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# Changes in Bank Lending Standards and the Macroeconomy: Evidence from Mongolia

Poghosyan Tigran, Davaasukh Damdinjav, Dulamzaya Batjargal, Tserendavaa Tsend-Ayush, Bat-Orgil Bat-Erdene, Gerelmaa Baatarchuluun

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# Changes in Credit Standards and the Macroeconomy: Evidence from Mongolia

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**ABSTRACT:** This paper examines the macroeconomic effects of credit supply shocks in Mongolia. Using bank credit surveys and a newly constructed indicator of changes in lending standards, adjusted for macroeconomic and bank-specific factors influencing credit demand, we identify the impact of credit supply disruptions on key macroeconomic variables. Our findings reveal that one standard deviation shock to credit supply leads to an initial reduction in total lending growth, output growth, and inflation. Decomposing the shocks into credit supply components we find that shocks to enterprise and household lending also have similar effects on respective lending growth rates. However, household credit supply shocks have a stronger impact on output growth, while enterprise credit supply shocks have a stronger impact on inflation. Variance decomposition analysis suggests that adjusted credit supply shocks purged from demand fluctuations hold significant power in explaining the variability of macroeconomic variables. Overall, our results confirm the importance of credit supply shocks for macroeconomic variables in Mongolia.

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| Author’s E-Mail Address: | tpoghosyan@imf.org, davaasukh@mongolbank.mn, dulamzaya@mongolbank.mn, tserendavaa.ts@mongolbank.mn, batorgil.ba@mongolbank.mn, bgerelmaa@imf.org |

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WORKING PAPERS

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# Contents

# I. Introduction

How do changes in credit supply impact the macroeconomy? Understanding this relationship is especially crucial for policymakers in emerging economies like Mongolia, where credit supply disruptions are common. This volatility stems from the country's heavy reliance on fluctuating mining exports, the dominant role of banks in the financial sector, limited access to alternative financing, and a growing yet underdeveloped capital market. However, distinguishing the supply-side effects of bank lending from demand-driven factors presents a significant empirical challenge, as the same factors that influence credit supply—such as shifts in monetary policy—can also simultaneously affect credit demand.

This study seeks to identify credit supply shocks in Mongolia by isolating changes in bank lending standards that are not influenced by bank-specific or macroeconomic factors that simultaneously affect credit demand. To achieve this, we construct a measure of credit supply shocks using bank-level responses from a quarterly bank lending surveys (BLS) submitted to the Bank of Mongolia. We then employ an econometric model to filter out demand-related influences, yielding a more precise measure of credit supply shifts driven by factors such as changes in internal lending guidelines, regulations, supervisory policies, and industry strategies. Finally, we use these adjusted supply shocks, along with unadjusted lending standards, to assess their impact on key macroeconomic variables.

The use of a Vector Autoregression (VAR) methodology in this study is well-justified given its advantages in capturing the dynamic interrelationships among macroeconomic variables, particularly in a small open economy like Mongolia where data limitations and endogenous feedback effects are prevalent. VAR models allow for the simultaneous modeling of credit supply, output, and inflation, making them especially suitable for analyzing the transmission of credit supply shocks over time. Unlike Local Projections (LP), which estimate each horizon-specific response separately and often suffer from efficiency loss and volatility in small samples (Jordà, 2005), VARs, particularly Bayesian VARs, are better equipped to handle limited data and provide more precise impulse response functions (Koop & Korobilis, 2010). Moreover, VAR models facilitate structural identification of shocks using techniques such as Cholesky decomposition or sign restrictions, enabling the clear isolation of credit supply shocks from other macroeconomic disturbances (Uhlig, 2005). The ability to conduct forecast error variance decomposition further enhances the explanatory power of VARs, allowing researchers to quantify the contribution of credit supply shocks to the variability in key macroeconomic indicators, an essential insight for policy analysis (Stock & Watson, 2001). Given these strengths, the VAR framework offers a robust and policy-relevant tool for assessing how changes in bank lending standards affect macroeconomic outcomes in Mongolia.

Using a VAR methodology, we find that tighter credit supply conditions lead to declines in lending growth, output growth, and inflation for several quarters following the shocks, with the effects gradually phasing out in the medium term. Specifically, impulse response functions (IRFs) suggest that a one-standard-deviation increase in the credit supply tightening indicator reduces lending growth by 5 percentage points, output growth by 1 percentage point, and inflation by 0.8 percentage points at its peak. Breaking down these shocks by credit supply components, we observe that both enterprise and household lending shocks have similar effects on their respective lending growth rates. However, household credit supply shocks exert a stronger influence on output growth, while enterprise credit supply shocks have a more pronounced effect on inflation. The variance decomposition analysis suggests that adjusted credit supply shocks hold significant power in explaining the variability of macroeconomic variables. Overall, our findings underscore the significant role of credit supply shocks in shaping key macroeconomic variables in Mongolia.

The findings of this research provide valuable insights for policymakers in Mongolia. First, monitoring credit standards should be a key priority for the Bank of Mongolia (BOM), as tighter lending conditions have significant consequences for loan growth and overall economic activity. Given the observed lag in the effects on real GDP and inflation, BOM must remain attentive to delayed impacts and consider counter-cyclical measures to mitigate potential economic downturns. Second, the pronounced and prolonged contraction in economic activity following a tightening of credit supply highlights the importance of proactive macroprudential regulation. Strengthening regulatory frameworks can help prevent supply-side disruptions from escalating into deeper recessions, ensuring greater financial and economic stability.

The remainder of the paper is structured as follows. Section II presents the literature review. Section III goes into detail about data and stylized facts. Section IV identifies adjusted credit supply shock. Section V analyzes the impact of credit supply shocks on the macroeconomic variables. The last section concludes.

# II. Literature Review

The interaction between credit supply and demand, as observed through BLS, plays a crucial role in macroeconomic outcomes, shaping the transmission of monetary policy and macroeconomic fluctuations. Policy rate changes influence credit markets through borrowing costs and banks' risk-taking behavior, with easing credit standards amplifying policy effects while tightening may counteract them (Bernanke and Blinder, 1988; Jiménez and others, 2012). Credit supply, being procyclical, exacerbates macroeconomic cycles by fueling booms and deepening recessions, while BLS provides early warnings of shifts in credit availability (Adrian and Shin, 2010). Sectoral differences in credit sensitivity highlight the importance of BLS for targeted policy interventions, particularly in real estate and SMEs, which heavily rely on bank financing (Gertler and Karadi, 2011). Furthermore, lending standards serve as indicators of underlying risks in the banking system and broader economy, offering valuable insights for macroprudential policy and financial stability (Kashyap and others, 1993).

During economic downturns, credit demand typically declines sharply, while supply may stabilize or recover more quickly due to supportive fiscal and monetary policies (Claessens and others, 2013). Debt-service-to-income (DSTI) thresholds also shape market dynamics: tighter limits reduce borrower eligibility and dampen demand, whereas looser thresholds can encourage excessive borrowing and asset bubbles (ESRB, 2022). Additionally, government interventions such as subsidized mortgages and interest rate reductions tend to stimulate both supply and demand by lowering financing costs and enhancing affordability (Andrews and others, 2011; Kuttner, 2012).

Numerous studies have explored the macroeconomic effects of credit supply shocks, particularly in advanced economies.

- For the United States, Bassett and others (2014) developed an adjusted lending standards indicator using U.S. bank survey data to isolate credit supply effects, which was more recently applied by Broadbent and others (2024). Their findings highlight the significant impact of credit supply shocks on GDP and lending capacity, emphasizing banks' role in business cycle fluctuations. Lown and Morgan (2006) analyzed U.S. credit cycles using the Loan Officer Opinion Survey, demonstrating that tighter lending standards often precede economic downturns, making them a useful predictive tool for business cycles. Gilchrist and Zakrajšek (2012) investigated corporate credit spreads, showing that credit supply constraints amplify economic contractions by restricting firms' access to financing.

- For Euro Area, Ciccarelli and others (2010) examined cross-country differences, finding that regulatory frameworks and banking structures significantly influence the transmission of credit supply shocks. Altavilla and others (2019) used bank-level data from the ECB's Bank Lending Survey to develop a loan supply indicator that isolates credit supply shocks from demand-related factors. Their results indicate that tighter credit standards lead to prolonged reductions in lending volumes, higher lending margins, and an increased reliance on market financing by firms.

Emerging markets face distinct challenges due to their vulnerability to external shocks and less developed financial systems. Asea and Blomberg (1998) studied the cyclical nature of lending standards in developing countries, highlighting how tighter credit conditions exacerbate economic volatility and deepen recessions. Mendoza and Terrones (2008) analyzed credit booms and busts, emphasizing external financing's role in creating vulnerabilities. Their findings suggest that sudden reversals in the credit supply often trigger sharp economic contractions.

Several studies on Mongolia's monetary policy transmission highlight the important but heterogeneous role of the credit channel in influencing macroeconomic outcomes. A common finding is that changes in monetary policy, particularly through interest rates and credit conditions, affect loan supply, domestic demand, and inflation. Expansionary monetary policy, particularly during the early 2010s, has been found to boost credit, demand, and inflation, but also to contribute to external imbalances by weakening net foreign reserves. Furthermore, empirical estimates suggest that changes in lending rates and credit availability lead to modest but measurable shifts in loan growth over multiple quarters. These findings underscore that while the credit channel is active in Mongolia, its effects are delayed and come with macro-financial trade-offs (Davaajargal and Khuslen, 2019; Bayardavaa et al., 2015; Urgamalsuvd, 2018; Enkhzaya, 2011). Kabundi (2025) analyzes monetary policy transmission mechanism in Mongolia using Large Bayesian Vector Autoregressive Model and finds support for the lending channel. In particular, a 1 percentage point increase in the policy rate leads to a reduction in lending volume to private sector by 1.8 percentage points and loans to individuals by 1.2 percentage points within a year.

Some studies on Mongolia have examined the reverse relationship; the influence of macroeconomic conditions on bank lending and loan quality. Gan-Ochir and Munkhbayar (2022) used a Bayesian vector autoregression (SBVAR) model to show that external factors such as U.S. monetary policy, Chinese economic activity, and global commodity prices significantly influence liquidity creation in Mongolia. Domestically, lending rates, non-performing loan (NPL) ratios, foreign exchange reserves, and banking sector competition were identified as key determinants. Moreover, Bayardavaa and Davaadalai (2014) assessed macroeconomic shocks on loan quality using a SVAR model (2000–2013 data), finding that exchange rate depreciation and excess money demand harm loan quality, while economic growth, real loan growth, and higher marginal interest rates reduce risk. Enkhzaya (2018) identified macroeconomic factors affecting loan quality, with exchange rate fluctuations, interest rates, and economic cycles having significant impacts. Sector-specific findings indicate that mining, construction, and trade contribute to NPL growth, while in manufacturing, exchange rate depreciation and higher interest rates are the most influential. Tsenguunjav and Saruul (2018) highlighted the role of macroprudential policies in mitigating credit cycles. Their findings suggest that measures such as risk weights, loan-loss provisioning, and reserve requirements help stabilize financial conditions; for example, imposing higher risk weights on foreign currency mortgage loans effectively reduces credit growth. Additionally, Gan-Ochir (2023) examined the macroeconomic impact of Covid-19 in Mongolia, a commodity-exporting country, and emphasized how the pandemic disrupted both credit and output dynamics of the economy. The study underscored the heightened vulnerability of Mongolia's financial system to internal and external shocks, with external shocks accounting for over 40% of the variability in key economic indicators such as output, consumer prices, bank credit, and nominal

wages. In particular, the decline in bank credit during the pandemic was initially driven by negative movements in copper and crude oil prices, as well as shocks to China's GDP.

This study builds upon the existing literature by extending the analysis of credit supply shocks to Mongolia drawing on a confidential quarterly BLS that was not used for empirical analysis before. Given Mongolia's high reliance on volatile mining exports, the dominant role of banks in the financial sector, and the underdeveloped capital market, understanding the macroeconomic impact of credit supply shocks as inferred form the BLS is crucial for policymakers. This study aims to fill this gap in the literature and provide empirical analysis of credit supply shocks and their transmission to macroeconomic variables in Mongolia.

# III. Data and Stylized Facts

## A. Quarterly Lending Survey by the Bank of Mongolia

We use data from the quarterly BLS[1] conducted by the Bank of Mongolia since 2017:Q4. The survey covers all banks in the banking system and has a 100 percent completion rate. Over the 2017:Q4-2025:Q1 period, 12 different commercial banks participated in the survey which consists of 3 big, 3 medium, and 6 small banks. Banks are asked to report whether they have changed their credit standards in the previous quarter, for total loans and their components, particularly household and enterprise loans. They answer the following question:

"Over the last quarter, how has your credit standard changed?"

Banks also report on their perception of changes in credit demand, and answer the following question:

"Over the last quarter, how has demand for your credit changed?"

Banks answer both questions by using a qualitative scale ranging from 1 to 5, where 1 indicates a considerable decrease, 2 indicates some decrease, 3 indicates no changes, 4 indicates some increase, and 5 indicates a considerable increase. Using these responses, we create categorical variables for credit standard and credit demand consisting of 5 components as follows:

$$I_{it}^{S}[k] = \begin{cases} -1, & \text{if bank reported considerable easing of credit standard on loan category } k \text{ in quarter } t \\ -0.5, & \text{if bank reported some easing of credit standard on loan category } k \text{ in quarter } t \\ 0, & \text{if bank reported no changes of credit standard on loan category } k \text{ in quarter } t \\ 0.5, & \text{if bank reported some tightening of credit standard on loan category } k \text{ in quarter } t \\ 1, & \text{if bank reported considerable tightening of credit standard on loan category } k \text{ in quarter } t \end{cases}$$

and

[1] The BLS was developed based on the Euro Area Bank Lending Survey's questionnaire. To better reflect with Mongolia's economic structure, each indicator was customized and enhanced. For instance, credit standards were classified by key economic sectors and various loan types. The BLS contains 22 standard questions past and expected changes: 14 backward-looking questions and 8 forward-looking questions related to enterprise and household loans to residents. It covers indicators such as credit standards, credit terms, influencing factors, credit demand and supply by categories.

$$I_{it}^{D}[k] = \begin{cases} -1, & \text{if bank reported considerable decrease in demand for loan category } k \text{ in quarter } t \\ -0.5, & \text{if bank reported some decrease in demand for loan category } k \text{ in quarter } t \\ 0, & \text{if bank reported no changes in demand for loan category } k \text{ in quarter } t \\ 0.5, & \text{if bank reported some increase in demand for loan category } k \text{ in quarter } t \\ 1, & \text{if bank reported considerable increase in demand for loan category } k \text{ in quarter } t \end{cases}$$

We use balance sheet information on loans issued by individual banks for each category *k* to construct a composite index of changes in overall credit standard and demand for loans using weighted averages:

$$\Delta S_{i,t} = \sum_{k} w_{i,t-1}[k] \times I_{i,t}^{S}[k] \quad \text{and} \quad \Delta D_{i,t} = \sum_{k} w_{i,t-1}[k] \times I_{i,t}^{D}[k] \tag{1}$$

where $w_{i,t-1}[k]$ represents the proportion of the bank *i*'s core loan portfolio allocated to category *k* in quarter *t-1*. Next, we use these composite indices to construct a diffusion index of credit standard and credit demand that take continuous values between -1 and 1. This measure reflects differences in loan composition by individual banks and each bank's relative share in total loans in the banking system.

$$\Delta S_{t} = \sum_{i} w_{i,t-1} \times \Delta S_{i,t} \quad \text{and} \quad \Delta D_{t} = \sum_{i} w_{i,t-1} \times \Delta D_{i,t} \tag{2}$$

where $w_{i,t-1}$ represents the fraction of total core loans on BLS respondents' balance sheets that are held by bank *i* at the end of quarter *t-1*.

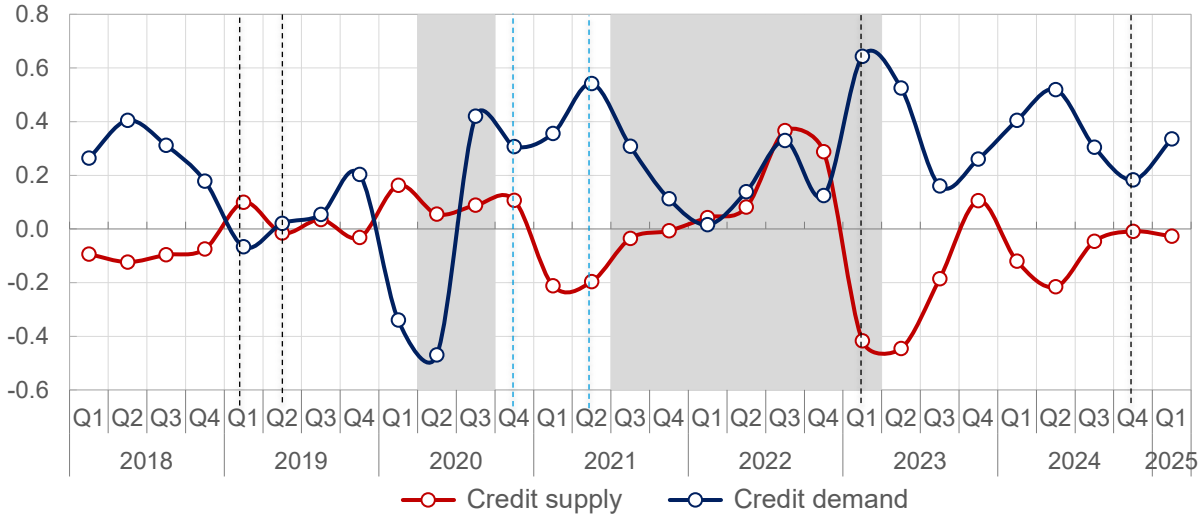
## B. Stylized Facts

**Figure 1** presents the dynamics of the diffusion indices for credit standard and credit demand from the BLS over the sample period. The observed movements in credit supply and demand align with established literature on the interaction between financial conditions and macroeconomic activity. Credit demand typically rises during periods of economic growth, supported by improved income prospects, heightened investment activity, and strengthened borrower confidence (Bernanke and Gertler, 1989; Jermann and Quadrini, 2012). In contrast, credit supply often tightens in expansions due to heightened regulatory constraints or risk-sensitive behavior by lenders, particularly when asset valuations become stretched or macroprudential concerns intensify (Adrian and Liang, 2018; Borio and Zhu, 2012).

During economic downturns[2] credit demand tends to weaken, reflecting deteriorating borrower sentiment and income uncertainty. Simultaneously, credit supply contracts as banks respond to rising credit risks and capital pressures (Peek and Rosengren, 2000; Dell'Ariccia et al, 2012). The co-movement of tightening standards and falling demand during these periods reinforces the procyclicality of credit markets and their role in amplifying macroeconomic fluctuations (Kashyap and Stein, 2000; Lown and Morgan, 2006).

[2] Economic downturn is derived by using Hodrick-Prescott filter on quarterly GDP and two or more consecutive quarters of negative growth is indicated as economic downturn, highlighted by the shaded areas in Figure 1.

**Figure 1. Credit standard and credit demand diffusion indices**

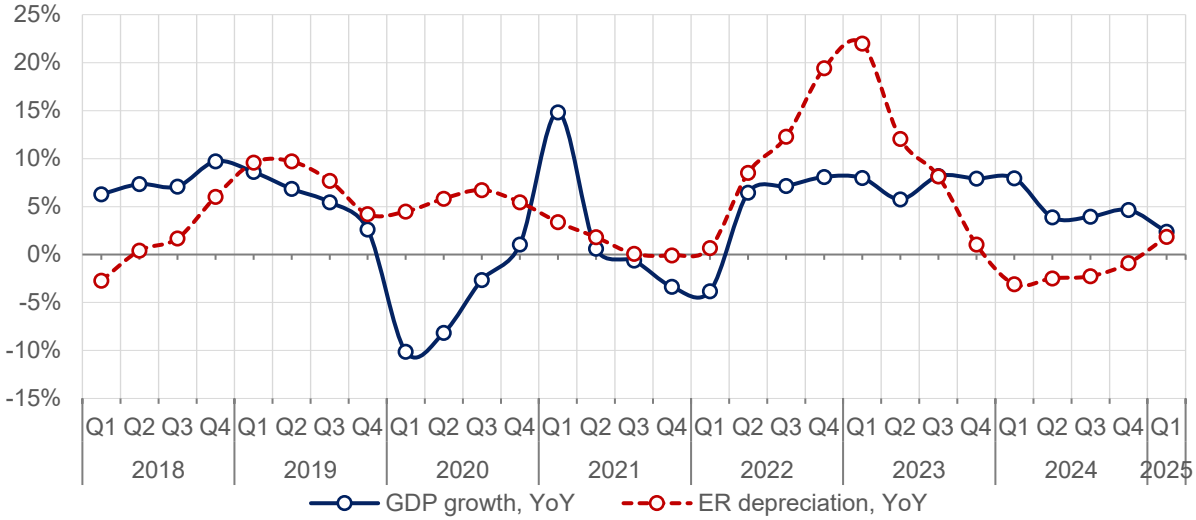



Source: Bank of Mongolia's Bank Lending Survey and authors' calculations.

Note: Sample period: 2017:Q4-2025:Q1. The solid blue line shows the DI of the change in overall bank lending credit standards (credit supply); the red line shows the DI of the change in credit demand. Positive values indicate a net tightening/increase in standards/demand, while negative values indicate otherwise. The vertical dotted lines represent macroprudential policy measures. The grey dotted lines represent tightening measures (70% DSTI cap and 30 months limit on consumer loans in Jan 2019, tightening of DSTI cap on consumer loans from 70% to 60% in Apr 2019, increase in risk weights for pension loans from 100% to 150% in March, 2023, and tightening of DST limit for consumer loans from 60% to 55% in July, 2024), while blue dotted lines represent loosening measures (exclusion of pension loans from DSTI limit in Dec 2020, and elimination of maturity limit for pension loans in July 2021). Grey shaded areas represent economic downturns, derived using Hodrick-Prescott filter on quarterly GDP and two or more consecutive quarters of negative growth.

When comparing to **Figure 2** below one can observe that credit demand has declined sharply during the 2020 COVID pandemic period, which has coincided with a substantial drop in GDP growth. Similarly, banks have tightened their credit standards sharply following a rapid exchange rate depreciation in 2022:Q3-2023:Q1.

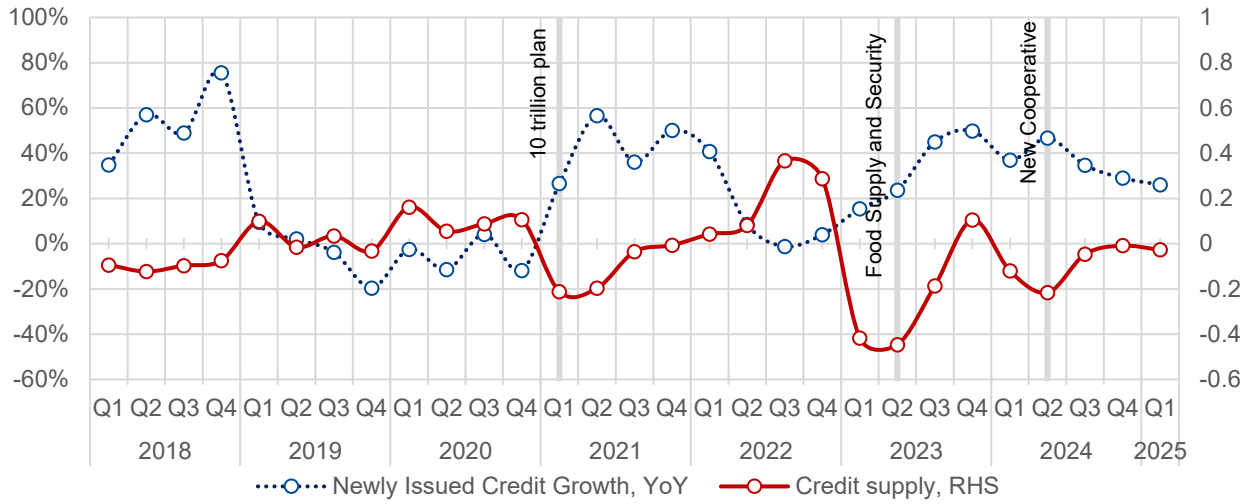
**Figure 2. GDP Growth and Exchange Rate Depreciation**




Source: Bank of Mongolia.

**Figure 3** presents the evolution of outstanding and newly issued credit growth during the sample under consideration. Periods of rising credit demand tend to coincide with looser credit standards and higher growth of outstanding loans. However, divergences are noticeable, such as when credit standards tighten despite increased demand, potentially reflecting macroeconomic uncertainties. The volatility in these indicators during 2020-2021 likely corresponds to economic disruptions and policy responses during the pandemic, followed by stabilization in the subsequent year. In February 2021, when the economy was stagnant, and employment had declined, the government of Mongolia approved a comprehensive 10 trillion MNT plan aimed at revitalizing money and credit growth, reducing interest rates, and supporting employment and investment resulting in around 0.1 percent growth in outstanding loans. Moreover, recent trends in 2023 show an uptick in loan growth alongside fluctuating credit demand and standards which may be a signal for economic activity as food revolution program was approved in April of 2023 which also made banks ease their credit standards to issue loans at around 5-6 percent.

**Figure 3. Credit Growth**




Source: Bank of Mongolia.

Note: In February 2021, the Mongolian government introduced the 10 trillion MNT Comprehensive Plan, a set of economic measures aimed at stimulating growth, reducing debt, supporting the financial sector, and enhancing social welfare, with a total funding target of 10 trillion MNT. In June 2022, the 36th resolution of the Parliament on "Measures to Ensure Food Supply and Security" was approved, and the General Agreement on Loans was signed by the government, banks, and the Bank of Mongolia in April 2023. The program provided subsidized loans to food and agricultural producers to support domestic production and reduce dependency on food imports. In April 2024, the Government of Mongolia launched the "New Cooperative" Campaign to enhance the livelihoods of herder families through cooperatives by providing subsidized loans, with a target of issuing MNT 1.0 trillion in loans in 2024.

# IV. Identification of Credit Supply Shocks

As discussed above, the changes in credit supply reported by banks in the quarterly credit survey reflect the combination of supply and demand factors. To “purge” the impact of demand factors and isolate the net changes in credit standards, we use the following empirical specification following Broadbent and others (2024):

$$S_{it} = \beta_1 S_{it-1} + \beta_2 D_{it} + \lambda_1' E_{t-1}[m_{t+4} - m_t] + \lambda_2' f_t + \eta_i + \varepsilon_{it} \quad (3)$$

where $S_{it}$ is DI of bank credit standard (for the current quarter), $D_{it}$ is DI of bank credit demand (of the current quarter), $m_t$ is GDP forecast, $f_t$ is a current economic condition including real GDP growth, policy rate, inflation, and the quarterly change in risk tolerance[3], $\eta_i$ is bank-specific variables and fixed effects.

**Table 1. Variable Definitions**

| Variable | Measurement | Unit | Source |
|---|---|---|---|
| DI of credit standard | Credit standard for the current quarter | Index | BOM BLS survey |
| DI of credit demand | Credit demand for the current quarter | Index | BOM BLS survey |
| GDP forecast | 1 year ahead GDP projection | Percent | BOM (survey of experts) |
| Real GDP growth | YoY growth of log of GDP in 2015 prices | Percent | NSO |
| Inflation | Annual CPI inflation, base=2023 | Percent | NSO |
| Policy rate | Policy rate | Percent | Bank of Mongolia |
| Risk tolerance | Risk tolerance of banks (enterprise loan type) | Index | BOM BLS survey |
| Share of core loans | Share of categorized loans reported in BLS survey, by banks | Percent | Bank of Mongolia |
| Share of deposits | Share of deposits, by banks | Percent | Bank of Mongolia |

Source: Bank of Mongolia's Bank Lending Survey, NSO, and authors' calculations.
Note: Real GDP and CPI have been seasonally adjusted prior to applying the log difference for further analysis.

Bank-specific fixed effects are included to control unobservable bank-specific factors that could influence bank responses to the survey (e.g., smaller banks tend to report broadly unchanged standards, while there is a bigger variation in responses by bigger banks).

The empirical model incorporates several control variables to comprehensively capture the factors influencing banks' credit standards $S_{it}$. The lagged dependent variable is added to control for the persistence of lending standards. Past decisions about tightening or easing credit standards often persist due to banks' inertia in decision-making. For example, conservative policies adopted during economic uncertainty may be carried forward into subsequent periods, sustaining tighter credit conditions. Conversely, prior easing of standards can encourage continued credit expansion. Similarly, the diffusion index of credit demand $D_{it}$ for the current quarter serves as another critical control, reflecting the dual role of credit demand in credit supply. Moreover, $m_t$ characterizes economic outlook which uses the values of $m_{t+4}$ and $m_t$ that is available on the survey of experts of Bank of Mongolia. Current economic indicators $f_t$ including real GDP growth, the policy rate, inflation, and shifts in risk tolerance—reflect banks' immediate perceptions of the economic environment. Lastly, we incorporated bank-specific factors ($\eta_i$) that could influence how banks establish their credit policies, such as risk tolerance, the proportion of core loans, and the share of deposits. These controls ensure the model accounts for real-time adjustments to credit supply driven by prevailing economic trends.

**Table 2** presents estimation results for total loans. Column (1) includes only the lagged level of credit standards and the bank-specific DI of credit demand, column (2) adds the expected real GDP growth as an economic outlook variable, column (3) includes the country-level macroeconomic conditions, column (4) adds policy rate, and column (5) includes bank-specific factors. As expected, tighter credit standards in the current quarter have a statistically significant effect on tightening standards in the next quarter, providing evidence of persistence in credit standards. A one-unit tightening in one quarter leads to a 0.32–0.37 unit tightening in the following quarter. We also find a strong negative relationship between credit demand and credit standards. Specifically, a one unit increase in credit demand leads to a 0.38 unit loosening of credit standards. This aligns with Mongolia's practice where credit standards tend to loosen in periods of rising credit demand, and vice versa.

[3] The risk tolerance indices are derived from BOM's Bank Lending Survey. Positive values indicate improved risk tolerance, while negative values indicate worsened risk tolerance.

**Table 2. Bank Credit Standards: Total Loans (OLS Estimates)**

| | Dependent variable: DI of bank credit standards for total loans | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Lag of credit standard | **.329*** ** | **.329*** ** | **.329*** ** | **.328*** ** | **.373*** ** |
| | (.02) | (.021) | (.023) | (.023) | (.021) |
| DI of credit demand | **-.381*** ** | **-.382*** ** | **-.381*** ** | **-.381*** ** | **-.38** ** |
| | (.106) | (.114) | (.117) | (.117) | (.136) |
| GDP outlook $y_{t+4} - y_t$ | | -.005 | .032 | .031 | .031 |
| | | (.046) | (.055) | (.056) | (.052) |
| Real GDP growth: $y_t - y_{t-4}$ | | | .026 | .024 | .032 |
| | | | (.104) | (.105) | (.103) |
| Inflation: $p_t - p_{t-4}$ | | | .069 | .062 | .051 |
| | | | (.081) | (.08) | (.066) |
| Policy rate change: $r_t$-$r_{t-1}$ | | | | .024 | .026 |
| | | | | (.038) | (.037) |
| Risk tolerance: $\Delta Risk_{i,t-1}$ | | | | | **-.435*** ** |
| | | | | | (.057) |
| Share of core loans: $CoreLns_{i,t-1}$ | | | | | .195 |
| | | | | | (.126) |
| Share of deposits: $CoreDep_{i,t-1}$ | | | | | -.176* |
| | | | | | (.088) |
| Constant | .006** | .006* | -.001 | 0 | -.001 |
| | (.002) | (.003) | (.007) | (.007) | (.01) |
| Observations | 330 | 330 | 330 | 330 | 330 |
| R-squared | .301 | .301 | .304 | .304 | .34 |

*Robust standard errors are in parentheses,*
**** p<.01, ** p<.05, * p<.1*

Note: Sample period: 2017Q4 to 2025Q1, Obs.=330; No. of banks=12; Dependent variable: DI of Credit Standards at bank i in quarter t, Bank fixed effects are included in the estimation.
Source: Bank of Mongolia's Bank Lending Survey, and authors' calculations.

As for macroeconomic determinants of credit standards – they are mostly insignificant, suggesting that broader economic conditions do not directly influence credit standards. Instead, economic conditions may be reflected in credit demand. However, risk tolerance becomes significant and negative in model (5), suggesting that when banks perceive greater risk tolerance, they ease credit standards.

**Tables 3** and **4** present estimation results for the same regressions run separately for household and enterprise loans. The results remain broadly unchanged. There is evidence of persistence in credit standards and a negative association with credit demand for both credit standards of enterprise and household. Economic growth and economic outlook are mostly insignificant. However, for household credit standards, the findings suggest that rising inflation is associated with tighter credit standards, possibly due to concerns over economic stability or inflation-driven interest rate hikes. The negative and significant coefficient on risk tolerance indicates that banks ease credit standards on household loans when they perceive improved risk tolerance.

**Table 3. Bank Credit Standards: Enterprise Loans**

| | Dependent variable: DI of bank credit standards for enterprise loans | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Lag of credit standard | **.285*** ** | **.286*** ** | **.286*** ** | **.285*** ** | **.311*** ** |
| | (.068) | (.07) | (.073) | (.073) | (.082) |
| DI of credit demand | **-.245*** ** | **-.244** ** | **-.245** ** | **-.245** ** | **-.252** * |
| | (.069) | (.079) | (.084) | (.083) | (.116) |
| GDP outlook: $y_{t+4} - y_t$ | | .008 | .011 | .008 | .01 |
| | | (.048) | (.031) | (.031) | (.03) |
| Real GDP growth: $y_t - y_{t-4}$ | | | -.01 | -.014 | -.008 |
| | | | (.065) | (.065) | (.063) |
| Inflation: $p_t - p_{t-4}$ | | | .059 | .046 | .042 |
| | | | (.097) | (.096) | (.078) |
| Policy rate change: $r_t$-$r_{t-1}$ | | | | .053 | .053 |
| | | | | (.062) | (.064) |
| Risk tolerance: $\Delta Risk_{i,t-1}$ | | | | | **-.217** ** |
| | | | | | (.091) |
| Share of core loans: $CoreLns_{i,t-1}$ | | | | | .21 |
| | | | | | (.122) |
| Share of deposits: $CoreDep_{i,t-1}$ | | | | | **-.222*** ** |
| | | | | | (.056) |
| Constant | .004*** | .004* | 0 | .001 | .002 |
| | (.001) | (.002) | (.009) | (.009) | (.016) |
| Observations | 330 | 330 | 330 | 330 | 330 |
| R-squared | .201 | .201 | .204 | .205 | .234 |

*Robust standard errors are in parentheses*
*** p<.01, ** p<.05, * p<.1*

Note: Sample period: 2017Q4 to 2025Q1, Obs.=330; No. of banks=12; Dependent variable: DI of Credit Standards at bank i in quarter t. Bank fixed effects are included in the estimation.
Source: Bank of Mongolia's Bank Lending Survey, and authors' calculations.

**Table 4. Bank credit standards: Household loans**

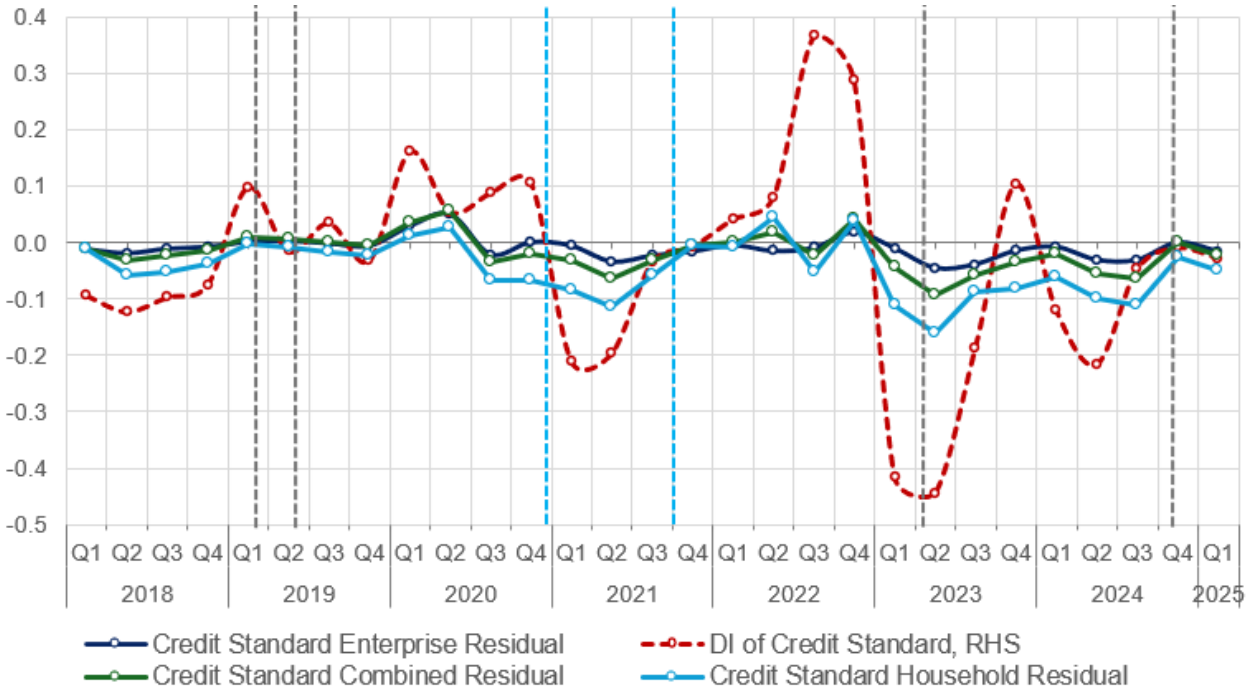
| | Dependent variable: DI of bank credit standards for household loans | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Lag of credit standard | **.328*** ** | **.328*** ** | **.324*** ** | **.325*** ** | **.358*** ** |
| | (.022) | (.022) | (.03) | (.03) | (.04) |
| DI of credit demand | **-.43*** ** | **-.433*** ** | **-.431*** ** | **-.431*** ** | **-.424*** ** |
| | (.077) | (.079) | (.086) | (.086) | (.09) |
| GDP outlook: $y_{t+4} - y_t$ | | -.027 | .038 | .039 | .034 |
| | | (.02) | (.084) | (.085) | (.078) |
| Real GDP growth: $y_t - y_{t-4}$ | | | .053 | .054 | .056 |
| | | | (.118) | (.12) | (.114) |
| Inflation: $p_t - p_{t-4}$ | | | .088 | .092 | .075 |
| | | | (.081) | (.073) | (.074) |
| Policy rate change: $r_t$-$r_{t-1}$ | | | | -.016 | -.01 |
| | | | | (.043) | (.045) |
| Risk tolerance: $\Delta Risk_{i,t-1}$ | | | | | **-.506*** ** |
| | | | | | (.031) |
| Share of core loans: $CoreLns_{i,t-1}$ | | | | | .095 |
| | | | | | (.1) |
| Share of deposits: $CoreDep_{i,t-1}$ | | | | | -.198 |
| | | | | | (.157) |
| Constant | .004** | .004** | -.006 | -.006 | .004 |
| | (.001) | (.002) | (.006) | (.006) | (.012) |
| Observations | 330 | 330 | 330 | 330 | 330 |
| R-squared | .291 | .291 | .295 | .295 | .325 |

*Robust standard errors are in parentheses*
*** p<.01, ** p<.05, * p<.1*

Note: Sample period: 2017Q4 to 2025Q1, Obs.=330; No. of banks=12; Dependent variable: DI of Credit Standards at bank i in quarter t. Bank fixed effects are included in the estimation.
Source: Bank of Mongolia's Bank Lending Survey, and authors' calculations.

The residuals from these regressions reflect net credit standards that are purged from demand factors. **Figure 4** plots these residuals of credit standards for total loans, as well as their components (household and enterprise loans) compared with DI of credit standards. A visual inspection of the figure reveals two key insights. First, comparing credit standards with the credit diffusion index shows some differences. The diffusion index tends to be more volatile compared to the credit standards, with the difference between the two reflecting the impact of demand factors. Second, comparing credit standards for total loans with those for their components shows close co-movement. This implies that changes in credit standards are broadly harmonized across categories of loans.

**Figure 4. Residuals**




Source: Bank of Mongolia's Bank Lending Survey, and authors' calculations.

Note: Sample period: 2017Q4 to 2025Q1, Obs.=330; No. of banks=12; Red dotted line represents diffusion index (DI) of credit standards on the right scale while the green line depicts the residual of Table 2, dark blue line represents the residuals of Table 3, and the light blue line shows the residuals of Table 4. Computed residuals have been multiplied by the share of outstanding C&I loan of bank *i* at quarter *t*. The vertical dotted lines represent macroprudential measures (see above).

# V. The Impact of Credit Supply Shocks on the Macroeconomy

In this section, we analyze the dynamic impact of credit supply shocks on macroeconomic variables using a VAR model. The sample period covers 2017:Q4 – 2025:Q1. The specification with 4 variables and 1 lag takes the following form:

$$Y_t = \Phi_1 Y_{t-1} + \epsilon_t \quad (4)$$

where $Y_t$ is a four-dimensional vector of endogenous variables and $\epsilon_t$ are the residuals. The endogenous variables include a measure of credit supply shock, lending growth (y/y), output growth (y/y), and CPI inflation (y/y). Given the short sample, we use a specification with only 1 lag.[4]

We consider two alternative estimations:

- A version of VAR with adjusted lending shocks estimated as residuals from the panel regressions described above. Since adjusted lending shocks are already purged from demand fluctuations, we order them first in the Cholesky decomposition with the assumption that they are not affected contemporaneously by any other endogenous variable in the VAR:

$$\mathrm{Y_t} = \begin{bmatrix} \text{Adjusted supply shocks}_\mathrm{t} \\ \text{Lending growth}_\mathrm{t} \\ \text{Output growth}_\mathrm{t} \\ \text{Inflation}_\mathrm{t} \end{bmatrix}^{5} \tag{5}$$

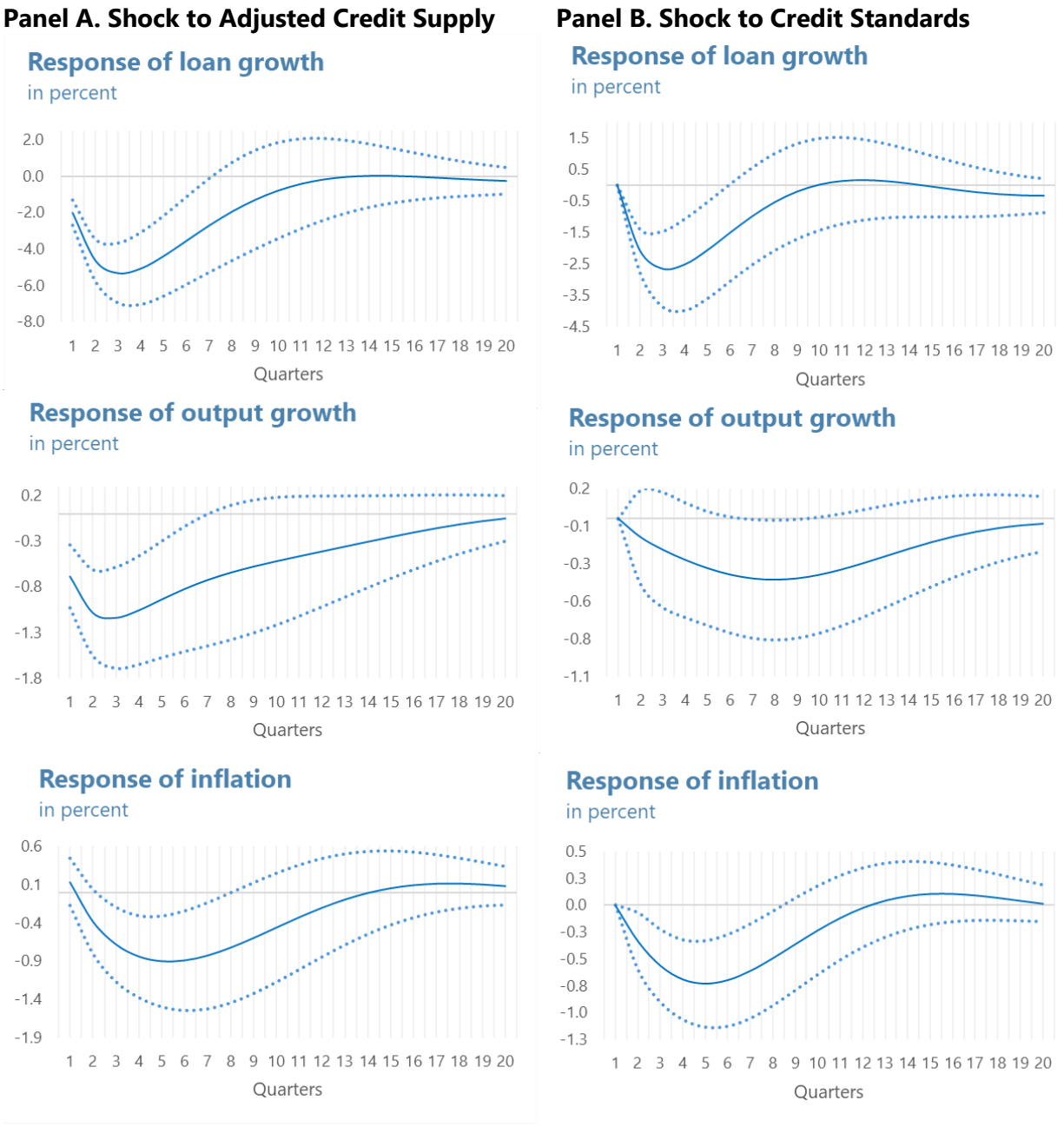
- A version of VAR with unadjusted lending standards expressed by the diffusion index. In this specification, lending standards are ordered last, since the estimation needs to extract all endogeneity in the process of identifying exogenous supply shocks.

$$\mathrm{Y_t} = \begin{bmatrix} \text{Lending growth}_\mathrm{t} \\ \text{Output growth}_\mathrm{t} \\ \text{Inflation}_\mathrm{t} \\ \text{Credit standards}_\mathrm{t} \end{bmatrix} \tag{6}$$

**Figure 5** presents impulse response functions (IRFs) illustrating the impact of credit supply shocks to total lending, output growth, and inflation. In both specifications, a tightening in credit supply (credit supply shock) leads to a significant decline in lending growth, output growth, and inflation, in line with expectations. The impact is most pronounced in the first two years following the shock (with one exception) before gradually phasing out in the medium term. Specifically, a one standard deviation tightening in adjusted credit supply reduces the lending growth by 5 percentage points, output growth by 1 percentage point, and inflation by 0.8 percentage points at its peak (left panel). The right panel, which reflects credit tightening based on unadjusted credit standards, shows a somewhat smaller but still substantial impact. These findings highlight the contractionary effects of tighter credit conditions on the broader economy, reinforcing the critical role of credit supply in economic activity.

[4] Results with 2 lags are conceptually comparable, but less significant.
[5] where 'lending growth' refers to the year-on-year growth of outstanding loans in the banking sector, 'output growth' refers to the year-on-year growth of 4 quarter rolling sum of real GDP, and 'inflation' is the year-on-year growth of quarterly average CPI of Ulaanbaatar city, base = 2020.

Figure 5. IRFs for Credit Supply Shock: Total Loans

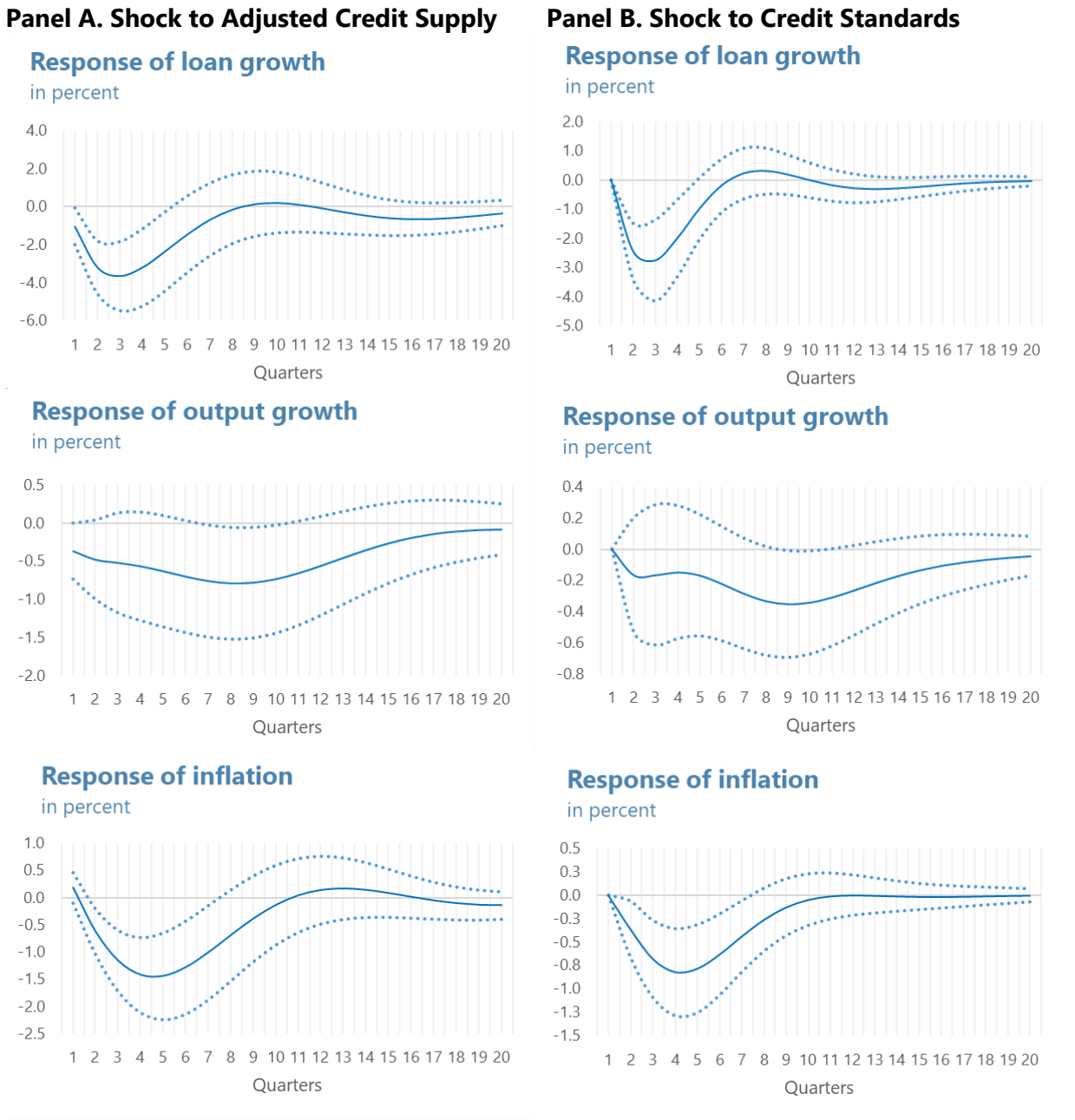



Source: Bank of Mongolia's Bank Lending Survey, and authors' calculations.

Note: The IRFs illustrate the dynamic responses of lending growth, output growth, and CPI inflation to the credit supply shocks over a 20-quarter horizon. The left panel shows IRFs from the specification with adjusted lending shocks, while right panel shocks IRFs from the specification with original credit standards/diffusion indices. Dotted blue lines represent the 68 percent confidence intervals.

In the next step, we try to better understand the relative importance of supply shocks to enterprise and household loans in shaping macroeconomic variables.

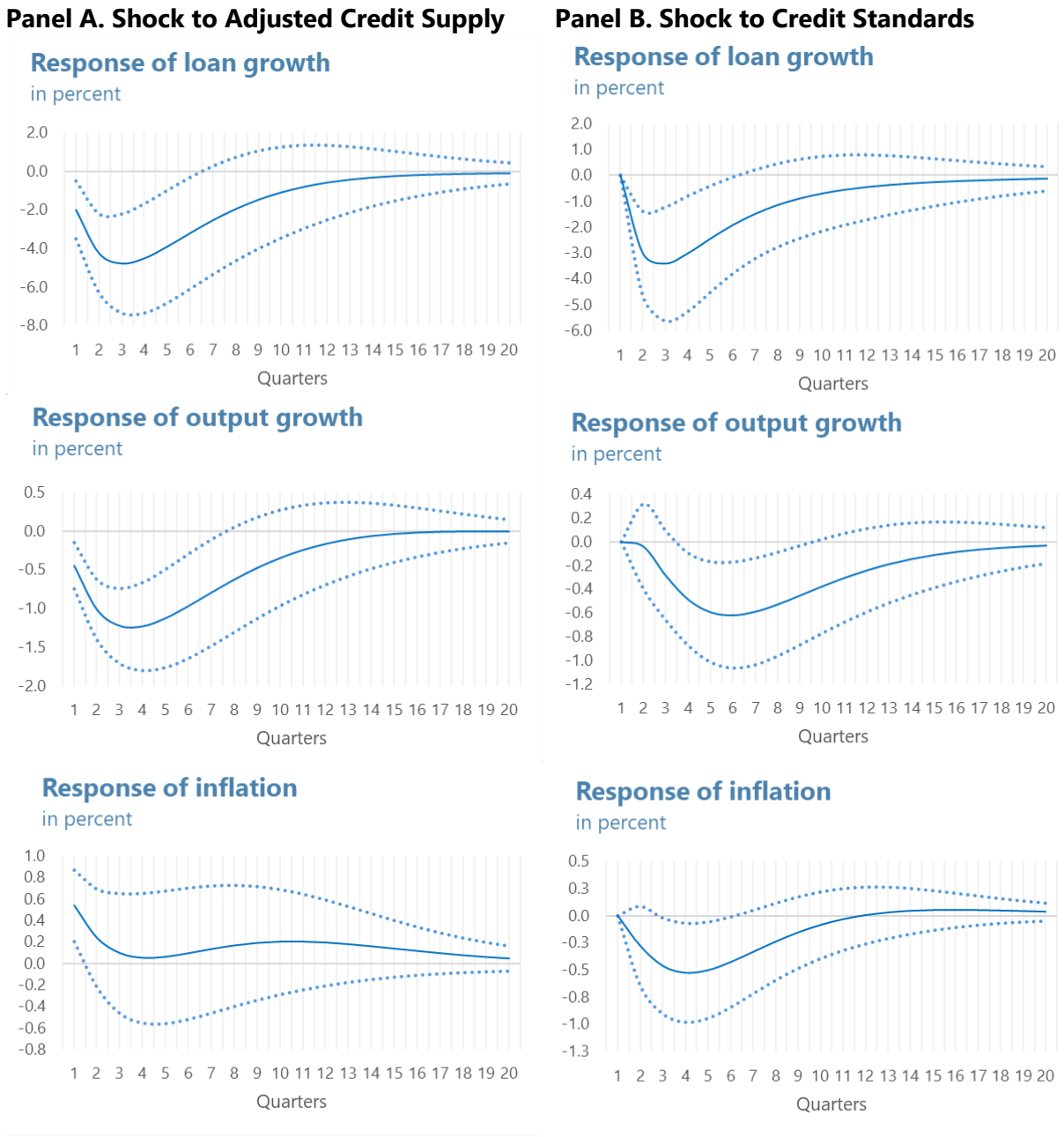
Figure 6. IRFs for Credit Supply Shock: Enterprise Loans




Source: Bank of Mongolia's Bank Lending Survey, and authors' calculations.

Note: The IRFs illustrate the dynamic responses of enterprise lending growth, output growth, and CPI inflation to the enterprise credit supply shocks over a 20-quarter horizon. The left panel shows IRFs from the specification with adjusted lending shocks, while right panel shocks IRFs from the specification with original credit standards/diffusion indices. Dotted blue lines represent the 68 percent confidence intervals.

Figure 7. IRFs for Credit Supply Shock: Household Loans




Source: Bank of Mongolia's Bank Lending Survey, and authors' calculations.

Note: The IRFs illustrate the dynamic responses of household lending growth, output growth, and CPI inflation to the household credit supply shocks over a 20-quarter horizon. The left panel shows IRFs from the specification with adjusted lending shocks, while right panel shocks IRFs from the specification with original credit standards/diffusion indices. Dotted blue lines represent the 68 percent confidence intervals.

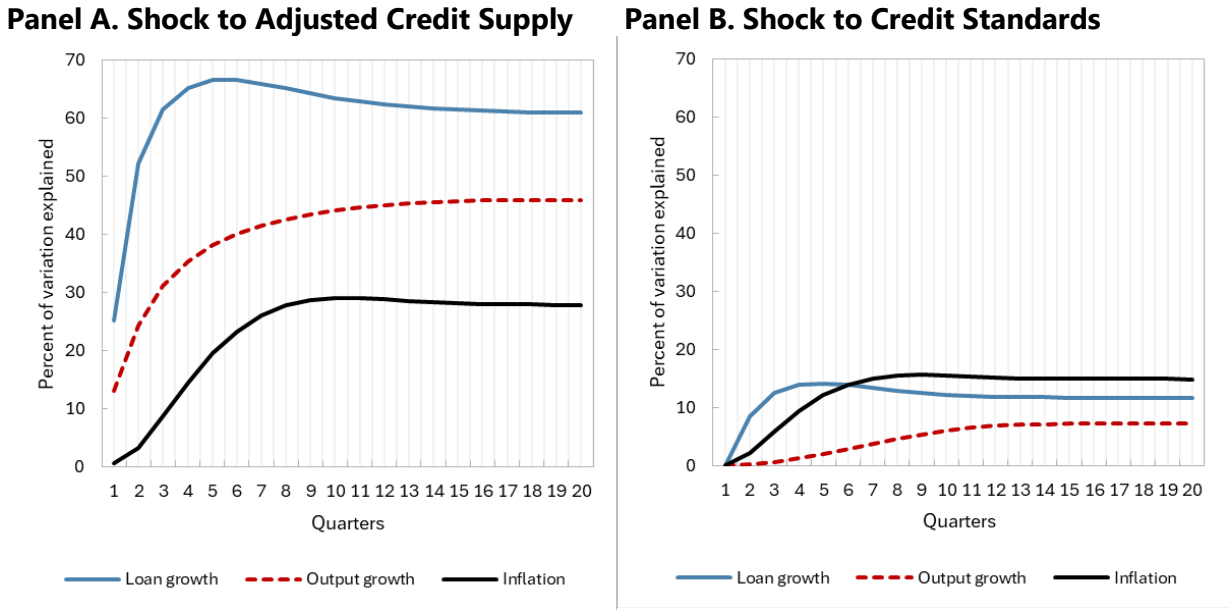
**Figure 6** presents IRFs from the specification analyzing the impact of shocks to enterprise lending supply, while **Figure 7** presents IRFs from the specification analyzing the impact of shocks on household lending supply. In both cases, credit supply shocks have a sizeable impact on lending growth, output growth, and inflation in most instances this impact is significant. However, household credit supply shocks have a stronger and more

significant impact on output growth, while enterprise credit supply shocks have a stronger impact on inflation. One possible reason household credit expansion does not significantly increase inflation is that the resulting household consumption demand is largely absorbed by imports. In contrast, the stronger impact of enterprise loans on inflation may be due to a credit supply shock influencing business costs —such as raw materials and wages — which firms may then pass onto consumers, driving up inflation. Meanwhile the insignificant impact of enterprise loans on output growth may be attributed to businesses shifting to alternative financing sources, such as equity financing and bond issuance, which are expanding in Mongolia.

Another important question to explore is the extent to which variability in the macroeconomic variables within our VAR models can be attributed to different shocks across various forecast horizons, particularly shocks to credit supply. To address this, **Figure 8** presents the forecast error variance decomposition for credit growth, output growth, and inflation, based on a VAR estimated using adjusted credit shocks and credit standards for total loans. The figure illustrates how this decomposition evolves across various forecast horizons, with variance decomposition generally converging to the unconditional variance decomposition within approximately 2–3 years.

Across all variables, adjusted credit supply shocks contribute more to variance than credit standards shocks. Notably, their impact is especially strong on loan growth, explaining over half of its long-term variability. This highlights the significant explanatory power of the constructed adjusted credit supply measure.

**Figure 8. Variance Decomposition for Credit Supply Shock: Total Loans**

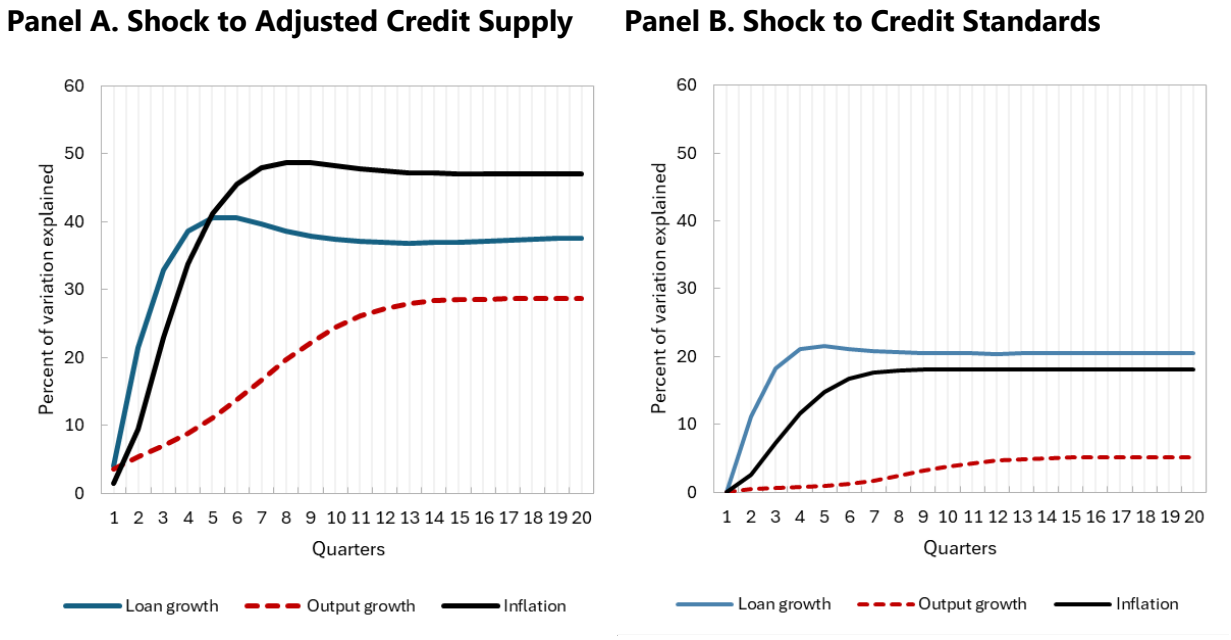



Source: Bank of Mongolia's Bank Lending Survey, and authors' calculations.

Note: The variance decomposition is constructed via Cholesky decomposition. Reported is the share of variances as percent of the total error variance for up to 20 quarters forecast horizon attributed to each given shock.

**Figures 9** and **10** display the variance decomposition of loan growth, output growth, and inflation using a VAR model estimated with adjusted credit supply shocks and credit standard shocks for enterprise and household loans. In both cases, credit supply shocks have lower explanatory power compared to the model for total loans, except for credit standard shocks on enterprise loan growth. However, adjusted credit supply shocks account for a significantly larger share of macroeconomic dynamics than credit standard shocks.

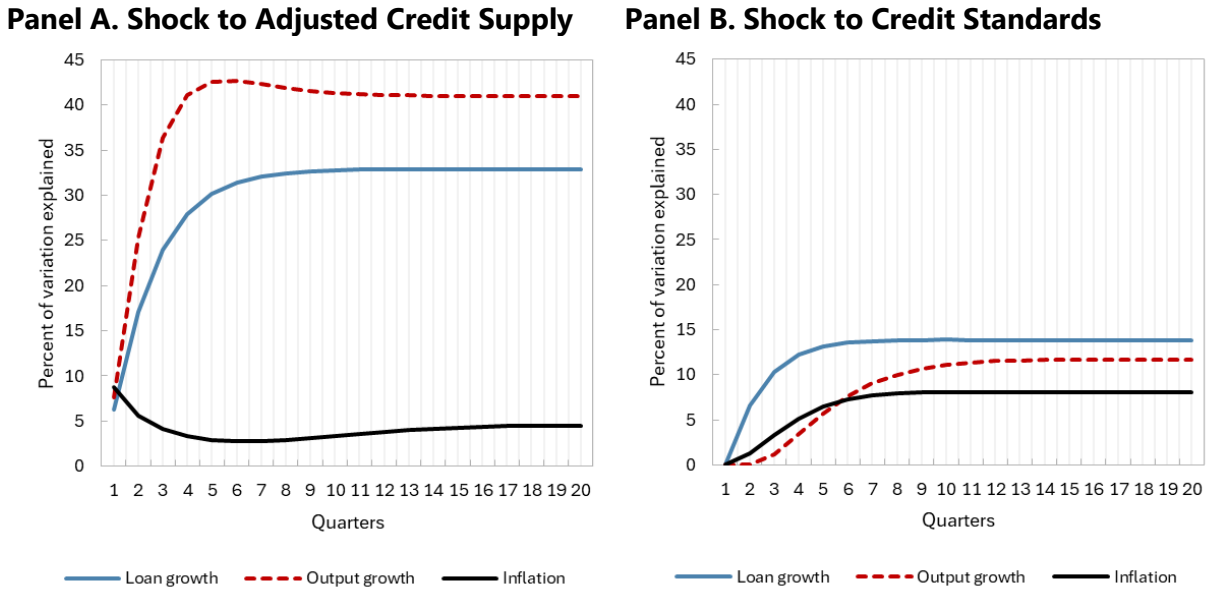
Figure 9. Variance Decomposition for Credit Supply Shock: Enterprise Loans




Source: Bank of Mongolia's Bank Lending Survey, and authors' calculations.

Note: The variance decomposition is constructed via Cholesky decomposition. Reported is the share of variances as percent of the total error variance for up to 20 quarters forecast horizon attributed to each given shock.

Figure 10. Variance Decomposition for Credit Supply Shock: Household Loans




Source: Bank of Mongolia's Bank Lending Survey, and authors' calculations.

Note: The variance decomposition is constructed via Cholesky decomposition. Reported is the share of variances as percent of the total error variance for up to 20 quarters forecast horizon attributed to each given shock.

# VI. Robustness Check

As part of our robustness checks, we incorporated external factors such as year-on-year growth in the exchange rate and coal prices into the baseline model to account for macroeconomic shocks that may influence credit standards. While the results indicate a positive association between exchange rate depreciation and the tightening of credit standards, this relationship is not statistically significant, suggesting that the exchange rate may not be a primary driver of credit conditions during the sample period. Additionally, to control potential unobserved heterogeneity and time-specific policy effects, we introduced dummy variables capturing the implementation of major government interventions. These include (i) the introduction of the 10 trillion MNT Comprehensive plan in 2021Q1, (ii) the General Agreement on Loans under the Food Supply and Security initiative in 2022Q3, (iii) the "New Cooperative" campaign supporting herder households in 2024Q2. Including these dummy variables jointly allows us to control for the potential influence of large-scale fiscal and financial programs on credit standards, beyond the observable macroeconomic and bank-specific variables. The estimated coefficients for the dummy variables show mixed results: the introduction of the 10 trillion MNT Comprehensive plan has a loosening but statistically insignificant effect on credit standards; while the General Agreement on Loans under the Food Supply and Security initiative shows a positive association at the 10 percent level, suggesting a tightening of credit standards potentially linked to the implementation of the plan, Meanwhile, the 2024Q2 is also statistically insignificant, implying that the New Cooperative Campaign had no discernible short-term effect on credit standards.

Additionally, in our VAR analysis, we modified the variable ordering in the second alternative VAR model. By placing the adjusted credit supply shock last, the findings show that a tightening in credit supply (credit supply shock) causes a notable decrease in lending growth, output growth, and inflation for six quarters, followed by a gradual recovery. Secondly, we have also included year-on-year growth in the exchange rate and coal prices in our VAR model as exogenous variables. New impulse responses yield similar movements to our baseline VAR model for total loans. As for the impact of shocks to enterprise lending supply, the impulse response analysis results indicate that a shock to enterprise type loans temporarily stimulates economic activity but leads to a short-term contraction in lending and downward pressure on prices, with effects fading over time. Moreover, shocks to household lending supply have significant impact on output growth.

When banks implement tighter credit standards, GDP growth tends to slow as firms reduce investment and production due to limited access to financing (Bassett et al., 2014). Corporate loan growth also declines as stricter lending conditions lead to fewer loan approvals and weaker credit demand. Structural VAR models with sign restrictions confirm these effects, showing that credit supply shocks result in lower output and credit growth, while inflation adjusts more slowly (Uhlig, 2005; Arias et al., 2018). Incorporating negative sign restrictions in a standard VAR model in this paper suggests that tighter credit standards reduce output growth by approximately 1.4 percentage points, inflation by 1.2 percentage points, and total loan growth by 5.2 percentage points in the first quarter, followed by a gradual recovery. Specifically, tighter credit standards for enterprises reduce output growth by 1.4 percentage points, inflation by 1.2 percentage points, and enterprise loan growth by 5.3 percentage points, with the effects persisting for about 10 quarters. In contrast, household credit tightening has a more pronounced impact, lowering output growth and inflation by the same margins but reducing household loan growth by 9.4 percentage points, indicating a stronger sensitivity of household loans to credit tightening compared to enterprise loans.

# VII. Conclusions

This study examines the effects of credit supply shocks on Mongolia's macroeconomic performance. Using a confidential quarterly BLS, we construct a measure of adjusted credit supply shocks that are not influenced by bank-specific or macroeconomic factors that simultaneously affect credit demand. These adjusted supply shocks, along with unadjusted lending standards, are then used to assess their impact on key macroeconomic variables.

Empirical results indicate that tighter credit supply conditions lead to declines in lending growth, output growth, and inflation for several quarters following the shocks, with the effects gradually dissipating in the medium term. The impact is substantial: a one standard deviation tightening of the credit supply indicator reduces lending growth by 5 percentage points, output growth by 1 percentage point, and inflation by 0.8 percentage points at the peak. Analyzing the components of credit supply, we find that both enterprise and household lending shocks have similar effects on their respective lending growth rates. However, household credit supply shocks exert a stronger influence on output growth, while enterprise credit supply shocks have a more pronounced effect on inflation. The forecast error variance decomposition suggests that adjusted credit supply shocks hold significant explanatory power.

Given Mongolia’s unique economic characteristics such as its reliance on volatile mining exports and the banking sector’s dominance in financial intermediation, our findings provide valuable insights for policymakers. The BOM should prioritize the continuous monitoring of credit standards derived from the BLS, as shifts in these standards have significant short- and medium-term implications for loan growth and overall economic activity. In the presence of protracted credit supply shocks, the BOM could implement policy measures, such as adjustments to the policy rate or macroprudential instruments, to counteract the negative effects in a countercyclical manner. Specifically, macroprudential frameworks such as modifying risk weights or debt-service-to-income thresholds can help mitigate the procyclical nature of credit supply and enhance resilience to external shocks.

Our findings have broader implications for other emerging economies facing similar vulnerabilities, emphasizing the need for tailored credit policies to ensure macro financial stability and sustainable growth. Future research could further explore the interplay between credit supply shocks and sector-specific dynamics, such as the varying sensitivities of small and medium-sized enterprises and the real estate sector to credit conditions.

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PUBLICATIONS

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