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Economic spillover effect of circulation industry development in China provincial cities

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Abstract

Purpose: The study aims to delve into the specific mechanisms through which the development of the circulation industry in provincial capital cities influences and promotes economic growth in surrounding non-capital cities under the framework of the strong provincial capital strategy. By conducting empirical analysis, this research aims to uncover the spillover effects of circulation industry development and its heterogeneous characteristics under different geographical, spatial, and economic conditions, providing empirical evidence for understanding the interactive relationships between regional economies.

Design/methodology/approach: This study employs the method of constructing an empirical analysis model, integrating multidimensional perspectives such as geographical zoning, spatial distance, and economic characteristics, to systematically examine the spillover effects of circulation industry development. By collecting and processing data on economic growth and circulation industry development in provincial capital cities and their surrounding non-capital cities, econometric tools are utilized to conduct regression analysis. Additionally, robustness checks and endogeneity treatments are employed to ensure the reliability and accuracy of the study's conclusions.

Findings: The vigorous development of the circulation industry in provincial capital cities has a significant and positive spillover effect on economic growth in surrounding non-capital cities, and this conclusion remains stable under multi-dimensional tests. Furthermore, it reveals the heterogeneous manifestations of the spillover effect under different geographical, spatial, and economic conditions. Notably, the study finds that the correction of capital misallocation plays a crucial role in this process, providing a new perspective for understanding the internal mechanisms of how the circulation industry promotes economic growth.

Research limitations: Despite the efforts made in data collection and analysis, this study still has certain limitations. Firstly, the comprehensiveness, timeliness, and accuracy of the data may be affected by differences in regional and industry statistical standards, limiting the

precision of the study's conclusions. Secondly, the sample selection may not fully represent the actual situation in all regions, resulting in limited universality of the study's conclusions. These limitations suggest that future research needs to further expand data sources and improve data quality to enhance the broad applicability of the study's conclusions.

Practical implications: This study has practical significance for understanding the mechanisms of regional economic interaction and formulating relevant policies. The research conclusions indicate that optimizing the layout of the circulation industry in provincial capital cities can effectively promote efficient resource allocation, drive economic development in surrounding areas, and achieve balanced and sustainable regional economic growth. This finding provides vital reference for policymakers, facilitating the formulation of more precise and effective regional economic development strategies. Additionally, it contributes to expanding the job market and enhancing overall social welfare levels.

Originality/value: This study enriches the theoretical framework of regional economic interaction and growth spillover, offering new research perspectives and empirical evidence to the academic community. At the practical level, the research conclusions provide valuable reference information for policymakers, guiding the formulation and implementation of regional economic development plans. Furthermore, this study emphasizes the crucial role of capital misallocation correction in the process of the circulation industry promoting economic growth, offering new insights and directions for research in related fields.

Keywords: Provincial Capital city, Circulation Industry, Economic Growth, Spillover Effect

Introduction

Due to China's economy's rapid expansion and the country's expanding urbanization, the problem of uneven regional economic development−particularly the disparities in economic growth between cities at different economic levels−has gained more attention. As early as the "Urban Planning Law" issued in China, it was proposed to shift the development focus to medium and small-sized cities. However, many scholars have opposed this (Wang, 2010). According to pertinent research, the scale impact and agglomeration effect are both aided by the agglomeration development of big cities. In addition to growing their benefits, they can have a linking effect on the neighbouring areas, which will spread to the surrounding areas' employment and economic growth. Provincial capitals are the hubs of each province's economy, politics, and culture. As such, they frequently receive greater support from the government and resource allocation, and their quick development has a significant effect on the general pattern of regional economic activity. A number of provinces have adopted the "strong provincial capital" strategy in an effort to make their economies more competitive. Its principal objective is to give provincial capital development top priority in order to advance the province's economy as a whole.

On the other hand, does the application of the "strong provincial capital" plan represent the large-scale city priority development strategy in a way that is "all benefits and no harm" to overall development? This is not the situation in reality. Many scholars have expressed concerns about the "strong provincial capital" strategy, mainly due to the resource over-concentration of provincial capitals and the resulting siphoning effect. That is, the development of provincial capitals is at the expense of absorbing talents, technology, capital, and other elements from surrounding areas. In this process, although provincial capitals gain the driving force for rapid development, the development of surrounding cities is severely restricted. The excessive inclination of production factors to provincial capitals will further intensify the development gap between cities of different sizes and also form a problem of "locking" the

spatial distribution of elements (Zhang & Ding, 2020). The development gap is too large and is not conducive to overall development in the long run. The circulation industry of provincial capitals, as a key link connecting production and consumption, is not only directly related to the economic prosperity of the provincial capitals themselves but also may have an important impact on the surrounding non-provincial capital cities. The efficient operation of the circulation industry can promote the rapid flow of goods, funds, information, and personnel, enhance market vitality, and thus become an important driving force for regional economic growth. Therefore, it is crucial to investigate how the growth of the circulation industry in provincial capitals affects the economic expansion of neighboring non-provincial capital cities to comprehend the mechanisms underlying regional economic interaction and to advance coordinated regional development.

How to rationally organize the circulation industry's physical structure to fully capitalize on its beneficial function in fostering economic progress is an issue worth considering. Looking at the spatial distribution structure of provincial capitals and non-provincial capitals, can focus on the development of the circulation industry in provincial capitals bring about the ideal effect of overall economic growth? Based on the thinking about this practical problem, this paper is committed to answering the following two questions: First, does the development of the circulation industry in provincial capitals have a positive spillover effect on the economic growth of surrounding cities? Second, if this spillover effect exists, what is its mechanism? Although there are many discussions on the spillover effect of the development of provincial capitals, there are relatively few studies that take the development of the circulation industry as the entry point, which is also the innovation of this paper.

Literature Review

The effect of the "strong provincial capital" plan on regional development has received a lot of attention, but a consensus has not yet been reached. Discussions on the development effects of provincial capitals in existing studies mainly unfold in two aspects: first, the positive agglomeration effect. Provincial capitals generate positive externalities through resource agglomeration and produce beneficial spillover effects on surrounding cities through three mechanisms: matching, learning, and sharing, thereby promoting the common development of the whole (Goldstein & Gronberg, 1984). At the same time, the advanced production technology intermediate inputs provided by the development of provincial capitals can also form spillover effects through industrial associations, driving the surrounding areas to "fly together" (Baldwin & Forslid, 2000). Second, the negative siphoning effect. Provincial capitals rely on their competitive advantages to divert production factors from surrounding cities to themselves, making the subsequent development resources of surrounding cities "hard to come by". In addition, some scholars have also explained the spillover and siphoning effects of provincial capital development from the perspective of market potential (Zhang Zhan-re, 2013; Chen & Partridge, 2013), or the spillover effects of the development of central cities in urban circles on satellite cities (Fang et al., 2017). Thus, there is significant practical utility in elucidating the spillover effects of provincial capital development and carrying out a more thorough evaluation of the overall impacts of the "strong provincial capital" plan.

The radiation effect of central cities on surrounding areas has been extensively covered in the literature (MacPherson & Krugman, 1992; Ouyang et al., 2023), and the priority development of provincial capitals can form growth poles, producing positive spillover effects on surrounding areas through industrial associations, technology diffusion, and market expansion (Knox & Myrdal, 1960). However, research on the specific spillover effects and mechanisms of the development of the circulation industry under China's "strong provincial capital" strategy

is still insufficient. In light of this, the study uses the growth of the circulation industry in provincial capitals as a starting point and uses empirical analysis to identify the precise effects of this industry on the economic expansion of neighboring non-provincial capital cities as well as the underlying mechanisms. This will provide a solid scientific foundation for pertinent policy decisions.

Theoretical background

Semple (1908) originally suggested that a site might be only a point and might have a powerful radiation effect on the surrounding territories, which is where the idea for the "strong provincial capital" plan originated. One may argue that the growth pole idea was the forerunner of the "strong provincial capital" tactic. According to the growth pole theory (Perroux, 1950), economic growth doesn't happen all at once; rather, it starts in some growth poles that have the capacity for innovation and then moves outward through a variety of channels, propelling the development of the entire region. Provincial capitals serve as regional growth poles, and the quick rise of the circulatory industry there can stimulate economic growth in the surrounding areas through polarization diffusion effects and multiplier effects. Furthermore, the spatial spillover effect theory points out that the distribution of economic activities in space is not isolated, but there are interdependencies and mutual influences (Griffith & Anselin, 1989). The development of the circulation industry in provincial capitals may have a positive impact on the industrial structure, production efficiency, and economic vitality of surrounding non-provincial capital cities through spatial spillover mechanisms, such as knowledge spillovers, technology diffusion, and market expansion.

The development of contemporary circulation systems and the swift rise in popularity of online consumption have led to the circulation industry's "up and down" role in the growth of the national economy, making it a significant engine for promoting consumption and driving economic growth. Existing research on how the development of the circulation industry affects economic growth mainly unfolds from two dimensions: direct and indirect mechanisms. (1) Direct impact mechanism. The process of regional economic expansion is also facilitated by the increase in the production value of the circulating industry, which is a significant component of the traditional industry. At the same time, the circulation industry can build a "bridge" between production and consumption, ensuring the circulation of goods through warehousing and logistics services, and then providing a carrier for the flow of funds, information, and logistics, creating benefits through efficient factor turnover (Wu & Meng, 2022). (2) Indirect impact mechanism. On the one hand, the growth of the circulation sector has the potential to overcome long-standing obstacles to the market and encourage the integrated development of the market and the integration of resources, which will support the best possible distribution of production resources and lower the cost markup caused by market segmentation. On the other hand, the circulation industry covers many links such as processing, storage, and transportation.

While promoting the deepening of the division of labor, it also helps to derive new service industries and provide more employment opportunities. In this context, the development of the circulation industry helps to expand the scale of consumption, optimize the consumption structure, and improve the consumption capacity of residents, thereby driving economic growth. The aforementioned arguments have been supported by a large number of empirical studies. For example, Tang (2022) suggests that increasing circulation speed can help optimize the structure of factors and promote economic growth; Shi et al. (2020) noted that the development of the circulation industry contributes continuously to economic growth and that this effect has a certain spillover characteristic for surrounding areas in addition to being

reflected locally. In a similar vein, Zou (2022) thinks that while the rise of the circulatory sector does contribute to regional economic growth, there are clear regional variances in this influence. Furthermore, Zhao et al. (2016) expanded on the notion that the rise of the circulation industry might raise the manufacturing sector's total factor productivity, spurring economic expansion. Although the conclusion that the development of the circulation industry promotes economic growth has become a consensus, there is still little in-depth discussion on the spillover effects brought about by the development of the circulation industry in provincial capitals that this paper focuses on, but existing studies believe that the analysis of how the development of the circulation industry in Chinese provincial cities affects the economic growth of surrounding areas provides an analytical approach for reference.

Methods

This paper adopts the aggregated industry data of cities within each province to depict the spillover effects of the economic growth generated by the development of the circulation industry in provincial capital cities. The four municipalities directly under the central government are temporarily not considered (Zhao,2021). By matching data at the provincial-city-industry level, the following baseline regression model is constructed:

$$ED_{it} = \alpha_0 + \alpha_1 LTY_{it} + \alpha_2 Control_{it} + v_i + \delta_t + \epsilon_{it} (1)$$

In the above equation,ED_{it}represents the economic growth level of non-provincial capital cities in province i in year t, mainly measured by the logarithm of per capita GDP. LTY_{it} represents the development level of the circulation industry in the non-provincial capital city i corresponding to province i in year t. This paper mainly uses the average proportion of employees in the transportation, warehousing, wholesale, and retail industries in the provincial capital city as a percentage of the total employment in the same industry in the province to represent the development level.

v_i represents city fixed effects, δ_t represents year fixed effects, and ϵ_{it} represents the error term, capturing other unobserved factors. α_1 describes the spillover effect of the development of the circulation industry in provincial capitals on economic growth.$Control_{it}$ represents a set of control variables, including urbanization rate (UR) measured by the proportion of urban population, The model includes three measures of human capital quality (HCQ) (average years of schooling per capital), industrial structure (IS) (ratio of value-added in the tertiary industry to the secondary industry), and foreign direct investment (FDI), which is calculated as the actual utilization of foreign capital to GDP. These control variables take into consideration pertinent aspects that could influence economic growth. The study makes use of panel data spanning from 2004 to 2019, with the National Bureau of Statistics and the "China City Statistical Yearbook" serving as the primary sources of county-level data.

It is worth noting that the above baseline regression model may suffer from endogeneity issues. This endogeneity can stem from the influence of omitted variables or unobservable factors, as well as from the reverse causality between non-provincial capital cities' economic growth and the development of the circulation industry in provincial capital cities. Potential endogeneity problems can lead to biased estimation results. Therefore, this study adopts two strategies to mitigate endogeneity concerns.

First, by adding interaction terms between city fixed effects and year fixed effects, we mitigate the endogeneity problem brought on by missing variables. Secondly, we employ the method of instrumental variables, specifically the share-shift approach or Bartik instruments. This method simulates the initial share composition and overall growth rate of units and uses the simulated values as instrumental variables for the actual values. This approach has been widely used in the construction of instrumental variables for various issues such as employment Charles et al.

(2018)and migration Tabellini (2019). The instrumental variable construction in this study can be represented as follows:

$$IV\_LTY_{it} = LTY_{it_0} \times (1 + G_t)(2)$$

LTY_{it_0} represents the proportion of circulation employment in capital cities in the initial year, and $G_t$represents the exogenous growth rate of national circulation employment. The residual term and the Bartik instrumental variable are uncorrelated due to the control of the fixed effects of cities and years. In addition, there is a strong correlation between this instrumental variable and the growth of the circulatory industry in provincial capitals, which will aid in resolving the endogenous issue brought on by reverse causality.

Findings

(1) Baseline regression analysis

Table 1 presents the estimated results of the economic growth spillover impacts from the expansion of the circulation industry in provincial capital cities, based on the Ordinary Least Squares (OLS) approach. The city and year fixed effects are gradually controlled for in Models 1 through 5. Fixed year effects are controlled by Model 2, fixed city effects are controlled by Model 3, and fixed year and fixed city effects are controlled by Model 4. Overall, there are notable positive spillover effects from the rise of the circulation sector in provincial capital cities (LTY) to the neighboring non-provincial capital cities' economies. The economic growth of surrounding cities is predicted to increase by 1.0013 to 1.4322 units for every unit increase in the level of development in the circulation industry in provincial capital cities. The coefficient of 1.4006 in Model 5, which includes the interaction terms of year and city fixed effects, at a significance level of 1%, indicates that the rise of the circulation industry in provincial capital cities has significant spillover effects on economic growth. This demonstrates that, even after controlling for additional disturbances and missing variables, the basic conclusion remains valid, indicating that, outweighing any potential negative suction effect, the growth of the surrounding non-provincial capital cities' economies is positively agglomerated by the expansion of the circulation industry in provincial capital cities.

Table 1. Economic growth spillover effect of circulation industry development in provincial capitals: baseline regression

	Model 1	Model 2	Model 3	Model 4	Model 5
LTY	1.3722*** (2.81)	1.0013*** (2.75)	1.4322*** (3.06)	1.1157*** (3.22)	1.4006*** (2.91)
Control variable	YES	YES	YES	YES	YES
Urban fixed effect	NO	NO	YES	YES	YES
Year fixed effect	NO	YES	NO	YES	YES
City x year fixed effect	NO	NO	NO	NO	YES
Sample size	3808	3808	3808	3808	3808
R2	0.4182	0.4203	0.3894	0.5131	0.4977

Note: ***, **, and * indicate passing the test at the significance level of 1%, 5%, and 10%, respectively. The following table is the same.

Moreover, Table 2 displays the endogeneity analysis findings using the Two-Stage Instrumental Variables (IV) approach. The instrument variable and the explanatory variable (LTY) have a substantial positive correlation, according to the first-stage estimation results. This indicates a high correlation between the simulated level of development in the circulation industry in provincial capital cities and the actual level. The estimation results in the second stage also maintain statistical significance, indicating that, even after overcoming the

endogeneity issues arising from reverse causality, the development of the circulation industry in provincial capital cities still generates significant economic growth spillover effects.

Table 2. Economic growth spillover effect of circulation industry development in provincial capitals: instrumental variable method

	Model 1	Model 2	Model 3	Model 4	Model 5
The first stage	dependent variable： *LTY*				
	0.8815** (2.14)	0.8437** (2.49)	0.8621** (2.22)	0.8006*** (2.71)	0.7344** (1.98)
The second stage	dependent variable： *ED*				
LTY	3.7741*** (4.89)	4.2381*** (5.03)	4.2343*** (3.81)	3.7822*** (5.92)	4.1023*** (4.65)
Control variable	YES	YES	YES	YES	YES
Urban fixed effect	NO	NO	YES	YES	YES
Year fixed effect	NO	YES	NO	YES	YES
City x year fixed effect	NO	NO	NO	NO	YES
F-Value	14.71	16.22	15.08	15.38	14.20
R^2	0.3784	0.5110	0.4892	0.3901	0.4317

Table 3 demonstrates the robustness analysis strategy used in this article by substituting the core explanatory variables, i.e., characterizing the development level of the circulation industry in the provincial capital city by calculating the average proportion of the added value of the transportation, warehousing, wholesale, and retail industries in the provincial capital city to the total added value of the same industry in the province. This further ensures the reliability of the estimation results. The 1% significance level coefficient is 0.4773 and 0.2754, and the results remain robust. Furthermore, this study examined the effects of the development of the circulation industry on the income and consumption levels of residents in provincial capital cities, in addition to using the economic development level of non-provincial capital cities as the dependent variable. The study found that the development of the circulation industry in provincial capital cities effectively boosts the income level and consumption capacity of residents in surrounding non-provincial capital cities. The significance values are 0.2219*** and 0.2754***, respectively. The reason behind this could be that the growth of the circulation sector in provincial capital cities facilitates the removal of conventional barriers to trade and encourages the integration of the markets between provincial and non-provincial capital cities, increasing and improving the purchasing power of citizens in non-provincial capital cities.

Table 3. Economic growth spillover effect of circulation industry development in provincial capitals: robustness test

	Model 1	Model 2	Model 3
	Change the core explanatory variable	Resident income	Household consumption
LTY	0.4773*** (2.73)	0.2219*** (3.87)	0.2754*** (3.31)
Control variable	YES	YES	YES
Urban fixed effect	YES	YES	YES
Year fixed effect	YES	YES	YES
City x year fixed effect	YES	YES	YES

Sample size	3808	3808	3808
R^2	0.3747	0.6782	0.7200

(2) Heterogeneity analysis

The empirical research presented earlier indicates that the development of the circulation industry in provincial capital cities generates positive and significant economic growth spillover effects. However, does this spillover effect differ based on the characteristics of non-provincial capital cities? This study looks at the economic spillover impacts of the circulation industry's growth in provincial capital cities from the standpoint of several regional divisions, such as the Southern and Northern regions, as well as the Eastern, Central, and Western regions. Table 4 presents the findings.

It is evident from the regional segmentation of the Eastern, Central, and Western regions that the growth of the circulation sector in provincial capital cities across these regions has a major positive spillover effect on economic growth. The eastern region's coefficient of 1.8931 is substantially greater than those in the central region (1.2631***) and western region (1.0007***) at a significance level of 1%. Nonetheless, there are variations in the degree of spillover effects among these regions. This suggests that the eastern region's provincial capitals have a significantly greater economic growth spillover effect from the development of the circulation industry than do the central and western regions. In addition, from the regional division of southern and northern regions, the spillover effects of economic growth in the development of the circulation industry in provincial capital cities are significantly positive, with a significance of 1.1329*** in the southern region and 1.1468*** in the northern region, and the difference in spillover intensity is not significant.

Table 4. Economic growth spillover effects of circulation development in provincial capitals: regional heterogeneity

	east	Middle part	west	south	north
LTY	1.8931*** (3.06)	1.2631*** (2.69)	1.0007*** (2.88)	1.1329*** (3.14)	1.1468*** (2.91)
Control variable	YES	YES	YES	YES	YES
Urban fixed effect	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES
City x year fixed effect	YES	YES	YES	YES	YES
R^2	0.6371	0.4519	0.4322	0.5225	0.3615

According to this study, the proximity and geographic separation between provincial and non-provincial capital cities have a significant impact on the economic spillover effects of the growth of the circulation sector in provincial capital cities. This study separates the sample into adjacent and non-adjacent samples according to whether there is an adjacency link between non-provincial capital cities and provincial capital cities within the same province. However, this study separates the sample into close-distance and far-distance samples according to the median geographic distance between provincial capital cities and non-provincial capital cities located within the same province. Table 5 displays the outcomes of the estimation.

From the standpoint of the adjacency connection, the development of the circulation industry in provincial capital cities has a greater economic growth spillover effect when non-provincial capital cities are close by. 2.0013 is the significance level coefficient at the 1% level. Although non-adjacent non-provincial capital cities also experience positive spillover effects from the development of the circulation industry in provincial capital cities, the spillover intensity is relatively weaker.

From a distance perspective, when the gap between provincial capital cities and non-provincial capital cities widens, the economic growth spillover effects of the expansion of the circulation sector in provincial capital cities show a declining tendency. Put another way, the effects of spillover are less strong the farther one is from the source.

Table 5. Economic growth spillover effects of circulation development in provincial capitals: adjacency and distance heterogeneity

	Adjacent sample	Non-adjacent samples	Close sample	Remote sample
LTY	2.0013*** (2.76)	1.1504*** (3.17)	1.8336*** (4.10)	1.0364** (3.41)
Control variable	YES	YES	YES	YES
Urban fixed effect	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES
City x year fixed effect	YES	YES	YES	YES
R^2	0.4224	0.3941	0.4013	0.4618

Furthermore, the industrial structure characteristics and human capital endowment of non-provincial capital cities themselves also determine how they are affected by spillovers from provincial capital cities. The significant level coefficient of 5% is 1.7222 when nonprovincial capital cities have advanced industrial structures, indicating a relatively strong attraction for creative resources and the ability to effectively deal with the siphoning effect of province capital cities. Surrounding non-provincial capital cities' economic growth is impacted by the expansion of the circulation industry in provincial capital cities. The relationship between provincial capital cities and non-provincial capital cities can also be successfully facilitated by non-provincial capital cities possessing superior human capital. This study divides the samples into high-level and low-level industrial structure samples based on the median value of the industrial structure of non-provincial capital cities (the ratio of value added in the tertiary industry to value added in the secondary industry). Furthermore, it uses the median value of human capital in non-provincial capital cities—that is, the percentage of the labor force with a higher education—to separate the samples into high and low human capital samples. Table 6 displays the outcomes of the estimation.

In general, non-province capital cities with a more developed industrial structure and higher caliber human resources have more spillover impacts from the growth of the circulation industry in provincial capital cities (the coefficient is 1.8734). To lessen the suction effect caused by the dominance of provincial capital cities, it is also implied that non-provincial capital cities must encourage the optimization of their industrial structures and the enhancement of the caliber of their human capital.

Table 6. Economic growth spillover effect of circulation industry development in provincial capitals: industrial structure and human capital heterogeneity

	Sample of advanced industrial structure	Sample of low-level industrial structure	Sample of high human capital	Low human capital sample
LTY	1.7222** (2.44)	1.0073*** (2.96)	1.8734*** (3.19)	1.0421** (2.48)
Control variable	YES	YES	YES	YES
Urban fixed effect	YES	YES	YES	YES

Year fixed effect	YES	YES	YES	YES
City x year fixed effect	YES	YES	YES	YES
R^2	0.4305	0.3891	0.5020	0.5322

(3) Mechanism test

The expansion of the circulation sector in province capital cities has been shown to have a knock-on effect on the economic growth of non-provincial capital cities; however, the exact mechanism by which this knock-on effect occurs is still unknown. Previous research has shown that the growth of capital cities in provinces can have a knock-on impact on capital cities outside of provinces through mechanisms such as division of labor and learning, resulting in the phenomenon known as "simultaneous economic flight".

This paper innovatively gives a new explanation based on the path of resource allocation. Specifically, the development of the circulation industry in provincial capitals can form a spatial leading role in the regional scope, accelerate the flow of production factors between cities, promote market integration, and alleviate the mismatch of production factors caused by market segmentation. Of course, the above analysis is still at the theoretical level, and further empirical tests are needed. Examining how the growth of the circulation sector in provincial capitals has affected the imbalance between labor and capital variables in those areas is the first stage.

$$CP_{Pt} = \alpha_0 + \alpha_1 LTY_{it} + \alpha_2 Control_{it} + v_i + \delta_t + \epsilon_{it} (3)$$

Examining how the disparity between labor and capital components affects non-provincial cities' economic growth is the second step.

$$ED_{it} = \alpha_0 + \alpha_1 CP_{Pt} + \alpha_2 Control_{it} + v_i + \delta_t + \epsilon_{it} (4)$$

CP refers to the indices of labor misallocation and capital misallocation. This study refers to the methods for measuring the misallocation of labor and capital variables that Zhang et al. (2023) and Bai and Hu (2018) adopted.

Table 7 displays the outcomes of the mechanism test. This study finds that the positive and significant spillover effects of the development of the circulation industry in provincial capital cities on the economic growth of non-provincial capital cities are mainly attributed to the correction of capital misallocation. The empirical results indicate that the development of the circulation industry in provincial capital cities contributes to a decrease in the capital misallocation index across the entire province. This suggests that the adoption of a strong provincial capital strategy in the development of the circulation industry does not lead to excessive agglomeration of capital factors; instead, it helps to improve the issue of misallocation.

However, the impact of the development of the circulation industry in provincial capital cities on labor misallocation within the province is not significant, the coefficient is -0.0732. It fails to effectively correct the problem of labor misallocation.

Table 7. Economic growth spillover effect of circulation industry development in provincial capitals: mechanism test

	Labor mismatch correction mechanism		Capital misallocation correction mechanism	
	CP	*ED*	*CP*	*ED*
LTY	-0.0732 (-1.60)		-0.0877*** (-3.41)	
CP		-0.4223*** (-295)		-0.1734*** (-2.72)
Control variable	YES	YES	YES	YES
Urban fixed effect	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES

City x year fixed effect	YES	YES	YES	YES
Sample size	3808	3808	3808	3808
R^2	0.3421	0.4003	0.2893	0.3005

Discussion and Conclusion

This paper conducts a thorough analysis of the effects of the growth of the circulation industry in provincial capital cities on the neighboring non-provincial capital cities, using the development of the industry as the primary research subject and the implementation of the strategy of strengthening provincial capital as the research background. The principal research findings are as follows: the growth of the circulation industry in provincial capital cities has a typical heterogeneity in its economic growth spillover effect; the development of the circulation industry in provincial capital cities has a significant positive spillover effect on the surrounding non-provincial capital cities' economic growth; and the aforementioned conclusions remain significant after the robustness test and endogeneity treatment. There is no discernible difference between capital cities in the south and north concerning geographical division; nonetheless, the eastern capital cities have a higher spillover impact than the central and western capital cities. The spatial spillover impact of the economic growth of the circulation industry development of the provincial capital city is substantial when the non-provincial capital city is close to the provincial capital city or when the distance between them is small. In the characteristic dimension of urban economic development, when the industrial structure of the non-provincial capital city is more advanced and the quality of human capital is higher, the economic growth spillover effect of the development of the circulation industry in the provincial capital city is stronger. Capital misallocation correction is the main mechanism to realize the spillover effect of the circulation industry development of provincial capital cities on the surrounding non-provincial capital cities, while the effect of labor force misallocation correction is not significant.

Theoretical Implications

The theoretical significance of this study is primarily manifested in two aspects. Firstly, it deepens the application and understanding of the growth pole theory. Through empirical analysis of the spillover effects of provincial capital cities' circulation industry on the economic growth of surrounding non-capital cities, this study validates the "polarization-diffusion" mechanism within the growth pole theory. That is, provincial capital cities, as growth poles of regional economies, not only drive their own economic growth through the development of their circulation industry but also stimulate economic development in surrounding areas through the diffusion of resources, technologies, and markets. This finding not only enriches the practical application cases of the growth pole theory but also deepens the understanding of its underlying mechanisms.

Secondly, this study provides new empirical support and theoretical perspectives for the theory of growth spillovers. By examining the heterogeneous manifestations of the spillover effects of circulation industry development under different geographical, spatial, and economic conditions, this study reveals the complexity and diversity of economic growth spillovers. Notably, the study discovers that the correction of capital misallocation plays a pivotal role in this spillover process. This finding not only enriches the content of the growth spillover theory but also offers a fresh theoretical perspective on how the circulation industry promotes coordinated regional economic development by improving resource allocation efficiency.

Practical and Social Implications

The practical significance of this study lies in providing vital reference for regional economic development planning and policy formulation.

Firstly, by revealing the spillover effects of provincial capital cities' circulation industry on the economic growth of surrounding non-capital cities, this study offers robust empirical support for inter-regional economic interaction and cooperation. Policymakers can leverage this information to optimize regional economic layouts, facilitate efficient resource allocation within the region, and thereby propel the integration process of regional economies.

Secondly, the study underscores the pivotal role of capital misallocation correction in the circulation industry's contribution to economic growth, offering targeted policy recommendations for policymakers. By enhancing the efficiency of capital allocation, governments can harness the full potential of the circulation industry in promoting regional economic growth, ultimately achieving sustained, balanced, and sustainable economic development. This, in turn, has positive implications for expanding job markets and elevating overall social welfare levels.

Limitations and Suggestions for Future Research

Despite the substantial efforts invested in data collection and analysis, this study inevitably encounters some limitations. Firstly, the comprehensiveness, timeliness, and accuracy of data, which are the foundation of any empirical research, are often compromised by disparities in statistical standards across regions and industries. Inconsistencies in data collection, processing, and reporting among different regions and industries may hinder complete alignment of data both horizontally and vertically, thereby constraining the precision of research conclusions. To overcome this limitation, future studies need to more meticulously examine the statistical systems of different regions, seeking standardized data collection and processing methods to ensure the comprehensiveness and accuracy of data.

Secondly, sample selection poses another potential limitation for this study. While the study endeavors to encompass multiple provincial capital cities and their surrounding non-capital cities, constraints related to data acquisition difficulties and costs may render the sample less than fully representative of all regions. This sample bias may restrict the universality of research conclusions, making it difficult to directly generalize to unstudied areas. To enhance the broad applicability of research conclusions, future studies should strive to expand the sample scope, encompassing more representative regions and industries, and adopt more rigorous sampling methods to ensure the representativeness and reliability of the sample.

The following policy implications arise from this paper: First off, despite the potential risks of agglomeration and siphon effects associated with the implementation of a strong provincial capital strategy, the development of the circulation industry in provincial cities indicates that such a strategy can effectively propel the economic expansion of neighboring cities.

Therefore, the strong provincial capital strategy should be persisted to promote the spatial distribution of circulation resources in the development of provincial cities. depending on the provincial cities' leadership and radiating role to propel the region's overall economic growth. The circulation industry should follow the "point with surface" development strategy and leverage the province capital city's strengths to propel overall economic growth. Furthermore, there is a characteristic variety in the way that economic expansion spills over into the development of the circulation industry in provincial capital cities. This implies that different kinds of provincial capital cities should structure the development of the circulation industry in different ways. On the one hand, considering that the development of the circulation industry in the eastern provincial capital city can better release the spillover effect of economic growth, the distribution of circulation resources in the eastern provincial capital city should be actively

promoted. On the other hand, the economic growth of non-provincial capital cities near the provincial capital city is more obviously affected by the spillover effect, and this spillover effect has an attenuation characteristic in the distance dimension.

As a result, the strategic scope of implementing a solid capital strategy should be constrained. Furthermore, to fully realize the positive ripple effect of provincial capital cities' economic growth, ongoing efforts should be made to optimize their industrial structure and enhance the caliber of their human resources. Lastly, it is imperative to actively support the development of an integrated market, remove obstacles to market segmentation, and open up avenues for enhancing the strategic role of provincial capitals by resolving the issue of labor, capital, and other factor misallocation. This is because the growth of the circulation industry in these cities can have a cascading effect on economic growth by resolving the misallocation of resources.

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