Hollowed-Out Villages and Siphon Cities: The Dilemma of Unbalanced Flow in China's Regional Development

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Abstract. actors—specifically labor and capital—remains a primary obstacle to equitable regional growth. Employing a comparative case-study analysis, this article explores Guizhou Province and Shenzhen city as extreme cases of this siphon effect. By integrating Lewis's dual-sector model with Friedmann's core-periphery framework, this research utilizes official longitudinal data to trace the patterns and directional courses of rural labor migration. The analysis reveals the structural drivers of such increasing regional divergence. To heal these rifts, the study recommends a strategic policy turn, including the promotion of "reverse flows" of human and industrial capital, the speeding up of market-based reform for resource allocation, and the empowerment of local governance. In the end, the article argues that bridging the developmental divide between stagnant rural nodes and aggressive urban centers is vital for ensuring China's long-term hold on economic resilience.

Keywords: Hollowed-out Villages, Siphon Cities, Regional Disparity, Unbalanced Factor Flow

1. Introduction

Since the launch of reform and opening-up, China has undergone one of the world's most rapid and large-scale urbanization processes.

The current urbanization rate was as high as 67.0% in 2024, and the rural population accounted for about 33% in 2024, with an increase of 17.9% in 1978 [1]. Roughly 380 million individuals with rural household registration moved to cities and towns between 1978 and 2024, with an average annual net migration of more than 9 million, according to figures from the National Bureau of Statistics [2]. Such a massive, one-way flow of population has engendered uneven patterns typified by the coexistence of "hollowed-out villages" and "siphon cities." Although national policies, such as "Rural Revitalization" and "Urban-Rural Integration," have been put in place, the policy pull has not been strong enough to counteract the economies of scale advantages enjoyed by major cities, and the trend of population shifting has not fundamentally reversed [3].

The "hollowed-out villages" are formed mainly in the traditional farming areas in central and western China and they feature an aged population, a labor force outflow, and a low-in-coming spatial utilization, resulting in a breaking up and hollowing out of the settlement pattern [4]. In contrast, these "siphon cities," which came into being primarily in the eastern coastal region and several key inland urban centers, are characterized with high-density agglomeration of population

and capital, vertical expansion of spaces, and rapid up-takes of resources and factors. Concentrated opportunities for work, public services, and industrial ecosystems in these cities make them magnets for inbound migrations [5]. Most scholars have observed coexisting "hollow villages" in the countryside and "siphon cities" in the cities of China; yet, the literature is fragmented with no consistent model incorporating the dual sector and the core–periphery theories to capture regional disparity in China. Hence, this paper investigates the lagged interregional flows of labor and capital in both directions, and analyzes the one-way drivers behind those flows as well as the outcome of these movements for both sending and receiving regions. This paper takes official data and relevant literatures as the basis to compare and analyze the Guizhou rural area with the Shenzhen siphon city, in an attempt to establish a more complete theoretical framework and to offer theoretical enlightenment as well as policy support through evidence for rural revitalization strategies and urban-rural integrated development. Case Studies of Hollowed-out Village and Siphon City

1.1. Hollowed-out village cases

Guizhou exemplifies severe rural hollowing-out, marked by population imbalance amid overall growth: its total resident population expanded from 34.75 million (2010) to 38.56 million (2020) [6], yet rural populations fell in 68 of its 88 counties during this decade. By 2024, the province's rural resident population dropped further to 16.73 million (a 2.1% decline from 2020), while urban populations in core hubs (e.g., Guiyang, Zunyi) rose by 12.3% between 2020 and 2024 [7]. This sharp urban-rural population split directly highlights the deepening rural hollowing out in Guizhou.

Specifically, 62% of Guizhou's inter-provincial migrants moved to Guangdong, Zhejiang, and Fujian [8]. In Guizhou's rural areas, the aging rate reached 18.2% (2020) [8], and the number of left-behind children stood at 379,700 in 2024—accounting for about 12.4% of the province's rural minor population, a figure far higher than the national average [9]. In 2024, Guizhou's primary sector investment fell by 13.3% year-on-year [10], further weakening rural areas' capacity to absorb labor. Underinvestment in agricultural infrastructure and modernization has drastically diminished rural employment prospects, driving a growing number of rural laborers to migrate to urban areas. Between 2010 and 2020, the net migration rate of Guizhou's rural labor force hit 19.2%, with 78.3% of migrants aged 18–45 (the core working-age group) [10]. This creates a vicious cycle: capital outflows reduce labor absorption capacity, which accelerates the migration of prime working-age laborers, in turn exacerbating rural hollowing-out.

Table 1. Distribution and industrial structure of major destinations for the out-migrant population from Guizhou province, 2023 [11]

Rank	Inflow City	Province	Percentage	Core Industrial Sectors
1	Hangzhou	Zhejiang	12.1%	E-commerce Logistics, Internet Operations,Manufacturing
2	Shenzhen	Guangdong	11.7%	Electronics Manufacturing, Information Technology, Cross-border E-commerce
3	Dongguan	Guangdong	9.8%	Apparel & Textiles, Electronics Assembly, Furniture Manufacturing
4	Guangzhou	Guangdong	8.5%	Catering Services, Logistics & Transportation, Construction
5	Ningbo	Zhejiang	6.3%	Garment Manufacturing, Port Logistics, Home Appliance Production

Table 1. (continued)

6	Fuzhou	Fujian	5.1%	Aquatic Product Processing, Construction & Decoration, Retail
7	Wenzhou	Zhejiang	4.9%	Footwear Manufacturing, Auto & Motorcycle Parts, Low-voltage Electrical Appliances
8	Quanzhou	Fujian	4.6%	Footwear & Apparel OEM, Ceramics & Sanitary Ware, Express Delivery Sorting

Table 1 shows that, the core industries of the destination cities in this table (e.g., e-commerce logistics in Hangzhou, electronics manufacturing in Shenzhen) are typical labor-intensive sectors. These industries have a great demand for low-skilled and semi-skilled labor, which perfectly matches the skill profile of rural migrants from Guizhou. This skill compatibility not only reduces the employment threshold for rural migrants but also strengthens the one-way flow of labor—rural areas lose a large number of working-age population, while cities continuously absorb labor, exacerbating the hollowing-out of Guizhou's rural areas.

1.2. Siphon city cases

Shenzhen exhibits a pronounced siphoning effect. By 2023, its permanent resident population had reached 17.66 million, recording a decadal growth rate of 69.2%—2.9 times the average of Guangdong Province [12]. The electronics sector, a core driver, draws a broad pool of immigrant labor, including 79% from the Pan-Pearl River Delta [13]. Non-local household registration holders account for 65.8% of residents [12].

In 2023, fixed-asset investment totaled 975.8 billion yuan, with high-efficiency industrial hubs like Nanshan Science Park leading the way—its GDP output density is 8.3 times the national average for high-tech zones [14]. This exceptional industrial efficiency fuels a positive feedback loop, attracting concentrated inflows of capital, technology, and high-skilled talent, which in turn strengthens Shenzhen's siphoning power.

Table 2. Distribution and industrial structure of major source regions for the in-migrant population to Shenzhen, 2023 [12]

Rank	City of Origin	Province	Percentage	Core Industrial Sectors
1	Bijie	Guizhou	5.6%	Electronics Assembly, Mobile Phone Manufacturing
2	Hengyang	Hunan	5.2%	Precision Instruments, Battery Production
3	Maoming	Guangdong	4.9%	Port Logistics, Cross-border E-commerce Customer Service
4	Ganzhou	Jiangxi	4.7%	Home Appliance Assembly, LED Packaging
5	Liangshan	Sichuan	4.5%	Mobile Phone Testing, Logistics Sorting
6	Zhaotong	Yunnan	4.3%	Construction & Decoration, Food Delivery
7	Yongzhou	Hunan	4.1%	Garment OEM, Electronics Repair
8	Hechi	Guangxi	3.8%	Toy Assembly, Catering Supply Chain
9	Shanwei	Guangdong	3.6%	Semiconductor Testing, Live-streaming E-commerce
10	Yichun	Jiangxi	3.4%	Lithium-ion Battery Production, Drone Assembly

As shown in table 2, the core industries here (electronics assembly, lithium-ion battery production) anchor Shenzhen's electronic information sector. The industry's large scale and high agglomeration make Shenzhen a top destination for rural migrants from western/central China (e.g., Bijie, Guizhou; Liangshan, Sichuan). Most workers in the manufacturing sector are employed without holding local household registration. This aligns with broader migration patterns: Henan, as a major source province, contributes a significant share of rural labor to industrial hubs like Shenzhen, drawn by the steady demand for manufacturing workers in sectors like electronics and battery production.

2. Analysis

2.1. Theoretical foundation

China's persistent and widening regional disparities can be effectively interpreted via an integrated framework of two core theories: Lewis's Dual-Sector Model and Friedmann's Core-Periphery Model.

Lewis's two-sector model lays a macro foundation for understanding the migration of urban and rural labor [15]. It assumes that developing economies include traditional agricultural sectors with low productivity and modern industrial sectors that absorb surplus labor. However, this theory has evolved into a unique semi-urbanization model in China: although rural laborers have flocked to urban areas, they struggle to access equal public services due to the household registration system. The income gap between urban and rural areas forms a "push-pull" mechanism, while the demand for high-skilled talents in cities intensifies the "selective siphon" effect and draws away rural human capital [16].

Friedman's core-periphery model offers a spatial perspective, arguing that development is inherently unbalanced in space, and the core area becomes a resource hub due to the agglomeration effect, but its spillover effect on the periphery will not be realized automatically [17]. In China, core areas consolidate factors of production via market and administrative forces, leaving peripheral areas trapped in a vicious cycle of disadvantage and struggling to retain young, dynamic labor. Notably, this polarization is multi-scalar, replicating the core-periphery relationship at national, provincial, prefectural and county levels [16].

China's registration system is a pivotal link between the two models. Under this system, most rural migrants are denied equal urban public services, preventing permanent urban settlement. As a result, their labor income fails to translate into rural development investment (e.g., agricultural modernization, local enterprise growth), severing the trickle-down effect from core to rural peripheral areas [16]. This institutional barrier not only strengthens the "push-pull" dynamic in the Dual-Sector Model (driving rural labor to cities while restricting full integration) but also exacerbates core-periphery polarization in Friedmann's Model, becoming a key driver of sustained regional imbalance .

The coupling of the two models reveals the systemic logic behind the "hollowed village-siphon city"dichotomy(see Figure1). The process starts with Lewisian dynamics: surplus agricultural labor migrates from the traditional sector driven by urban-rural income gaps and superior public services [15]. Their destination, determined by Friedmann's spatial hierarchy, is the core urban areas. This one-way concentration drains rural peripheries of vital human capital, causing rural hollowing and economic marginalization. In turn, it weakens or severs essential trickle-down effects (e.g.,remittance-driven investment, knowledge transfer) for peripheral development, ultimately forming a self-reinforcing cycle of regional inequality.
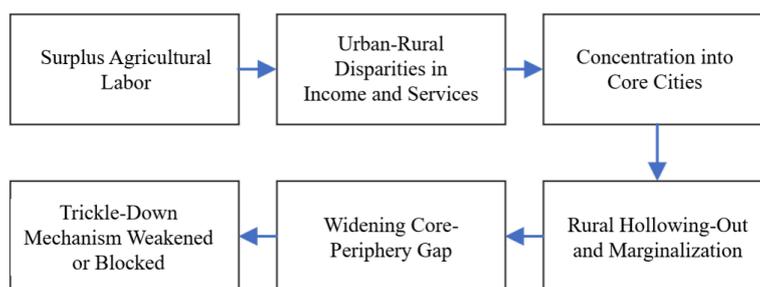
Figure 1. The coupling mechanism between the dual-sector and core-periphery models

2.2. Multi-dimensional structural causes of unbalanced development

Case studies have shown that there is a clear pattern of unbalanced factor flow between regions, which is rooted in the in-depth causes of three dimensions: economic, institutional, and social structures. These three dimensions are intertwined and mutually reinforcing, collectively exacerbating regional development imbalance [18].

Economically, the significant efficiency gap between urban and rural areas is the core driver of one-way factor flow. Core cities form efficiency advantages through industrial upgrading and technological innovation, continuously absorbing various high-quality production factors; while rural and underdeveloped areas face the dilemma of fragmented production factors and insufficient investment supply, which further weakens their factor agglomeration capacity [18].

Institutionally, the difference in institutional supply between core cities and rural areas constitutes a structural barrier to factor flow. Core cities have formed institutional advantages in factor agglomeration relying on strong financial strength, improved infrastructure and preferential policies; while rural areas are hindered by institutional constraints such as the household registration system and land tenure, which obstruct the flow and optimal allocation of factors [18]. This difference is directly reflected in resource allocation: core cities invest a large amount of resources in high-value-added industries, such as Shenzhen's concentrated investments in high-tech industries, which promotes the improvement of factor utilization efficiency [19]; while the investment in agricultural infrastructure in rural and underdeveloped areas is relatively weak. In 2024, the budgetary funds for agricultural infrastructure construction at the prefectural level in Liangshan Prefecture were only 1 million yuan. Although there are relevant investment in rural revitalization at the prefectural level, the problem of insufficient precise investment in agricultural infrastructure remains prominent, which makes it difficult to support rural factor agglomeration [20]. At the same time, the dual structure of urban and rural social security caused by the household registration system makes it difficult for agricultural transfer population to settle stably in cities, forming a "migratory bird-type" flow pattern, which further solidifies the unbalanced pattern of factor flow [18].

Socially, social networks, information channels and cultural path dependence jointly dominate the direction of population flow, thereby exacerbating the imbalance of factor flow [18]. The demonstration effect and social networks forged by early migrants have shaped fixed paths for factor mobility, imparting distinct agglomeration traits to the flow of rural labor toward core cities. For instance, via east-west labor cooperation, Liangshan Prefecture has facilitated the flow of a substantial number of rural laborers to Chengdu, the Pearl River Delta, and other such regions. In 2024, the "Ningbo-Liangshan" special labor cooperation output of rural laborers increased by 7,742, and some young laborers concentrated in the construction industry in Chengdu and the Pearl River Delta and related manufacturing enterprises in Shenzhen [21]. This directional flow based on social

networks enables core cities to continuously obtain supplementary labor factors, while rural areas face the dilemma of continuous loss of high-quality labor factors.

2.3. Multi-dimensional impacts of unbalanced factor flow

On the social level, siphon city faces the problems of mismatch between public service supply and population demand and high population heterogeneity; The hollowed-out villages are characterized by accelerated aging and concentrated children staying behind, and the hollowed-out villages in the west stem from the outflow of labor, which is different from that in the east [22].

Economically, siphon cities can boost economic efficiency in the short term, but there is a long-term risk of diminishing marginal income and regional imbalance, Due to the outflow of human capital, hollowed-out villages are caught in the dilemma of "factor loss → function decline", which hinders sustainable growth [23].

In spatial layout, siphon cities are over-concentrated, and high-density development intensifies the ecological carrying pressure; Hollow villages are inefficient in space utilization due to population outflow, idle homesteads and farmland. This two-way imbalance is a typical model of central city expansion [24].

3. Suggestions

3.1. Promoting the sustainable return of population and industries

The core task of resolving the "hollowed-out villages-urban siphoning" dilemma lies in guiding the high-quality return of population to rural areas and small-to-medium-sized cities, with the key being to establish a sound interaction mechanism between population and industries. Priority should be given to enhancing the carrying capacity of county-level administrative regions: taking counties as the basic unit, we will concentrate the layout of public services, industrial infrastructure, and employment opportunities in county seats and central towns, and construct a three-tier carrying system covering "counties-towns-villages" to improve rural areas' attractiveness and retention capacity for the labor force [25].

3.2. Deepening reforms of spatial and resource allocation mechanisms

Institutional rigidities in spatial and resource allocation are major obstacles to reversing rural hollowing, requiring in-depth structural reforms in land policies and public service systems. Firstly, advance the composite utilization of rural residential land: expand the pilot reform of the rural residential land system, encourage farmers to participate in rural cultural tourism, health and wellness, and study-tourism projects through equity investment and entrusted management of idle residential land, realizing the transformation of "space into assets" [17].

4. Conclusion

5. Combining theoretical frameworks with focused case analysis, this study examines the structural asymmetry in factor flows between "hollowed out" rural areas and "siphon cities." the study reveals a fundamental logic of labour and capital moving in a one-way stream that is driven not only by differences in productivity but also by bureaucratic and social network complexities.

This has major implications for regional solidarity. While this work does provide a comprehensive framework to understand these imbalances and offer a guide to making the best in

use of the resource, it does have limitations. There is therefore potential for broader case selection and/or further analytical generalisation. Therefore, the scenarios investigated in this study should be extended and the discourse refined by emerging trends in future work. In the end, addressing the disparity in regional growth demands a multi-pronged approach; this study is a step toward fairer and sustainable regional development."

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