Regional Heterogeneity of the Monetary Policy in China

Cihang Wang*

University of Illinois†

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Abstract

This paper examines the regional heterogeneity in the transmission of China's monetary policy by estimating the effects of national-level monetary shocks on GDP growth across different economic regions. Using a local projections framework and a newly identified M2 monetary policy shock series from Chen et al. (2018), I find that the economically advanced East (coastal) region exhibits a significantly weaker output response compared to the rest of the country. While this pattern suggests that China's monetary policy may have an inequality-reducing effect by disproportionately stimulating less developed regions, a deeper investigation reveals that the underlying mechanisms—particularly land supply policies and muted exchange rate channels—may not yield efficient or welfare-enhancing outcomes. These findings highlight the need for complementary regional policies to ensure that aggregate monetary interventions promote balanced and sustainable growth.

*Department of Economics, University of Illinois at Urbana-Champaign. 214 David Kinley Hall, 1407 W. Gregory Dr, Urbana, IL 61801. Email: **cwang153@illinois.edu**. Website: **sites.google.com/view/cihangwang**

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The effectiveness of the monetary policy is often not uniform across regions within a country or a monetary union, particularly when substantial differences in regional economic development exists. In large economies or currency unions, such as China or Euro Zone, a single monetary policy at the national level can lead to uneven outcomes, exerting heterogeneous impacts depending on different economic structure and institutional arrangement in each region. Such regional heterogeneity is highly consequential for policymakers, as uniform measures intended to stimulate the entire economy may fail to achieve their objectives, which could exacerbate rather than reduce economic inequalities across regions (Beraja et al., 2019). Thus, a monetary framework that systematically generates or fails to address these regional disparities risks long-term ineffectiveness unless it is complemented by targeted regional or fiscal interventions (Micossi, 2015; De Grauwe, 2011).

Although the regional heterogeneity of monetary policy effects has been extensively studied for advanced economies, particularly in the contexts of the Euro Zone and the United States, the case for China remains underexplored despite several distinctive features that make it an important and unique subject of analysis. Unlike Euro Zone, China operates as both a monetary and fiscal union, which allows more flexible fiscal tools that can potentially accommodate regional economic disparities. In contrast to the United States, China faces relatively lower labor mobility due to substantial internal migration barriers (such as hukou system), therefore limiting the capacity of regions to adjust in response to localized shocks, such as external demand shortfalls (Farhi and Werning 2014). Furthermore, China employs a monetary policy framework targeting broad money supply (M2 growth) rather than interest rate, reflecting its status as a transitioning emerging market economy with an underdeveloped financial system. These unique institutional and structural characteristics imply that monetary policy transmission may differ significantly in China compared to advanced economies.

In this paper, I use the Local Projections (Jórda, 2005) to examine how economic activities (regional and provincial GDP growth rate) in four different economic regions specified by the National Bureau of Statistics in mainland China respond to the central banks' monetary policy actions. My results provide robust evidence that the economically developed East (coastal) region is significantly less responsive to monetary policy shocks compared to the less developed regions, a finding that contradicts earlier literature suggesting stronger monetary transmission in more developed regions. This study contributes to the existing literature in two critical ways: First, it provides an updated empirical perspective by focusing specifically on the period after 2005, a period marked by indirect monetary control via aggregate money supply (M2). Previous studies, such as Guo and Tajul (2014,

2017) and Cortes and Kong (2007) employed earlier data that covered substantial regime changes and direct monetary controls. It can potentially obscure the true effects of contemporary monetary policies. Until 1998, the period of indirect control of aggregate money and credit began and PBC announced that M2 became the sole policy target. Second, I adopt a more precise and recently developed methodology for identifying the monetary policy shock following Chen et al. (2018), which provides clearer identification of exogenous monetary policy actions compare to earlier approaches.

1 Literature Review

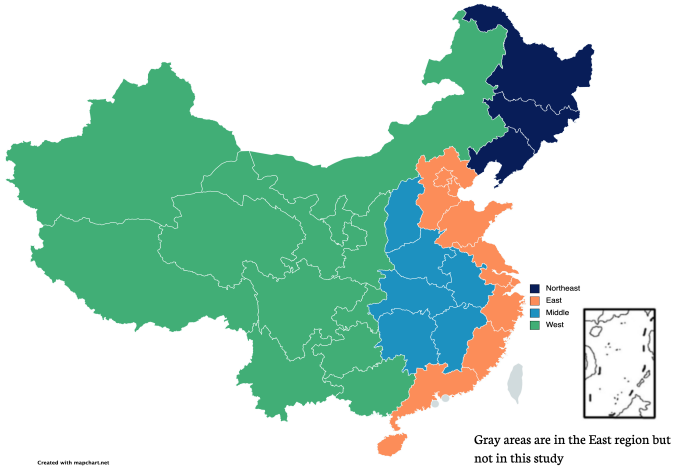
The empirical analyses of asymmetric effects of monetary policy on economic activity date back to the 1970s (Beare, 1976)[1] Until the 1990s, the literature almost exclusively concentrated on the United States (Garrison and Chang, 1979; Garrison and Kort, 1983; Carlino and DeFina, 1998) and occasionally on Canada (Beare, 1976). When it comes closer to the end of the century, studies focused on Europe on the occasion of the launch of the Euro (Gerlach and Smets, 1995; Tremosa-Balcells and Pons-Novell, 2001; Peersman, 2004). The global financial crisis and the broad use of the monetary policy regain the interests in this issue, for the Euro Zone (Cavallo and Ribba, 2015; Georgiadis, 2015; Mandler et al., 2016) Australia (Vespignani, 2015)Indonesia (Phiromswad, 2015), and India (Nachane et al., 2002).

There are also several studies about China. Cortes and Kong (2007) measure the impact of monetary policy on real output both at the national and regional (provincial) level during the period of 1980–2004 using the Vector Error Correction (VEC) method. They develop a provincial GDP system comprising four endogenous variables (monetary policy variable (M2) or bank lending rate), exchange rate, price index, and provincial real GDP) and one exogenous variable, world GDP. They find that monetary shocks produce greater responses in coastal, and therefore mostly the East region provinces, than in inland provinces. Guo and Tajul (2014) use the annual data from 1978 to 2011 for the three regions of China to study the regional effects of the single monetary policy. In their follow-up study (Guo and Tajul, 2016), they extend their studies to 31 provinces in mainland China and show that bank lending channel is more effective than interest rate channel at the regional level, and the finding is similar to Cortes and Kong (2007) in the sense that they also show the East region has a larger response.

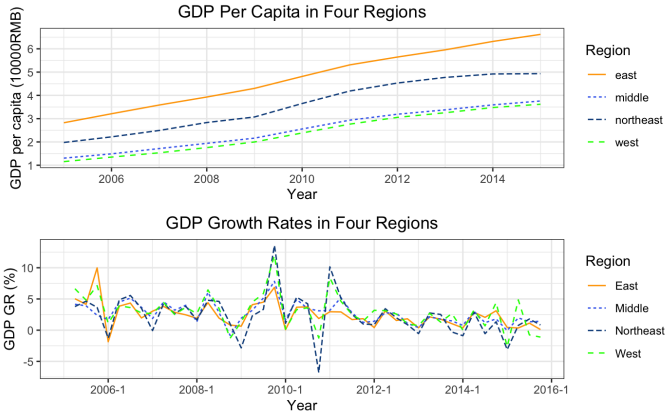
[1] I only refer to a few selected papers. See Dominguez-Torres and Hierro (2019) for a survey of the literature on the sources of heterogeneous regional effects of monetary policy.

2 China's Monetary Policy and Regional Differences in Economic Development

In this section, I discuss the special features of China's monetary policy, which are key to the empirical analysis in this paper. I aim to address two important aspects: the monetary policy framework, and transmission mechanisms. I also show the regional differences in economic development across China.



(A) Four Economic Regions Specified by NBS of China



(B) Regional GDP per capita and GDP Growth

Figure 1. Economic Region Division and Heterogeneity in Regional GDP per capita and GDP Growth. Panel (a) displays the four economic regions of mainland China as defined by the National Bureau of Statistics: East, Middle, West, and Northeast. Panel (b) shows the average GDP per capita and GDP growth rate by region during the sample period (2005–2015). The East region consistently exhibits higher income and more stable growth compared to the others.

2.1 Monetary Policy Framework

Unlike the monetary authorities in the advanced and some emerging economies who rely on price-based means, the central bank of China (Peoples' Bank of China, or PBC) mainly uses quantity-based instruments to conduct its monetary policy, since China is still in a transitioning stage. In 1998 the PBC announced M2 supply to be the policy target, and Until 2018, it still set a specific monetary aggregate target (Huang, Ge, and Wang 2018). People's Bank of China defined M2 as M1 plus Quasi-Money (Time Deposits + Saving Deposits + Other Deposits). M1 is defined as M0 + Demand Deposits where M0 is the currency in circulation both from financial and non-financial sectors. The central banks' monetary policy objectives are specified by the People's Bank of China Law, article 3: "the objective of the monetary policy shall be to maintain the stability of the value of the currency and thereby promote economic growth".

Nevertheless, Zhou Xiaochuan, the former governor of PBC, stated, "for a long time, the annual objectives of the PBC mandated by the Chinese government have been maintaining price stability, boosting economic growth, promoting employment, and broadly maintaining a balance of payments". According to Huang, Ge, and Wang (2018), Zhou also implied that actually the most important policy objective for the PBC's monetary policy. However, based on the study of Chen et al. (2018), the overriding objective of the central government is to achieve the annual GDP growth target, which will be discussed in detail in the paper. Whether the GDP target or inflation target is more crucial than the other may remain to be debated, it is no doubt that both GDP growth and price stability are priorities of PBC's objectives. Also, though PBC is not as independent as the central banks in the advanced economies, but it does have certain level of freedom to conduct the open market operations, which constitutes the shock series used in this study.

2.2 Regional Differences in Economic Development

According to the National Bureau of Statistics of China in 2011, to reflect differences in regional economic development, four economic regions are specified based on economic and geographical factors: East, Middle, Northeast, and West, as seen in the left panel of Figure 1. On the right panel, I calculate the regional GDP per capita and aggreagte GDP growth rate in four regions. The GDP per capita in the East region is much higher than the rest of the country, and compared to the rest of the three regions, the growth rate of GDP in the East region is more stable than the rest of the three regions. The GDP growth rates of the four regions are particularly

volatile during the period of the 2008 global financial crisis and two years onward, which are also reflected in the analysis later in this paper.

There are many differences between the East region and the rest of the country. The financial market is more developed in the East region. It also specializes more in export goods compared to the rest of the country. However, the central government also initialized more fiscal projects in the Northeast, Middle and West region than it does in the East region since 1999 [2].

3 Data

The primary dataset used in this analysis comprises quarterly regional economic data for mainland China, covering the period from 2005Q1 through 2015Q4. This period aligns with the indirect monetary control regime wherein the People's Bank of China (PBoC) explicitly targets aggregate money supply growth (M2). The dataset includes information on economic growth, inflation, monetary policy shocks, exports, and land supply at both the regional and provincial levels.

Regional Economic Indicators Quarterly GDP and consumer price index (CPI) data are sourced from the National Bureau of Statistics of China (NBS). Provincial-level GDP data, initially reported in nominal terms, have been seasonally adjusted and deflated by the author using the X-13 ARIMA-SEATS methodology and corresponding provincial CPI series. Provincial CPIs, originally reported as year-over-year growth rates, were converted into standard CPI indices by combining monthly growth data. Data coverage includes all 31 provinces in mainland China.

Monetary Policy Shock Monetary policy shocks are measured using the quarterly M2 growth shocks identified by Chen et al. (2018). These shocks isolate exogenous variations in monetary policy, specifically reflecting outcomes of open market operations distinct from changes in reserve requirement ratios. This identification method is considered superior to earlier approaches due to its clearer reflection of policy intention and its explicit control for policy targets such as inflation and GDP growth.

Export Data Provincial-level export data are obtained from the NBS, reported annually, and converted into quarterly frequency through interpolation using quadratic minimization consistent with standard practices in the literature (Denton, 1971). Export shares relative to provincial GDP

[2] In 1999, the government initiated the Trillion Western Development Plan; in 2001, Northeast Area Revitalization Plan; in 2003, 2-3 Trillion Rise of Central Plan; in 2008, 2 Trillion Post-Earthquake Reconstruction Fund

are computed using annual averages from the entire sample period to capture persistent structural differences in provincial exposure to international markets.

Land Supply Data Provincial land supply data, specifically the area of state-owned land granted to regional governments, are sourced from the China National Land and Resource Statistical Yearbook. Annualized growth rates of state-owned land supply are computed for each province over the entire sample period. These data serve to examine how regional variations in land policies might mediate the differential transmission of monetary policy.

Spatial Data Spatial spillover analyses utilize inter-provincial distances, measured as the geographic distance between provincial capital cities. These distances form the basis for constructing spatial weighting matrices used to assess economic spillovers and regional interdependencies.

4 Empirical Framework

4.1 Monetary Policy Shock

Chen et al. (2018) developed a tractable rule characterizing the essential part of the otherwise intractably complex operations of China's monetary policy. Unlike the advanced economies such as the U.S., the Taylor Rule does not apply to China for two major reasons: First, China is an emerging market economy with unbalanced growth the rising share of investment in GDP since the late 1990s (Chang, Chen, Waggoner, and Zha, 2016). Second, financial markets in China are underdeveloped and no interest rates have become the policy target of the monetary authority.

At the end of each year, the central government sets the target of M2 growth consistent with targeted GDP growth for the next year. Within each year, the Monetary Policy Committee meets at the end of each quarter to make a policy decision for the next quarter. The monetary policy they propose is formalized as

$$g_{m,t} = \gamma_0 + \gamma_t g_{m,t-1} + \gamma_\pi(\pi_{t-1} - \pi^*) + \gamma_{x,t}(g_{x,t-1} - g^*_{t-1}) + \epsilon_{m,t}, \tag{4.1}$$

where $g_{m,t}$ is the $M2$ growth rate, $\pi_t = \Delta P$ is the actual CPI inflation, π^* is the inflation target, $g_{x,t}$ is the actual GDP growth, $g^*_{x,t}$ is the target GDP growth. $\epsilon_{m,t}$is a serially independent random shock that has a normal distribution with mean zero and time-varying standard deviation $\sigma_{m,t}$.

Since the GDP target serves as a lower bound,which means that it is very likley that the M2 growth response will be more aggressive when GDP is below the target, Chen et al. (2018) allow the output coefficient to be time-varying with the form

$$\gamma_{x,t} = \begin{cases} \gamma_{x,a} & \text{if } g_{x,t-1} - g^*_{x,t} \geq 0 \\ \gamma_{x,b} & \text{if } g_{x,t-1} - g^*_{x,t} < 0 \end{cases}$$

The monetary policy shock identified by the method above and used in this paper are the residuals $\epsilon_{m,t}$, and has shown by Chen et al. (2018) that M2 growth shock is orthogonal to changes in the reserve requirement ratio and thus reflects only the outcome of open market operations. The estimated result also shows that the overriding objective of the central government is to achieve the annual GDP growth target (Chen et al., 2018) The shock series is shown in Figure 2 and their estimated coefficients are shown in Table 1.

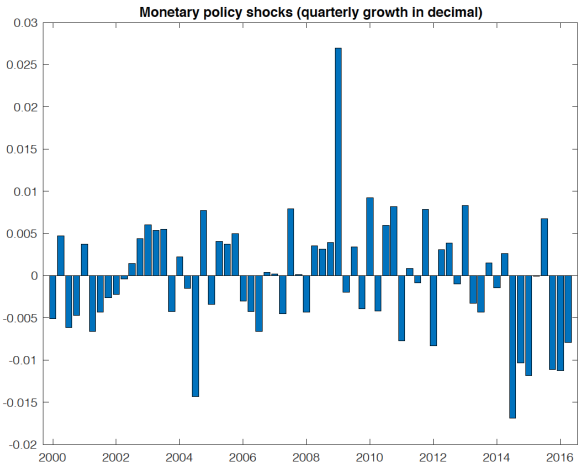


Figure 2. Quarterly M2 Shock by Chen et al. (2018). This figure plots the residual monetary policy shocks estimated by Chen et al. (2018), based on deviations from a policy rule targeting M2 growth. These shocks represent exogenous components of monetary policy after accounting for inflation and GDP targets, and are used as the main policy variable in the empirical analysis.

4.2 Estimation of Impulse Response Function

A Local Projections framework developed by Jordà (2005) is used to estimate the effect of monetary policy on GDP growth in the four different regions and later extended to data at the provincial level. Although Chen et al. (2018) employed a state-dependent framework when they estimate the M2 growth shock, no such framework will be applied in this study when estimating the GDP growth response. There are two reasons: first, due to the limited observation of data, a

Coefficient	Estimate	SE	p-value
γ_m	0. 391***	0.101	0.000
γ_π	-0.397^{***}	-0.121	0.001
$\gamma_{x,a}$	0.183^{***}	0.060	0.002
$\gamma_{x,b}$	-1.299^{***}	0.499	0.009
$\sigma_{x,a}$	0.005^{***}	0.001	0.000
$\sigma_{x,b}$	0.010^{***}	0.002	0.000

Table 1. Estimated Monetary Policy, Table 3 in Chen et al. (2018). This table reports the parameter estimates from the monetary policy rule specification in Chen et al. (2018), used to construct the monetary policy shock series employed in this paper. The dependent variable is quarterly M2 growth. The rule includes lagged M2 growth, lagged CPI inflation, and deviations from GDP growth targets. Parameters $\gamma_{x,a}$ and $\gamma_{x,b}$ capture asymmetry in response to GDP deviations above and below target, respectively. Standard errors are robust and p-values are reported.

state-dependent framework can hardly yield a reasonable result; second, the "state" in the policy rule proposed in their paper is based on the government targeted GDP growth rather than a more objective measure of the true "state" of the economy. Therefore, it is not the case that the GDP growth response to the monetary policy shock is essentially dependent of this government's perceived "state". The specification is the following:

$$\ln GDP_{r,t+h} - \ln GDP_{r,t-1} = \beta_h Z_t + \sum_{l=0}^{n} \gamma_h^l (CPI_{t-l}) + \sum_{l=1}^{n} \alpha_h^l (\ln GDP_{t-l}) + \epsilon_{r,t+h}, \tag{4.2}$$

where h = 0, 1, 2, ..., 12, $\ln GDP$ is the deseasonalized GDP log level, Z_t is the identified monetary policy shock, $r \in \{\text{East, Northeast, West, Middle}\}$, and the model is estimated for each region is estimated. β_h is the parameter of interest, a series of which are the impulse response function of monetary policy shock on cumulative GDP growth rate. In the main results, $n = 4$, and I will change the number of lags later for a robustness check.

I also estimate a panel Local Projections both at the regional and provincial level:

$$\ln GDP_{r,t+h} - \ln GDP_{r,t-1} = \beta_h Z_t + \beta_h^E Z_t \times 1[r = East] \tag{4.3}$$
$$+\gamma_h^E \ln CPI_{t-l} \times 1[r = East] + \gamma_h \ln CPI_t + \sum_{l=1}^{4} \gamma_{h,l}^X X_{t-l} + \epsilon_{r,t+h}.$$

Here r indicates the region or province in the two different specifications and $X_t s$ are lagged $\ln GDP$, $\ln CPI$ and interaction term of the East dummy and $\ln CPI$

To account for the potential output spillover effect across the provinces and regions, following Bräuning and Sheremirov (2019) I extend the model in Equation (3) to directly include provincial output spillovers:

$$\ln GDP_{r,t+h} - \ln GDP_{r,t-1} = \beta_h Z_t + \beta_h^E Z_t \times 1[r = East] + \sum_{l=1}^{n} \alpha_h^l \mathbf{W} \ln GDP_{t-l} + \kappa \text{Controls} + \epsilon_{r,t+h}. \tag{4.4}$$

W is the spatial weighting matrix, which is based on the distance between the capital cities in each province rather than the center of the province, to better reflect the economic activity.

5 Results

My results consistently indicate significantly weaker GDP responses in the economically advanced East region compared to less-developed regions. The robustness checks, including different control specifications and VAR analyses, confirm that these differences are neither artifacts nor sensitive to econometric methods. This finding contradicts earlier conclusions, clearly establishing a revised understanding of regional monetary policy transmission in contemporary China.

5.1 Impulse responses of Four Regions Separately

The estimated impulse responses of monetary policy shock on GDP growth in each region display differences in magnitude and precision as shown in Figure 3. In general, the monetary policy shock has a positive effect on GDP growth in each region, although at around quarter 9, the responses in the Northeast and West region are much noisier and are not statistically different from zero. For the East region, the cumulative growth rate (the log difference between h periods of lead of GDP and 1 period of lag of GDP) peaks within 10 quarters of 2 % and fall back to 1.4 % at quarter 12, under a 1% of M2 growth shock.

For the Middle, Northeast, and West regions, the means of impulse response functions are larger than that of the East region. Up to 12 quarters, the rest of the three regions show 2.5 %, 4.3 %, and 3.8% cumulative GDP growth respectively. The higher volatility of growth rates in the rest of three regions than that of the East region (as shown in Figure 1.) can explain the phenomenon that

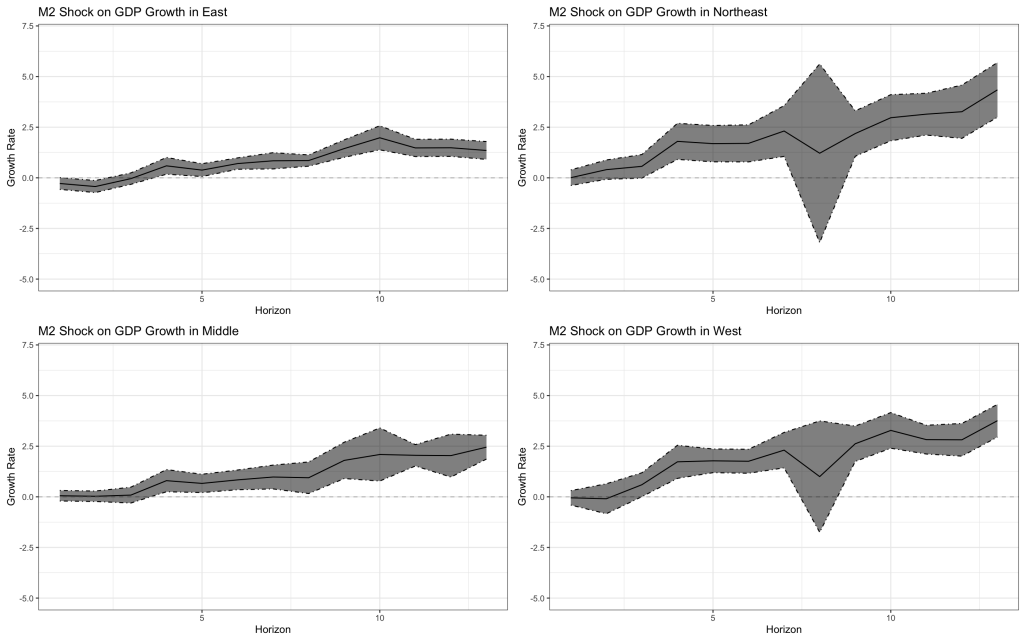


Figure 3. IRF of Monetary Policy on GDP Growth in Each Region. These impulse response functions are estimated separately for each economic region using the local projections method. The shock corresponds to a 1 percentage point increase in quarterly M2 growth. Shaded areas represent 68% confidence intervals. Responses are cumulative over the horizon and measure the effect on log GDP.

those three regions have more volatile impulse response functions. The growth rates are especially volatile during the period of the 2008 global financial crisis. At a first glance, contrary to previous literature, (Kong et al., 2007, Guo and Tajul 2014; 2017) which shows the East region is more responsive than the rest of the regions in China, my result here tells a different story. Nonetheless, at the regional level and with % 68 error band, in most of the horizons, the impulse response functions of the four regions are not statistically different from each other.

Since the goal of this study is to investigate whether the GDP growth rates in the rest of the country have a jointly different response to the monetary policy shock than the East does, I also estimate a panel Local Projections at the regional level. In addition, to take the advantage of the availability of provincial-level data, I estimate a Panel Local Projections at the provincial level to measure the response of the provinces in East region and the rest of the three regions anddiscuss the results in section B.

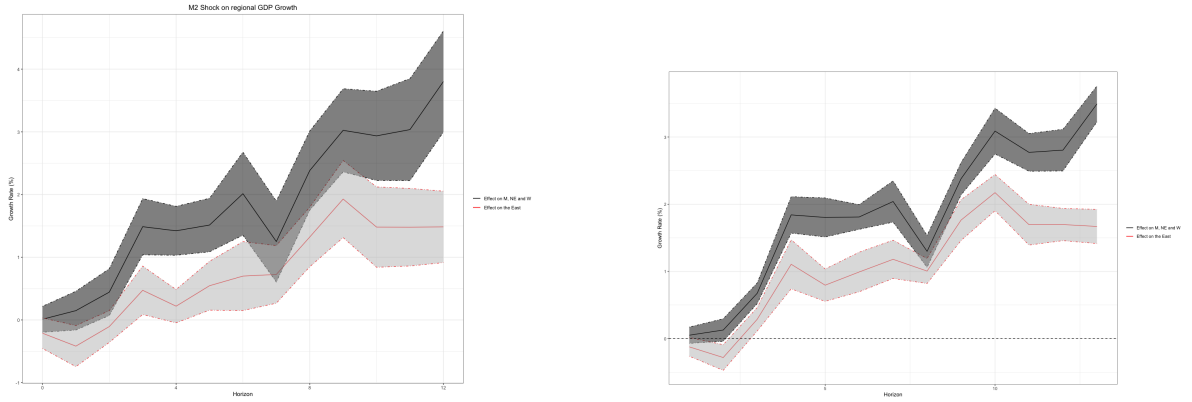
5.2 Impulse responses of Pooled Results at the Regional and Province Level

The estimated impulse responses in the Panel Local Projections with 68 % confidence intervals show a similar qualitative result in section A. As panel A and B in Figure 4 show, the GDP

growth rate of the rest of the three regions is mostly larger than the GDP growth in the East region, both at the regional and provincial level, except for quarter 8, when there's a drop in the impulse response of all regions. The impulse response functions in panel A and B are very similar, and the result in the provincial panel Local Projections show more statistical power in distinguishing the responses in the East and non-East region. Similar to the result shown in Figure 3, the GDP growth of the East region peaks within 10 quarters of 2.2 % and fall back to 1.7 % at quarter 12, under a 1% of M2 growth shock. For the rest of the country, the impulse response reaches its maximum at quarter 12 at 3.5 % and this is the horizon when the growth rates of the East region and the rest of the regions differ the most.

We observe more similar results in panel A and B of Figure 4 and a more statistically different result between panel A of Figure 4 and Figure 3. This fact implies that the insignificance in Figure 3 (when estimating results for each region separately) is likely due to the limited observation of data, rather than the uncaught dynamics using the provincial level data such as the strong spillover effect within the regions.

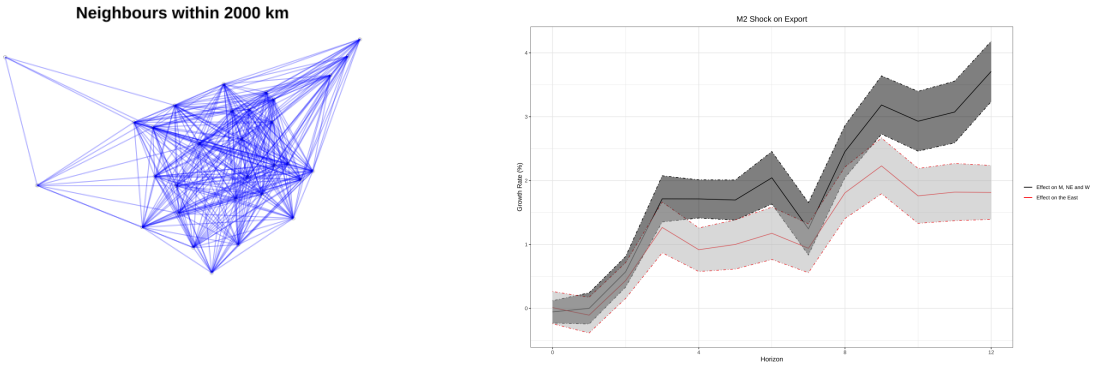
The result of the specification with the spatial weighting matrix is displayed in panel (b) of Figure 5, and panel (a) shows the spatial linkages within 2000 km. Before quarter 8, the difference in GDP growth rates is less salient compared to the result in Figure 2(b). Nonetheless, we still see a significant difference between the East and non-East regions after quarter 10, a similar pattern to Figure 4(a).



(A) Regional Panel Local Projections

(B) Provincial Panel Local Projections

Figure 4. Impulse Responses of M2 Shock on GDP Growth (Pooled IRF). Panel (a) shows pooled regional-level estimates, and panel (b) shows provincial-level estimates using panel local projections. The estimates capture differential effects of M2 shocks between the East region and the rest of the country. Each line represents cumulative GDP response, and shaded bands denote 68% confidence intervals.



(A) Spatial Network **(B)** IRFs with the Network Effect

Figure 5. IRF of M2 Shock on GDP Growth with the Network/Spillover Effect. Panel (a) displays spatial linkages constructed using inter-capital distances within 2000 km. Panel (b) shows IRFs of GDP growth incorporating spatial spillovers via a spatial weighting matrix. The estimates suggest regional dependencies in output responses to monetary shocks.

5.3 Robustness Check

In this section, I alter the specifications in Figure 4 and Figure 5 by changing the number of lags of control variables from 1 to 3. Also, to make sure the consistency of results across different econometric methods, I also run a three-variable simple VAR(4) for each region separately using the following specification:

$$y_{r,t} = C_r + \sum_{i=1}^{4} B_{r,t} y_{r,t-i} + \epsilon_{r,t} \tag{5.1}$$

where $y_{r,t} = [M2GR_t \; CPIGR_t \; GDPGR_{r,t}]$, $r \in$ {E, NE, W, M}

I use the Cholesky identification and order the identified M2 growth shock the first and GDP growth rate in each region the last. This ordering follows the monetary policy rule discussed in section IV. A that the current policy (growth) rate is determined by variables in the last period and should have a contemporaneous effect on the variables in this period. Assuming the identified M2 growth shock is reasonably exogenous, it should not respond to any contemporaneous variables.

The results of impulse response functions are shown in Figure 7. The responses of the GDP growth rate of the four regions in this VAR analysis display similar patterns as those in the Local Projections estimated for each region separately. The point estimates in the Northeast, Middle, and West region are larger than that of the East region. However, again, the GDP growth responses are not statistically different from each other due to large error bands and are again probably a result of lack of degrees of freedom discussed in section B.

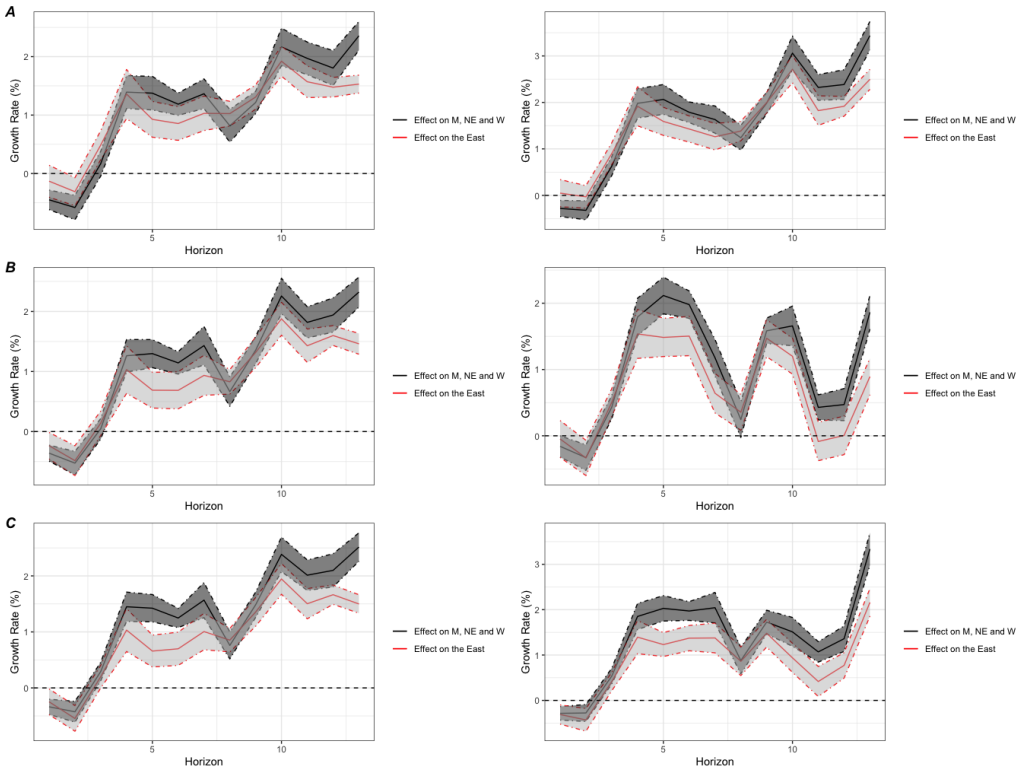


Figure 6. Impulse Response Functions with different control variables. This figure presents IRFs under alternative specifications with 1 to 3 lags of control variables. Results confirm robustness of baseline findings: the East region responds less to monetary shocks. Controls include national CPI and lagged GDP growth.

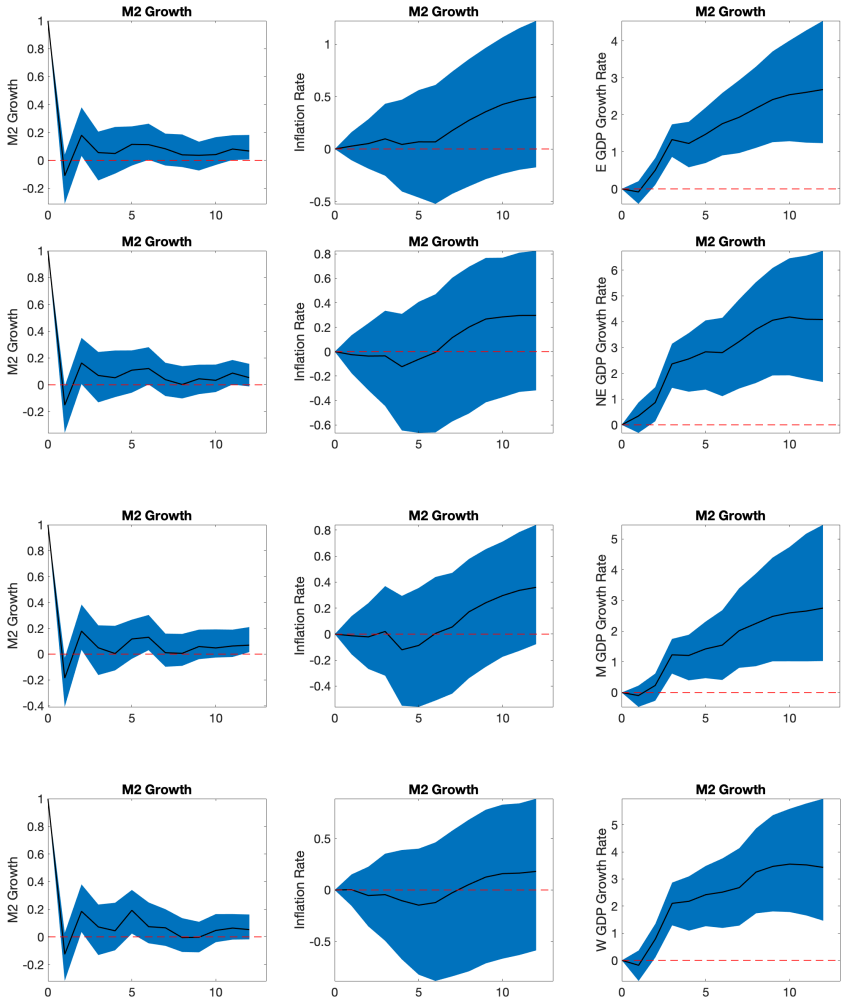


Figure 7. IRFs of three-variable VAR(4) for each economic regions separately. IRFs are derived from a three-variable VAR (M2 growth, CPI growth, GDP growth) estimated separately for each region. Cholesky ordering assumes M2 growth is exogenous. The estimates broadly replicate local projection results, with stronger responses outside the East.

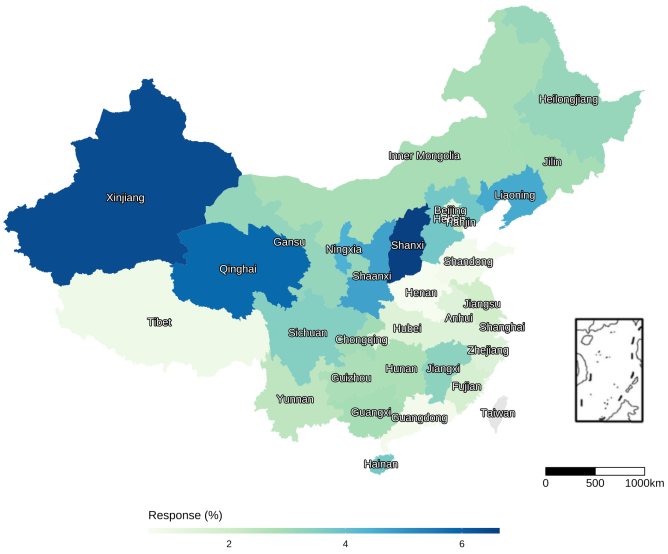


Figure 8. Horizon-12 response rates estimated from the Local Projections Model for Each Province. This heatmap shows the estimated GDP response at horizon 12 for each province following a 1% M2 shock. Estimates are obtained via province-level local projections. Darker shades indicate stronger output responses. The East shows systematically weaker effects.

5.4 Drivers of the Different Output Effects across Regions

At a first glance, it seems reassuring that the monetary policy is not accelerating the difference in economic growth within China, for it is having a larger impact on provinces or regions which are less developed. However, it is still important to investigate what is the driving force behind these heterogeneous responses. Only then we can make a judgment call about whether this phenomenon is truly welfare-improving and inequality-reducing.

Two channels are investigated in this study: the exchange rate and land supply channel. To better examine the mechanisms by using the cross-sectional variation, I run the Local Projections Model for each province as I have done for each region. Following Georgiadis (2015), I then take their horizon-12 response point estimates (shown as a heatmap in Figure 8) for the simple OLS regression with the export-GDP ratio and annualized state-owned land growth rate. A more detailed description will be provided in the following subsections.

5.4.1 Exchange Rate Channel

The first possibility is the muted channel of the exchange rate. Two branches of studies tell two parts of the story of the exchange rate channel. It turns out that monetary policy does not influence the exchange rate (Huang et al., 2020). This phenomenon could be attributed to two possible reasons.

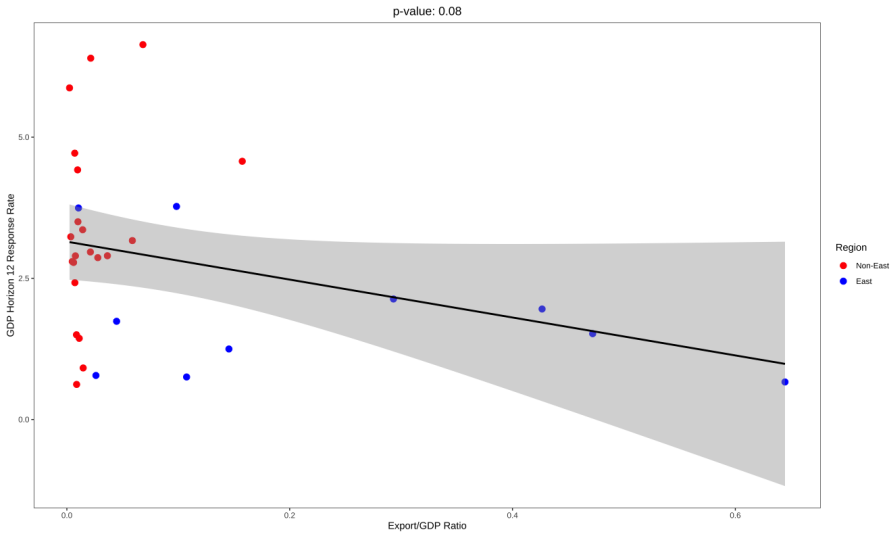


Figure 9. Export/GDP Ratio Plotted against the horizon-12 Response from the Local Projections estimate for each province. This scatter plot regresses each province's horizon-12 GDP response on its average export-to-GDP ratio (2005–2015). The negative slope suggests that provinces with greater export dependence, primarily in the East, are less responsive to monetary shocks—consistent with a muted exchange rate channel.

First, the exchange rate regime remains rigid, and therefore it does not sensitively respond to changes in monetary policy. In addition, variation of the exchange rate is determined by many factors in addition to monetary policy, such as external economic environment, trends of economic growth, and others (Huang et al., 2020). However, in terms of the part that the exchange rate to the real economy, Chen et al. (2023) showed that it works relatively well. The characteristic of this channel is key to the analysis in this paper when it comes to the difference between the East region and the rest of the country. Because export takes a larger GDP share in the East region, we can expect the exchange rate channel to have differential impacts across regions in China.

The idea goes as follows: if the exchange rate channel is well-functioning, when there is an expansionary monetary policy, the domestic currency is depreciated against foreign currencies, making the export goods relatively cheaper, and therefore could increase in quantity demanded for the export good. However, since the channel is malfunctioning, this way of increasing the GDP growth rate is blocked. Figure 9 shows the simple OLS between the point-estimate response of each province and their respective 11-year average export-GDP ratio. The result suggests that the provinces with larger shares of export-GDP ratio are associated with smaller responses of GDP growth rates, significant at 10%, indicating the possible story of the shut-down of the exchange rate channel. However, we can see the responses within the non-East regions are very volatile, suggesting this exchange rate channel could be weak.

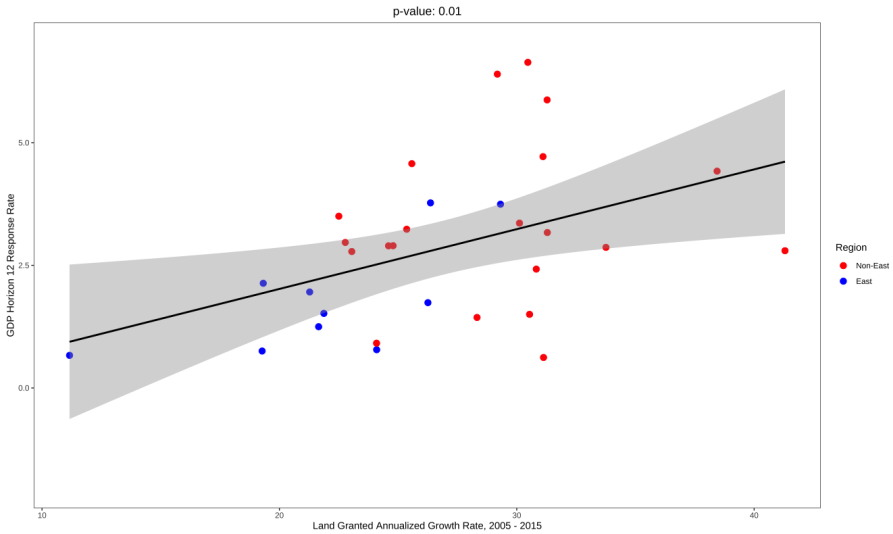


Figure 10. Annualized Growth Rate of the State-owned Land Granted Plotted against the horizon-12 Response. fhis figure plots the relationship between each province's GDP response and its annualized growth in state-owned land supply. The positive correlation indicates that increased land supply may explain stronger monetary transmission in less developed regions.

5.4.2 Land Supply Channel

In China, all land in the non-rural areas is state-owned (rural land is collectively owned), and to use the land, each region needs to obtain the land use right from the central government. Since 2003, the policy regarding the land supply started to favor the central and western regions. Also, the cities where land supply generally has been restricted after 2003 are basically coastal cities and large inland metropolises that are attracting population inflow (Han and Lu, 2018). As shown in Figure 10, larger responses of GDP growth can be accounted for by higher annualized state-owned land supply growth.

This seems to be a good result because less developed regions are getting more resources (in this case, land supply) and therefore the monetary policy is having a larger impact on those regions. However, this may not be as desirable as it may look from the surface. In fact, there exist many industrial parks not in use in the non-East region (Lu, 2017). In Fang et al. (2021), they show that even though it seems that the inland-favoring land supply policy achieved its original goal of shrinking regional output gaps, it in reality hurts workers from underdeveloped areas. People's incomes from almost all places were decreased and the convergence of the income is due to the fact that people from developed regions were hurt more.

6 Other Important Transmission Channels Not Explicitly Addressed

Interest Rate Channel The interest rate channel has traditionally been central to the monetary policy transmission literature. However, this study does not explicitly examine it due to the historically limited effectiveness of this channel within the Chinese context. Previous studies, including Laurens and Maino (2007) and Koivu (2009), have demonstrated that the interest rate channel in China historically exhibited only moderate effects on the real economy. Several structural factors explain this weak transmission, notably financial repression, preferential lending conditions to large state-owned enterprises, and regulatory floors and ceilings on deposit and lending rates. Despite these historical constraints, recent policy shifts towards interest rate liberalization suggest a strengthening role of interest rates in China's monetary transmission mechanism (Fernald et al., 2014; Chen and Zha, 2017; Huang et al., 2018; Ge, 2019). Future research may increasingly need to consider this channel given its evolving significance.

Credit Channel Although this paper does not explicitly model the credit channel, a growing body of research suggests it plays a central role in China's monetary transmission.Chen et al. (2016) demonstrate that China's monetary policy affects output primarily through asymmetric credit allocation across sectors, rather than through traditional interest rate or consumption channels. In particular, during the 2009 stimulus, monetary easing disproportionately expanded credit to capital-intensive, state-dominated sectors such as real estate and heavy industry, leading to a sharp but uneven boost in GDP growth.

This finding is particularly relevant for understanding regional heterogeneity in monetary transmission. Inland regions, especially in the Northeast, Central, and Western provinces, have a higher concentration of state-owned enterprises (SOEs) due to historical industrial policies and limited private sector development. In contrast, the more market-oriented coastal provinces host a larger share of private and foreign-invested firms, which are typically more constrained by market discipline and less favored in politically driven credit allocation.

Given that SOEs are often the primary beneficiaries of directed lending during monetary expansions, it is plausible that the inland regions, with their higher SOE intensity, received a larger share of credit inflows during easing episodes—particularly under expansionary policy regimes like the 2009 stimulus. This pattern could explain why inland regions exhibit stronger output responses to

monetary shocks in our estimates. However, due to the lack of comprehensive province-level credit allocation data by firm ownership or sector, we are unable to directly test this channel. Future research combining spatial and firm-level credit data would help clarify the interaction between ownership structure, credit allocation, and regional policy effectiveness.

7 Conclusion

Regional heterogeneity significantly shapes the effectiveness of monetary policy, especially when it has implications for regional economic disparities. In this paper, I utilized a newly developed identification strategy for monetary policy shocks by Chen et al. (2018) and employed the Local Projections method to investigate the varied regional impacts of China's monetary policy on GDP growth. Contrary to previous findings in the literature, my analysis reveals that the economically developed East (coastal) region exhibits notably weaker responses to monetary policy shocks compared to less developed inland regions. This heterogeneity is partially attributable to differences in regional land supply growth rates and the limited effectiveness of the exchange rate channel in the export-oriented coastal provinces.

At first glance, these findings may suggest a favorable outcome, as monetary policy seemingly provides greater stimulus to less developed regions, potentially narrowing regional disparities. However, deeper investigation into underlying mechanisms indicates that policies like increasing land allocation to inland regions have limited efficiency and may lead to underutilized resources and unsustainable economic growth patterns. Given the ongoing population migration toward the more developed East region, reliance on such resource allocation policies could inadvertently restrict the economic potential of rapidly growing coastal cities.

Therefore, my findings highlight the necessity of formulating complementary regional development policies alongside national monetary interventions. Policymakers should cautiously design these complementary policies to balance growth across regions effectively, promoting sustainable development and ensuring that aggregate monetary stimulus aligns more closely with welfare-enhancing outcomes.

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