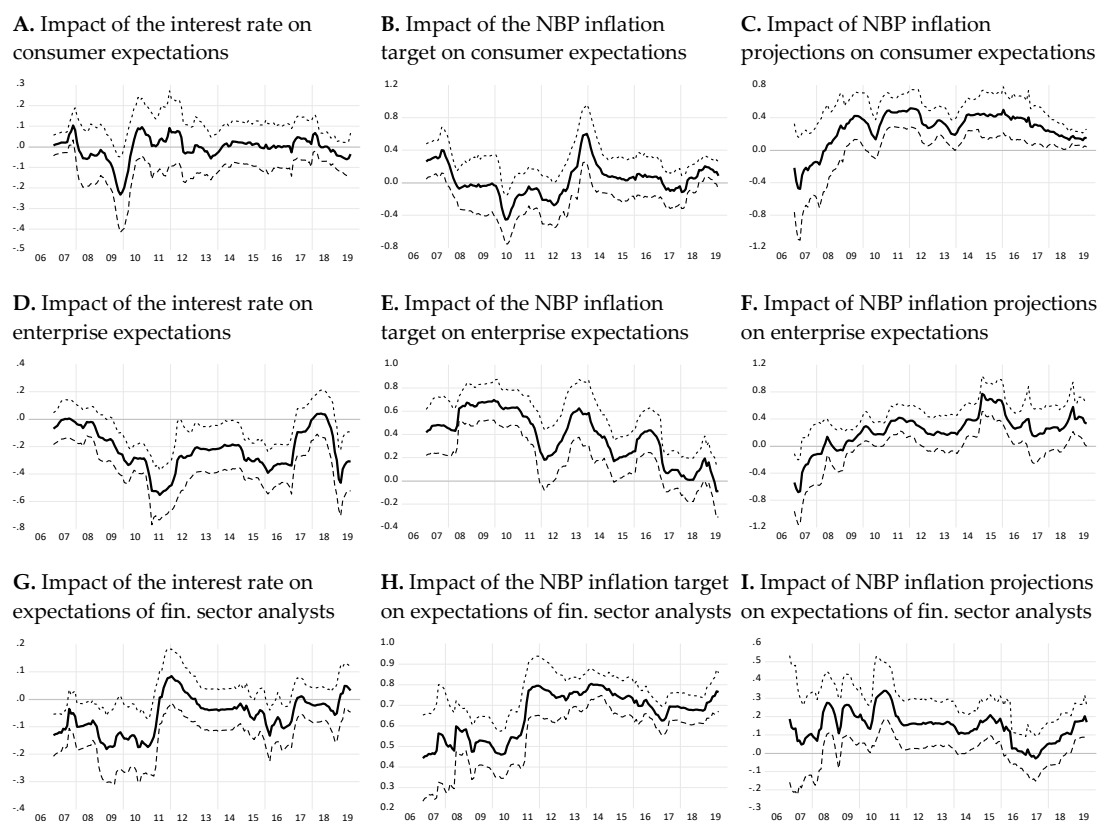
The analysis of changes in the process of forming inflation expectations over time³⁶ indicates that among the analysed monetary policy tools, only the central bank's inflation projections seem to have an impact on consumers' inflation expectations; however, since 2016 the impact of this factor has been clearly declining and in recent estimation windows it is insignificant (Figure 24.C). The factors influencing consumer inflation expectations in the vast majority of the estimation periods include the exchange rate and the current price dynamics, while the impact of the inflation indices analysed is quite variable over time. In particular, the impact of food and energy price dynamics on consumer expectations has been decreasing over recent years, with relatively strong effects of core inflation changes. The impact of economic activity on consumer expectations has also decreased significantly recently. The latter conclusion is also true for the inflation expectations of other groups of agents.

³⁵ Inflation expectations of consumers and enterprises also fall after a positive monetary policy shock but this response is not statistically significant.

³⁶ In this section, we only show the responses of expectations to variables related to monetary policy (Figure 24). Responses to other variables are included in Annex 8.

The importance of wage growth is clearly visible among the factors shaping the inflation expectations of enterprises in recent quarters. When it comes to the impact of monetary policy tools, most of the estimation windows show a statistically significant impact of the interest rate on expectations of enterprises (Figure 24.D). Whereas the impact of the NBP inflation target on these expectations decreased over time (Figure 24.E), the inflation projections published by the central bank became more significant in the period after the outbreak of the financial crisis (Figure 24.F). The impact of the analysed price indices on the inflation expectations of enterprises appears, as in the case of consumers, to be time-varying and, in the case of core inflation, relatively small.

The inflation expectations of financial sector analysts respond to a limited extent to price changes in particular parts of the consumer basket. However, the sensitivity of analysts' forecasts to changes in core inflation over the last 3 years should be noted. Considering the management of inflation expectations by the central bank, the importance of the NBP inflation target for the expectations of financial sector analysts has remained quite high since 2011 (Figure 24.H); however, also since then the impact of the interest rate on opinions concerning future inflation (Figure 24.G) has been fading. The significance of the NBP inflation projections is, for the majority of estimation windows, significant but rather time-varying (Figure 24.I). As mentioned above, financial sector analysts have recently ceased to adjust their expectations to changes in economic activity; however, like enterprises, they started to respond to changes in wage growth.

Figure 24. Change over time in the impact of factors linked with monetary policy on short-term inflation expectations

Notes: The solid line shows the results of estimates of individual parameters in 72-monthly moving windows, while dashed lines show the results of these estimates increased or decreased by 2 standard deviations. Responses to other impulses are presented in Annex 8.

Source: own calculations.

2.5.2 Anchoring medium-term and long-term inflation expectations

Anchored long-term inflation expectations are evidence of central bank credibility, which in turn, is one of the factors determining the effectiveness of the monetary transmission as well as the costs of disinflation (sacrifice ratio) and its pace. For this reason, it is desirable that the expectations are stable and in line with the inflation target of the central bank.

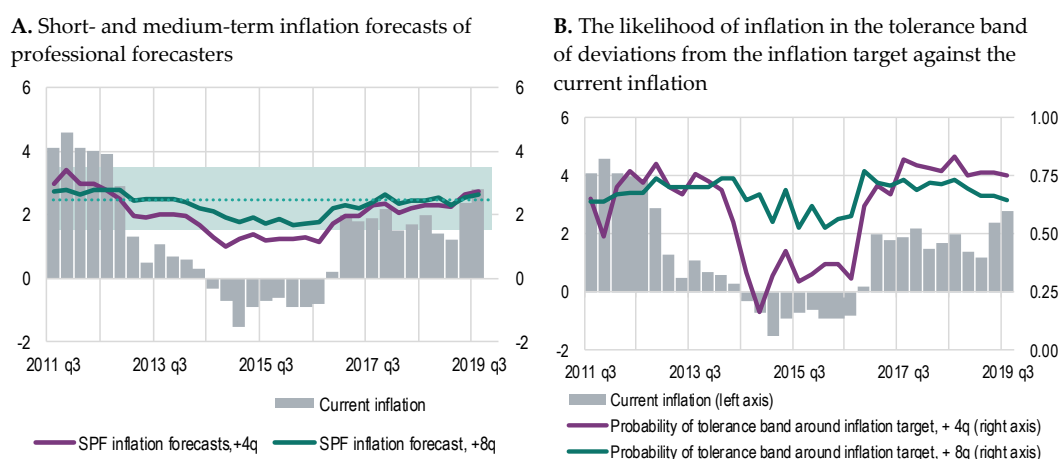
As in previous editions of the report, we examine the anchoring of inflation expectations using medium-term forecasts (8-quarters ahead) and short-term forecasts (for the current year and 4-quarters ahead) formulated by professional forecasters (experts). To a limited extent we use the forecasts in the longer horizon, related to inflation in year 4th and 5th of the forecasting horizon,

due to their implied nature.³⁷ Inflation expectations come from the NBP Survey of Professional Forecasters (NBP SPF).³⁸

Medium-term inflation expectations demonstrate a fairly high degree of anchoring. Over the last two years, they were stable and oscillated around the NBP inflation target (Figure 25.A). The probability of inflation in the tolerance band around the NBP inflation target remained high, especially in the case of short-term forecasts (Figure 25.B). For medium-term forecasts, this likelihood decreased over the past year, due to slightly increased expert uncertainty, but remains close to its long-term average.

A low sensitivity of longer-term expectations to changes in current inflation persists. Medium-term forecasts are less responsive to current inflation changes than short-term forecasts. On the other hand, the implied long-term forecasts develop independently of current inflation, inflation surprises³⁹ and changes in short-term forecasts (Figure 26).

Figure 25. Short-term and medium-term inflation forecasts by professional forecasters and the probability of inflation in the tolerance band around the inflation target



Source: own calculations.

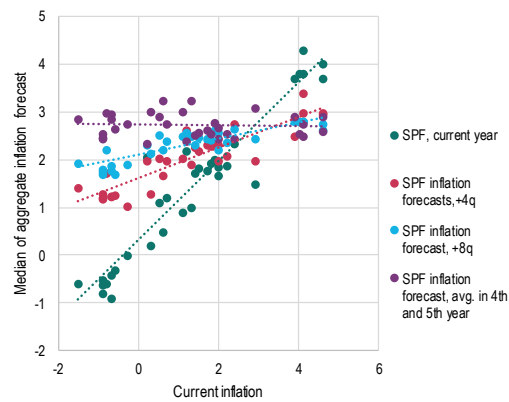
³⁷ Inflation forecasts for the fourth and fifth year are determined on the basis of the annual average inflation forecasts for the next five years and inflation forecasts for the current year and two subsequent years.

³⁸ The survey description and results are available on the website: <https://amakro.nbp.pl>.

³⁹ The inflation surprise is an unexpected component of the CPI published by GUS, i.e. the difference between the actual inflation reading and the value forecasted by analysts.

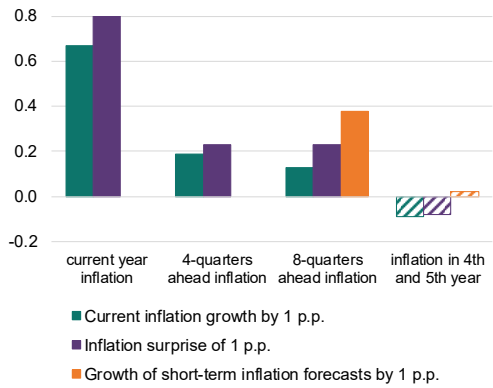
Figure 26. Anchoring of inflation forecasts

A. Sensitivity of inflation forecasts to current inflation



Notes: Current inflation is the CPI inflation rate for the quarter preceding the relevant round of the NBP SPF.

B. Sensitivity of inflation forecasts to changes in current inflation and short-term forecasts



Notes: Results from models estimated on individual forecasts (see Annex 8). A statistically insignificant response was marked by stripes.

Source: own calculations.

3 Special topics

This part of the report is devoted to the special topics covered by our new research. The first of these topics concerns the importance of bank credit in the monetary policy transmission mechanism in Poland (section 3.1), while the second one refers to the impact of the textual content of the MPC minutes on the expectations of private sector analysts (section 3.2).

3.1 Credit in the monetary policy transmission mechanism

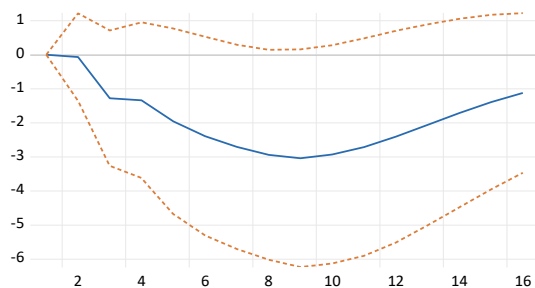
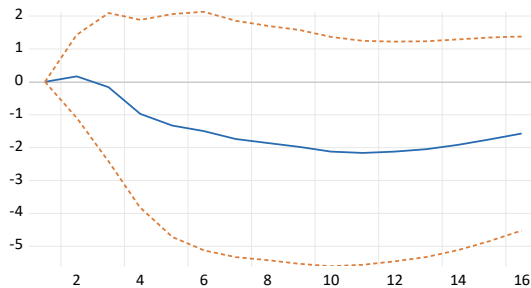
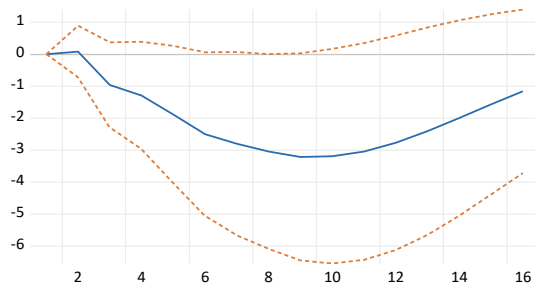
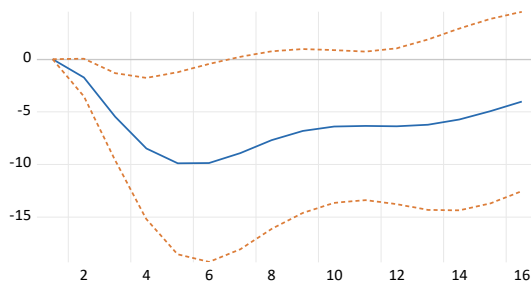
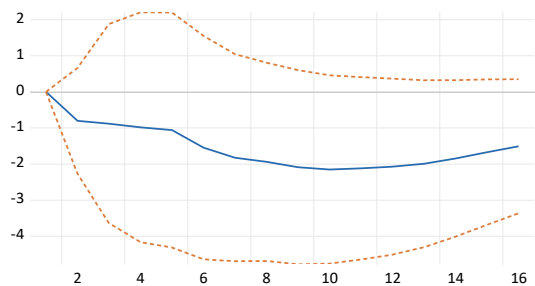
3.1.1 Credit volume response to the monetary policy impulse

In section 2.1 we showed the response of the total volume of PLN loans to an unexpected change in the interest rate. In this part of the report, we present the responses of narrower credit aggregates to monetary policy shocks. We use models analogous to those from section 2.1, we only change types of loans.

The response of the volume of loans for households to an unexpected change in the interest rate is relatively strong, stronger than in the case of enterprises (Figure 27). The fastest and strongest response is displayed by the housing loans in PLN. Consumer loans also respond quickly. While a statistically significant response of total loans to households occurs in the 8th-10th quarter after the shock, in the case of consumer loans it occurs in the 5th-10th quarter. The estimated response of housing loans and, to a certain extent, also loans for households in general, to the interest rate shock can be slightly overestimated. This is associated with the fact that the annual growth rate of PLN housing loans until the time of the financial crisis showed considerable volatility⁴⁰ which can probably be attributed to factors other than included in the model, such as the possibility of taking out foreign currency loans, government programmes (Housing for the Young, Family on its Own) as well as supervisory decisions.

The response of corporate loans is statistically insignificant (Figure 27.B). This is confirmed by the impulse response functions obtained from the models we use to analyse the impact of monetary policy and bank lending standards and conditions on investment and credit (see section 3.1.2 and Figure 28). Investment loans for enterprises respond rather to shocks of lending standards and conditions whereas loans for financing of working capital and overdraft react to the interest rate.

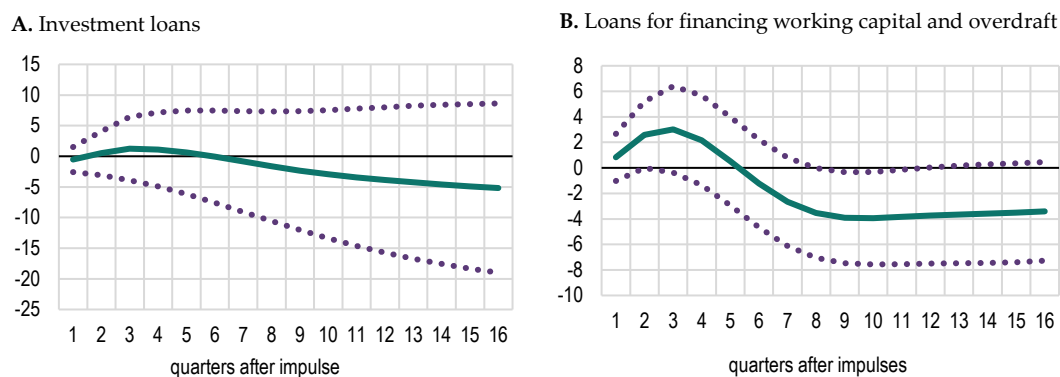
⁴⁰ In the sample from June 1999 to June 2009, the descriptive statistics of the annual growth rate of PLN housing loans (in percentages) are as follows: average: 31.6, maximum: 68.7, minimum: -4.6, standard deviation: 21.2.

Figure 27. Responses of the volume of loans to the 1 p.p. WIBOR 3M interest rate shock**A. Total household loans****B. Corporate loans****C. Consumer loans****D. Housing loans****E. Loans for sole proprietors**

Notes: Loans in PLN in real terms. The solid line indicates the estimated response and the dashed line indicates the limits of the ± 2 standard deviation band around this response. The number of quarters after the shock is marked on the horizontal axis. We use quarterly data, the sample covers the period from 1999Q2 to 2019Q1.

Source: Own calculations based on NBP data.

Figure 28. Responses of the corporate loans to the 1 p.p. WIBOR 3M interest rate shock



Notes: The solid line indicates the estimated response and the dashed line indicates the limits of the ± 2 standard deviation band around this response.

Source: Own calculations based on NBP data.

3.1.2 The role of lending policy of banks in the monetary policy transmission mechanism

In the NBP survey, the chairpersons of commercial banks' credit committees are asked, among others, whether—and if so, to what extent—lending standards in a given bank have been tightened, loosened or remained unchanged over the last quarter. A similar question refers to the lending terms and conditions.⁴¹ Respondents are also asked to indicate the reasons for changes in lending policy and qualify them into the following groups: (i) macroeconomic risk, (ii) industry risk, (iii) risk related to the situation of the largest borrowers, (iv) risk related to the quality of own loan portfolio, (v) risk resulting from own capital situation, (vi) risk resulting from competitive pressure from other banks or the capital market, (vii) central bank monetary policy (viii) changes in demand or (ix) other. The replies are subsequently weighted by the banks' shares in the market of the product concerned (type of credit). The use of qualitative information from banks in the research on the monetary transmission mechanism is very important, as it allows to separate demand and supply elements in the volume of loans as well as to verify whether banks really "do what they say".

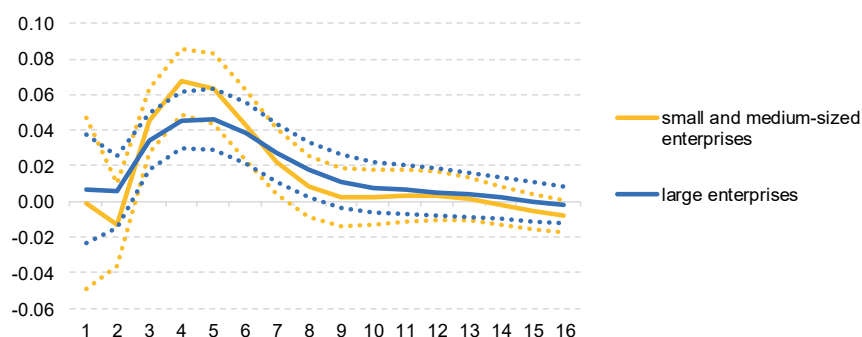
In section 2.3.2 we have shown that the NBP monetary policy affects the interest rate on loans and, consequently, the demand for loans. Analyses using the SVAR-type models on data from the survey conducted among credit officers⁴² show that decisions of monetary authorities have a significant impact on credit standards and terms and conditions. Interest rate shocks also have

⁴¹ Credit standards (criteria) are banks' internal guidelines for accepting credit applications, e.g. the minimum expected return on investment. The terms and conditions of granting a loan are as follows: the credit margin, the margin for more risky borrowers, non-interest credit costs, required value of legal collateral, loan-to-value and the maximum amount and maturity of the loan, see http://www.nbp.pl/en/systemfinansowy/ankieta_en.pdf.

⁴² We use quarterly data for the period from 2003Q3 to 2019Q2. Endogenous variables of the models comprise: investments (gross expenditure on fixed assets), investment/overdraft loans and loans for working capital financing (in real terms, deflator – investment prices), risk factors indicated in the survey by banks as drivers of changes in standards, short-term WIBOR 3M interest rate, lending standards – long/short-term loans for large and small and medium-sized enterprises or conditions of loan granting. Using such data, we build a set of models that differ in terms of risk factors, type of credit and credit standards/terms. In order to estimate monetary policy shocks and credit standards/conditions, we apply a decomposition where standards and interest rates can respond simultaneously (see Wróbel, 2018).

a statistically significant impact on risk factors, which in turn affect credit standards and terms and conditions of granting loans. These are both risk factors which describe the financial situation of companies and those which reflect the capital position of banks and the quality of their loan portfolio. This means that both directly and indirectly the central bank influences the propensity and ability of commercial banks to grant loans and thus the supply of credit. It is worth noting that, after an unexpected change of the interest rate by the central bank, banks adjust the credit standards for small and medium-sized enterprises more strongly than for large entities. This particularly applies to standards of granting long-term loans, which are exposed to more risk than short-term loans (see Figure 29). These observations are in line with the credit channel concept. On the basis of these premises, we conclude that the credit channel operates in the Polish economy and within it, both the balance sheet channel and the bank lending channel exist.

Figure 29. Response of long-term credit granting standards to the 1 p.p. increase in the interest rate



Note: The solid line represents the estimated response and the dashed lines represent the boundaries of the interval around these estimates with a width of ± 1 standard deviation. The number of quarters after the impulse is shown on the horizontal axis.

Source: Own calculations based on GUS and NBP data.

In order to estimate the role of the credit channel for investments—in section 2.2.3 we have shown its approximate role in the entire economy—we have conducted a technical exercise by imposing restrictions that disabled the functioning of this channel in the model. We have compared the obtained response functions with the response functions from the full model, in which the credit channel operates jointly with the interest rate channel.⁴³ Figure 30 shows the impulse response functions of investments and long-term and short-term loans to an unexpected interest rate increase by 1 perc. point obtained from four models that use different types of loans.

The differences in investment levels between the full model specification and the specification with the credit channel turned off are observable in the models in which we use long-term standards. However, they are not large and usually appear in the long-time horizon. This is probably due to the fact that the maximum response of credit standards to the short-term interest rate shock occurs after about 4 quarters. Moreover, the results confirm that in accordance with the

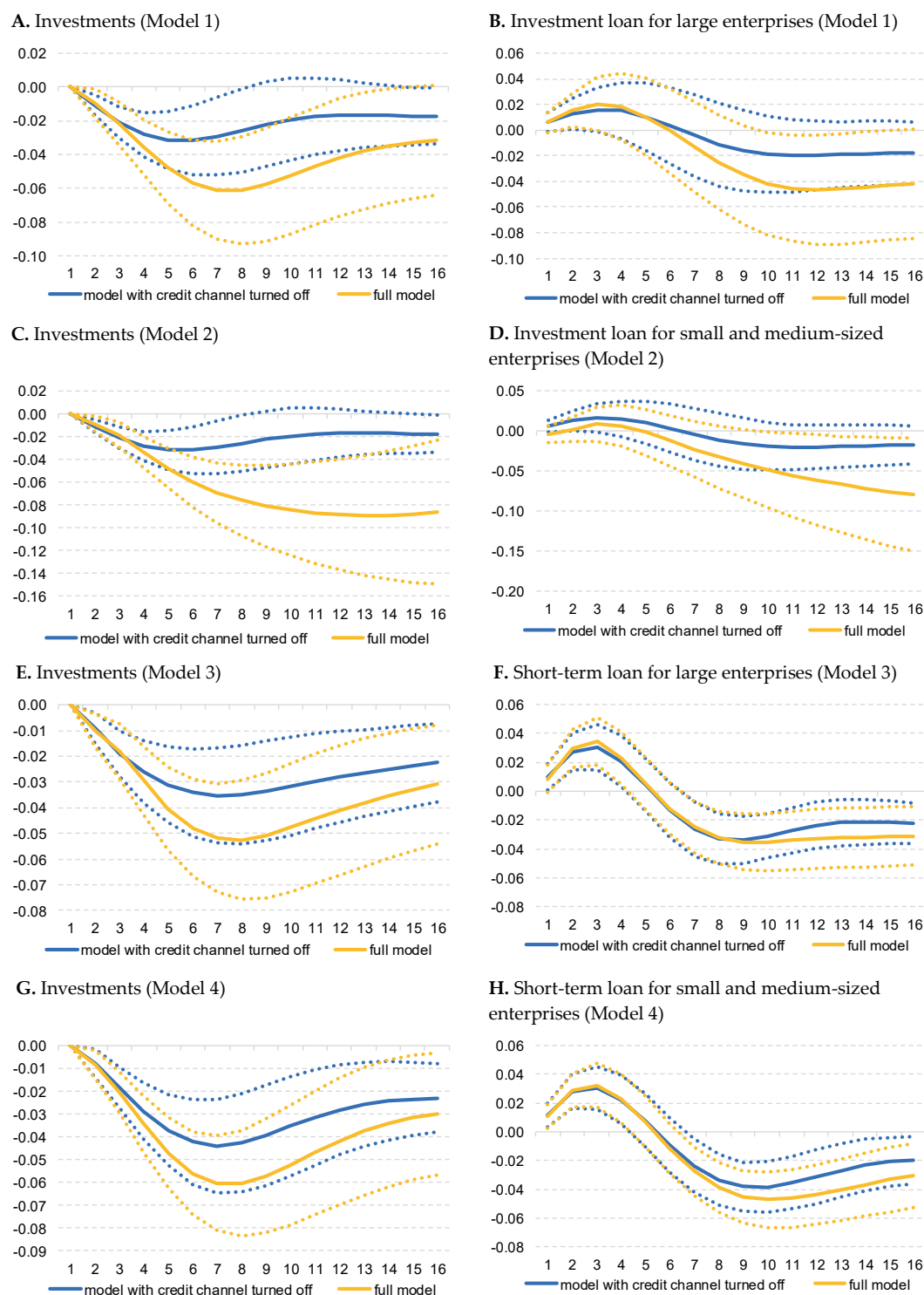
⁴³ In particular, in the lending standards equation we have imposed restrictions eliminating the impact of interest rate lags on them; analogous restrictions have been imposed in the equation of risk perceived by banks (in this case, macroeconomic risk). Moreover, in the matrix defining simultaneous relationships between variables, we have excluded the simultaneous impact of interest rate on credit standards.

credit channel concept, adjustments to monetary tightening affect smaller and medium-sized enterprises more than large enterprises.⁴⁴

The impulse response functions of investment and the volume of overdrafts and working capital financing show virtually no differences in the full version of the model and in the version that ignores the impact of the interest rate on lending standards—whether for large or small and medium-sized enterprises. This means that the operation of the credit channel is limited to long-term loans which are exposed to more risk than short-term loans.

⁴⁴ To confirm this finding, we have replaced investment loans with “large” loans in our models, which can be attributed to large companies without the risk of making a mistake. The reaction functions of “large” credit obtained from the full model and model without the credit channel showed practically no differences.

Figure 30. Role of the credit channel: the response of investments and credit volume to a 1 p.p. increase in the interest rate

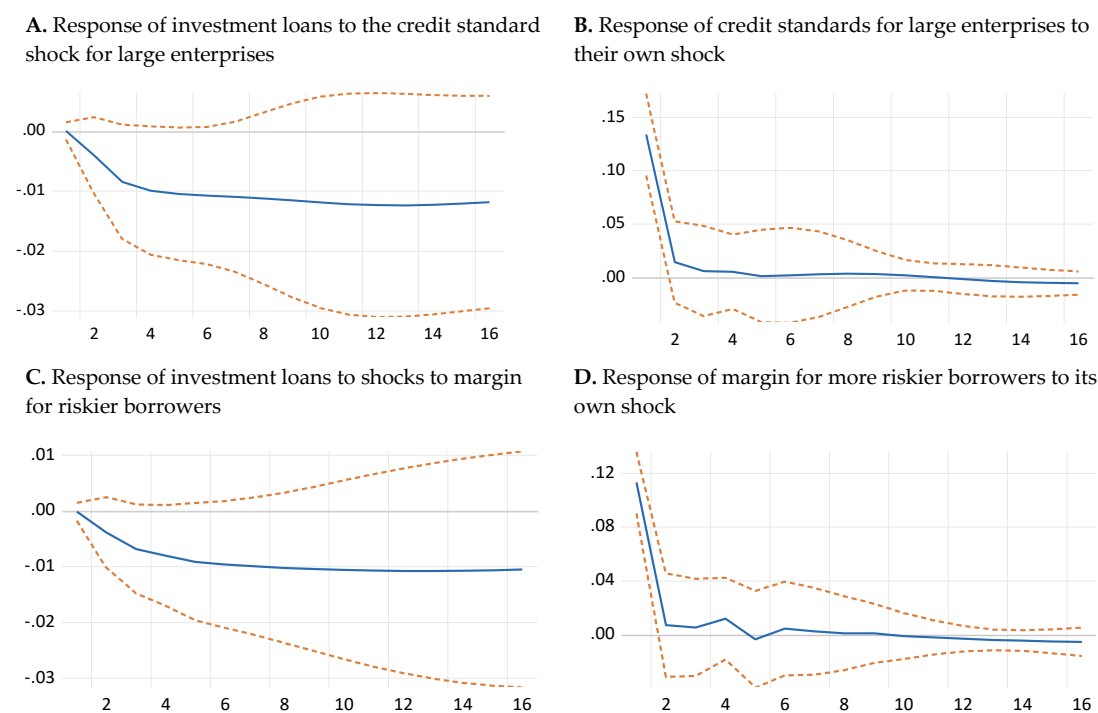


Note: The dashed lines show an interval with the range of ± 1 standard deviation. The number of quarters after the interest rate shock is shown on the horizontal axis. In models 1 and 3 we use credit standards for large companies, in models 2 and 4, we use standards for small and medium-sized enterprises. The risk factor perceived by banks in these models is the macroeconomic risk.

Source: Own calculations based on GUS and NBP data.

Another issue worth discussing is the impact of exogenous shocks of credit standards and terms and conditions on investments and credits. These shocks mean that banks tighten or loosen their lending policies not only independently of the central bank's monetary policy, but also to a different extent than the changes in net present value (NPV) for an investment project financed by a loan would suggest.⁴⁵ Our results show that we are not able to rule out that the banks' lending policies have an impact on the level of corporate investment and lending. In many of the models we use, the unexpected tightening of banks' lending policies leads to a decrease in investment and lending, both in terms of investment loans and short-term loans. The impact of lending terms and conditions on investment and credits is similar to the impact of standards (Figure 31). Importantly, investment and lending as well as lending standards and terms and conditions, are affected by unexpected changes in banks' risk perception. This means that shocks to risk perception can be treated as a kind of "animal spirits" that also affect the demand side of the economy. Statistical tests indicate that changes in macroeconomic risk, industry risk, risk related to the largest borrowers as well as in the quality of banks' loan portfolios are useful for predicting changes in the demand for credit reported in the survey by banks.

Figure 31. Functions of investment loans response to selected shocks of credit standards and lending terms



Note: The solid line represents the estimated response and the dashed lines represent the boundaries of the interval around these estimates with a width of ± 2 standard deviations. The number of quarters after the impulse is shown on the horizontal axis.

Source: Own calculations based on GUS and NBP data.

⁴⁵ As suggested in Berlin (2009) and applied by Wróbel (2019), actual changes in the lending standards take place only if they do not result from changes in the NPV or are greater/smaller than such changes.

Our results confirm that both standards and lending terms and conditions respond to the vast majority of risk factors indicated by banks in the survey as the cause of changes in their lending policy, confirming therefore that banks really “do what they say”. Thus, shocks related to the perception of the macroeconomic risk, industry risk, risk related to the situation of the largest borrowers, risk resulting from the quality of the loan portfolio and the bank's capital situation have a statistically significant impact on credit standards and lending terms and conditions. Only unexpected changes in competition in the market seem to have a negligible impact on the lending policy in the sample analysed.

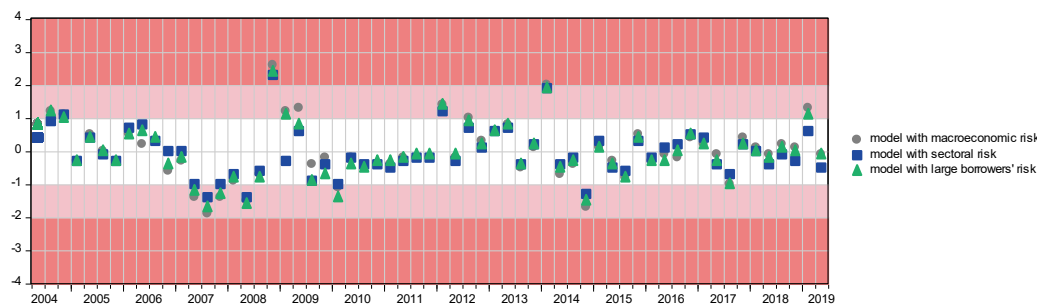
3.1.3 Measuring the stance of banks' lending policy

Due to the importance of the banks' lending policy, Figure 32 shows when, from the perspective of our models, banks' lending policy was restrictive, loose (expansionary) or consistent with micro- and macroeconomic risk conditions. This “natural” lending policy stance is approximated by the level of standards obtained from SVAR model forecasts, using variables that affect the net present value of investment projects of enterprises financed by bank credit. Since the actual standards are not only shaped by these factors but also by those that result from the risk related to the banks themselves (quality of the loan portfolio, capital situation), the difference between the actual standards and their theoretical values obtained from forecasts derived from models using variables affecting the NPV may provide information concerning the stance of banks' lending policy.

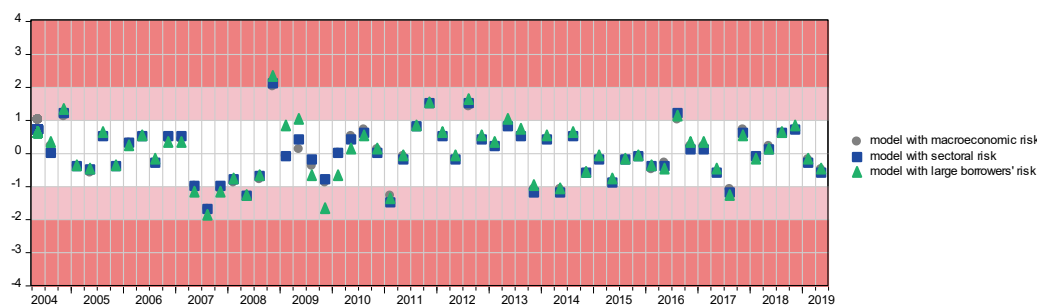
From the beginning of 2007 to 2008Q3, banks pursued a loose credit policy, both with respect to large and small enterprises. During the sharp phase of the global financial crisis, banks clearly, although for a short time, tightened their lending policy—in the second half of 2009 its stance was already contained within the limits that can be considered appropriate in relation to the economic conditions and the level of micro- and macroeconomic risk. In the second phase of the financial crisis, more specifically, during the European sovereign debt crisis, banks tightened their lending standards. In the period from 2014 to 2019Q2, they pursued policies that can be considered as compliant with the factors determining the net present value of investments financed by credit, although there have been isolated observations where standards were too loose or too stringent. However, there were no long-lasting periods of loose credit policy, which might have been dangerous for the stability of the sector .

Figure 32. Index of banks' lending policy stance

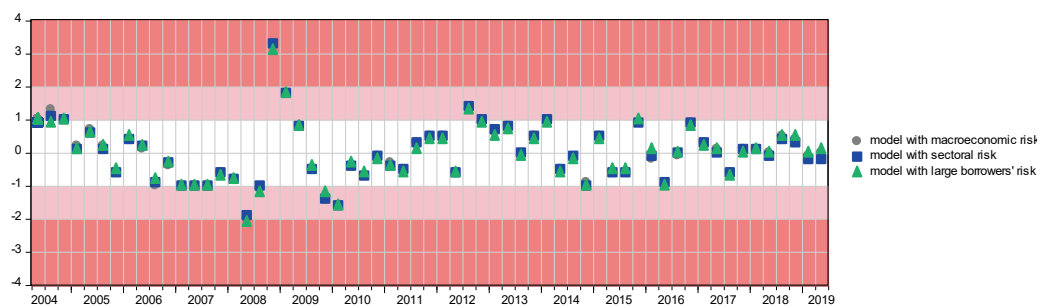
A. Long-term loans for large enterprises



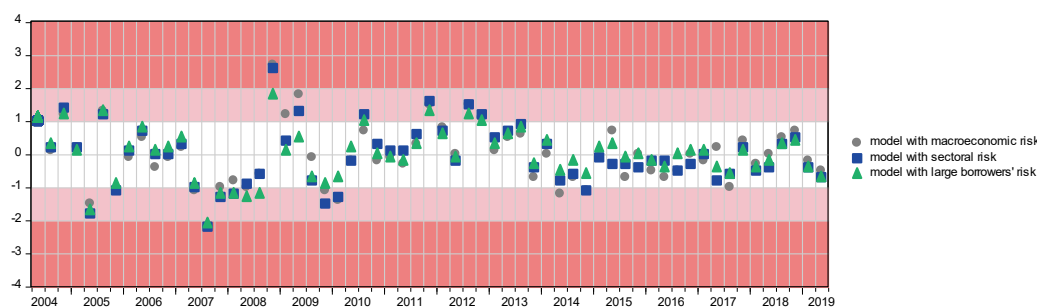
B. Long-term loans for small and medium-sized enterprises



C. Short-term loans for large enterprises



D. Short-term loans for small and medium-sized enterprises



Note: The index of banks' lending policy stance is expressed as the deviation of lending terms against their projected value, expressed in units of standard deviation of the projected value. Higher values mean more restrictive bank lending policies.

Source: Own calculations based on GUS and NBP data.

3.1.4 The impact of monetary policy on the quality of the loan portfolio—can the low level of nominal interest rates encourage banks in Poland to take a higher risk?

The concept of the risk-taking channel indicates that in response to decreasing profitability under the conditions of low interest rates (a decline in interest rates leads to a decrease in interest margins, which for banks with a traditional business model is one of the main factors shaping profitability), if it is not possible to counteract it by other means, banks adjust the structure of their lending. This adjustment leads to granting a relatively higher volume of loans to more risky entities since financing of more risky customers allows banks to get higher interest margins and improve profitability, at least in the short term.

The long period of low interest rates in Poland and the growing importance of the banking sector in the economy (financial deepening) motivates research on their potential impact on banks' risk appetite. Preliminary results of research conducted on a large group of commercial banks, presented in the previous edition of the report (Chmielewski *et al.*, 2018), did not confirm that this channel is active in the Polish economy. The results of further research in this area (Chmielewski *et al.*, 2020)—taking into account a longer period of low interest rates and non-linear effects—suggest that there is a relatively weak risk-taking channel in relation to a part of the banks' loan portfolio.

Empirical research on the operation of the risk-taking channel faces similar problems as in the case of other non-classical channels since the observed changes in the volume of loans granted result from directly unobserved changes in demand and supply. One of the ways of resolving the problem of identification employed in the study by Chmielewski *et al.* (2020), is the use of granular data at the level of individual entities (banks). This approach assumes that all banks provide services to similar customers and that customers of various banks (the demand side of the credit market) respond in a similar way to current economic processes, including the policy of the central bank. Thus, the systematic diversification of behaviour of individual banks with different characteristics (e.g. size, capital, liquidity, etc.) indicates that the observed changes in the credit market are due to supply-side factors.

In the study we measured how the risk of loan portfolio (the whole, i.e. comprising all non-financial sector loans, or narrowed down to large corporate loans) of individual commercial banks changed in the years 2008-2018, and subsequently. Next, with the use of the econometric model, we verified whether the risk changes depended on the level of the short-term nominal interest rate and whether the banks adjusted the loan portfolio risk to changes in this interest rate in a different way. The model specification took into account the possibility of non-linear effects in terms of the impact of interest rate changes on the size of risk taken by individual banks, which is a novelty in the literature. The behaviour of large and small banks, more and less liquid and financing themselves to a larger or lesser extent with deposits from enterprises and households was compared.

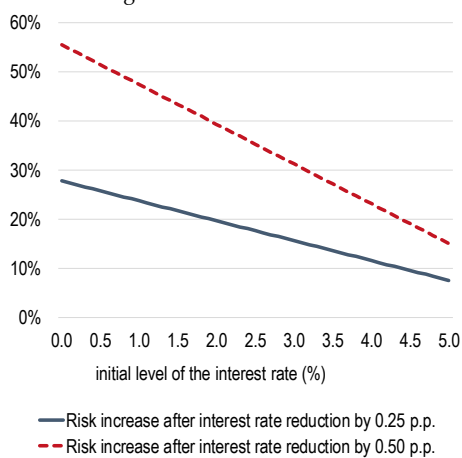
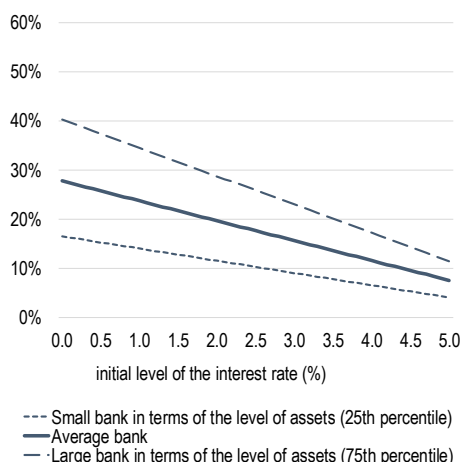
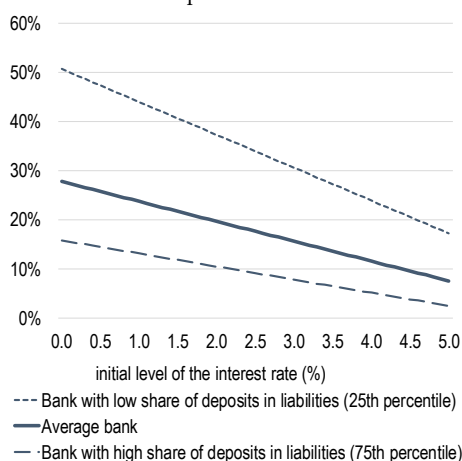
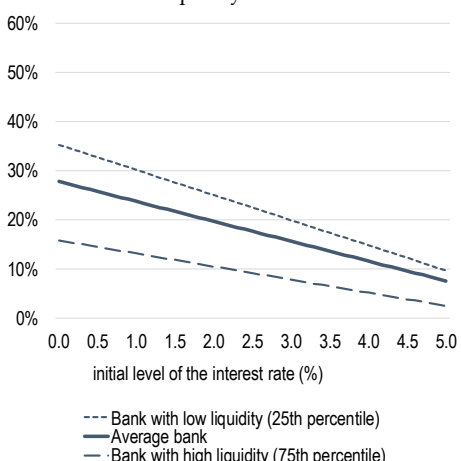
Our approach to constructing the risk measures is based on the concept of changes in the bank's exposure to risk—this means that not only changes in the probability of loan default were taken into account but also the amount (volume) of granted loans. It is worth noting that the current

level of risk present in the bank's portfolio depends both on the characteristics of loans granted in the current period and on changes in risk related to loans granted earlier. The financial situation of existing borrowers may change, leading to higher probability of credit losses by the bank. However, changes in the risk level of the existing portfolio remain under the limited control of the bank. Therefore, the risk measures used were based on the structure of only those net loans that appeared in a given period.

For the whole loan portfolio, changes in the structure of loans were analysed by business lines (e.g. housing loans, consumer loans, investment loans for enterprises, etc.) and, in the case of loans granted to non-financial enterprises, by industry. The risk of particular types of loans was measured in two ways. The probability of a borrower's bankruptcy was approximated either by the share of provisions created for loan impairment or by the implied average profitability level.

Model estimates indicate a negative correlation between the level of nominal interest rates and the increase in risk taken by banks. The aforementioned relationship exists both at the level of the entire loan portfolio and the corporate loan portfolio. It is worth stressing that, in accordance with the intuition, this relationship is non-linear: the specific change in interest rates has a stronger impact on the risk taken by banks at lower levels of rates than at higher rates. However, the functioning of the risk-taking channel was confirmed only with respect to the part of the banks' loan portfolio which consists of corporate loans. The strength of effects of the risk-taking channel for banks is also not considerable. Changes in the level of risk resulting from a typical decline in interest rates (interest rate reduction by 0.25 or 0.5 perc. points) are smaller than the typical volatility of the analysed risk measure (Figure 33.A).

The banks' response to a decline in the short-term interest rate depends on their characteristics. In particular, the increase in the risk of new loans in response to the expansionary monetary policy is stronger in the case of large banks (with high assets), with a smaller deposit base and a lower degree of liquidity (Figure 33.B, Figure 33.C, Figure 33.D).

Figure 33. Impact of the short-term interest rate falls on the level of risk (in % of its typical volatility)**A.** Effects of a 0.25 and 0.50 p.p. decrease of the interest rate in an average bank**B.** Effects of a 0.25 p.p. decrease of the interest rate in banks of various sizes**C.** Effects of a 0.25 p.p. decrease of the interest rate in banks with various deposit bases**D.** Effects of a 0.25 p.p. decrease of the interest rate in banks with various liquidity

Notes: The impact of interest rate changes by 0.25 perc. points and 0.50 perc. points on risk—depending on the initial interest rate level—was expressed in relation to the typical volatility of the risk measure. Typical risk volatility is approximated by the standard deviation of the risk measure used in the study.

Source: Chmielewski *et al.* (2020).

In the case of the entire loan portfolio, it has not been confirmed that banks with different characteristics responded differently to interest rate changes, so it is uncertain whether the increase in the risk after a decrease of interest rate is the result of the supply or demand effects. Thereby we are not able to rule out that interest rate changes result only in changes in the structure of borrowers applying for loans (e.g. low interest rates encourage more risky borrowers who would not be able to use the banks' offer at higher interest rates).

3.1.5 Impact of monetary policy on consumption of households with debt

3.1.5.1 Analysis at microeconomic data level

When analysing the transmission mechanism at the stage of the bank credit market, it is useful to widen the perspective and to look not only at issues related to credit demand, credit supply and risk profile of new lending, but also at the effects of monetary policy decisions on entities already holding a loan. In the context of studies on the monetary policy transmission mechanism in Poland, this issue is important due to the fact that the domestic credit market is dominated by loans bearing an interest rate indexed to short-term money market interest rates (NBP, 2019). For this reason, the central bank's decisions have a direct impact not only on entities which are only considering raising external financing—especially in the form of loans—but also on the debt servicing of households and enterprises which had previously taken out loans. Assuming that income levels remain unchanged, an increase in interest rates means, for indebted households, a decline in free cash flow that can be used for consumption or investment (saving). Therefore, the strength of the monetary impulse effect may depend on the free cash-flow buffers available to indebted entities.

An additional factor important for studies on the monetary policy transmission mechanism in Poland is the continuously observed expansion of the group of borrowers. Along with the development of the credit market, not only the ratio of granted loans to GDP changes, but also the number of households that repay various types of financial liabilities (Table 3 in the section 1.2.4). A larger number of households with debt means that more entities are directly affected by the central bank's decisions through the above-mentioned mechanism of changes in free cash flow. In addition, changes in the structure of borrowers—the extent to which new borrowers have similar sensitivity to monetary policy to those who already have a loan—may affect changes in the transmission mechanism over time.

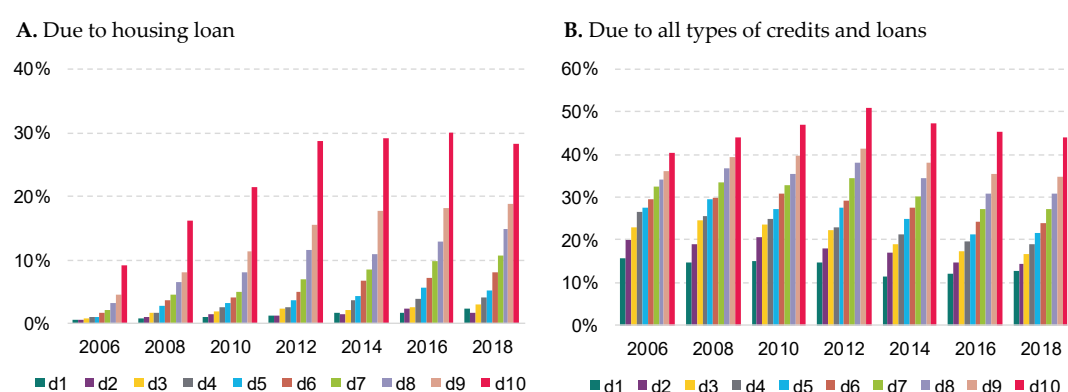
The results of the Household Budget Survey (HBS) carried out regularly by Statistics Poland (GUS, 2018) allow drawing some conclusions concerning the above issues.⁴⁶ First of all, changes in central bank interest rates—through changes in cash flows necessary to service loans—affect primarily households with relatively high incomes. The fact that a household is indebted, especially on account of a housing loan, is strongly correlated with its income⁴⁷—the higher the income

⁴⁶ In addition to the basic demographic characteristics of the household, this survey collects information on, among others, the structure and volume of consumption and expenses related to the service of financial liabilities, including bank loans. The caveat is that these are values reported by individual households, not verified on the basis of documents. It can also be expected that certain characteristics of households (e.g. arrears in payments, including the repayment of loans and credits) may be correlated with a lower propensity of such households to participate in the survey. On the other hand, a higher percentage of refusals of households with a higher income typically encountered in this type of surveys leads to underrepresentation of households with housing loans in the sample. However, comparing the sample analysed with external data sources leads to the conclusion that the group of households with housing loans is well represented.

⁴⁷ The category “income” is defined as disposable income, i.e. the difference between current household income (less advances on income tax and social security and health insurance contributions) and expenditure (see GUS, 2018). In order to standardise the level of the income relative to the size of the household, the size of the household was measured according to the so-called OECD Modified Equivalence Scale, where a value of 1 is attributed to the first adult in the household, a value of 0.5 is attributed to each subsequent member of the household aged 14 or over and a value of 0.3 is attributed to all children under 14.

decile, the higher the share of households with debt (Figure 34) in a given decile. In addition, the dynamic growth in the number of borrowers with a housing loan in the years 2006-2012 was concentrated mainly in the group of households with the highest income. The last years of the period in question demonstrate however an increase in housing loans granted to households from slightly lower deciles of the distribution, but still rather above its median. On the other hand, households with income in lower income deciles are more likely to use non-residential loans and credits (Figure 34.B), which are less sensitive to interest rate changes in the period after their granting. However, due to the typically short maturities of these loans and the propensity of borrowers to renew (roll over) their debt (BIK, 2017), also in this case, changes in the central bank's interest rates affect, although probably with a longer delay, the amount of cash flow needed to service the debt.

Figure 34. Share of indebted households by income decile

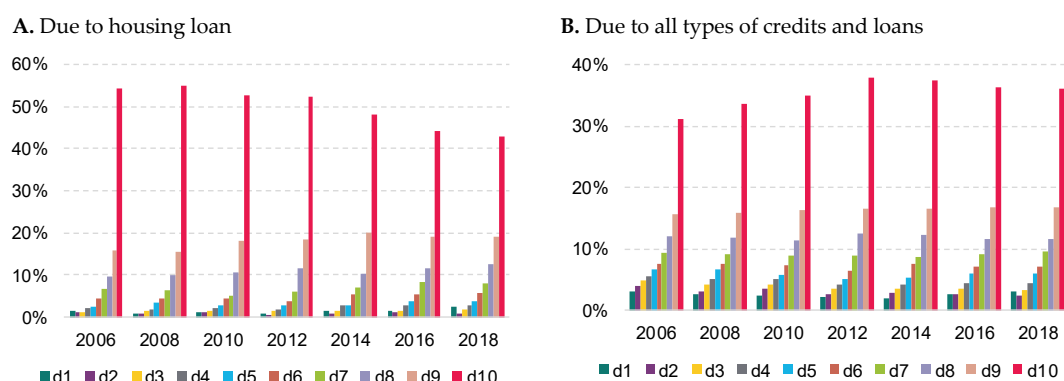


Note: the symbols d1 to d10 indicate the successive deciles of the distribution of households according to disposable income per equivalent unit (see footnote 47), d1 - lowest income, d10 - highest income.

Source: Own calculations based on GUS (HBS).

Secondly, higher income borrowers account for the dominant part of household debt service expenditure (Figure 35). This is particularly evident in the case of housing loans — households from the two highest income deciles account for over 60% of cash flows from the household sector to the banking sector related to the current servicing of this type of debt. Changes in short-term interest rates may therefore affect a concentrated group of households through the channel of changes in free cash flow available to borrowers (e.g. La Cava *et al.*, 2016).

Figure 35. Share of households' loan servicing expenditure to the total of such expenditure of all households by income decile



Note: the symbols d1 to d10 indicate the successive deciles of the distribution of households according to disposable income per equivalent unit (see footnote 47), d1 – lowest income, d10 – highest income.

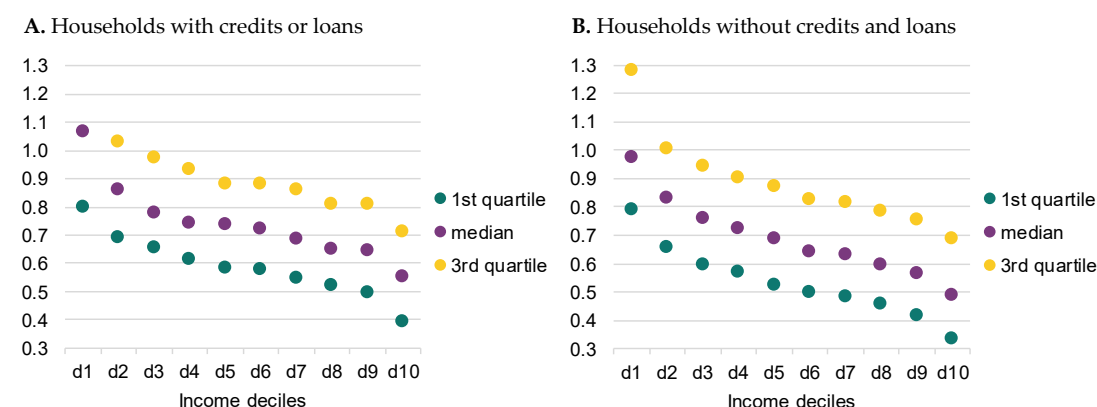
Source: NBP calculations based on GUS (HBS) data.

Thirdly, indebted households demonstrate a higher level of consumption than households comparable in terms of income level which are not indebted. This is illustrated by the analysis of the distribution of the average propensity to consume, i.e. the ratio of expenditure on consumer goods and services to disposable income, depending on the fact of repaying debt⁴⁸ (Figure 36). Higher level of consumption of indebted households can be considered as a factor potentially increasing the impact of monetary policy on aggregate demand.

Fourth, expenditure on debt servicing incurred by households in higher income deciles is systematically higher in relation to consumption expenditure and disposable income than in the case of lower-income indebted households (Figure 37). This may have a significant impact on the strength of transmission of monetary policy shocks when an increase in interest rates, resulting in higher principal and interest instalments, would involve substitution between consumer expenditure and debt servicing expenditure. Under such circumstances, a high ratio of debt servicing costs to consumption expenditure would imply the necessity of a significant reduction in consumption by such households and, due to their share in the consumer expenditure of the entire sector, a noticeable reduction in aggregate household demand (see section 3.1.5.2).

⁴⁸ The difference in the level of consumption between indebted and non-indebted households does not result to a significant extent from financing of the current consumption with credit. Particularly in the case of housing loans, the observed group of indebted households had incurred their liabilities in earlier periods.

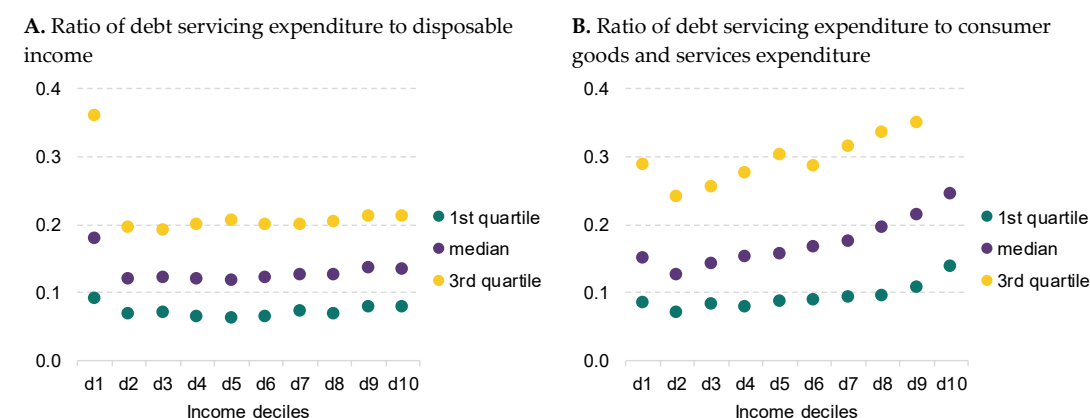
Figure 36. Ratio of expenditure on consumer goods and services to disposable income (average propensity to consumption) by income decile



Note: deciles of the distribution of households according to disposable income per equivalent unit (see footnote 47), d1 – lowest income, d10 – highest income. Data for 2018.

Source: Own calculations based on GUS (HBS).

Figure 37. Distribution of households burden due to debt servicing by income decile



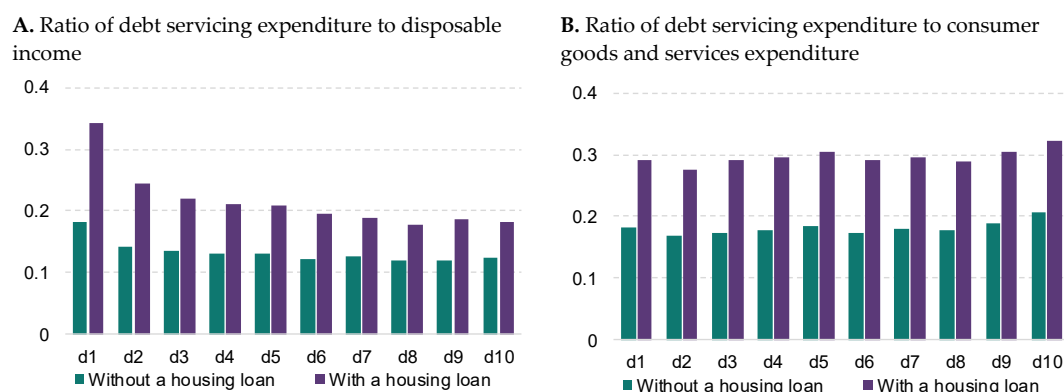
Note: the symbols d1 to d10 indicate the successive deciles of the distribution of households according to disposable income per equivalent unit (see footnote 47), d1 – lowest income, d10 – highest income.

Source: Own calculations based on GUS (HBS).

Fifth, households with housing loans⁴⁹—compared to indebted households with a similar level of income but without such loans—demonstrate a higher burden on the current disposable income with expenditure on servicing liabilities and a higher ratio of expenditure on servicing liabilities to consumer expenditure (Figure 38). For this reason, they may be more directly affected by changes in central bank interest rates due to the automatic adjustment of interest rates on existing housing loans to changes in money market interest rates.

⁴⁹ Households with housing loans also include households which repay both housing loans and other loans or credits.

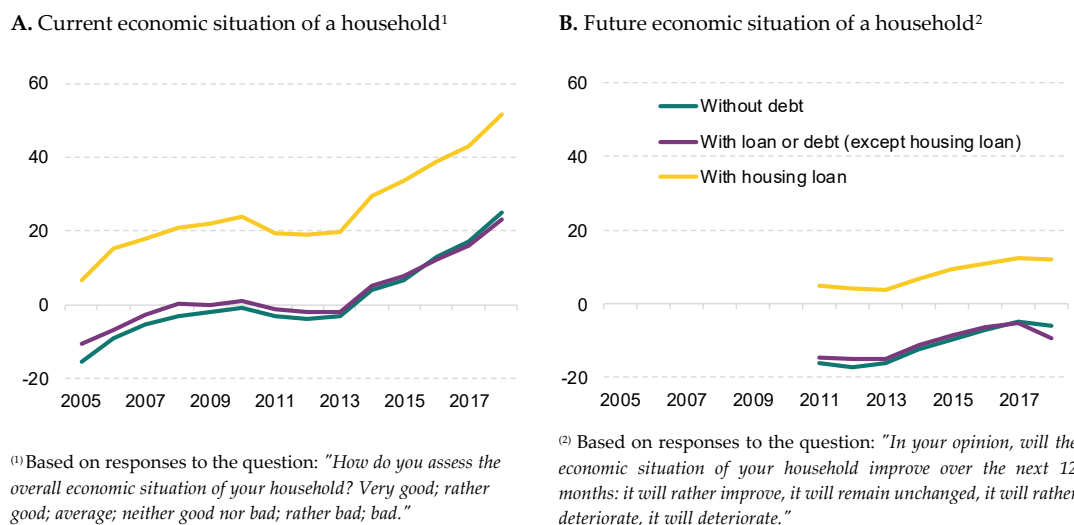
Figure 38. Household burden due to debt servicing by income decile and type of debt



Note: The charts show average values. Deciles of the distribution of households according to disposable income per equivalent unit (see footnote 47), d1 – lowest income, d10 – highest income.

Source: Own calculations based on GUS (HBS) data for 2018.

Sixth, the status of household activity in the credit market is correlated with a subjective assessment of the current and future economic situation (Figure 39). Households paying off a housing loan are more likely to choose positive answers than households without debt or indebted, but without housing loans. This is probably mainly related to the average higher income in this group. Subjective assessments of households' own economic situation may be significant from the point of view of analyses of the potential strength of the central bank's influence on the economy since more optimistic assessment may reduce the propensity of households to accumulate savings determined by a precautionary motive, or even increase the propensity to borrow and the scale of borrowing. On the other hand, the larger scale of indebtedness of individual households, as mentioned earlier, suggests a greater extent of potential impact of the central bank's decisions on households' consumption decisions as a result of changes in the level of expenditure necessary to service the debt.

Figure 39. Subjective assessments of the economic situation of a household by debt status

Note: The charts present balance statistics summarising in a synthetic way the structure of answers to the survey question. Balance statistics present a weighted sum of fractions of answers to the survey question, where the most positive answer has a weight of 1, the neutral answer 0 and the most negative answer -1. The intermediate responses have the weight of 0.5 and -0.5 respectively. A higher value of balance statistics means increased household optimism and a lower value means increased pessimism.

Source: Own calculations based on GUS (HBS).

3.1.5.2 Attempt to assess the impact of the cash-flow channel on consumption

The long period of stable interest rates in Poland and changes in the number and structure of borrowing households over that time hinder accurate estimation the response of these entities to monetary policy shocks which may occur in the future. However, it is possible to make an attempt to assess this response, taking into account certain individual household characteristics. When estimating the ratio of possible changes in the amount of debt servicing expenditure (the amount of principal and interest instalments) to expenditure on consumer goods and services at the level of individual households, we have adopted simplifying assumptions, which make it necessary to treat the results obtained as values close to the maximum possible effects.

The response of household consumption to a change in available free cash flow after a change in monetary policy parameters depends on a number of factors. First, on the liquidity buffers held by the household and the accumulated assets that can be used to cover differences in debt servicing expenditure. Secondly, on the willingness to change the amount of potential resources allocated to systematic saving (if a household, despite debt repayment, decided to accumulate saving assets in parallel). Thirdly, on the propensity to potentially adjust the volume of consumer expenditure and the possibility to generate additional revenue from other sources.

The following analysis is based on a simplifying assumption that the change (increase) in the amount of the principal and interest instalments paid is followed by an adjustment (decrease) in consumer expenditure in the same amount. This approach means that the estimated effect of monetary policy shocks on aggregate consumption for the group of households analysed may

be slightly overestimated. However, it is worth remembering that the household sector in Poland is characterised by a relatively low saving rate, so there is probably no much room for adjustment through savings, and the higher interest income from accumulated assets is not likely to affect strongly the consumption of indebted households. In addition, after monetary policy tightening, the prospect of generating income on the labour market should deteriorate, so adjustment through additional income does not appear to be potentially important either.⁵⁰

In order to estimate the possible scale of the impact of interest rate changes on consumption, we use information provided by households concerning the amount of debt servicing expenditure, the type of debt (housing and other loans) and, in the case of housing loans, the remaining repayment period and the currency.⁵¹ For liabilities other than housing loans, average maturity was taken from external sources (BIK, 2017), whereas data on average lending rates were derived from interest rate reporting submitted by commercial banks to NBP. We also assumed that the loans are repaid in equal principal and interest instalments. With such assumptions, it was possible to estimate the total amount of liabilities for individual households and the change in the debt servicing expenditure due to change in interest rates.

The estimates of the likely impact of interest rate changes on consumption presented below refer to the moment after the end of the full cycle of interest rate adjustments compared to the situation before the monetary policy shock. In line with what has been mentioned above, the estimates relate only to the effect of changes in debt servicing expenditure. Therefore, neither the effects of higher interest income, if any, nor changes in income linked to the monetary policy shock or the effects of inter-temporal substitution are taken into account.

With the assumptions presented so far, on the basis of the available data it can be concluded that households that have taken out a housing loan are most sensitive to interest rate changes.⁵² In the case of households with a housing loan in PLN, it can be estimated that the change in expenditure on debt servicing after an increase in interest rates by 1 perc. point would be equivalent to 1.9% of consumption expenditure of this group of households. It is worth noting that this effect would be even higher in the case of households with FX housing loans (2.4% of consumer spending); however, the interest rate on these loans does not depend on the decisions of NBP.

The effect of an interest rate increase would be much smaller in the case of indebted households, which, however, do not repay housing loans. In their case, the effect of changes in instalments after an increase in interest rates by 1 perc. point can be estimated as equivalent to 0.3% of their consumer expenditure. The difference in the scale of the effect between households repaying housing loans and those whose debt concerns only consumer loans and credits stems from several

⁵⁰ A factor that may contribute to the understatement of the estimates presented is the fact that the HBS data used, as in the case of other such surveys, demonstrate under-representation of high-income households. The survey data indicate that such households are more likely to become borrowers while at the same time they demonstrate a higher ratio of debt servicing expenditure to consumer spending. This means that the share of households with credit in the analysed sample is lower than in the whole population, which may translate into a higher impact of changes in debt servicing expenditure on consumption, *ceteris paribus*, for the whole population.

⁵¹ Data on the remaining repayment term and the currency of housing loans in the HBS are available for the entire sample until 2017.

⁵² This estimate also takes into account the changes in expenditure on servicing other loans and credits taken out by these households.

factors. The most important of them is the difference between the level of housing loans and consumer loans. Additionally, due to the long repayment period of housing loans, especially in the initial period of their duration, the principal and interest instalments are dominated by interest payments. This means that a change in the interest rate translates into a significant change in the instalment amount. Finally, households with housing loans spend more on debt servicing in relation to consumer expenditure than households repaying liabilities other than housing loans.

As mentioned above, some indebted households are not directly affected by the domestic monetary policy due to holding housing loans bearing interest at rates determined for other currencies. However, it is possible to indicate a scenario in which, due to the global increase in economic activity, interest rates will increase at a similar time in Poland and abroad. In such a scenario, it can be estimated that the cumulative effect of changes in debt servicing expenditure for all categories of indebted households could be equivalent to 1.1% of their consumer spending.

Estimating the magnitude of the impact of the monetary policy shock on aggregate demand within the cash-flow channel requires assessing the role of indebted households in total consumption. With the above mentioned caveats as to the degree of representativeness in the analysed sample of households' structure in terms of their activity in the credit market, it can be estimated that the changes in debt servicing expenditure for loans bearing interest at a rate dependent on the domestic monetary policy after a 1 perc. point increase in interest rates would be equivalent to approx. 0.25% of consumer expenditure of all households (regardless of whether they are indebted or not). If such a change in interest rates also applies to loans bearing interest based on foreign interest rate indices, the total effect would increase to approx. 0.35% of consumer spending.

3.2 The impact of MPC communication and decisions on private sector expectations

Managing private sector expectations is an essential element of the monetary policy transmission mechanism. These expectations are influenced not only by monetary policy decisions but also by the information made available by the central bank to the general public. For this reason contemporary central banks develop various forms of communication with private sector agents.

In the recent study (Baranowski *et al.*, 2020) we attempt to answer the question to what extent the communication of NBP and changes in short-term interest rates influence the expectations of financial sector analysts regarding the NBP reference rate and CPI inflation. The analysis covered the period of 2011-2019 or, for the longest horizon considered, 2007-2019. We have considered the central bank's communication as fully as possible, taking into account the GDP and inflation projections prepared by NBP staff and published by NBP, the tone of the descriptions of discussions at the MPC meetings (minutes) and controlling possible effects of forward guidance.

For the analysis of the tone of minutes, we use a dictionary text analysis, which consists in counting the relative frequency of words or phrases with positive and negative connotations. The words (phrases) analysed are predefined by the authors of the dictionary. In the context of monetary policy, we look for the words (phrases) associated with a loose or restrictive the monetary stance and the difference in their frequency in central bank documents is a synthetic measure of their

tone. In our study we use two dictionaries designed for monetary policy analysis, i.e. the BN dictionary (Bennani and Neuenkirch, 2017) and the ABG dictionary (Apel and Blix Grimaldi, 2014). The obtained measure of tone of the minutes' was orthogonalized relative to the information available at the time of publication of the minutes.

The results of the study show that, depending on the horizon and the forecasted variable, inflation expectations of the private sector respond to the central bank's communication (Figure 40). The NBP reference rate expected 2-3 quarters ahead rise after a positive surprise in NBP's GDP growth projection, while one-year-ahead inflation expectations rise after a positive surprise in the inflation projection published by the central bank. The strength of this impact is not large, but it is also not negligible: on average, the surprise of the NBP inflation projection in the projection horizon (current year and two subsequent years), equal to 1 perc. point, shifts the expected annual inflation by about 0.14 perc. points. The impact of a corresponding surprise in the NBP projection related to the GDP growth rate on the expected change in the NBP reference rate seems even greater and exceeds 0.2 perc. points.

The results concerning the significance of central bank tone for the expectations of financial sector analysts are largely sensitive to the choice of the dictionary. In the case of interest rate expectations, the tone measured by the ABG dictionary is more important, while in the case of inflation expectations, we identify the impact of the tone of communication only for the BN dictionary. This may result from the fact that the dictionaries used in the analysis are based on a different linguistic models (single words vs. phrases), therefore the obtained measures of the central bank tone catch slightly different aspects in MPC communication.

The central bank's tone shocks (measured with the use of ABG dictionary) have a positive impact on the NBP reference rate expectations in the current quarter and in two subsequent quarters. This means that when the tone of the discussion descriptions of the decision-making body becomes more hawkish, experts expect a more restrictive monetary policy in the coming quarters. After a typical increase in the NBP communication measure, the expected level of the NBP reference rate increases by about 0.03-0.04 perc. points. Moreover, the tone of the communication affects interest rate expectations in the one-year ahead horizon; however, we are only able to confirm this on a longer sample (2007-2019).

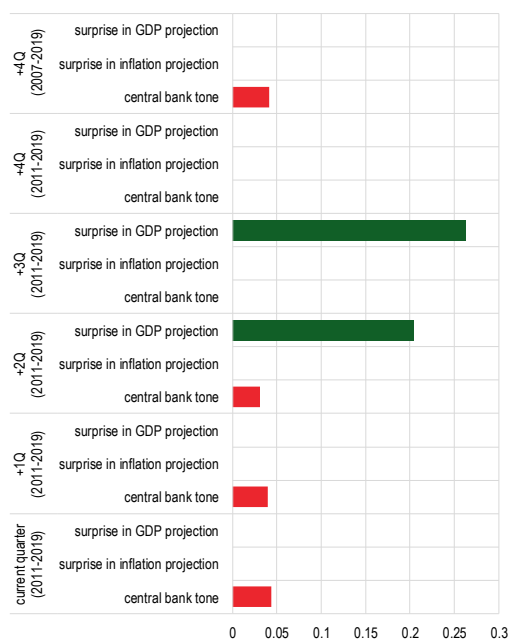
The tone of MPC communication seems to influence also inflation expectations; however, only in a very short time horizon (current and next quarter). The impact of a typical change in the central bank tone on inflation expectations is similar to the impact of a typical CPI inflation surprise.

As far as macroeconomic surprises are concerned, it turns out that unexpected changes in economic activity— both in GDP and retail sales growth rates—lead to the revision of the expected NBP reference rate path, while the CPI and PPI inflation surprises affect inflation forecasts of financial sector analysts. Interestingly, macroeconomic surprises change the expectations of experts in terms of interest rates and inflation in almost all, even relatively long, forecasting horizons (see Baranowski *et al.*, 2020).

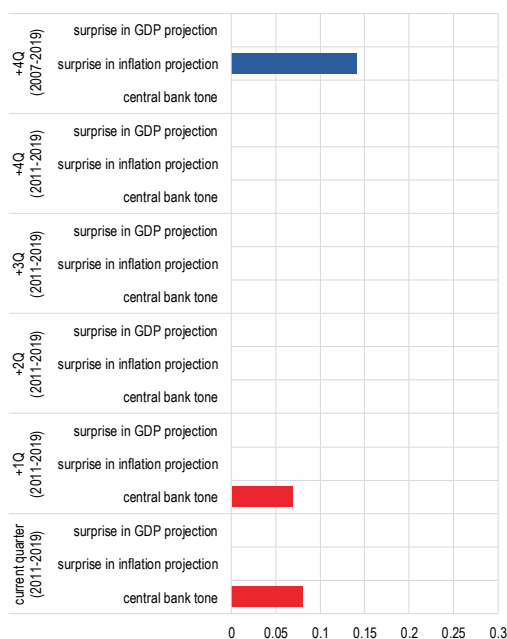
Summarising the role of the central bank's communication in shaping private sector expectations, it can be generally stated that the tone of the MPC minutes affects primarily expectations for the immediate future (current quarter and next quarter) and the macroeconomic projections affect expectations in a slightly longer horizon (two quarters and later).

Figure 40. Impact of typical changes in central bank communication variables on revisions of private sector forecasts

A. NBP reference rate forecasts, tone measured with the use of ABG dictionary



B. CPI inflation forecasts, tone measured with the use of BN dictionary



Notes: The chart includes estimates of statistically significant parameters at the level of at least 5%. A description of the models and detailed results are presented in Baranowski *et al.* (2020).

Source: Baranowski *et al.* (2020).

Conclusion

This report contains a number of new elements that broaden the knowledge of the mechanism of monetary policy transmission in Poland. First of all, the latest analyses increasingly use granular data, indicating the heterogeneity of private sector entities in responding to monetary policy changes and exchange rate shocks. Second, we take into account structural factors affecting the monetary transmission mechanism related to the labour market and the credit market in a more comprehensive way. Third, the scope of data used in transmission mechanism analyses is also extended in other directions than microeconomic data – when analysing the transmission in the sector of commercial banks as well as in modelling macroeconomic expectations, we make more intensive use of survey data, while in the analyses of central bank communication we take into account the text content of monetary authorities' documents. Fourth, by observing the changes in the monetary policy transmission mechanism over time, we use sophisticated tools enabling to draw conclusions concerning the uncertainty related to the effects of potential monetary policy decisions in the nearest future.

Our research on the importance of bank credit, performed in the context of the study on the effects of monetary policy, has potential applications in the field of financial stability analysis. In the report we introduced a new index of commercial banks' lending policy stance and we have also used new empirical measures of the risk taken by banks when granting new loans. The directions of our work show how far the analyses relating to price stability and monetary policy measures in this area intertwine with the area of financial stability.

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