

# Monetary Policy Transmission Mechanism and Regional Effects: An Overview

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**Abstract:** *Due to the differences in customs, geographic conditions and economic development among regions, the heterogeneity among regions will lead to different impacts of unified monetary policy tools on different regions. In the face of the regional imbalance caused by regional differences in the implementation of monetary policy, understanding the mechanism of monetary policy transmission and in-depth study of the phenomenon of regional effects and its underlying causes have become the focus of research in the field of monetary policy. From the combing of existing literature, current research has generally proved the existence of regional effects of monetary policy, but has not formed a unified conclusion on its causes.*

**Keywords:** *monetary policy, transmission mechanism, regional effects*

## 1. Introduction

With the differentiated deployment of resources and the further upgrading of industrial structure in various countries, the impact of the implementation of unified monetary policy in different regions is becoming more and more obvious, which leads to the problem of regional development imbalance has become the biggest obstacle to the high-speed development of various countries at the present time. In this economic context, the unified implementation and effectiveness of monetary policy transmission will be seriously impeded, which not only increases the difficulty of the implementation of monetary policy by the central bank, but also from the policy instead of intensifying the contradiction in the allocation of financial resources between regions within the country, and ultimately further increase the gap in regional economic development.

As the phenomenon of monetary policy leading to an imbalance in various areas between regions becomes more and more common, it is urgent to recognize the regional effects caused by monetary policy and make corresponding policy regulation based on the conclusions. Therefore, this paper attempts to further study the theory and conclusions related to the regional effects caused by monetary policy on the basis of the study of the transmission mechanism of monetary policy. The understanding of the regional effects of monetary policy will be conducive to the effective implementation of monetary policy and promote the coordinated development of the region, which is of great practical significance to the theoretical system of monetary policy.

In order to achieve such a research purpose, this paper compiles and reviews the relevant papers on the theoretical basis of monetary policy transmission and regional effects, so as to provide a reference for the government to better implement monetary policy. In this paper, the main content is divided into several parts: firstly, it organizes the various transmission mechanisms of monetary policy, and understands the transmission process of monetary policy from the theoretical basis; secondly, it summarizes the definition of the region in the regional effect of monetary policy, and clarifies the research premise of the regional effect; and finally, it compares whether there is the variability of the impact of monetary policy among different regions and the causes behind it.

## 2. Theoretical foundations of the monetary policy transmission mechanism

Monetary policy transmission mechanism is the theoretical basis for analyzing the role of monetary policy in the actual economy. From the Keynesian era, the transmission mechanism of monetary policy has become one of the key topics of discussion among economists. All types of schools of thought stand on different economic conditions and the background of the times to put forward their respective theories of monetary policy, but so far there is no unified conclusion. The specific theoretical core ideas

and development process are shown in Table 1.

Table 1: The development of the theory of monetary policy transmission mechanism

	Economist	Theory of the monetary policy transmission mechanism
Monetary perspective	1936 Keynes	Interest rate transmission channel
		Interest rates are central to the overall transmission of monetary policy, with the level of interest rates affecting the cost of investment, which in turn affects the level of income through the multiplier effect, given the propensity to consume.
	1969 Tobin	Asset price transmission channel ——q Theory
		Defines q as the ratio of the market price of a firm to the replacement cost of capital. Monetary policy affects the value of q by influencing the market price of a firm, which ultimately has an impact on the investment market.
	1960 Mundell-Fleming	Exchange rate transmission channel
Changes in interest rates affect the exchange rate of the local currency through its reflection in the international parity relationship, which in turn changes the country's net international trade balance and ultimately affects aggregate output.		
1971 Modigliani	Wealth transmission channel —— Life Cycle Income Theory	
	It is assumed that consumers will seek to maximize their utility over the life cycle, including their various assets such as stocks and bonds. Changes in interest rates can significantly affect the value of consumers' wealth, making changes in consumer spending and thus acting on overall economic output.	
Credit perspective	1988 Bernanke &Blinder	Bank lending channel —— CC-LM model
		Adding credit factors to the traditional IS-LM model shows that if the central bank adjusts its monetary policy, it can affect the deposit and loan reserves of commercial banks, which in turn affects the economic activities such as investment by enterprises or individuals who have taken out loans with the bank through the credit channel.
	1995 Bernanke &Gertler	Balance-sheet transmission channel
		Introduced the concept of information asymmetry in the real economic cycle model, emphasizing the effectiveness of central banks in regulating corporate balance sheets through monetary policy, which in turn affects corporate borrowing and market investment.

Based on the above simple combing of the development process of monetary policy conduction mechanism, the following will focus on the analysis of various theories to facilitate a better understanding of the specific transmission process of monetary policy, but also to provide theoretical support for the subsequent thesis of the regional effects of monetary policy combing.

(1) Interest rate transmission channel

On the basis of classical monetary quantity theory, Keynes's liquidity preference theory proposes that the interest rate is jointly determined by money supply and money demand, while the neoclassical synthesis school further proposes the IS-LM model, which combines the liquidity preference theory and the money supply theory, emphasizing the regulation of investment and output by the key factor of interest rate. The IS-LM model is based on two major premises. On the one hand, there are only two types of financial assets, money and bonds, and all assets other than money are perfectly substitutable with bonds; on the other hand, interest rates are out of the financial market. Therefore, based on the assumption of complete information in the financial market, monetary policy changes the price of financial assets mainly by affecting the interest rate, which in turn affects investment and output. For example, when the central bank controls the interest rate (i) to fall by increasing the money supply (M), and the fall in real theory indicates that this the cost of investment falls further, therefore the demand for investment rises. At the same time the increase in consumption (C) in turn affects the increase in output (Y). The specific transmission process can be expressed as follows:

$$M \uparrow \rightarrow i \downarrow \rightarrow I \uparrow, C \uparrow \rightarrow Y \uparrow$$

(2) Asset price transmission channel

The asset price transmission channel emphasizes the impact of monetary policy on residents' asset portfolios and aggregate wealth. In this type of transmission theory, interest rates mainly cause changes in asset prices and wealth values. The most representative theories are the Tobin's q theory and the wealth effect theory.

Tobin's q theory analyzes the impact of monetary policy on output from the perspective of asset restructuring. The theory proposes to define q as the value of a firm's stock divided by the replacement cost of capital. When q is greater than 1, firms are more likely to purchase new fixtures to invest in production, while when q is less than 1, the market value of the firm is less than the replacement cost of capital, which means that firms will not choose to replace their fixtures. Tobin's q theory holds on the premise that a change in the money supply can cause a change in the interest rate and that the stock market is sufficiently developed so that a change in the interest rate can cause a change in the price of stocks. Changes in monetary policy will affect the yields on stocks and bonds, which will lead to a change in q, and investors will further adjust their asset structure. For example, when the money supply (M) increases, it causes the interest rate (i) to fall, which leads the market to prefer investing in stocks with high returns. And it leads to an increase in stock prices (Pe) and q, which promotes a further increase in investment (I) and output (Y). The specific transmission process can be expressed as follows:

$$M \uparrow \rightarrow i \downarrow \rightarrow P_e \uparrow \rightarrow q \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

The wealth transmission channel, also known as life-cycle theory, analyzes the transmission process of monetary policy from the perspective of the impact of changes in wealth on residents' consumption. The theory proposes that consumers will seek to maximize the utility of their wealth over the life cycle, so the rational allocation of their own income and consumption becomes the core of the impact of monetary policy. Residents' wealth includes stocks, bonds and real estate, etc. When monetary policy affects the value of residents' wealth by causing changes in interest rates, it constrains residents' consumption expenditures. When the money supply (M) rises and causes the interest rate (i) to fall, the rise in stock prices (Pe) prompts a rise in the value of consumers' lifelong wealth (W), including stocks, which causes an increase in consumer spending (C), thus having a positive effect on output (Y). The specific transmission process can be expressed as follows:

$$M \uparrow \rightarrow i \downarrow \rightarrow P_e \uparrow \rightarrow W \uparrow \rightarrow C \uparrow \rightarrow Y \uparrow$$

### (3) Exchange rate transmission channels

Under the environment of open economy, economic exchanges between countries strengthen the degree of economic dependence, resulting in changes in the exchange rate greatly affecting the level of a country's imports and exports. The exchange rate conduction mechanism, also known as the interest rate-exchange rate mechanism, centers on the theory of influencing changes in the exchange rate through interest rates, thus affecting international economic exchanges. The exchange rate transmission channel follows two prerequisites: the free convertibility of currency and the free flow of capital, and the country's floating exchange rate system. In an open economy, when the central bank makes monetary policy adjustments, the level of interest rates in the home country versus foreign currencies affects the demand and supply of currencies, which is further manifested in the floating exchange rate, and ultimately affects the change in net exports. For example, a rise in the money supply (M) causes a fall in the domestic interest rate (i), and thus a rise in the attractiveness of foreign currencies causes a fall in the exchange rate of the domestic currency, which increases the competitiveness of domestic goods and further leads to an increase in exports and imports (NX) and output (Y). The specific transmission process is as follows:

$$M \uparrow \rightarrow i \downarrow \rightarrow E \downarrow \rightarrow NX \uparrow \rightarrow Y \uparrow$$

### (4) Credit transmission channel

The credit transmission channel consists of the bank credit route and the balance sheet route, both of which are based on the problem of incomplete information in the market and the high cost of contract fulfillment, which leads to the existence of additional factors such as the evaluation of information, moral hazard and the cost of constraints on both borrowers and lenders. Therefore, in credit transmission, monetary policy affects not only the interest rate, but further affects the cost of corporate loan financing.

The bank credit transmission channel is also known as the narrow credit transmission path, a theory that adds a variable such as bank lending to the IS-LM model. This theory makes assumptions both on

the asset side and on the liability side. For the asset side, there is no substitution between bank loans and securities; and for the liability side, there is no substitution between bank loans and the remaining non-bank sources of finance, and the reduction in bank loans cannot be fully addressed by direct financing. In addition to this, the credit transmission channel functions under the prerequisites of non-neutrality of monetary policy and the ability of the central bank to manipulate bank lending through reserves. In such a setting, specific borrowers are highly dependent on bank loans, so the central bank can influence the reserves of major banks through monetary policy, which in turn affects investment and output through the supply of bank loans. For example, an expansionary monetary policy increases banks' reserves, which represents an increase in the money supply (M), with a corresponding rise in bank reserves and bank deposits (D). When the asset structure of the bank remains essentially unchanged, the decline in funds available for borrowing causes the volume of bank lending (L) to rise, which in turn affects a rise in spending available for investment (I) by a given borrower, which ultimately leads to a rise in output (Y). The specific transmission process can be expressed as follows:

$$M \uparrow \rightarrow D \uparrow \rightarrow L \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

Balance-sheet transmission channel, also known as the broad credit channel, introduces the central factor of the firm's balance sheet, which is a consideration of the impact of monetary policy on the asset and liability position of a given borrower. The balance sheet is similarly preconditioned by the non-neutrality of monetary policy and the imperfect substitutability of loans and bonds. The theory defines corporate net worth as the net value available for pledging on a firm's balance sheet, and fluctuations in monetary policy not only affect market interest rates, but also, through direct or indirect effects on corporate net worth and liquid assets, in turn affect the ability of firms to raise capital and, ultimately, the amount of normal economic activity and investment. For example, an expansionary monetary policy increases the money supply (M), causing a decrease in interest rates (i) and allowing corporate share prices (Pe) to increase. At the same time the increase in cash flow (NCF) leads to an improvement in the asset position of borrowers, and the elevated volume of bank loans (L) causes investment (I) to rise and final output (Y) to increase. The specific transmission process can be expressed as follows:

$$M \uparrow \rightarrow i \downarrow \rightarrow P_e \uparrow, NCF \uparrow \rightarrow L \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

To summarize, so far, academics mainly believe that the transmission channels of monetary policy include interest rate channels, asset price channels, exchange rate channels, credit channels, etc. Through the perspective of financial institutions' assets and liabilities, these theories can be summarized into two types, one is the monetary perspective, including interest rate channels, exchange rate channels, etc.; and the second is the credit perspective, including credit channels, balance sheet channels, etc.. The central bank's monetary policy acts on the economy through both monetary and credit channels.

### 3. Overview of studies on the regional division

The definition of region is a prerequisite for analyzing the existence of regional effects of monetary policy, because choosing different ways of dividing the region within a country or between different countries will come to different empirical results. However, there is no uniform standard on how to adopt a reasonable division.

For example, within a country, most of the studies on the United States are based on the 48 states as the research unit. Carlino and Defina (1998) studied the existence of regional effects of monetary policy on the United States of America for each state, who found that the sensitivity of the region to monetary policy was related to the proportion of the region's industry, and the response to policy shocks was small for the region for the energy change but showed a high degree of sensitivity[1]. Nachane and Ray (2002) examined the significance of the monetary policy response of 14 major states in India, using states (first class administrative districts) as the regional criterion[2]. Arnold and Vrugt (2004) revealed that the output of 10 major German provinces exhibited heterogeneity in response to monetary policy shocks, and that heterogeneity was related to the composition of the industry[3]. Dow and Montagnoli focused on the response of England, Wales, Scotland and the South East to a change in the flat rate and argued that it was the credit transmission process that exhibited heterogeneity[4]. Anagnostou and Gajewski (2019) observed a PVAR model of GDP, investment, unemployment and CPI for 16 voivodships in Poland and found that output and investment exhibited greater regional heterogeneity in monetary policy[5]. Faraz and Iftikhar (2020) studied the asymmetry

in the response of real output to the central bank's monetary policy across Pakistan's provinces using an SVAR model, and showed that manufacturing-intensive provinces and provinces with high concentration of small firms were more responsive to changes in monetary policy shocks[6].

And in addition to the natural administrative region division criteria, some scholars also choose further economic partitioning methods that incorporate geographic factors. For example, on the basis of the 48 states in the United States, Garrison and Chang (1979) used the eight major economic regions in the United States as the object to explore the impact of monetary policy on the industry in different regions, which not only proved that monetary policy had an industry effect, but also proved that in the United States the impact of monetary policy on the manufacturing industry was more significant, and the sensitivity on different regions had different characteristics[7]. Owyang and Ramey (2004) also used the data of the eight economic regions of the United States to conduct a study, applying the regime-switching technique to the measurement of monetary policy regimes, which revealed that the regional effects of the Federal Reserve's monetary policy were related to policy switching[8]. Pizzuto (2020) shocked personal income and employment in eight economic regions by using Romer and Romer's (2004) narrative series as a measure of unanticipated changes in the Federal Reserve's policy interest rate, and showed that the regional effects of monetary policy were more pronounced on the basis of taking into account spillovers, and that interest rates and the real estate market conduction played a more significant role in the transmission channel[9].

The definition of region is much broader in studies of the variability of the effects of monetary policy implementation across countries, often using the whole country as a single region to compare the variability of the impact of monetary policy in different countries within a unified currency area. Peersman and Smets (2002) collected data from seven countries and eleven industries in the euro area over a period of 18 years, and their study showed that there was a difference in monetary policy impact in different regions on the output growth asymmetrically and further obtained that the differential impact of monetary policy shocks was greater in recessions than in booms[10]. Huchet (2003), using EMU data, found that structural differences in finance and differences in industry structure can better explain the different sensitivities of different countries to a single monetary policy[11]. Barigozzi et al. (2014) find that the monetary transmission mechanism in euro area countries has become more homogeneous following the ECB's implementation of a unified monetary policy for the EA countries, but there are still differences in implementation outcomes across countries with different economic structures.[12].

In general, studies on the subject of regional effects of monetary policy have generally been conducted within the same country or currency area, and regional divisions have mostly been limited to administrative jurisdictions within a country and natural boundaries between countries. However, this kind of geographically based approach does not take into account similarities in industrial structure, financial structure and market development within regions, which makes the study of regional differences in the implementation of monetary policy more inaccurate.

#### **4. Overview of studies on the regional effects of monetary policy**

As early as the optimal currency area theory was proposed, the regional effect of monetary policy in the beginning of the study of the regional economy has become one of the important topics, and until today, about the unification of monetary policy will be formed in different regions of the obvious heterogeneity of this conclusion, from different perspectives by many scholars of the wide range of proof. Among foreign scholars, Toal (1977) took the regional economic data of the United States as the object of study and examined whether there were sensitivity differences for monetary policy in different regions in the United States, which proved that there was a regional effect of monetary policy in the United States.[13]. On the financial side, Carlino and Defina (1998) observed the regional effects of monetary policy in the United States in terms of the financial structure of the region and the size of the industry[1]. In terms of overall economic development, Ehrmann (2000) used a VAR model to find that the transmission mechanism of monetary policy differs among 13 European countries, with differences in transmission strength and transmission response time[14]. Owyang and Wall (2003) collected data on GDP, personal income, unemployment rates, and inflation rates for U.S. regions, and used the differential situations exhibited by different regions on these four dimensions to demonstrate that the impact of U.S. monetary policy at the regional level varied widely[15].

The reasons for regional differences in monetary policy are not uniform, but there is a wide range of opinions in the academic community. The main reason is that the regional effects of different countries

have different characteristics, while the impact of monetary policy on the region is comprehensive, involving the financial system, industry base, living habits, etc. Kashyap and Stein (1995) used a firm size profile to consider the importance of the credit channel's impact on the transmission of monetary policy, while emphasizing the importance of bank size in contributing to differences in responses across regions[16].Carlino and DeFina (1999) found that the size of the response to monetary policy in different U.S. states is significantly correlated with the industry mix variables, which provides evidence of the interest rate transmission channel for monetary policy[17]. Arnold and Vrugt (2002) not only proved the existence of monetary policy effects in the Netherlands, but also combined region and industry in their empirical study, and found that the phenomenon was due to the different sensitivities of different industries to interest rates, and there were significant differences in the structure of industry and industry in each region[18].Huchet (2003) attributed the reasons for the regional effects of monetary policy to financial and industrial structure. structure and industrial structure. Using EMU data, he found that structural differences in finance and differences in industrial structure could better explain the different sensitivities of different countries to a single monetary policy[11].Owyang and Wall (2003) related the regional differences exhibited by monetary policy to banking sector concentration, and industry structure[15].Anagnostou and Papadamou (2016) used PVAR model to get that the regional effects of monetary policy in Greece could be explained accordingly by industrial structure[19].Anagnostou and Gajewski (2019) found that the regional effects of monetary policy exhibited in Poland are related to industrial structure and demographic characteristics[5].

In summary, it can be concluded that there is a wealth of academic research related to the regional effects of monetary policy. On the one hand, it has demonstrated the general feature of the variability of the impact of monetary policy on different regions in various ways; On the other hand, the causes of the regional effects of monetary policy have been studied in depth in the light of national conditions and policy transmission, and the extent to which regional differences in factors such as industrial structure, bank size and financial market development are related to the phenomenon has been explored.

## 5. Conclusion

In this paper, firstly, the mainstream theoretical basis of the monetary policy transmission mechanism is sorted out in accordance with the chronological order of the proposal. Secondly, the definition of the region is sorted out to summarize the diversity of the delineation of the research object. And finally, the performance of the regional effect of monetary policy and its causes in various fields are studied and analyzed. On the whole, the current research on the regional effects of monetary policy has yet to be supplemented and improved, mainly in the following points:

Firstly, different ways of dividing regions will lead to different conclusions, so the definition of regions becomes a prerequisite for studying the regional effects of monetary policy. A review of existing studies shows that most of the study subjects focus on different regions of the same country or different countries within the same currency area, and most of them are limited to the division of administrative jurisdictions within a country and the natural boundaries between countries. This geographic approach does not take into account the similarity of economic factors within regions. Therefore, it will underestimate the impact of regional economic differences when studying the different impacts of monetary policy on regions, which can lead to inaccurate conclusions.

Secondly, on the basis of determining the regional division, we can get a unified conclusion to confirm the prevalence of regional heterogeneity of monetary policy, and combined with national conditions and policy transmission paths to study in-depth the causes of the regional effects of monetary policy, and to explore the extent to which regional heterogeneity factors are related to the phenomenon. However, current studies on the regional effects of monetary policy are rarely innovative in their choice of models, which can be summarized as the fact that most of the empirical studies use the traditional VAR model or similar models to analyze and observe the exposure of regions to shocks.

In conclusion, this paper not only shows a basic knowledge and understanding of the regional effect of monetary policy through combing the related literature and the theoretical basis of monetary policy transmission, but also finds that there are parts of the research to be improved. Recognizing the regional effects of monetary policy is of great practical significance for the use of national monetary policy tools and macroeconomic regulation. Only through an in-depth understanding of the phenomenon of regional effects of monetary policy in different countries and the reasons for them can we promote the coordinated development of interregional economies.

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