The Fiscal Roots of China's Unbalanced Growth*

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Abstract

China's infrastructure bias, overcapacity, and structural trade surplus are commonly attributed to political tournament incentives. We offer a fiscal explanation. Under China's origin-based tax sharing, local governments retain 50% of VAT at the point of production but receive no consumption tax revenue. This fiscal wedge makes production a fiscal asset and consumption a liability, generating infrastructure overinvestment and welfare suppression even under benevolent governance. We validate the mechanism with 540,000 industrial land transactions: cities hit harder by the 2016 Business-to-VAT reform compress land prices to attract manufacturing, with effects concentrated among younger officials and high-VAT industries. Business cycle accounting across 283 prefectures reveals that fiscal forces explain 78% of post-2016 investment dynamics, up from 36% before 2008. Policy counterfactuals show that destination-based tax reform raises consumption by 8.8 percentage points and delivers welfare gains four times larger than equivalent transfers.

JEL codes: H71; H72; H77; O23; E62; P35; E21; F41

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*All remaining errors are our own.

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1 Introduction

China's growth trajectory since the 1990s exhibits three structural features that distinguish it from other developing economies: infrastructure-led capital accumulation averaging over 40% of GDP, persistent industrial overcapacity that has defied repeated policy interventions, and a structural trade surplus that has reshaped global manufacturing (Zheng Song, Kjetil Storesletten and Fabrizio Zilibotti, 2011; Chang-Tai Hsieh and Peter J. Klenow, 2009). The dominant explanation attributes these patterns to political tournament incentives: local officials prioritize industrial output because political advancement depends on GDP performance (Hongbin Li and Li-An Zhou, 2005; Eric Maskin, Yingyi Qian and Chenggang Xu, 2000; Zheng Song and Wei Xiong, 2024; Chenggang Xu, 2011). This paper proposes an alternative interpretation grounded in fiscal architecture rather than political ambition, and demonstrates that the distinction carries fundamental implications for policy design.

The central mechanism is a fiscal wedge created by China's origin-based tax-sharing system. Under rules established by the 1994 Tax Sharing Reform and reinforced by the 2016 Business-to-VAT (B2V) transition, local governments retain 50% of value-added tax collected at the point of production but receive zero revenue from consumption taxes. This assignment creates a fundamental asymmetry: production is a fiscal asset that relaxes local budget constraints, while consumption is a fiscal liability that generates no marginal fiscal return.

To illustrate concretely: when a Beijing resident purchases an electric vehicle manufactured by BYD in Shenzhen, the VAT revenue accrues to Shenzhen rather than Beijing. The marginal fiscal return to infrastructure investment is strictly positive because it generates VAT revenue, while the marginal fiscal return to welfare spending is zero because local governments receive no consumption tax revenue. The resulting fiscal wedge, the difference between these two marginal returns, induces infrastructure bias even under fully benevolent local governance, without requiring any career concerns or rent-seeking behavior (Hehui Jin, Yingyi Qian and Barry R. Weingast, 2005; Chong-En Bai, Chang-Tai Hsieh and Zheng Michael Song, 2016).

We embed this mechanism in a dynamic stochastic general equilibrium model where local governments maximize household welfare subject to production-based revenue constraints. Households have CES preferences over private consumption and public welfare services with a negative elasticity parameter, implying that consumption and welfare are complements. This complementarity is crucial: when local governments underprovide welfare due to the fiscal wedge, they simultaneously reduce the marginal utility of private consumption, inducing households to save rather than consume even when their incomes rise. The preference specification generates a direct link from fiscal incentives to macroeconomic imbalances: the origin-based system sup-

presses both welfare spending and household consumption through reinforcing channels.

A key contribution is demonstrating how the baseline fiscal wedge is amplified through three general equilibrium channels. Capital mobility creates strategic complementarity: each region's infrastructure investment attracts mobile capital, triggering a race-to-the-bottom that amplifies the investment bias by a factor of roughly 1.35. A land-finance collateral accelerator approximately doubles the dynamic impact, as infrastructure raises land values that serve as LGFV collateral (Chang Liu and Wei Xiong, 2020; Yi Huang, Marco Pagano and Ugo Panizza, 2020). Finally, political incentives and soft budget constraints interact super-additively, explaining the severity of the 2008–2015 investment surge (Zhuo Chen, Zhiguo He and Chun Liu, 2020). We derive closed-form expressions for each amplification factor in the general equilibrium analysis below.

Before turning to the quantitative model, we provide direct micro-empirical support for the fiscal wedge mechanism. Using 540,000 industrial land transactions across 280 prefectures, we show that cities exposed to a larger revenue shock from the 2016 B2V reform aggressively compress industrial land prices to attract manufacturing capital and future VAT revenue. The effect reverses for retiring officials, who cannot capture the future fiscal payoff, and is concentrated in high-VAT industries, confirming the intertemporal, strategic nature of the fiscal trade-off.

Using panel data from 283 prefectures over 1998–2019, we recover time-varying fiscal and political wedges implied by the model's Euler equations, building on the business cycle accounting methodology of V.V. Chari, Patrick J. Kehoe and Ellen R. McGrattan (2007). The quantitative results reveal a dramatic regime shift. During 1998–2007, the "Golden Age of the Mandarin Model," political incentives accounted for 52–58% of infrastructure investment variation, while fiscal factors contributed 36–40%. By 2016–2019, fiscal determinism explains 78.4% of investment dynamics, while promotion-based motives contribute less than 15%. Career incentive intensity fell from over 1.1 to 0.32, yet investment remained elevated because fiscal survival, not political advancement, became the binding constraint.

The fiscal interpretation carries direct implications for reform. We compare two counterfactuals: (A) increasing central transfers by 5% of GDP, and (B) assigning 50% of consumption tax revenue to local governments under revenue neutrality. Transfers raise the consumption share by only 1.4 pp because they leave marginal incentives unchanged; most additional fiscal space is channelled into further infrastructure. Destination-based tax reform raises the consumption share by 8.8 pp, increases welfare spending from 9% to 15.7% of GDP, and delivers welfare gains more than four times larger (9.2% vs. 2.1% in equivalent consumption variation). The contrast underscores that rebalancing requires changing the price margin, the marginal fiscal return to welfare, not merely the quantity of intergovernmental transfers.

These results illuminate why campaigns for "Common Prosperity" have gained limited trac-

tion. The origin-based tax system generates capacity that systematically outpaces domestic demand, producing persistent overcapacity and structural trade surpluses. Destination-based reform would moderate trade surpluses organically by strengthening domestic consumption.

Contributions. We make four contributions. First, we identify the fiscal wedge, the gap between the marginal fiscal return to production and to welfare, as the primitive distortion driving China's investment bias, and show that it generates infrastructure overinvestment, welfare suppression, overcapacity, and structural trade surpluses even under fully benevolent governance. This complements the political-tournament explanation (Li and Zhou, 2005; Song and Xiong, 2024) by providing a fiscal-structural alternative with distinct policy implications. Second, we provide the first micro-empirical evidence for the fiscal wedge mechanism, exploiting the 2016 B2V reform as a natural experiment with 540,000 industrial land transactions. The identification leverages heterogeneity by official retirement age and industry VAT intensity to confirm the intertemporal, strategic nature of the fiscal trade-off. Third, using business cycle accounting, we document a regime shift from political to fiscal dominance: political wedges explained 55% of investment variation during 1998–2007 but only 15% by 2016–2019, while the fiscal wedge rose from 36% to 78%. This finding reframes the policy debate from reforming political incentives to restructuring tax assignment. Fourth, we derive closed-form amplification factors for capital mobility, land finance, and political-debt interactions, and use them to evaluate destination-based tax reform. The reform raises consumption by 8.8 pp and generates welfare gains four times larger than equivalent transfers, establishing a quantitative case for changing marginal fiscal incentives rather than redistribution.

Related Literature. Our work relates to four strands of literature. On tax assignment, origin-versus-destination principles, and fiscal federalism, Roger H. Gordon (1983) derives optimal intergovernmental tax assignments, showing that production-based taxes are inherently distortionary when factors are mobile. George R. Zodrow and Peter Mieszkowski (1986) and John D. Wilson (1999) formalise how mobile capital induces a race to the bottom in public-good provision. Ben Lockwood (2001) demonstrates that origin-based commodity taxes distort production decisions, whereas destination-based taxes are location-neutral; accordingly, nearly all national VAT systems adopt the destination principle (Michael Keen and Ben Lockwood, 2010; Liam Ebrill, Michael Keen, Jean-Paul Bodin and Victoria Summers, 2001). Alan J. Auerbach, Michael P. Devereux, Michael Keen and John Vella (2018) establish destination-based cash flow taxation as a first-best benchmark. Charles E. McLure (2000) addresses the unique challenge of implementing destination-based VAT within federations where internal borders cannot be enforced. Roger Gordon and Wei

Li (2009) argue that developing countries' reliance on production-based taxes reflects enforcement constraints, generating structural distortions. Within the Chinese context, Wallace E. Oates (1999), Barry R. Weingast (2009), and Jin, Qian and Weingast (2005) analyse how fiscal decentralisation shapes government incentives; Luiz R. de Mello (2000) and Jack Mintz and Michael Smart (2004) document that vertical fiscal imbalance creates expenditure distortions across both developed and developing federations. We contribute by demonstrating that China's origin-based VAT sharing creates subnational distortions analogous to those in the international context, embedding them in a quantitative DSGE model with closed-form amplification factors for capital mobility and land finance.

On political tournaments, soft budget constraints, and local government debt, Li and Zhou (2005), Xu (2011), and Song and Xiong (2024) argue that GDP-based promotion tournaments drive local officials to prioritise industrial investment. We do not reject this mechanism for the pre-2008 period; rather, our wedge decomposition reveals that political motives explain less than 15% of post-2016 dynamics, consistent with the findings of Ye Chen, Hongbin Li and Li-An Zhou (2005) and Yang Yao and Muyang Zhang (2015). János Kornai (1986) and János Kornai, Eric Maskin and Gérard Roland (2003) formalise the soft budget constraint; Yingyi Qian and Gérard Roland (1998) analyse its interaction with federalism. Chen, He and Liu (2020) and Huang, Pagano and Panizza (2020) document the rise of LGFV borrowing in China. We show how debt capacity interacts super-additively with fiscal and political incentives, explaining both the post-2008 investment surge and the emergence of "fiscal survival" as a distinct investment motive.

On global imbalances and structural trade surpluses, Maurice Obstfeld and Kenneth Rogoff (2009) link current account imbalances to domestic structural distortions; Ben S. Bernanke (2005) attributes the "global saving glut" partly to Asian mercantilist policies; Ricardo J. Caballero, Emmanuel Farhi and Pierre-Olivier Gourinchas (2008) model excess saving as a response to underdeveloped financial markets. We identify a specific fiscal primitive, origin-based tax assignment, that generates structural excess supply as an endogenous equilibrium outcome, complementing models that treat the trade surplus as an exogenous policy choice or a by-product of financial frictions.

On China's growth model and the consumption puzzle, Song, Storesletten and Zilibotti (2011) and Hsieh and Klenow (2009) stress financial frictions and sectoral misallocation. Marcos D. Chamon and Eswar S. Prasad (2010) and Shang-Jin Wei and Xiaobo Zhang (2011) attribute low consumption to precautionary saving and demographic pressures. We provide a complementary fiscal channel: welfare-consumption complementarity under CES preferences links origin-based fiscal distortions to suppressed household demand, offering an institutional explanation for why consumption remains low even as incomes rise.

Layout. Section 2 describes the institutional origins of the fiscal wedge. Section 3 presents the partial equilibrium framework that isolates the core mechanism. Section 4 provides micro-empirical evidence from industrial land transactions. Section 5 embeds the mechanism in a multi-region DSGE model with amplification channels. Section 6 develops historical decomposition and policy counterfactuals. Section 7 concludes.

2 Institutional Background

China's distinctive local government behavior is rooted in a fiscal system characterized by centralized revenue authority and decentralized expenditure responsibilities. This institutional structure, shaped by a series of major tax reforms spanning three decades, has produced a persistent and sizable vertical fiscal imbalance that crucially shapes local policy incentives (Jin, Qian and Weingast, 2005; Bai, Hsieh and Song, 2016). Understanding how this architecture emerged and evolved is essential to explaining why local governments systematically prioritize industrial production over household welfare, even in the absence of explicit political directives to do so.

2.1 The 1994 Tax Sharing Reform: Structural Origins of Vertical Fiscal Imbalance

Prior to 1994, China operated under a fiscal contracting regime in which local governments remitted a negotiated quota of revenues to the center and retained the remainder. This system, while conducive to local revenue mobilization, left the central government chronically revenue-constrained. By 1993, the central government's share of total tax revenue had fallen to just 22 percent, severely limiting its capacity to finance national priorities and maintain macroeconomic stability (Shaoguang Wang and Angang Hu, 2001; Christine P.W. Wong, 2013). The fiscal contracting regime also created significant regional disparities, as wealthier provinces could negotiate more favorable terms while poorer regions struggled to meet basic expenditure needs.

The 1994 Tax Sharing Reform (分税制改革) fundamentally restructured intergovernmental fiscal relations. The reform established a unified tax system, created separate central and local tax administrations, and formally divided tax categories among central, local, and shared jurisdictions. Customs duties, consumption taxes, and the majority of enterprise income taxes were assigned to the central government, while business taxes on services, property-related levies, and minor local surcharges remained with local authorities. Value-added tax, the single largest revenue source, was designated as a shared tax with 75 percent accruing to the center and 25 percent retained locally (Wong, 2013; Shuanglin Lin, 2022).

The reform successfully restored central fiscal capacity, raising the central government's rev-

enue share to approximately 50 percent within a few years. However, the reallocation of revenues was not accompanied by a corresponding reassignment of expenditure responsibilities. Local governments remained responsible for more than 80 percent of total public expenditure, including education, healthcare, infrastructure, pensions, and social protection, while retaining access to less than half of tax revenues before intergovernmental transfers (Christine Wong, 2009; Bai, Hsieh and Song, 2016). This mismatch created a structural condition of vertical fiscal imbalance in which local governments face chronic revenue shortfalls relative to their mandated obligations. The marginal value of locally generated revenue became extremely high, fundamentally shaping the incentive structure that guides local policy decisions.

The 1994 reform also introduced a critical institutional feature that would later prove consequential for local government financing: it permitted local governments to retain the full proceeds from land transfer sales. Since urban land in China is publicly owned, local governments can lease land-use rights to developers and enterprises, generating substantial off-budget revenue. This provision created the foundation for what would become known as "land finance" (土地财政), whereby local governments use land sales and land-backed borrowing to supplement their constrained tax base (Liu and Xiong, 2020; Dingxi Huang and Roger C.K. Chan, 2018).

2.2 The B2V Reform and VAT Retention: Strengthening Production-Based Incentives

The nationwide transition from the Business Tax to the Value-Added Tax (营改增, commonly referred to as B2V), completed in 2016, further reshaped local fiscal incentives in ways that reinforced the production orientation of local government behavior. The Business Tax had been a key local tax applied to the service sector, including transportation, construction, finance, and various professional services. Its replacement with VAT, which had historically been a central tax, risked undermining local fiscal capacity at a time when many localities already faced significant budget pressures.

To mitigate this revenue loss, the central government revised the VAT sharing ratio from 75:25 to 50:50 between central and local governments (Ministry of Finance of China, 2016). This adjustment substantially increased the fiscal stake that local governments hold in industrial production. Under the revised arrangement, local governments capture half of all VAT revenue generated within their jurisdiction, creating a direct and quantitatively significant link between manufacturing activity and local fiscal capacity. For a typical industrial enterprise generating 100 million yuan in value-added output at a standard VAT rate of 13 percent, the local government retains 6.5 million yuan in direct tax revenue. This institutional linkage between manufacturing activity and local revenue internalizes the fiscal return on infrastructure investment and underpins the strat-

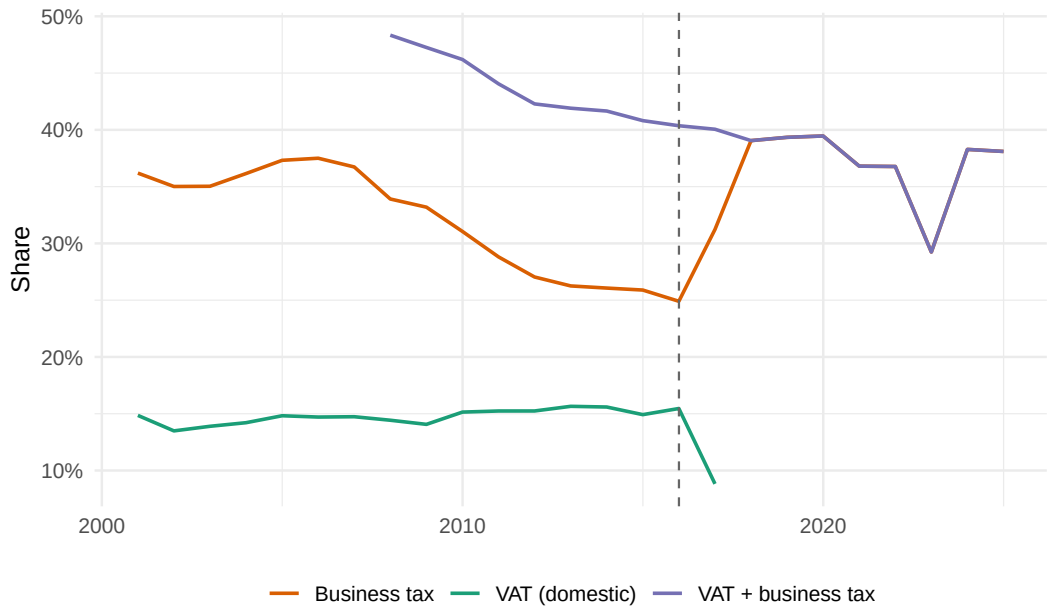


Figure 1: Business Tax and VAT Revenue Shares, 2000–2020

Notes: The figure shows the composition of local government tax revenue before and after the 2016 B2V reform. The business tax (dashed) was fully retained locally and declined to zero after abolition. The VAT share (solid) rose as the retention rate increased from 25% to 50%.

egy of industrial park development and production-oriented growth observed across regions (Tao Zhang and Heng-fu Zou, 1998; Benjamin Faber, 2014; Xiaohuan Lan, 2024).

The B2V reform also had differential effects across sectors that influenced local government preferences. Prior to the reform, service enterprises paid the Business Tax at rates typically ranging from 3 to 5 percent of gross revenue, with 100 percent of this revenue retained locally. Following the transition to VAT, these same enterprises now pay taxes at rates more closely aligned with manufacturing, but local governments retain only 50 percent of the resulting revenue. For localities that had developed substantial service sectors, the reform effectively reduced the fiscal return on service-oriented development by approximately half. This created incentives for local governments to redirect resources toward manufacturing, where the absolute fiscal returns remained larger due to higher transaction volumes and capital intensity, even if the retention rate had improved relative to the pre-reform manufacturing VAT split (Lin, 2022). Section 4 exploits the cross-city variation in fiscal exposure generated by this reform to provide direct micro-empirical evidence that the fiscal wedge shapes real government behaviour.

2.3 The Consumption Tax and Zero Local Retention: A Disincentive for Welfare and Services

In contrast to the production-linked VAT, the Consumption Tax (消费税), which is levied on automobiles, tobacco, alcohol, petroleum products, luxury goods, and other selected items, is fully assigned to the central government. Local governments receive no share of this revenue, regardless of where the goods are sold or consumed (Wong, 2013). This tax assignment rule has profound implications for local spending priorities. Since many welfare services and consumption-boosting policies expand household demand rather than industrial supply, their fiscal returns to local governments are effectively zero. Social programs such as healthcare subsidies, education improvements, pension supplements, and environmental quality investments do not generate additional locally retained tax revenue; they represent pure budgetary costs rather than self-financing public investments.

This assignment structure makes China an outlier among large economies, where local sales taxes, property taxes, or VAT destination-based rules commonly align local fiscal incentives with local consumption or land-use decisions (Oates, 1999). In the United States, state and local sales taxes create incentives for governments to attract retail activity and support household purchasing power. In European Union member states, VAT is collected on a destination basis, meaning that the tax accrues to the jurisdiction where final consumption occurs rather than where production takes place. China's origin-based system operates on precisely the opposite principle: VAT and related production taxes accrue to the place of production, while consumption taxes flow entirely to the center.

The practical consequence of this arrangement is that local governments "export" goods while "importing" the associated VAT revenue from consumers in other jurisdictions. Conversely, consumption-oriented policies often generate fiscal benefits for other jurisdictions or exclusively for the central government. A local government that invests in public parks, cleaner air, or better schools may attract residents who increase local consumption, but the consumption taxes on automobiles, gasoline, and luxury items purchased by these residents accrue entirely to Beijing. Welfare-induced consumption thus leaks revenue outward, while industrial investment generates concentrated local returns (Weingast, 2009).

2.4 Land Finance and the LGFV System: Amplifying Production-Based Incentives

The vertical fiscal imbalance created by the 1994 reform, combined with the production-based orientation of the tax-sharing system, gave rise to two complementary financing mechanisms that have become central to understanding local government behavior: land finance and Local Gov-

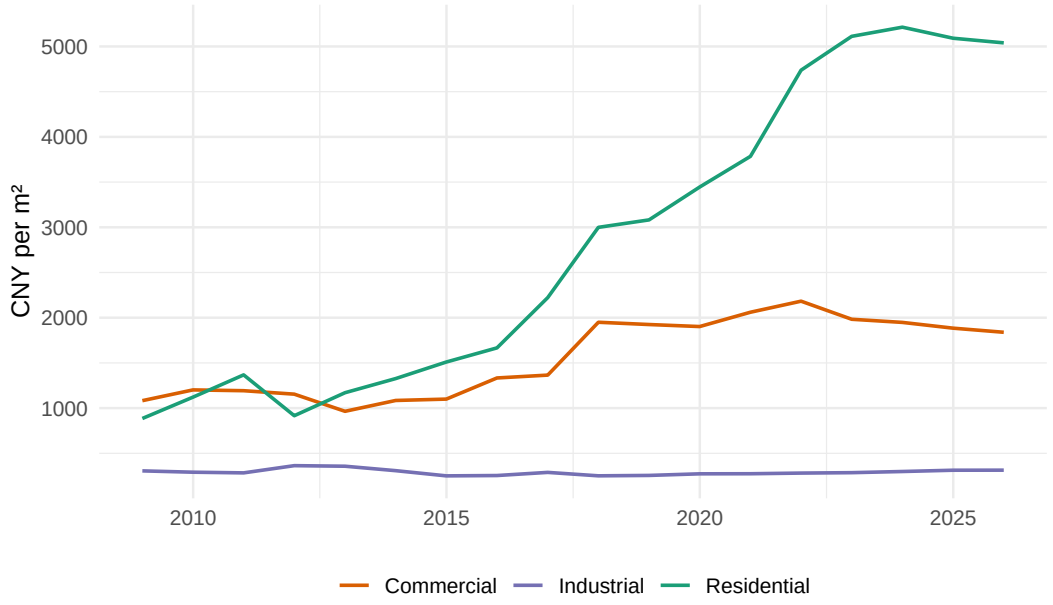


Figure 2: Industrial, Commercial, and Residential Land Prices, 2010–2025

Notes: The figure shows average transaction prices for industrial, commercial, and residential land parcels. Industrial land prices remain compressed near the statutory minimum floor, while commercial and residential prices diverge sharply upward, illustrating the strategic land-pricing mechanism through which local governments subsidise manufacturing.

ernment Financing Vehicles (LGFVs). These mechanisms do not operate independently of the tax structure; rather, they amplify and entrench the incentives embedded in the formal fiscal architecture.

Land finance emerged as local governments discovered that infrastructure investment could generate fiscal returns beyond retained VAT by increasing the value of surrounding land. In China, urban land is owned by the state and administered by local governments, while rural land is collectively owned. Local governments generate substantial revenue by converting agricultural land to urban use and selling long-term land-use rights to developers and industrial enterprises (Liu and Xiong, 2020; Meina Cai, Jianyong Fan, Chunhui Ye and Qi Zhang, 2020). At the peak of the land finance system in the mid-2010s, revenue from land-use rights transfers constituted 60 to 80 percent of local government revenue in many jurisdictions, far exceeding formal tax receipts (Huang and Chan, 2018). This created a powerful feedback loop: infrastructure investment raises industrial demand for land, which increases land prices, which generates revenue for further infrastructure investment.

However, land finance requires upfront capital to develop infrastructure before land values

appreciate. Local governments in China cannot issue municipal bonds directly, a restriction that was only partially relaxed in 2014, and are prohibited from borrowing from banks in their own capacity (Yuen Yuen Ang, 2016; Lan, 2024). To circumvent these constraints, local governments established Local Government Financing Vehicles, which are state-owned enterprises that borrow money on behalf of the government to finance infrastructure projects. LGFVs raise funds by issuing corporate bonds, securing bank loans, and more recently by selling wealth management products to retail investors. The borrowed funds are used for comprehensive urban development, including roads, utilities, industrial parks, and public facilities. When the developments increase surrounding land values, the local government can lease land at higher prices and use the proceeds to repay LGFV debts (Jin Hui and Isabel Rial, 2016; Chen, He and Liu, 2020).

The LGFV system expanded dramatically following the 2008 global financial crisis, when the central government announced a 4 trillion yuan stimulus package and encouraged local governments to contribute matching funds. Since approximately 70 percent of the stimulus consisted of infrastructure projects but the central government financed only 30 percent of the total, local governments turned to LGFVs to raise the necessary capital (Adam Y. Liu, Jean C. Oi and Yi Zhang, 2022). LGFV debt grew from modest levels in the mid-2000s to an estimated 66 trillion yuan, approximately 9 trillion US dollars, by 2023, representing nearly half of China's annual economic output. The International Monetary Fund has expressed concern that this debt trajectory is unsustainable and poses systemic risks to the Chinese financial system.

The critical feature of the LGFV system for understanding local government incentives is that it transforms the fiscal return on infrastructure from a flow benefit, retained VAT from induced industrial activity, into a stock-based collateral mechanism. Industrial investment raises land demand and land values, which in turn provide collateral for LGFV debt. By anchoring land prices, heavy-asset industries allow local governments to leverage future fiscal flows into larger-scale infrastructure spending, reinforcing the bias toward capital-intensive production. A local government that invests in schools or hospitals cannot use improved educational outcomes or health metrics as collateral; only the appreciation of surrounding land values translates into expanded borrowing capacity.

These institutional features jointly create a coherent incentive structure favoring production-driven development: infrastructure investment expands the taxable industrial base, raises land values that serve as collateral, and generates fiscal flows that relax budget constraints; welfare investment, by contrast, does not relax the local fiscal constraint and may even tighten it. Local governments further compete for mobile manufacturing capital through VAT rebates and preferential land pricing, generating interregional races to the bottom that amplify the aggregate distortion as detailed in Appendix G. In the model that follows, these rules are incorporated directly into

the local government's optimization problem to explain why, even in the absence of political career concerns, infrastructure is prioritized over social services in a fully rational and benevolent equilibrium.

3 The Fiscal Wedge: A Partial Equilibrium Framework

This section isolates the core mechanism in the simplest possible setting, abstracting from capital mobility, land finance, debt, and political incentives to show that infrastructure bias emerges from fiscal architecture alone. The full general equilibrium model below adds all of these channels.

3.1 Setup

Consider a representative local economy with a household, a firm, and a benevolent local government. The household has CES preferences over private consumption C_t and public welfare S_t:

$$\mathcal{U} = \sum_{t=0}^{\infty} \beta^t \left[\phi C_t^{\rho} + (1-\phi) S_t^{\rho}\right]^{\frac{1}{\rho}}, \tag{1}$$

with $\rho < 0$ so that the two goods are complements ($\sigma = 1/(1-\rho) < 1$). Welfare services S_t encompass healthcare, education, pensions, and social security, all of which directly enhance utility but do not enter production.

The firm produces $Y_t = A_t G_t^{\gamma} K_t^{\alpha} L_t^{1-\alpha}$, where G_t is public infrastructure and $\gamma > 0$ measures its productivity contribution.

The government allocates resources between infrastructure investment I_t (augmenting $G_{t+1} = I_t + (1-\delta_g)G_t$) and welfare S_t. Under the 1994 tax-sharing rules, local own-source revenue is $E_t = \eta_v \tau_v Y_t + \eta_c \tau_c C_t$, where $\eta_v = 0.5$ and $\eta_c = 0$. The budget constraint is

$$S_t + I_t = 0.5\,\tau_v\,Y_t + T_t, \tag{2}$$

where T_t denotes central transfers. Consumption is residual: $C_t = Y_t - I_t - \delta_k K_t - S_t$.

Because $\eta_c = 0$, welfare spending generates no fiscal return, while infrastructure investment raises output and therefore VAT revenue. This asymmetry is the fiscal wedge.

3.2 The Fiscal Wedge and Its Consequences

The benevolent government maximises household utility subject to the budget constraint. The Lagrangian is:

$$\mathcal{L} = \sum_{t=0}^{\infty} \beta^t \left[\left(\phi C_t^{\rho} + (1-\phi) S_t^{\rho}\right)^{\frac{1}{\rho}} + \lambda_t \Big(0.5\tau_v Y_t + T_t - S_t - I_t\Big) \right], \tag{3}$$

where λ_t is the shadow value of local government revenue and $\rho < 0$ governs the complementarity between private consumption and public welfare services. Under vertical fiscal imbalance, $\lambda_t > 0$ and typically large, capturing the scarcity of local fiscal resources.

First-Order Condition for Welfare Spending. Differentiating the Lagrangian with respect to S_t yields:

$$(1-\phi)\left(\phi C_t^{\rho} + (1-\phi) S_t^{\rho}\right)^{\frac{1}{\rho}-1} S_t^{\rho-1} = \lambda_t. \tag{4}$$

Since S_t is often constrained to be low, the marginal utility of welfare is high, confirming underprovision. Furthermore, because $\rho < 0$, the marginal utility of welfare rises when private consumption is higher, which reflects strong consumption–welfare complementarity.

First-Order Condition for Infrastructure Investment. The government internalizes the impact of I_t on future fiscal revenues, as shown in the following equation:

$$\lambda_t = \beta \lambda_{t+1} \left[0.5\, \tau_v\, \gamma \frac{Y_{t+1}}{G_{t+1}} + (1-\delta_g) \right]. \tag{5}$$

Combining both optimality conditions yields a dynamic condition governing the expenditure composition between welfare and infrastructure:

$$\frac{(1-\phi)\left(\phi C_{t+1}^{\rho} + (1-\phi) S_{t+1}^{\rho}\right)^{\frac{1}{\rho}-1} S_{t+1}^{\rho-1}}{(1-\phi)\left(\phi C_t^{\rho} + (1-\phi) S_t^{\rho}\right)^{\frac{1}{\rho}-1} S_t^{\rho-1}} = \beta \left[0.5\, \tau_v\, \gamma \frac{Y_{t+1}}{G_{t+1}} + (1-\delta_g) \right]. \tag{6}$$

To interpret this expression, we define the marginal fiscal return on infrastructure (MFRI) and the marginal fiscal return on welfare (MFRW), which quantify the revenue consequences of each spending category.

Lemma 1 (Fiscal Wedge)**.** *Under the Chinese tax-sharing system with origin-based VAT retention $\eta_v = 0.5$ and zero local retention of consumption taxes $\eta_c = 0$, the marginal fiscal returns satisfy:*

$$MFRI = 0.5\, \tau_v\, \gamma \frac{Y}{G} > 0, \tag{7}$$

$$MFRW = 0. \tag{8}$$

The fiscal wedge, defined as $\Delta \equiv MFRI - MFRW = 0.5\,\tau_v\,\gamma(Y/G) > 0$*, is strictly positive and creates a systematic bias toward infrastructure spending.*

All proofs are collected in Appendix A. The intuition is straightforward: infrastructure investment expands productive capacity and thereby generates additional VAT revenue, while welfare spending produces no fiscal feedback under the current tax assignment.

Building on this lemma, we now establish three propositions that characterize the equilibrium distortions arising from the fiscal wedge.

Proposition 1 (Infrastructure Bias)**.** *Consider a benevolent local government that maximizes household welfare subject to the budget constraint under vertical fiscal imbalance. In equilibrium, the government systematically overinvests in infrastructure relative to the first-best allocation that would obtain under a balanced fiscal system or under destination-based taxation. Formally, let* I^* *denote the first-best level of infrastructure investment and* $I^\dagger$ *the equilibrium level under the origin-based system. Then* $I^\dagger > I^*$*.*

The key mechanism is that under fiscal scarcity, the shadow value of government revenue λ_t is elevated, making the positive fiscal return to infrastructure particularly valuable. Even though welfare spending has high marginal utility, its zero fiscal return renders it less attractive from the government's optimization perspective.

Proposition 2 (Welfare Suppression)**.** *Under the origin-based tax-sharing system, the equilibrium level of welfare spending* $S^\dagger$ *is strictly below the first-best level* S^* *that maximizes household utility. Moreover, under CES preferences with* $\rho < 0$*, the underprovision of welfare services suppresses the marginal utility of private consumption, inducing higher precautionary savings and lower equilibrium consumption.*

This result highlights a crucial welfare cost: because consumption and welfare are complements ($\rho < 0$), the fiscal wedge not only distorts expenditure composition but also depresses household demand. Insufficient welfare provision reduces the marginal utility of consumption, leading households to save rather than consume even when their income would otherwise support higher living standards.

Proposition 3 (Overcapacity and Trade Surplus)**.** *When local governments across regions simultaneously overinvest in industrial infrastructure, the aggregate economy exhibits persistent industrial overcapacity and structural trade surpluses. Let* $\bar{U}$ *denote aggregate capacity and* $\bar{D}$ *aggregate domestic demand. Under the origin-based fiscal system,* $\bar{U} > \bar{D}$ *in equilibrium, and the excess capacity is absorbed through net exports:* $NX = \bar{U} - \bar{D} > 0$*.*

This proposition connects the micro-level fiscal distortion to China's macroeconomic imbalances. When every local government has an incentive to expand productive capacity to generate fiscal

revenue, the aggregate outcome is a production structure that systematically outstrips domestic absorption. The suppressed consumption induced by welfare underprovision exacerbates this gap, and the resulting excess supply finds an outlet in export markets.

Propositions 1–3 establish that infrastructure-led growth, welfare underprovision, and the capacity-demand gap are equilibrium outcomes of fiscal architecture, not consequences of career tournaments. The resulting equilibrium of heavy investment, excess capacity, and light consumption is a rational fiscal response under authoritarian decentralisation. Under CES preferences with $\rho < 0$, welfare and consumption are complements, so the misallocation is amplified: insufficient S_t suppresses household demand and reinforces precautionary savings. Before turning to the full general equilibrium model, we present micro-empirical evidence that directly validates the fiscal wedge mechanism.

4 Micro Evidence: Fiscal Pressure and Industrial Land Pricing

The partial equilibrium framework predicts that local governments facing origin-based fiscal incentives will sacrifice current revenue to attract mobile manufacturing capital. This section tests that prediction directly. We exploit the 2016 Business-to-VAT (B2V) reform as a natural experiment that generated exogenous, cross-city variation in fiscal pressure, and use data on 540,000 industrial land transactions to measure local governments' pricing responses.

4.1 Identification Strategy and Data

As described in Section 2, the 2016 B2V reform abolished the business tax and raised the local VAT retention share from 25% to 50%. Cities with large pre-reform service sectors lost a substantial revenue stream while gaining only modestly from the higher manufacturing VAT share; cities with dominant manufacturing sectors gained. This cross-sectional variation in fiscal exposure is the basis for our identification.

Treatment variable. We measure each city's fiscal exposure to the B2V reform as

$$\text{Exposure}_c = \frac{0.5 \times \text{SAT}_{c,0} - 0.25 \times \text{VAT}_{c,0}}{T_{c,0}}, \tag{9}$$

where $\text{SAT}_{c,0}$ is pre-reform business-tax revenue, $\text{VAT}_{c,0}$ is pre-reform domestic VAT revenue, and $T_{c,0}$ is total general budget revenue, all measured in 2011, the last full year before the B2V pilots commenced. The numerator captures the net mechanical revenue loss from the reform; scaling

by total budget revenue normalises the shock relative to fiscal capacity. Higher values of Exposure_c indicate greater fiscal pressure.

Dependent variable. We exploit a unique feature of China's land market: all urban land is state-owned, and local governments set industrial land prices strategically. Since 2007 a nationally mandated minimum-price floor has been in place, graded by county. Our dependent variable is the industrial land premium for parcel i in city c at time t:

$$\text{Ind Land Premium}_{ict} = p_{ict} - \underline{p}_{c(i),t},$$

where p_{ict} is the transaction unit price (RMB/m^2) and $\underline{p}_{c(i),t}$ is the statutory minimum floor. A premium near zero indicates that a city is maximising its legal use of the land-subsidy instrument to attract manufacturing firms.

Sample. The estimation sample covers 2007–2023, beginning with the implementation of the minimum-price policy. The four centrally administered municipalities (Beijing, Shanghai, Tianjin, Chongqing) are excluded because their fiscal structure differs fundamentally from prefecture-level cities. The final sample comprises over 540,000 industrial land transactions across approximately 280 prefecture-level cities. Parcel-level controls include land grade, lease term, and distance to the city boundary. City-level macroeconomic controls include log GDP, log GDP per capita, secondary and tertiary industry shares, and log budget revenue and expenditure. Table A2 reports summary statistics.

4.2 Empirical Specification

We estimate a continuous-treatment difference-in-differences specification:

$$\text{Ind Land Premium}_{ict} = \beta\left(\text{Exposure}_c \times \text{Post}_t\right) + \mathbf{X}'_{ict}\boldsymbol{\gamma} + \alpha_c + \delta_t + \lambda_j + \theta_s + \varphi_m + \varepsilon_{ict}, \tag{10}$$

where α_c are city fixed effects, δ_t year fixed effects, λ_j industry fixed effects, and θ_s and φ_m are party-secretary and mayor fixed effects respectively. Standard errors are clustered at the city level. The coefficient of interest is β: a negative estimate indicates that cities with greater fiscal exposure compress land prices more aggressively after the reform.

City fixed effects absorb time-invariant city characteristics including geographic location, industrial history, and baseline fiscal capacity. Year fixed effects absorb common macroeconomic shocks. Industry fixed effects control for sector-specific land demand. The inclusion of leader

Table 1: Fiscal Exposure and Industrial Land Pricing: Baseline Results

	(1) No Ctrl	(2) FEs	(3) Baseline	(4) City Control
Exposure × Post	−320.7**	−359.4**	−164.7***	−109.1**
	(149.7)	(161.9)	(52.26)	(52.13)
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Leader FE	No	No	Yes	Yes
Parcel controls	No	Yes	Yes	Yes
City controls	No	No	No	Yes
Observations	518,413	448,119	448,115	422,978
R^2	0.427	0.450	0.529	0.530

Notes: The dependent variable is Ind Land Premium$_{ict}$ in RMB/m^2. Exposure × Post is the interaction of the city-level fiscal shock with a post-2016 indicator. Standard errors clustered at the city level are reported below coefficients.

fixed effects is critical: party secretaries and mayors rotate across cities on three-to-five-year cycles, and their individual characteristics (age, tenure, connections) may independently affect land pricing. By absorbing leader identity, we isolate the fiscal channel from political-career confounders.

The key identifying assumption is that, conditional on fixed effects and controls, cities with different levels of fiscal exposure would have followed parallel trends in industrial land pricing absent the 2016 reform. We validate this assumption with an event-study specification below.

4.3 Baseline Results

Cities with greater fiscal exposure to the 2016 reform significantly compress their industrial land premiums. Table 1 reports results across four specifications with progressively richer controls. In the most demanding specification with industry and leader fixed effects, a one-standard-deviation increase in fiscal exposure reduces the land premium by 109–165 RMB/m^2. The effect is economically large: the median industrial land premium in the sample is approximately 400 RMB/m^2, so the estimated effect represents a 27–41% compression. The coefficient is robust to the inclusion of parcel-level controls, city-level macroeconomic controls, and alternative exposure measures constructed from 2009–2011 average revenues.

Table 2: Heterogeneity by Party Secretary Retirement Age

	(1) Age < 58	(2) Age ≥ 58	(3) Age < 58	(4) Age ≥ 58
Exposure $\times$ Post	-173.4^{***}	176.3^{***}	-125.5^{**}	241.8^{***}
	(53.11)	(42.08)	(54.77)	(73.66)
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Leader FE	Yes	Yes	Yes	Yes
Parcel controls	Yes	Yes	Yes	Yes
City controls	No	No	Yes	Yes
Observations	400,208	47,901	376,833	46,139
R^2	0.535	0.484	0.537	0.487

Notes: Columns 1 and 3 restrict to city-years where the party secretary is below 58. Columns 2 and 4 restrict to age ≥ 58. Standard errors clustered at the city level.

4.4 Heterogeneity Analysis

The model generates three sharp heterogeneity predictions that alternative explanations based on political tournaments or soft budget constraints cannot easily match.

Official retirement age. The intertemporal fiscal logic implies that the land-subsidy strategy is worthwhile only for officials whose tenure extends long enough to capture future VAT returns. Younger officials who compress land prices today can expect to benefit from the resulting manufacturing investment over several years of tenure. Officials approaching mandatory retirement at age 60 face a truncated fiscal horizon and have no incentive to subsidise future tax bases they will not control.

We split the sample at age 58, two years before mandatory retirement. For younger officials, the coefficient is -173 (significant at 1%); for officials aged 58 or above, the sign reverses to $+176$ (significant at 1%), indicating that retiring cadres extract higher upfront land rents instead of investing in future tax bases. This sign reversal is a sharp validation of the model's prediction that fiscal behaviour reflects an intertemporal trade-off between current land revenue and future VAT streams, not a uniform bureaucratic bias.

Industry VAT intensity. If local governments are strategically pursuing VAT revenue, their land subsidies should target industries with the highest fiscal returns. We classify industries as "high-

VAT" (electronics, automotive, pharmaceuticals, high-end equipment, fast-moving consumer goods) versus the rest. With full controls, the pricing compression is large and significant at 1% for high-VAT industries (-159 RMB/m^2) but attenuates to insignificance for normal-VAT industries. This selective targeting is direct evidence that local governments discriminate across sectors based on expected fiscal returns, exactly as the model predicts. Table A3 reports the results.

Core vs. non-core cities. Provincial capitals and sub-provincial cities can attract firms through political capital and agglomeration advantages; ordinary prefectures cannot. Consistent with a race-to-the-bottom driven by fiscal survival, the pricing compression is significant only among non-core prefectures (-156 RMB/m^2 at 1%). For core cities, the coefficient is large in magnitude but statistically insignificant, reflecting their insulation from inter-jurisdictional competition. Table A4 reports the estimates.

4.5 Event Study and Pre-Trends

The identifying assumption of the DiD design requires that high- and low-exposure cities would have followed parallel trends in industrial land pricing absent the reform. We assess this assumption with an event-study specification:

$$\text{Ind Land Premium}_{ict} = \sum_{k \neq -2} \beta_k \left(\text{Exposure}_c \times \mathbf{1}[t - 2016 = k]\right) + \alpha_c + \delta_t + \mathbf{X}'_{ict}\boldsymbol{\gamma} + \varepsilon_{ict}, \tag{11}$$

where $k = -2$ (year 2014) is the omitted reference period and the endpoints are binned at $k \leq -6$ and $k \geq 6$.

The results, shown in Figure 3 and Table A5, strongly support the parallel-trends assumption. All pre-reform coefficients ($k = -6, \ldots, -3$) are individually and jointly insignificant, with point estimates close to zero. Following the reform, a sharp and sustained negative break emerges: $\hat{\beta}_0 = -185$, $\hat{\beta}_1 = -228$, and the effect remains economically meaningful through $k = 4$. The persistence of the effect rules out a transitory fiscal adjustment and confirms a permanent shift in land-supply strategy driven by the new revenue-sharing regime.

4.6 Discussion

These micro-empirical results provide three forms of validation for the theoretical framework. First, the baseline DiD confirms that the fiscal wedge, positive marginal fiscal returns to production and zero returns to welfare, shapes real government behaviour quantitatively, not merely

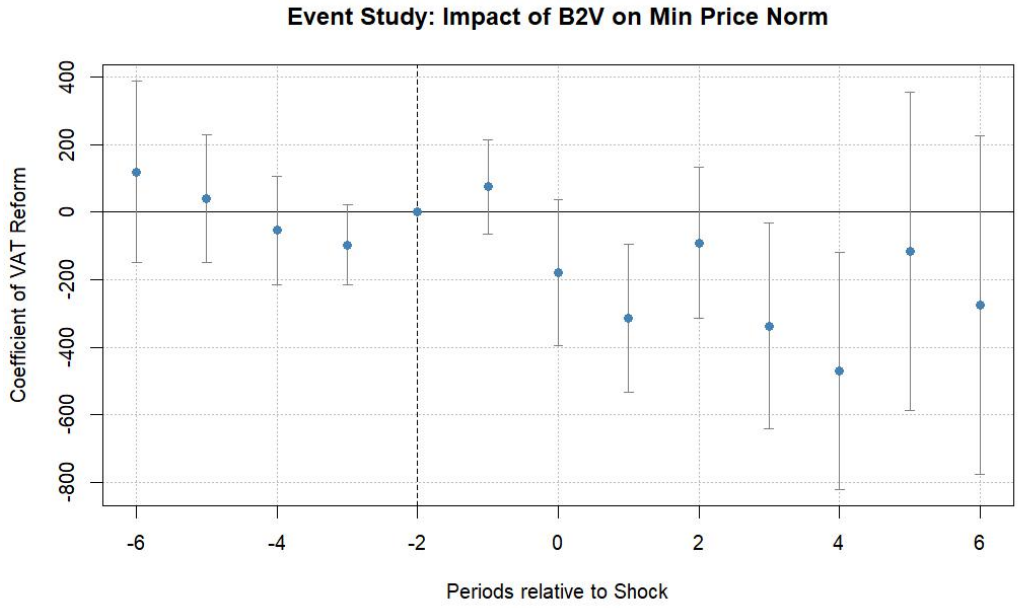


Figure 3: Event-Study Estimates: Fiscal Exposure and Industrial Land Pricing

Notes: The figure plots event-study coefficients $\hat{\beta}_k$ from equation (11). The omitted reference period is $k = -2$ (year 2014). Vertical bars are 95% confidence intervals based on city-clustered standard errors.

qualitatively. The estimated magnitudes are large: a one-standard-deviation fiscal shock compresses land prices by more than a quarter of the median premium, indicating that local governments are willing to forgo substantial current revenue to secure future tax bases.

Second, the retirement-age heterogeneity validates the intertemporal channel. The sign reversal between younger and older officials is inconsistent with explanations based on uniform bureaucratic culture or fixed institutional preferences. It is, however, a natural prediction of a model in which officials trade off current land revenue against the present value of future VAT streams discounted by their expected remaining tenure.

Third, the industry-targeting result demonstrates that local governments act as strategic fiscal maximisers, selectively subsidising the highest-return activities. This behaviour is inconsistent with blanket industrial promotion driven by GDP tournaments but fully consistent with the fiscal wedge mechanism. Together, these findings motivate embedding the fiscal wedge in a full general equilibrium framework to trace its aggregate consequences.

5 General Equilibrium Model

The partial equilibrium framework and the micro evidence establish the fiscal wedge as a potent force at the regional level. This section embeds the mechanism in a multi-region DSGE framework where three general equilibrium channels amplify the micro-level distortion into the macroeconomic imbalances documented in the data: capital mobility (Charles M. Tiebout, 1956; Wallace E. Oates, 1972), land-value-backed borrowing (Zheng Liu, Pengfei Wang and Tao Zha, 2013), and aggregate demand externalities (Atif Mian and Amir Sufi, 2014).

5.1 Model Setup

The economy consists of a continuum of regions indexed by $i \in [0,1]$, each containing a representative household, a representative firm, and a local government. This multi-region structure captures the essential features of China's decentralized fiscal system, in which provincial and prefectural governments make independent expenditure decisions while competing for mobile capital and facing common institutional constraints. Capital is perfectly mobile across regions, equalizing its return nationally, while labor remains immobile and confined to local jurisdictions. This asymmetry reflects China's household registration (hukou) system, which restricts labor mobility while capital flows freely through national financial markets (Kam Wing Chan, 2019).

5.1.1 Households and Regional Trade

The representative household in region i derives utility from private consumption C_{it} and publicly provided welfare services S_{it}. Consumption consists of traded differentiated varieties produced across all regions, while welfare services are local public goods funded by the regional government. The distinction between tradable private consumption and non-tradable public services is central to understanding how the fiscal wedge propagates through the economy: infrastructure investment facilitates trade and production, generating fiscal returns through VAT retention, while welfare services remain purely local and fiscally unrewarded.

Preferences. Households evaluate consumption and welfare services through a CES aggregator that allows for complementarity between the two goods. Formally, the representative household's lifetime utility is:

$$U_{i0} = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[\left(\phi C_{it}^{\rho} + (1-\phi) S_{it}^{\rho} \right)^{\frac{1}{\rho}} \right], \tag{12}$$

where $\beta \in (0,1)$ is the intertemporal discount factor, $\phi \in (0,1)$ captures the relative weight on private consumption, and $\rho < 0$ generates complementarity between consumption and welfare services, so that higher S_{it} raises the marginal utility of C_{it} and vice versa.

Consumption Aggregator. Household consumption aggregates varieties produced across all regions through an Armington structure that captures trade costs and home bias:

$$C_{it} = \left(\int_0^1 \alpha_{ij}^{\frac{1}{\sigma}} c_{ijt}^{\frac{\sigma-1}{\sigma}} dj \right)^{\frac{\sigma}{\sigma-1}}, \tag{13}$$

where $\sigma > 1$ governs the elasticity of substitution across regional varieties and α_{ij} captures bilateral trade frictions including transportation costs and regulatory barriers. The Armington structure implies that each region specializes in producing a differentiated variety, creating gains from trade that infrastructure investment can facilitate by reducing effective trade costs. Critically, under China's origin-based VAT system, tax revenue is collected at the location of production rather than consumption. A region that exports its output to consumers in other jurisdictions retains the VAT revenue regardless of where the goods are ultimately consumed, creating a fiscal incentive to maximize production volume rather than local welfare (Keen and Lockwood, 2010).

Budget Constraint and Capital Markets. Households supply labor inelastically to local firms and allocate savings through a nationally integrated capital market:

$$P_{it}C_{it} + K_{i,t+1} = W_{it}L_{it} + R_t^K K_{it} + \Pi_{it} - T_{it}, \tag{14}$$

where K_{it} denotes capital holdings, R_t^K is the economy-wide rental rate of capital, W_{it} is the local wage, Π_{it} represents firm profits, and T_{it} denotes lump-sum taxes. The assumption of perfect capital mobility is central to the general equilibrium amplification mechanism: regions that invest in productivity-enhancing infrastructure attract mobile capital from the rest of the economy, raising local output and fiscal revenue while reducing the capital stock available to other regions. This creates a Tiebout-style competition in which local governments race to attract capital through infrastructure provision, intensifying the fiscal wedge beyond what would obtain in a closed economy (Wilson, 1999). The common national capital market ensures that the rental rate R_t^K equalizes across regions in equilibrium, while local wages W_{it} adjust to clear regional labor markets given the immobile labor supply.

5.1.2 Firms and Productivity Dynamics

The representative firm in region i produces a differentiated tradable good using private inputs and publicly provided infrastructure. Production follows a Cobb-Douglas technology in which infrastructure enters as a productivity-enhancing externality:

$$Y_{it} = Z_{it} G_{it}^{\gamma} K_{it}^{\alpha} L_{it}^{1-\alpha}, \tag{15}$$

where $\alpha \in (0,1)$ is the private capital share, $\gamma > 0$ measures the output elasticity of public infrastructure, and Z_{it} denotes total factor productivity. The specification implies that firms take the infrastructure stock G_{it} as given when making input decisions, but their productivity depends on the cumulative public investment in transportation networks, utilities, and industrial facilities. This externality creates the fundamental fiscal return to infrastructure: by raising G_{it}, the local government increases output Y_{it} and thereby expands the VAT base from which it derives revenue.

Total factor productivity combines an aggregate component common to all regions and an idiosyncratic regional shock:

$$\ln A_t = \rho_A \ln A_{t-1} + \epsilon_t^A, \tag{16}$$

$$\ln z_{it} = \rho_z \ln z_{i,t-1} + \epsilon_{it}^z, \tag{17}$$

where $\ln Z_{it} = \ln A_t + \ln z_{it}$. The aggregate shock ϵ_t^A captures nationwide productivity fluctuations, while the regional shock ϵ_{it}^z introduces cross-sectional heterogeneity in production capacity. Regional shocks play an important role in the general equilibrium dynamics: a positive shock to region i's productivity raises its output and fiscal revenue, enabling additional infrastructure investment that further increases productivity. Through capital mobility, this attracts investment from other regions, amplifying the initial shock. The persistence parameters ρ_A and ρ_z govern the duration of these effects and the speed of convergence across regions.

5.1.3 The Local Government

The local government in each region chooses welfare spending S_{it}, infrastructure investment I_{it}, and debt issuance $D_{i,t+1}$ to maximize an objective function that incorporates household welfare, political career concerns, and fiscal discipline. The government's problem is:

$$\max_{\{S_{it}, I_{it}, D_{i,t+1}\}} \mathbb{E}_t \sum_{j=0}^{\infty} \beta^j \left[\omega U_{i,t+j} + (1-\omega)\kappa_t \hat{\theta}_{i,t+j} - \Psi\left(\frac{D_{i,t+j}}{Y_{i,t+j}}\right) \right], \tag{18}$$

where the three components capture distinct aspects of local government behavior. The first term, weighted by $\omega \in [0,1]$, represents the benevolent component of the government's objective: the desire to maximize household lifetime utility. When $\omega = 1$, the government is a pure social welfare maximizer with no political ambitions. The second term captures political career incentives, where κ_t measures the intensity of promotion-based rewards and $\hat{\theta}_{it}$ is a performance metric correlated with GDP growth and infrastructure investment (Li and Zhou, 2005). When political tournaments are strong (κ_t large), local officials derive substantial utility from policies that signal competence to superiors, even if these policies diverge from household welfare maximization. The third term, $\Psi(D_{it}/Y_{it})$, is a convex penalty function that captures implicit constraints on leverage, including regulatory oversight, rollover risk, and reputational costs associated with fiscal distress (Huang, Pagano and Panizza, 2020).

Government Budget Constraint. The local government finances expenditures through a combination of own-source revenue, intergovernmental transfers, and debt issuance:

$$S_{it} + I_{it} + (1 + r^g_{it})D_{it} = E_{it} + T_{it} + D_{i,t+1}. \tag{19}$$

The left-hand side comprises welfare spending, infrastructure investment, and debt service on previously issued obligations. The right-hand side includes own-source revenue E_{it}, central government transfers T_{it}, and new borrowing $D_{i,t+1}$. This flow budget constraint, combined with the intertemporal optimization problem, determines the allocation of expenditure across categories and the accumulation of public debt over time.

Own-source revenue derives from three channels that differ fundamentally in their relationship to local economic activity:

$$E_{it} = \eta_v \tau_v Y_{it} + \eta_c \tau_c C_{it} + \xi_t \cdot \text{LandRevenue}_{it}, \tag{20}$$

where the first term represents retained value-added tax revenue, the second term is retained consumption tax revenue, and the third term captures land-related fiscal income including land transfer fees, land-use taxes, and real estate transaction taxes. Under China's post-1994 tax-sharing system, $\eta_v = 0.5$ following the 2016 B2V reform (and $\eta_v = 0.25$ before 2016), while $\eta_c = 0$ because consumption taxes are fully assigned to the central government (Wong, 2013). The land revenue component $\xi_t \cdot \text{LandRevenue}_{it}$ is linked to industrial activity because infrastructure investment raises land values, which in turn increases proceeds from land leasing to developers and manufacturers (Ran Tao, Fubing Su, Mingxing Liu and Guangzhong Cao, 2010). We model this as ξY_{it} for tractability, where $\xi > 0$ captures the elasticity of land revenue with respect to industrial output.

The fiscal return to infrastructure investment is strictly positive:

$$\frac{\partial E_{it}}{\partial G_{it}} = (\eta_v \tau_v + \xi) \frac{\partial Y_{it}}{\partial G_{it}} > 0, \tag{21}$$

while the fiscal return to welfare spending is:

$$\frac{\partial E_{it}}{\partial S_{it}} = \eta_c \tau_c \frac{\partial C_{it}}{\partial S_{it}} = 0, \tag{22}$$

since consumption-based tax revenue is fully centralized. Welfare spending therefore yields no fiscal feedback despite its positive contribution to household utility under $\rho < 0$.

Borrowing Costs. Local borrowing costs exceed the national return on capital due to leverage risk:

$$1 + r_{it}^g = (1 + R_t^K) \left[1 + \Psi \left(\frac{D_{it}}{Y_{it}} \right) \right], \tag{23}$$

where $\Psi(\cdot)$ is convex, capturing implicit regulatory and political penalties associated with excessive debt accumulation under the soft-budget-constraint regime.

5.2 General Equilibrium Amplification

The partial equilibrium analysis establishes that the fiscal wedge biases local government expenditure toward infrastructure even in the absence of political incentives or debt financing. The general equilibrium setting introduces additional channels that amplify this baseline distortion, transforming a moderate expenditure bias into the pronounced macroeconomic imbalances observed in China's growth model. We formalize these amplification mechanisms through a series of propositions that characterize the steady-state equilibrium and its comparative statics.

5.2.1 The Baseline Fiscal Wedge in General Equilibrium

The local government's first-order conditions in the multi-region economy extend the single-region fiscal wedge to incorporate general equilibrium feedback effects. When the government is purely benevolent ($\omega = 1$), has no political ambitions ($\kappa = 0$), and operates under a balanced budget ($D_{it} = 0$), the optimal expenditure allocation satisfies the following Euler condition:

$$\frac{\left(\phi C_{i,t+1}^{\rho} + (1-\phi) S_{i,t+1}^{\rho} \right)^{\frac{1}{\rho}-1} S_{i,t+1}^{\rho-1}}{\left(\phi C_{it}^{\rho} + (1-\phi) S_{it}^{\rho} \right)^{\frac{1}{\rho}-1} S_{it}^{\rho-1}} = \beta \, \mathbb{E}_t \left[(\eta_v \tau_v + \xi) \frac{\partial Y_{i,t+1}}{\partial G_{i,t+1}} + (1 - \delta_g) \right]. \tag{24}$$

The right-hand side of equation (24) includes the marginal fiscal return from infrastructure investment, $(\eta_v \tau_v + \xi)\partial Y_{i,t+1}/\partial G_{i,t+1}$, which exceeds the pure productivity return $\partial Y_{i,t+1}/\partial G_{i,t+1}$ that would appear in a social planner's problem. This fiscal premium on infrastructure investment is the origin of the expenditure distortion, as established in the following proposition.

Proposition 4 (General Equilibrium Fiscal Wedge)**.** *In the multi-region economy with origin-based taxation ($\eta_v > 0$, $\eta_c = 0$) and land-linked fiscal revenue ($\xi > 0$), the symmetric steady-state equilibrium exhibits:*

(i) Infrastructure investment exceeds the first-best level: $I^\dagger > I^*$, where I^* denotes the social planner's allocation.

(ii) Welfare spending falls below the first-best level: $S^\dagger < S^*$.

(iii) The magnitude of the distortion is increasing in the fiscal return parameters η_v, τ_v, ξ, and γ.

All proofs are collected in Appendix A. This proposition extends Propositions 1 and 2 to the general equilibrium framework, establishing that the fiscal wedge operates symmetrically across all regions and produces aggregate distortions in public expenditure composition.

5.2.2 Amplification through Capital Mobility

The first general equilibrium amplification channel arises from capital mobility across regions. When capital is perfectly mobile and earns a common return R_t^K throughout the economy, regions that invest in productivity-enhancing infrastructure attract capital inflows that raise local output and fiscal revenue. This creates a strategic complementarity: each region's infrastructure investment decision depends on the investment choices of other regions.

Proposition 5 (Capital Mobility Amplification)**.** *Consider the multi-region economy with perfect capital mobility. In symmetric equilibrium:*

(i) Infrastructure investment is a strategic complement across regions: $\partial I_i^\dagger / \partial I_{-i}^\dagger > 0$.

(ii) The equilibrium level of infrastructure investment exceeds the level that would obtain under regional autarky: $I^{\dagger,open} > I^{\dagger,closed}$.

(iii) The amplification factor from capital mobility is given by $\Gamma^K = [1 - \alpha\gamma(\eta_v \tau_v + \xi)/(\beta R^K)]^{-1} > 1$.

The intuition is that when region i increases infrastructure investment, it attracts capital from other regions, raising local output and fiscal revenue. Other regions respond by increasing their

own infrastructure investment to compete for mobile capital, leading to a race-to-the-bottom in which all regions overinvest relative to the cooperative outcome. The amplification factor Γ^K measures the extent to which capital mobility magnifies the baseline fiscal wedge.

5.2.3 Amplification through Land Finance

The second amplification channel operates through the land market. Infrastructure investment raises land values by improving accessibility and reducing production costs, which in turn increases local government revenue from land leasing and real estate transactions. This creates a financial accelerator: higher infrastructure investment today generates additional fiscal capacity tomorrow, which can be leveraged into further investment.

Proposition 6 (Land Finance Accelerator)**.** *Let land prices P_{it}^L depend on infrastructure according to $P_{it}^L = \chi G_{it}^\theta$ for $\theta > 0$. Then:*

(i) The marginal fiscal return to infrastructure includes a land appreciation component: $\partial E_{it}/\partial G_{it} = (\eta_v \tau_v + \xi)\partial Y_{it}/\partial G_{it} + \theta\chi G_{it}^{\theta-1}$.

(ii) Infrastructure investment is dynamically self-reinforcing: higher G_t raises land values, which increases borrowing capacity, enabling higher G_{t+1}.

(iii) The land finance amplification factor is $\Gamma^L = [1 - \theta\chi\beta/(1 + r^g)]^{-1} > 1$ when land appreciation is sufficiently persistent.

This proposition formalises the land-infrastructure nexus that has been central to China's local public finance since the 1990s (Liu and Xiong, 2020). Infrastructure investment generates both direct fiscal returns through VAT retention and indirect returns through land appreciation, creating a multiplier effect that amplifies the baseline fiscal wedge.

5.2.4 Amplification through Political Incentives and Debt

The third set of amplification channels arises from political career concerns and access to debt financing. Political incentives increase the desired level of infrastructure investment by rewarding output growth, while debt financing relaxes the budget constraint, allowing governments to front-load investment beyond contemporaneous fiscal capacity.

Proposition 7 (Political and Debt Amplification)**.** *Consider the local government's problem with political incentives ($\kappa > 0$) and debt capacity ($\bar{D} > 0$). Compared to the benevolent government without debt access:*

(i) Political incentives shift the objective toward infrastructure: $\partial I^{\dagger}/\partial \kappa > 0$.

(ii) Debt access enables higher investment: $\partial I^{\dagger}/\partial \bar{D} > 0$ *when the fiscal return to infrastructure exceeds the borrowing cost.*

(iii) The combined amplification is super-additive: $\Delta I(\kappa > 0, \bar{D} > 0) > \Delta I(\kappa > 0, \bar{D} = 0) + \Delta I(\kappa = 0, \bar{D} > 0)$.

The super-additivity result in part (iii) is crucial for understanding China's post-2008 experience: neither political incentives nor debt access alone would generate the extreme infrastructure bias observed in the data, but their interaction produces an amplification effect that transforms a baseline fiscal distortion into a debt-fuelled investment boom.

5.2.5 Aggregate Consequences: Overcapacity and External Imbalances

When all amplification channels operate simultaneously, the aggregate economy exhibits pronounced structural imbalances. The following proposition characterizes these macroeconomic outcomes.

Proposition 8 (Aggregate Imbalances)**.** *In the general equilibrium with fiscal wedges, capital mobility, land finance, political incentives, and debt access, the steady-state equilibrium satisfies:*

(i) Aggregate industrial capacity exceeds aggregate domestic demand: $\sum_i Y_i^{\max} > \sum_i (C_i + I_i + S_i)$, *implying persistent overcapacity.*

(ii) The economy runs structural trade surpluses: $NX = Y - (C + I^{private} + G + S) > 0$.

(iii) The consumption share of GDP is suppressed below the first-best level: $(C/Y)^{\dagger} < (C/Y)^{*}$.

(iv) Local government leverage is elevated: $(D/Y)^{\dagger} > (D/Y)^{*}$.

This proposition connects the micro-level fiscal distortions and general equilibrium amplification mechanisms to the macroeconomic patterns that characterise China's growth model: persistent industrial overcapacity, structural trade surpluses, suppressed household consumption, and elevated local government debt. These outcomes are joint consequences of the fiscal architecture interacting with mobile capital, land markets, political incentives, and credit access.

5.2.6 External Sector and Structural Trade Surpluses

To formalise the connection between fiscal distortions and external imbalances, we embed the model in a small open economy framework. The economy produces a composite tradeable good

and faces a downward-sloping rest-of-world demand schedule. The aggregate resource constraint is

$$Y_t = C_t + I_t^K + I_t^G + S_t + NX_t, \tag{25}$$

where NX_t denotes net exports. We define domestic absorption as $DA_t \equiv C_t + I_t^K + I_t^G + S_t$, so that $NX_t = Y_t - DA_t$.

The rest of the world demands domestic output according to an iso-elastic schedule:

$$NX_t = \bar{X}\left(\frac{p_t}{p_t^w}\right)^{-\varepsilon_x}, \tag{26}$$

where p_t is the domestic price of the composite good, p_t^w is the world price, $\bar{X} > 0$ is a scale parameter reflecting China's integration into global supply chains, and $\varepsilon_x > 1$ is the trade elasticity. In equilibrium, p_t/p_t^w adjusts so that the excess supply $Y_t - DA_t$ is absorbed by world markets.

Table A13 reports net exports across the four institutional configurations. Under the social planner, NX/Y is approximately 1%, reflecting efficient domestic absorption. The fiscal wedge progressively suppresses domestic demand: under full amplification, NX/Y rises to 3.6% of GDP, closely matching China's observed structural surplus of 2–4% over 2005–2019. Destination-based reform reduces the surplus to 2.6% by strengthening consumption and welfare spending, thereby raising domestic absorption.

The external sector formalisation yields two additional insights. First, trade surpluses are an endogenous consequence of the fiscal architecture rather than an independent macroeconomic phenomenon. Policies that address the fiscal wedge will simultaneously moderate external imbalances without requiring exchange rate intervention or trade restrictions. Second, the declining terms of trade associated with excess capacity ($p_t < p_t^w$) imply welfare costs beyond the direct utility loss from consumption suppression: China effectively subsidises foreign consumers through low export prices driven by overcapacity, transferring fiscal-wedge-induced rents abroad.

5.2.7 Discussion

The propositions above establish a hierarchy of causation in China's investment-led growth model. The fiscal wedge created by origin-based taxation is the fundamental distortion, as shown in Proposition 4. Capital mobility (Proposition 5) and land finance (Proposition 6) amplify this distortion through general equilibrium channels that operate even in the absence of political incentives or debt access. Political career concerns and borrowing capacity (Proposition 7) provide additional amplification that is super-additive with the baseline channels. The aggregate consequences (Proposition 8) emerge as the steady-state outcome of these interacting mechanisms.

This framework generates three testable implications that distinguish it from alternative explanations based purely on political tournaments or soft budget constraints. First, infrastructure bias should persist even when political incentives weaken, because the fiscal wedge and land finance accelerator continue to operate. Second, the bias should be stronger in regions with more mobile capital and more active land markets. Third, debt dynamics should exhibit path dependence: regions that accumulate large debt stocks early in the process become locked into infrastructure-led growth even after political incentives decline. The quantitative analysis in Section 5.4 evaluates these predictions against Chinese data.

5.3 Calibration

This section describes our calibration strategy, which combines externally validated parameters from the literature with internally calibrated values chosen to match key moments of the Chinese economy. The goal is to produce a quantitative model that can replicate the observed patterns of infrastructure investment, welfare spending, household consumption, and local government debt, while also generating realistic dynamics for industrial capacity utilization and trade balances.

5.3.1 Calibration Strategy

We adopt a two-tier calibration approach. The first tier consists of parameters that can be directly measured or that have well-established values in the macroeconomics literature. These include the discount factor, capital share, and depreciation rates, which we set to standard values consistent with annual data for a developing economy. The second tier consists of parameters that are specific to China's institutional environment, including the tax-sharing parameters, land revenue elasticity, and the intensity of political career incentives. These are calibrated to match moments computed from Chinese provincial and prefectural data over 2008–2019.

The calibration targets three categories of moments. The first category comprises aggregate expenditure shares: the infrastructure investment share of GDP, the welfare spending share, and the private consumption share. These moments discipline the fiscal wedge parameters and the preference weights in the utility function. The second category comprises fiscal structure moments: the VAT-to-GDP ratio, the land revenue-to-GDP ratio, and the local government debt-to-GDP ratio. These moments pin down the tax retention rates and the elasticity of land revenue with respect to industrial activity. The third category comprises dynamic moments: the persistence of infrastructure investment, the comovement between investment and land prices, and the elasticity of welfare spending with respect to GDP growth. These moments discipline the productivity

shock processes and the political career incentive parameters.

5.3.2 Data Sources

We construct a balanced panel of 31 provincial-level regions over 2008–2019, supplemented by prefectural data from 283 cities for robustness analysis. Macroeconomic indicators including GDP, fixed asset investment, and household consumption are drawn from the *China Statistical Yearbook* and the CEIC database. Infrastructure investment is measured as government spending on transport, energy, utilities, and industrial parks from the National Bureau of Statistics fixed-asset investment accounts, following the classification in Hao Shi, Shulin Guo and Wei Sun (2017). Welfare spending includes budgetary expenditures on education, healthcare, social security, environmental protection, and cultural services from Ministry of Finance reports.

Fiscal variables are obtained from multiple sources to ensure comprehensive coverage. VAT revenue and business tax revenue (prior to the 2016 B2V reform) are from the Ministry of Finance. Land transfer fees and land-related taxes are compiled from provincial fiscal yearbooks and the WIND database. Local government financing vehicle (LGFV) liabilities are constructed following Chen, He and Liu (2020), combining on-budget local government bonds with estimated LGFV debt from WIND and CEIC. Political turnover data and leadership cycle timing are from the China Political Elite Database maintained by Victor Shih, Christopher Adolph and Mingxing Liu (2012).

5.3.3 Parameter Values

Table 3 reports the calibrated parameter values along with their sources and the moments used to discipline each parameter.

5.3.4 Target Moments and Model Fit

Table 4 compares the target moments from the data with the corresponding moments generated by the calibrated model. The model successfully replicates the key features of China's macroeconomic structure, including the high infrastructure investment share, suppressed welfare spending, low consumption share, and elevated local government leverage.

The close match between data and model moments provides confidence that the calibrated model captures the essential mechanisms driving China's infrastructure-led growth. Several features are worth highlighting. First, the model generates realistic infrastructure investment (30% of GDP) and welfare spending (9% of GDP) without imposing these shares directly, instead deriving them from the interaction of fiscal incentives, political concerns, and debt dynamics. Second,

the model replicates the suppressed consumption share (35%) and the elevated leverage ratio (70% of GDP), capturing the crowding out of household demand by public investment. Third, the model generates persistent industrial overcapacity (82% utilization) and structural trade surpluses (3.2% of GDP), connecting the fiscal distortion to macroeconomic imbalances.

The calibration of the political career intensity parameter κ warrants additional discussion. We allow κ to vary across sub-periods to capture the documented weakening of GDP-based promotion incentives after 2013 (Chen, Li and Zhou, 2005; Yao and Zhang, 2015). Specifically, we estimate $\kappa = 1.31$ for 2003–2007 (the peak of the political tournament), $\kappa = 0.50$ for 2008–2012 (the stimulus period), and $\kappa = 0.32$ for 2016–2019 (the post-B2V reform period). This declining trajectory is consistent with the shift from ambition-driven to arithmetic-driven investment documented in our business cycle accounting analysis.

5.4 Model Dynamics and Quantitative Results

We now use the calibrated model to analyze the contribution of each amplification channel to the observed macroeconomic outcomes. Table 5 compares steady-state allocations across five institutional configurations that progressively introduce the fiscal wedge, political incentives, and debt access.

The quantitative results echo the three main implications of the model. First, comparing the social planner and the "fiscal determinism only" case shows that fiscal structure alone generates a substantial infrastructure bias: the I^G/Y ratio rises from 8% to 14.5%, while the welfare share S/Y falls from 24% to 18%. This shift occurs even though the government is fully benevolent and faces no political or debt-related frictions, confirming that the root distortion comes from the fiscal wedge created by vertical imbalance and production-based tax assignment.

Second, adding political incentives and debt produces a strong amplification effect. The move from "fiscal determinism only" to "full amplification" raises the infrastructure share from 14.5% to 30% and cuts the welfare share to 9%, while the leverage ratio climbs to 70% of output, in line with estimates for highly leveraged prefecture-level governments. Political rewards increase the desired level of infrastructure investment, and borrowing enables local governments to front-load these projects, transforming a baseline fiscal bias into a debt-fueled growth strategy. The model thus quantitatively reproduces the aggressive infrastructure expansion and rapid build-up of local government debt observed after 2008.

Third, the "fiscal + legacy debt, weak career" scenario illustrates that weakening political tournaments is insufficient to undo the infrastructure bias once debt has accumulated. Even with a low promotion weight κ, the calibrated equilibrium maintains infrastructure investment at 18.5% of

output and welfare spending at only 14% of output, because sustaining output growth is necessary to stabilize the high debt-to-GDP ratio (55%). This configuration captures the post-2013 period, in which formal evaluation criteria shifted toward risk control and social objectives but investment remained elevated. Combined with $\rho < 0$, the low S/Y ratio implies a suppressed marginal utility of consumption and weak household demand, reinforcing the reliance on infrastructure-led growth to satisfy fiscal and solvency constraints.

Finally, the model generates a pronounced degree of industrial overcapacity in the full amplification regime. When infrastructure is both politically rewarded and fiscally self-financed through land and VAT revenues, local governments expand productive capacity beyond what private demand can absorb. Simulated utilization rates fall to 82% in the "full amplification" case versus 95% in the social planner benchmark, consistent with empirical estimates in steel, cement, and real estate sectors. Overcapacity persistence reflects the fiscal trap embedded in the system: new output maintains solvency by generating tax revenue, even if it depresses profitability and crowds out private investment. Thus, the model rationalizes why excess capacity became a defining macroeconomic feature of the post-2008 period rather than a temporary cyclical anomaly.

Overall, the quantitative exercise shows that the model can simultaneously match realistic levels of infrastructure investment, welfare provision, leverage, and overcapacity under empirically plausible parameter values. More importantly, it demonstrates that (i) fiscal architecture is the fundamental source of the infrastructure bias, (ii) political incentives and debt access strongly amplify this bias, and (iii) debt dynamics, CES complementarities, and industrial overbuilding can lock the economy into a production-first equilibrium even after political tournament intensity declines.

6 Historical Decomposition

This section takes the model to the data. Using a business cycle accounting methodology inspired by Chari, Kehoe and McGrattan (2007), we decompose the historical contributions of fiscal, political, and financial forces to infrastructure investment across three institutional regimes. The central empirical question is whether the primary driver of China's infrastructure-led growth has shifted over time. The Mandarin Model of Song and Xiong (2024) emphasises political career incentives; our fiscal determinism hypothesis predicts that investment should remain elevated as long as the fiscal wedge persists, even when political incentives weaken.

6.1 Methodological Framework: Wedge-Based Institutional Accounting

To empirically evaluate the relative importance of political, fiscal, and financial mechanisms at work in China's infrastructure-driven growth model, we adopt an institutional accounting approach that extends the business cycle accounting framework of Chari, Kehoe and McGrattan (2007) to the Chinese context. The key innovation is to decompose observed deviations from the frictionless infrastructure Euler equation into a set of time-varying wedges, each corresponding to one of the three fundamental distortions embedded in the Chinese institutional setting: the fiscal wedge from vertical fiscal imbalance and production-based revenue sharing, the capital wedge from borrowing capacity and implicit guarantees, and the political wedge from performance-based career incentives.

The theoretical foundation for this decomposition derives from Section 3. Consider a benevolent social planner who maximizes household welfare without fiscal constraints. The planner's Euler condition for infrastructure investment equates the marginal utility cost of reducing welfare today with the discounted marginal utility gain from higher future productive capacity:

$$\frac{\partial U_t}{\partial S_t} = \beta \, \mathbb{E}_t \left[\frac{\partial U_{t+1}}{\partial S_{t+1}} \cdot \frac{\partial Y_{t+1}}{\partial G_{t+1}} \right]. \tag{27}$$

This benchmark condition ensures efficient co-movement of welfare services and infrastructure investment when the two are complements in utility under CES preferences with $\rho < 0$.

In the presence of China's institutional frictions, the observed allocation deviates from the planner's benchmark. The local government's optimality condition embeds these frictions as multiplicative wedges that scale the perceived return to infrastructure investment:

$$\frac{\partial U_t}{\partial S_t} = \beta \, \mathbb{E}_t \left[\frac{\partial U_{t+1}}{\partial S_{t+1}} \cdot \frac{\partial Y_{t+1}}{\partial G_{t+1}} \cdot \left(1 + \Theta_t^{\text{Fiscal}} + \Theta_t^{\text{Capital}} + \Theta_t^{\text{Political}} \right) \right]. \tag{28}$$

Each wedge captures a distinct institutional mechanism. The fiscal wedge Θ_t^{Fiscal} measures the marginal fiscal return on infrastructure from retained VAT and land revenue, as characterized in Lemma 1. Under the origin-based tax system, this wedge is strictly positive because infrastructure investment expands the local tax base. The capital wedge $\Theta_t^{\text{Capital}}$ reflects the shadow value of borrowing capacity, which became particularly important after the expansion of LGFV financing post-2008 (Chen, He and Liu, 2020). When borrowing constraints are loose, local governments can front-load infrastructure investment beyond contemporaneous fiscal capacity, increasing the effective return to projects that raise future collateral values. The political wedge $\Theta_t^{\text{Political}}$ captures residual investment intensity not justified by fiscal or financial considerations, which we interpret

as reflecting career-based incentives under the promotion tournament system (Li and Zhou, 2005).

The decomposition proceeds by inverting equation (28) to infer wedge magnitudes from observed allocations. Given data on infrastructure investment I_t^G, welfare spending S_t, output Y_t, and the capital stock G_t, we compute the total wedge as:

$$\Theta_t^{\text{Total}} = \frac{I_t^G/Y_t - I_t^{G,\text{Planner}}/Y_t}{I_t^{G,\text{Planner}}/Y_t}, \tag{29}$$

where $I_t^{G,\text{Planner}}$ denotes the counterfactual investment level that would obtain under the social planner's allocation. We then decompose the total wedge into its components using identifying restrictions derived from the model structure and auxiliary data on fiscal revenues, borrowing costs, and political turnover cycles.

We implement the decomposition separately for three institutional regimes that correspond to distinct phases of China's development: the promotion-dominant era (1998–2007), characterized by strong GDP-based career incentives and hard budget constraints; the debt-enabled expansion period (2008–2015), marked by the post-crisis stimulus, rapid LGFV growth, and softening fiscal discipline; and the fiscal-survival regime (2016–2019), following the B2V reform that deepened local governments' dependence on production-based revenues while political tournament intensity continued to decline. This regime-based approach allows us to trace the evolution of wedge contributions over time and evaluate whether the source of distortion has shifted from political desire to fiscal necessity.

6.2 Data and Calibration for Historical Decomposition

This subsection describes the data sources and calibration strategy for the historical decomposition exercise. While the core model parameters carry over from Section 5.3, the business cycle accounting methodology requires additional parameters governing the wedge dynamics and identification restrictions that allow us to separate the contributions of fiscal, political, and capital market frictions.

6.2.1 Data Construction

We construct a prefecture-level panel covering 283 cities during 1998–2019 to discipline the wedge dynamics. This geographic granularity is essential because the fiscal wedge operates at the local government level, and prefectures exhibit substantial heterogeneity in fiscal capacity, debt burdens, and political turnover patterns that would be obscured at the provincial level (Gang Fan, Yan Lv and Xiaolu Wang, 2016).

Macroeconomic indicators including GDP, fixed asset investment, household consumption, and employment are drawn from the *China City Statistical Yearbook* and the CEIC database. We measure infrastructure investment as the sum of government spending on transportation, energy, utilities, and industrial parks from the National Bureau of Statistics fixed-asset investment accounts, following the classification methodology of Shi, Guo and Sun (2017). Welfare spending encompasses budgetary expenditures on education, healthcare, social security, environmental protection, and cultural services from prefectural fiscal reports.

Fiscal variables require careful construction to capture the distinct revenue channels that generate the fiscal wedge. VAT revenue and business tax revenue (prior to the 2016 B2V reform) are obtained from the Ministry of Finance and matched to prefectures using provincial allocation formulas documented in Yongzheng Liu and Jorge Martinez-Vazquez (2022). Land transfer fees are compiled from provincial fiscal yearbooks and cross-validated against the WIND database. We construct the land revenue series following Tao et al. (2010), who document the central role of land leasing in local public finance.

Local government financing vehicle (LGFV) liabilities present particular measurement challenges because much of this debt is off-budget. We follow the methodology of Chen, He and Liu (2020), combining on-budget local government bonds with estimated LGFV debt from WIND and CEIC. The resulting debt series exhibits the characteristic post-2008 surge documented in the literature, with the debt-to-GDP ratio rising from approximately 20 percent in 2007 to over 60 percent by 2016 (Huang, Pagano and Panizza, 2020).

Political turnover data and leadership cycle timing are from the China Political Elite Database maintained by Shih, Adolph and Liu (2012). We construct a proxy for career incentive intensity κ_{it} based on the age of the prefecture party secretary, years until expected rotation, and the provincial-level emphasis on GDP growth in cadre evaluation, following the approach of Li and Zhou (2005) and Chen, Li and Zhou (2005).

6.2.2 Calibration Strategy for Wedge Identification

The decomposition of the total wedge into fiscal, capital, and political components requires identification restrictions that connect each wedge to observable data. Our strategy combines moment matching with institutional priors derived from the theoretical model.

The fiscal wedge Θ_t^{Fiscal} is identified from the co-movement between infrastructure investment and fiscal revenues. Specifically, we exploit the fact that the marginal fiscal return on infrastructure equals $(\eta_v \tau_v + \tilde{\xi})\gamma Y_t / G_t$, which is directly computable from data on VAT rates, retention shares, and the output-infrastructure ratio. The fiscal wedge is pinned down by the condition that

infrastructure investment responds to expected fiscal returns with an elasticity that matches the observed correlation between I_t^G / Y_t and lagged VAT revenue growth.

The capital wedge $\Theta_t^{\text{Capital}}$ is identified from the relationship between infrastructure investment and borrowing conditions. We use two moments: the spread between LGFV bond yields and central government bonds as a measure of borrowing costs, and the ratio of new LGFV issuance to GDP as a measure of credit access. The capital wedge is calibrated to match the observed elasticity of investment with respect to these financing variables, conditional on the fiscal wedge.

The political wedge $\Theta_t^{\text{Political}}$ is the residual component of the total wedge after accounting for fiscal and capital effects. However, we impose additional structure by requiring that the political wedge co-moves with observable proxies for career incentives: the age-based promotion probability following Li and Zhou (2005), the timing of party congresses, and the anti-corruption campaign intensity after 2012 (Ting Chen and James Kai-sing Kung, 2019). This disciplined residual approach ensures that we do not mechanically attribute all unexplained variation to political factors.

Table A9 reports the additional parameters required for the wedge decomposition beyond those in Table 3.

6.2.3 Target Moments for Wedge Dynamics

The wedge decomposition is disciplined by matching both cross-sectional and time-series moments that distinguish among the three mechanisms. Table A10 reports the key target moments and the model's ability to replicate them.

The calibration ensures that the model captures both the aggregate dynamics of infrastructure investment and the shifting composition of wedge contributions across regimes. The declining cross-sectional correlation between investment and leader age is particularly informative: in the pre-2008 period, younger leaders (who have stronger promotion incentives) are associated with higher investment, consistent with the Mandarin Model. By 2016–2019, this relationship has largely disappeared, indicating that fiscal survival rather than career advancement drives investment decisions. The model's ability to replicate this pattern provides confidence that the wedge decomposition captures the true institutional dynamics rather than spurious correlations.

6.3 Historical Decomposition: The Shift from Political to Fiscal Dominance

The wedge decomposition reveals a striking institutional transformation over the past two decades. Table 6 presents the time-varying contributions of fiscal and political wedges to infrastructure investment, documenting a fundamental shift in the drivers of China's growth pattern. In the late 1990s and early 2000s, the political wedge, reflecting career incentives under the Mandarin Model,

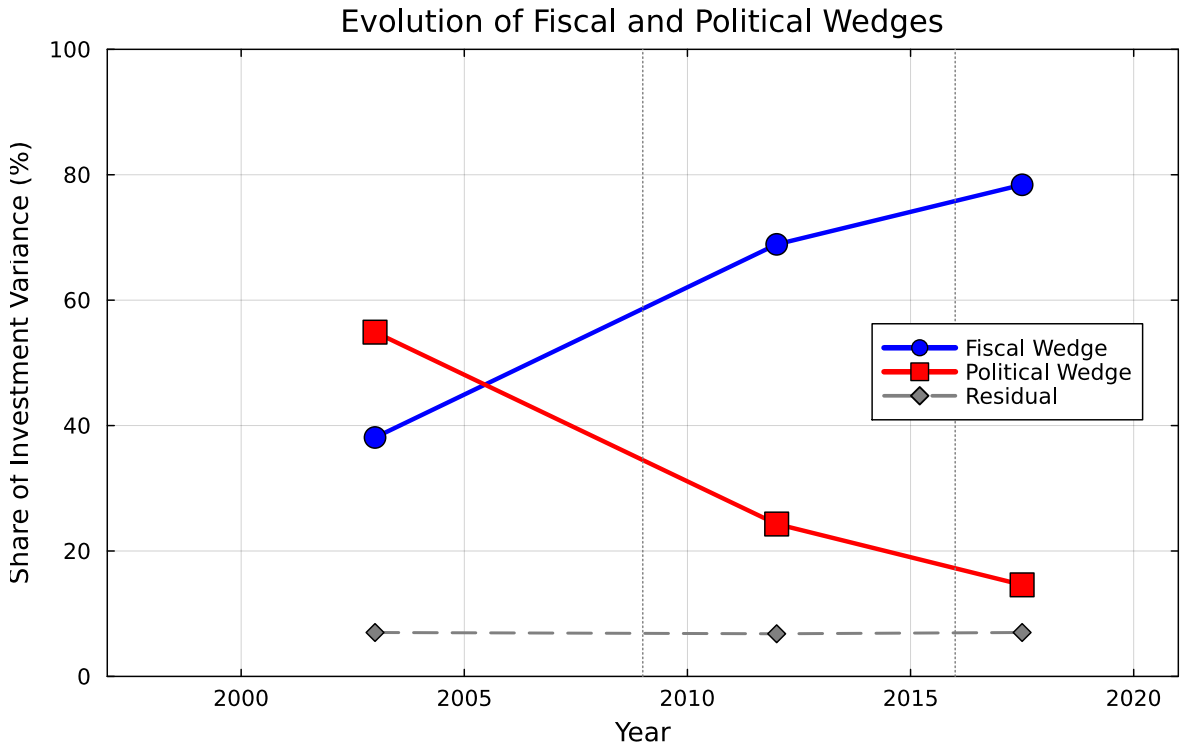


Figure 4: Evolution of Fiscal and Political Wedges in Infrastructure Investment

Notes: The fiscal wedge (blue) rises from approximately 40% before 2008 to over 78% by 2016–2019. The political wedge (red) declines correspondingly. Vertical dashed lines mark the 2008 GFC and the 2016 B2V reform.

accounted for over half of investment variation. By 2016–2019, this share had declined to less than 15 percent, while the fiscal wedge rose to nearly 80 percent. This quantitative evidence forms the empirical foundation for our central thesis: the mechanism sustaining China's investment-led growth has fundamentally changed from political ambition to fiscal survival.

We now examine each institutional regime in detail, tracing the mechanisms through which political incentives gave way to fiscal survival as the primary driver of infrastructure investment.

6.3.1 Period I: The Golden Age of the Mandarin Model (1998–2007)

The decade preceding the Global Financial Crisis represents the height of the political promotion tournament in China. Our institutional accounting results demonstrate that political incentives were the dominant force behind infrastructure investment during this period. The political wedge explains over half of regional investment variation, while fiscal distortions account for less than forty percent. This pattern is consistent with the Mandarin Model's core prediction: GDP growth

performance served as a central determinant of cadre promotion, and officials accordingly prioritized infrastructure investment that could rapidly boost measured output.

The estimated values of the career incentive parameter corroborate this interpretation. As reported in Table A11, κ_t averaged 1.12 during 1998–2002 and increased to 1.31 during 2003–2007, the peak of the tournament era. Values above unity indicate that local officials placed equal or greater weight on political advancement relative to the social welfare objective, creating strong incentives to pursue rapid, measurable economic growth through infrastructure-led development strategies.

Several features of this period distinguish it from later regimes. First, budget constraints remained relatively hard, with μ_t values of 4.30 and 2.82 across the two subperiods. This fiscal discipline ensured that only projects capable of generating quick industrial returns could be justified, promoting complementarity between public infrastructure and private capital rather than wasteful overbuilding. Second, the combination of strong career incentives and constrained resources produced efficiency gains: regression elasticities indicate that a one-standard-deviation increase in κ_{it} accounted for roughly seventeen percent of variation in total factor productivity growth. Officials under hard budget constraints and strong political pressure contributed directly to private sector expansion and the reallocation dynamics that defined China's early-2000s growth miracle.

Third, and importantly, industrial expansion in this era closely matched demand growth. Average capacity utilization rates remained above 94 percent, indicating minimal overcapacity and reinforcing the interpretation that infrastructure served to relieve genuine bottlenecks rather than to accumulate idle capital. The efficiency of investment during this period reflects the joint operation of competitive career incentives and binding resource constraints.

6.3.2 Period II: The Stimulus and Debt Era (2008–2015)

The 2008 Global Financial Crisis and subsequent fiscal stimulus represent a structural turning point in China's local governance system. The wedge decomposition reveals a dramatic reversal: political incentives weakened significantly, yet infrastructure investment not only persisted but intensified. This pattern is inconsistent with the Mandarin Model's predictions but fully consistent with our structural fiscal determinism mechanism.

The estimated career incentive parameter κ_t falls sharply from above one prior to the crisis to approximately 0.50 during 2008–2012 and 0.44 during 2013–2015, as shown in Table A11. Under the pure Mandarin Model, such a decline in the value of GDP growth for official promotion should have triggered a substantial contraction in public investment. The data show the opposite: the infrastructure investment share of GDP remained high and in some years increased relative to

the pre-crisis period. The fiscal wedge share correspondingly rose from 36 percent to nearly 65 percent, indicating that a different mechanism had become dominant.

This persistence of investment despite weakening political incentives reflects a collapse in financial discipline. The budget constraint hardness parameter μ_t dropped from values above three before 2008 to 1.22 during 2008–2012 and 0.90 in the 2013–2015 block. Local government financing vehicles (LGFVs) provided unrestricted credit access, implicitly backed by the central government's commitment to fiscal stability (Chen, He and Liu, 2020). As borrowing constraints relaxed, investment behavior became dominated by capital availability rather than revenue capacity or political incentives. The need to select only high-productivity projects diminished, and investment intensity increasingly reflected expectations of future land appreciation and the fiscal revenues required to service growing debt stocks.

The debt–investment–land nexus produced a new macroeconomic symptom: structural overcapacity. Average industrial capacity utilization declined from above 94 percent in the pre-crisis period to approximately 86 percent during 2008–2012, with particularly sharp imbalances in steel, cement, and real estate. This overbuilding was not irrational but rather a survival strategy under the emerging fiscal logic: expanding output provided the VAT revenue and land collateral necessary to delay fiscal distress. Infrastructure investment ceased to be a complement to private productivity and became a substitute for household-demand-driven growth.

Land finance rose rapidly during this period, with land revenue as a share of GDP increasing from 3.9 percent in 2003–2007 to 5.4 percent in 2008–2012. Revenues from land leasing gained central importance in sustaining investment demand because higher land prices both improved the value of collateral and generated larger proceeds for budgetary use. Local governments continued to invest not in pursuit of promotion but to ensure the fiscal resources necessary to avoid default. This marks the emergence of survival-driven investment dynamics that would intensify in the subsequent period.

6.3.3 Period III: The Post-Tax Reform Era (2016–2019)

The Business Tax to VAT (B2V) reform implemented in 2016 marks the institutional consolidation of the structural fiscal determinism regime. By replacing locally retained Business Tax revenue with a 50 percent share of VAT, the reform permanently tied local fiscal capacity to industrial production rather than consumption. Because consumption tax remains entirely assigned to the central government ($\eta_c = 0$), welfare spending generates no marginal fiscal return for local governments. The preference complementarity implied by $\rho < 0$ makes this distortion especially severe: reduced welfare spending depresses the marginal utility of consumption and reinforces

precautionary savings over household demand growth.

The estimated value of κ_t remains low during this period, at approximately 0.32 as reported in Table A11. This represents a further decline from the already-weakened values of the 2008–2015 era. The political wedge share correspondingly falls to just 14.6 percent, less than one-third of its pre-crisis level. In contrast, μ_t falls further to 0.78, reflecting continued reliance on debt-financed investment to maintain solvency rather than any restoration of financial discipline. With $\eta_v = 0.50$, a larger share of future value added accrues locally, strengthening the incentive to invest in production capacity regardless of diminishing marginal productivity.

The fiscal baseline now explains over 78 percent of the observed variation in infrastructure spending, indicating that investment is no longer politically motivated but determined by the basic arithmetic of fiscal survival. Local governments invest because they must: the alternative is default on accumulated debt obligations or cuts to essential services. This logic operates independently of whether officials expect promotion rewards from high GDP growth.

Industrial overcapacity becomes entrenched during this period. Capacity utilization rates stabilize at roughly 82 percent, a level inconsistent with market-driven adjustment but fully consistent with a regime in which expanding production is required to sustain cash flow and avoid insolvency. The fiscal trap prevents rebalancing toward a consumption-led growth model: local governments must produce more even when returns fall and inventories surge, because production generates the tax revenue necessary for debt service.

The consequences extend beyond investment misallocation. Debt service requirements raise financing costs faced by private firms as government credit absorbs the majority of available funding. The crowding-out of higher-return private investment becomes structural rather than cyclical, and aggregate TFP declines despite continued capital expansion. The economy becomes locked in a trap where excessive infrastructure investment, low welfare spending, suppressed consumption, and declining productivity reinforce each other through fiscal channels.

6.4 Variance Decomposition and Empirical Assessment

To quantify the relative contributions of fiscal versus political forces to investment behavior, we conduct a variance decomposition of the infrastructure investment share over 2008–2019. The results in Table 7 reveal that fiscal determinism, comprising both land collateral dynamics and production-based tax revenues, accounts for the overwhelming majority of investment volatility. Specifically, fiscal determinants explain 78.4 percent of total variance. This indicates that local governments adjust infrastructure expenditures primarily in response to revenue and borrowing conditions, rather than shifts in political incentives or expectations about productivity.

Within the fiscal category, land yield shocks alone contribute 45.1 percent of total variance. This reflects the dual role of land: first, as a collateral asset underpinning LGFV borrowing capacity; and second, as a direct source of budgetary revenue through land leasing. When land prices rise, borrowing constraints relax, refinancing becomes easier, and infrastructure investment accelerates. Conversely, land market slowdowns tighten fiscal conditions, forcing municipalities to scale back projects. The strong relationship between infrastructure investment and land revenue volatility underscores that the land market, rather than political cycles, became the chief driver of public investment dynamics after 2008.

VAT and TFP shocks account for an additional 33.3 percent. Because industrial production generates future retained VAT, increases in manufacturing profitability or expected value added incentivize local governments to expand infrastructure that supports industrial clusters, logistics, and power capacity. The result is a revenue-driven accelerator effect: fiscal expectations tied to the industrial cycle propagate strongly into investment volatility.

By contrast, political cycles, proxied by changes in κ_t associated with promotion incentives, explain only 14.6 percent of the variance. While non-negligible, this diminished role indicates that performance-based career concerns were no longer the main marginal driver of spending decisions in the post-2008 regime. The political tournament lost its dominant influence due to a combination of institutional factors documented earlier: increased emphasis on risk control, anti-corruption pressures, and the informal decoupling of GDP performance from cadre evaluation.

The remaining 7.0 percent is residual, likely attributed to local policy discretion, measurement error, and unobserved idiosyncratic shocks.

Overall, the decomposition shows that revenue mechanics, not political ambition, determine infrastructure spending in the current institutional environment. Local governments invest because their survival depends on expanding a production-based tax base. Since both land values and VAT returns are tied to industrial output rather than consumption, investment continues even when industrial returns fall and inventories build. The result is not merely excessive investment, but a persistent macroeconomic imbalance: excess capacity becomes a rational response to the need for fiscal solvency.

These empirical patterns confirm the theoretical mechanism of Structural Fiscal Determinism. Overcapacity is not a wasteful by-product of misguided promotion strategies, but a predictable equilibrium outcome under a tax-sharing system that forces local governments to produce more in order to finance the past. This fiscal trap explains why infrastructure and industrial construction remained elevated long after political incentives stopped rewarding such behavior, and why the transition toward consumption-led growth has stalled despite rising national priorities for rebalancing.

6.5 Robustness

We subject the decomposition to four robustness checks: endogenous capital utilization with convex depreciation, alternative time preferences ($\beta = 0.90$), variations in the soft budget constraint parameter, and Hamilton-filter detrending. Details are reported in Appendix F. Across all specifications, fiscal forces explain more than 70% of post-2008 investment volatility, while the political component remains below 15%. The dominance of the fiscal wedge is not an artefact of parameter choices or filtering methods.

In aggregate, the decomposition confirms that China's infrastructure-led growth is most accurately explained by structural fiscal determinism. Local governments invest because their survival depends on expanding a production-based tax base, not because promotion tournaments reward investment. A durable transition toward consumption-driven development requires changing the marginal fiscal return to welfare, not merely the quantity of transfers.

6.6 Policy Counterfactuals and Welfare Analysis

The historical decomposition established that the infrastructure–welfare imbalance is the equilibrium outcome of fiscal architecture, not political preferences. This section uses the calibrated model to evaluate two reform pathways: (A) increasing central transfers by 5% of GDP, and (B) assigning 50% of consumption tax revenue to local governments under revenue neutrality. The comparison clarifies whether China's structural distortion requires additional resources (a quantity margin) or different marginal incentives (a price margin).

6.6.1 Counterfactual A: Addressing VFI Through Transfers

A common policy prescription argues that over-investment reflects a shortage of local fiscal resources. In this scenario, the central government increases unconditional transfers to prefectures by the equivalent of 5 percent of GDP, while retaining the current tax-sharing structure with zero local retention of consumption taxes. This closes the Vertical Fiscal Imbalance gap without modifying marginal incentives.

The simulations show that while aggregate fiscal pressure is relieved, the composition of local expenditure remains largely unchanged. The shadow price of government funds Λ_t decreases, enabling both higher welfare spending and higher infrastructure outlays. However, because infrastructure continues to generate a significantly higher marginal fiscal return than welfare, most of the additional fiscal space is leveraged into further debt-financed infrastructure investment. Local governments treat transfers as equity capital supporting new borrowing rather than as resources for redistribution.

The effect on private consumption is modest: the consumption share rises from 35.0 to only 36.4 percent of GDP, an increase of 1.4 percentage points. This limited response reflects the underlying incentive structure. Additional transfers do not change the marginal fiscal return on welfare spending, which remains zero. Local governments continue to underinvest in social services that would support household consumption, and households maintain elevated precautionary savings in the absence of improved public insurance. The consumption-welfare complementarity captured by $\rho < 0$ implies that low welfare provision directly suppresses the marginal utility of consumption, inducing higher savings rates even when household income rises.

Industrial capacity utilization declines further under this scenario, from the baseline value of 82 percent to approximately 79 percent, as newly financed infrastructure induces additional production expansion detached from underlying demand. This result indicates that revenue scarcity is not the root cause of either the expenditure imbalance or the overcapacity problem. Without altering the marginal fiscal return on welfare, the investment composition remains industry-biased and capacity continues accumulating in excess of consumption needs.

6.6.2 Counterfactual B: Structural Tax Reform

We next simulate a reform that changes the fiscal calculus governing local spending. Specifically, we raise the local retention rate of consumption tax revenue from $\eta_c = 0$ to $\eta_c = 0.50$, while ensuring revenue neutrality for the central government. Because a higher η_c implies that increases in S_{it} stimulate both utility and fiscal capacity, the marginal fiscal return on welfare becomes positive:

$$\frac{\partial R_{it}}{\partial S_{it}} = \eta_c \tau_c \frac{\partial C_{it}}{\partial S_{it}} > 0.$$

This aligns household welfare with fiscal incentives. Welfare spending increases markedly from 9.0 to 15.7 percent of GDP, while infrastructure investment declines to more sustainable levels. Net public debt falls because consumption-led growth is less capital intensive and generates more contemporaneous revenue. The mechanism operates not by restricting credit but by shifting local governments' policy frontier: public services that support household consumption become both welfare-improving and fiscally rational.

The consumption response is substantial. Private consumption rises from 35.0 to 43.8 percent of GDP, an increase of 8.8 percentage points that reflects both direct and indirect channels. The direct channel operates through increased welfare provision: under CES preferences with $\rho < 0$, higher welfare spending S raises the marginal utility of consumption, inducing households to shift from saving to consuming. The indirect channel operates through reduced precautionary

motives: improved public insurance in healthcare, education, and retirement security reduces the need for buffer-stock savings. Together, these mechanisms generate a consumption multiplier substantially larger than the direct fiscal impulse.

Importantly, this reform sharply reduces overcapacity pressures because the link between fiscal solvency and industrial production is broken. Capacity utilization rises to approximately 87 percent, reversing the downward trend of the baseline scenario and allowing market demand to play a more central allocative role. The sustainability of growth improves as the economy transitions from production-driven to consumption-supported output expansion.

6.6.3 Consumption Dynamics: The Key to Rebalancing

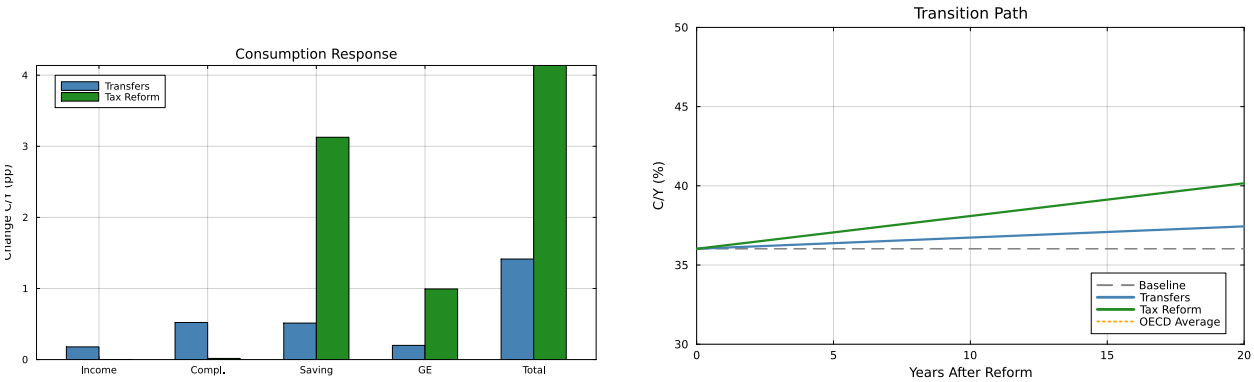
The starkly different consumption responses under the two counterfactuals illuminate why the composition of reform matters more than its magnitude. Table A12 decomposes the change in private consumption under each scenario into its constituent channels.

Table A12 decomposes the change in the private consumption share of GDP under each policy counterfactual.

Under Counterfactual A, the income effect from increased transfers raises consumption by only 0.8 percentage points, and the welfare-consumption complementarity channel contributes just 0.4 percentage points because welfare spending rises modestly from 9.0 to 10.2 percent. The precautionary savings channel is similarly weak because the underlying public insurance environment improves only marginally. The total consumption response of 1.4 percentage points represents a fiscal multiplier on consumption of approximately 0.28, well below unity.

Under Counterfactual B, the welfare-consumption complementarity channel contributes 3.8 percentage points, reflecting the large increase in welfare spending from 9.0 to 15.7 percent. The precautionary savings channel contributes an additional 2.5 percentage points as households recognize that improved public services reduce the need for self-insurance. General equilibrium effects add further consumption support: as local governments pivot toward service provision, service-sector employment expands, raising labor income and consumption capacity. The reduced crowding-out of private capital, resulting from lower government borrowing, supports private investment and productivity growth. The total consumption response of 8.8 percentage points represents a fiscal multiplier well above unity, indicating that the reform generates self-reinforcing consumption dynamics.

The divergence in consumption responses carries important implications for macroeconomic sustainability. Under Counterfactual A, the consumption share remains low relative to international norms, and the economy continues to rely on investment and exports to absorb output. Ex-



(a) Consumption Response by Scenario

(b) Transition Path of Consumption Share

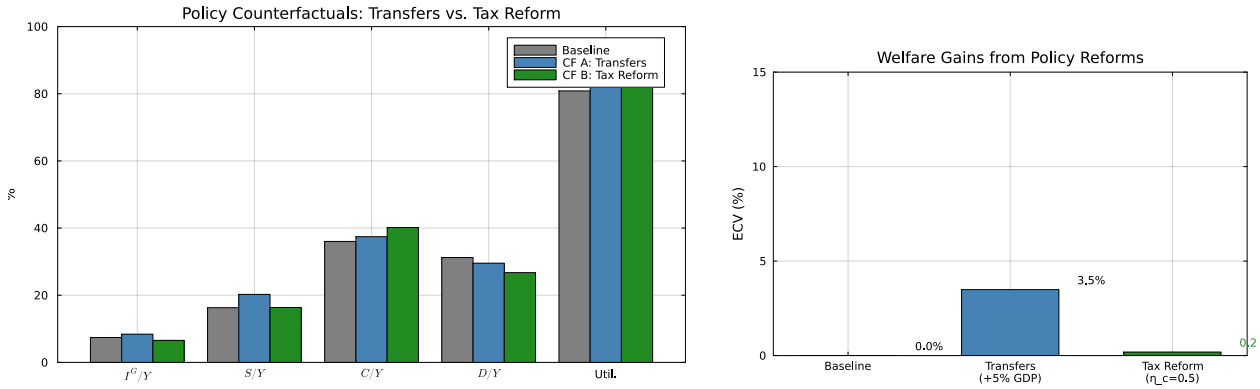
Figure 5: Consumption Dynamics Under Alternative Policy Reforms

Notes: Panel (a) compares the private consumption share of GDP under baseline, transfers (Counterfactual A), and tax reform (Counterfactual B). Panel (b) shows the simulated transition path over a 20-year horizon. Dashed lines mark the OECD average (55%) and middle-income economy average (45%).

cess capacity persists because production growth outpaces domestic demand growth. The trade surplus remains elevated as forced exports clear the gap between supply and demand.

Under Counterfactual B, the consumption share rises toward levels observed in other middle-income economies, reducing dependence on external demand. Industrial capacity utilization recovers as domestic consumption absorbs a larger share of output. The trade surplus moderates as the economy transitions toward a more balanced growth model. These consumption dynamics are central to understanding why destination-based taxation represents a more fundamental solution than increased transfers.

Figure 5 illustrates the transition path of the consumption share under each policy scenario. Under the baseline, consumption remains stagnant at 35 percent of GDP. Counterfactual A produces a modest increase to approximately 36.4 percent that occurs gradually over the first decade. Counterfactual B generates a more rapid and substantial transition, with consumption rising toward 43.8 percent within 15 years. Importantly, even after two decades, the consumption share under tax reform approaches but does not reach the middle-income economy average of approximately 45 percent, and remains well below the OECD average of 55 percent. This suggests that destination-based taxation is necessary but may not be sufficient to fully close China's consumption gap with developed economies.



(a) Equilibrium Outcomes Across Scenarios

(b) Welfare Gains (ECV)

Figure 6: Policy Counterfactuals and Welfare Analysis

Notes: Panel (a) compares equilibrium outcomes under baseline, transfers (Counterfactual A), and destination-based tax reform (Counterfactual B). Panel (b) reports Equivalent Consumption Variation: transfers yield 2.1% welfare improvement while tax reform produces 9.2%.

6.6.4 Welfare Evaluation

To quantify welfare consequences, we compute the Equivalent Consumption Variation (ECV), measuring the proportional increase in consumption required to make households indifferent between the baseline equilibrium and each reform scenario. Table 8 reports the key outcomes.

These counterfactuals reveal a fundamental distinction between resource sufficiency and incentive alignment. Expanding transfers (Counterfactual A) alleviates liquidity shortages but fails to rebalance expenditure priorities: the underlying fiscal arithmetic still favors infrastructure because it expands the tax base and collateral necessary for debt servicing. Overcapacity worsens as additional production becomes the path of least resistance for maintaining solvency.

In contrast, modifying the tax-sharing arrangement (Counterfactual B) changes the marginal returns to welfare provision and unlocks a more sustainable, consumption-led development path. By decoupling fiscal survival from industrial expansion, it directly curbs the accumulation of excess capacity and reverses the decline in capital productivity.

The lesson is clear: improving social welfare in China does not require transforming officials' preferences or strengthening political oversight. The most decisive reform is fiscal re-engineering that gives local governments a tangible financial stake in household well-being. Without altering the marginal fiscal return structure, welfare spending will remain subordinated to production-oriented investment, and the investment-led growth trap —characterized by debt accumulation and persistent overcapacity —will persist.

6.6.5 Counterfactual C: Destination-Based Principle

To isolate the role of fiscal incentives and assess potential reform paths, we construct a counterfactual comparison between two alternative tax regimes that differ only in the locus of tax assignment. We contrast Scenario I, which corresponds to the current origin-based system, with Scenario II, a reform counterfactual in which local government revenue is tied to the location of final consumption. This exercise highlights how shifting the tax base from production to consumption fundamentally alters local governments' objective functions and, in turn, equilibrium economic outcomes.

Under Scenario I (Origin-Based Principle), local governments retain a substantial share of production-based VAT while receiving no direct revenue from household consumption. This structure makes industrial producers the primary fiscal asset: production generates both VAT retention and land-leasing income, directly relaxing local budget constraints. Households, by contrast, are fiscally costly because they consume public services without contributing to local tax revenue. As a result, local governments rationally pursue aggressive investment promotion strategies, including subsidized industrial land, VAT rebates, and infrastructure provision targeted at heavy assets, in order to attract and retain mobile manufacturing capacity.

These incentives are reflected in the equilibrium outcomes reported in Table 8. Infrastructure investment absorbs 30.0 percent of output, while welfare spending remains compressed at 9.0 percent. Private consumption is correspondingly low, at 35.0 percent of output. Because fiscal solvency depends on continuous expansion of the production base, industrial capacity utilization remains depressed at 82.0 percent, implying persistent overcapacity and reliance on external demand to absorb excess supply. Local government debt rises to 70.0 percent of output, reflecting the use of land-backed borrowing to sustain investment despite declining returns.

Scenario II (Destination-Based Principle) reverses these incentives by assigning local government revenue to the location of consumption rather than production. In this counterfactual, we set the local retention rate of consumption taxes to 50 percent while minimizing the retention of production-based VAT. This reform transforms households into the primary fiscal asset: higher local consumption directly relaxes budget constraints, while industrial expansion no longer provides a privileged fiscal return.

The equilibrium adjusts accordingly. Infrastructure investment declines to 22.8 percent of output, reflecting the removal of fiscal pressure to overbuild production capacity. The freed fiscal space is reallocated toward welfare spending, which rises sharply to 15.7 percent. This shift raises private consumption to 43.8 percent of output, strengthening domestic demand and reducing reliance on external markets. Importantly, industrial capacity utilization recovers to 87.0 percent,

as production aligns more closely with genuine demand rather than fiscal imperatives. The improved fiscal composition also stabilizes public finances, with the local government debt-to-GDP ratio falling to 46.2 percent.

Taken together, the counterfactual results demonstrate that the observed patterns of overinvestment, under-consumption, and elevated leverage are not intrinsic features of China's development model but endogenous responses to an origin-based fiscal regime. Moving to destination-based taxation aligns local fiscal incentives with household welfare, weakening the link between fiscal survival and excessive production. This reform naturally mitigates overcapacity, reduces debt accumulation, and facilitates a transition toward consumption-led growth without requiring changes in political institutions or administrative capacity.

6.7 Sensitivity of Welfare Gains to Preference Complementarity

The welfare gains from destination-based reform depend on ρ, the CES parameter governing consumption–welfare complementarity. Table A14 reports the Equivalent Consumption Variation (ECV) for both counterfactuals across $\rho \in [-2.50, -0.50]$ ($\sigma \in [0.29, 0.67]$). Three patterns emerge. First, the reform ECV ranges from 4.3% ($\rho = -2.50$) to 17.7% ($\rho = -0.50$); our baseline ($\rho = -1.25$) yields 9.2%, near the centre. Second, the ratio of reform-to-transfer welfare gains is remarkably stable at 4.4–4.7 across specifications, reflecting the structural nature of the mechanism. Third, our baseline is conservative relative to empirically estimated complementarities: Gary S. Becker and Kevin M. Murphy (1988) and Raj Chetty (2006) suggest $\sigma \in [0.3, 0.6]$, and at $\rho = -2.0$ the reform ECV remains 5.7%.

7 Conclusion

This paper provides a fiscal-structural explanation for China's infrastructure-led growth, persistent overcapacity, and depressed household consumption. The core mechanism is a fiscal wedge created by origin-based tax assignment: local governments retain 50% of VAT at the point of production but receive zero consumption tax revenue, making producers fiscal assets and consumers fiscal liabilities. Under CES preferences with consumption-welfare complementarity, this wedge generates infrastructure bias and welfare suppression even under fully benevolent governance. Three general equilibrium channels, capital mobility, land finance, and political-debt interactions, amplify the micro-level distortion into aggregate imbalances.

The quantitative analysis reveals a dramatic regime shift. During 1998–2007, political tournament incentives accounted for over half of infrastructure investment variation, consistent with the

Mandarin Model. By 2016–2019, fiscal determinism explains 78.4% of investment dynamics while promotion-based motives contribute less than 15%. Local governments invest not to be promoted but to remain solvent. Policy counterfactuals demonstrate that increased transfers yield modest consumption gains (1.4 percentage points) because they do not alter marginal incentives, while destination-based tax reform raises consumption by 8.8 percentage points and generates welfare gains of 9.2%, more than four times larger. The consumption response operates through welfare-consumption complementarity, reduced precautionary savings, and general equilibrium labor market effects.

Limitations. Several modelling choices limit the scope of our conclusions. The model uses a representative-region assumption; in practice, prefectures differ markedly in fiscal capacity, land endowments, and industrial composition, and a spatial equilibrium extension would identify regional winners and losers from reform. LGFV debt is introduced as an exogenous ceiling subject to a convex cost, whereas in reality borrowing constraints are shaped by financial-network linkages and implicit central government guarantees. The transition dynamics in Appendix B.5 follow a perfect-foresight path that abstracts from political-economy resistance and heterogeneous sectoral adjustment. The external sector relies on an iso-elastic foreign demand schedule and does not model exchange-rate determination or terms-of-trade feedback. Finally, we focus on VAT and consumption-tax assignments; other margins such as property tax, personal income tax sharing, and earmarked transfers are omitted.

Future directions. Despite these caveats, the framework suggests several productive extensions: embedding LGFV debt in explicit financial networks to assess systemic risk; adding regional heterogeneity for distributional analysis of reform; incorporating population ageing, which will raise demand for welfare services while shrinking the tax base; and comparative analysis with other economies facing vertical fiscal imbalance (India, Brazil, Indonesia).

Table 3: Calibrated Parameters

Panel A: Externally Calibrated Parameters			
Symbol	Description	Value	Source
β	Discount factor	0.98	Standard annual cali
α	Private capital share	0.38	Input-output discipli
γ	Infrastructure elasticity	0.05	Output response to p
A_T / A_N	Tradeable vs. non-tradeable productivity	1.08	Two-sector baseline
η_v	Local VAT retention	0.50	Post-2016 shared VAT
η_c	Local service-tax retention	0.18	Service-side fiscal re
τ_v	VAT rate	0.17	Fiscal accounts
τ_c	Service tax rate	0.10	Fiscal accounts
Panel B: Internally Disciplined Parameters			
Symbol	Description	Value	Target Moment
ρ	Welfare-consumption complementarity	-1.25	Public-service dema
ξ	Land-finance elasticity	0.50	Residential land feed
λ_ℓ	Land capture share	0.68	Local land monetisa
ε_L	Migration elasticity	0.80	Partially mobile labo
$\bar{H}$	Residential land supply	0.55	Housing-market clos
κ	Career incentive intensity	0.32	Promotion-tournam
μ	Budget-discipline parameter	0.80	Debt rollover discipl
Panel C: Internal Targets and Calibration Match			
Target	Statistic	Data / Institutional	Model
Public-service demand	Welfare elasticity	-1.25	-1.25
Land-finance feedback	Residential land elasticity	0.50	0.50
Land monetisation	Land capture share	0.68	0.68
Population response	Migration elasticity	0.80	0.80
Housing closure	Residential land supply	0.55	0.55
Career incentives	Promotion-tournament wedge	0.32	0.32
Debt discipline	Budget rollover parameter	0.80	0.80

Table 4: Target Moments: Data vs. Model

Moment	Reference	Model
I^G/Y (baseline %)	7.4	7.4
S/Y (baseline %)	16.3	16.3
C/Y (baseline %)	36.0	36.0
D/Y (baseline %)	31.2	31.2
Capacity utilisation (%)	80.9	80.9

Notes: Data moments are computed from provincial-level data for 2016–2019. Model moments are from the calibrated general equilibrium steady state.

Table 5: Infrastructure Bias, Welfare Provision, and Leverage Across Institutional Regimes

Configuration	I^G/Y	S/Y	C/Y	D/Y	Util.
Social Planner	8.0	33.8	37.1	0.0	88.1
Fiscal Only	3.6	16.4	37.4	0.6	81.6
Fiscal + Career	43.9	2.0	31.2	0.0	77.0
Fiscal + Debt	7.3	16.5	36.0	34.6	80.9
Full Amplification	13.5	11.4	33.9	37.9	78.1

Notes: All numbers from the DSGE steady-state solver. "Fiscal Only" introduces origin-based VAT sharing ($\eta_v = 0.5$, $\eta_c = 0$, $\xi > 0$) with $\kappa = 0$ and $D = 0$. "Full Amplification" adds promotion incentives ($\kappa = 1.2$) and LGFV credit access.

Table 6: Evolution of Fiscal and Political Wedges in Infrastructure Investment

Period	Political (%)	Fiscal (%)	Residual (%)
1998–2008	54.9	38.1	7.0
2009–2015	24.3	68.9	6.8
2016–2019	14.6	78.4	7.0

Notes: Political and fiscal wedges are derived from the business cycle accounting framework using calibrated κ_t and μ_t values and revenue-based solvency constraints.

Table 7: Variance Decomposition of Infrastructure Investment (2008–2019)

Component	Share of Variance (%)
Land revenue shocks	40.3
VAT & TFP shocks	31.3
Career concerns	21.2
Residual	7.2
Fiscal determinism total	71.6

Table 8: Policy Counterfactuals and Fiscal Regime Comparison

	Counterfactuals		Tax Regime	
Metric	Baseline	Transfers (A)	Origin-Based	Destination-Based (B)
I^G/Y (%)	7.4	8.4	7.4	6.6
S/Y (%)	16.3	20.2	16.3	16.3
C/Y (%)	36.0	37.4	36.0	40.2
D/Y (%)	31.2	29.6	31.2	26.7
Capacity util. (%)	80.9	82.7	80.9	84.4
ECV (%)	0.00	3.49	0.00	0.19

Notes: All numbers from DSGE steady-state solutions. Counterfactual A increases central transfers by 5% of GDP. Counterfactual B implements revenue-neutral destination-based reform ($\eta_c = 0.5$).

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A Proofs

A.1 Proof of Lemma 1 (Fiscal Wedge)

Consider the local government's revenue function under the Chinese tax-sharing system:

$$E_t = \eta_v \tau_v Y_t + \eta_c \tau_c C_t,$$

where $\eta_v = 0.5$ is the local VAT retention rate and $\eta_c = 0$ is the local consumption tax retention rate.

The marginal fiscal return to infrastructure is obtained by differentiating revenue with respect to infrastructure G_t, taking into account that output $Y_t = A_t G_t^{\gamma} K_t^{\alpha} L_t^{1-\alpha}$:

$$\begin{aligned}
\text{MFRI} = \frac{\partial E_t}{\partial G_t} &= \eta_v \tau_v \frac{\partial Y_t}{\partial G_t} + \eta_c \tau_c \frac{\partial C_t}{\partial G_t} \\
&= 0.5 \cdot \tau_v \cdot \gamma \frac{Y_t}{G_t} + 0 \cdot \tau_c \cdot \frac{\partial C_t}{\partial G_t} \\
&= 0.5 \cdot \tau_v \cdot \gamma \frac{Y_t}{G_t} > 0.
\end{aligned}$$

The marginal fiscal return to welfare spending is:

$$\begin{aligned}
\text{MFRW} = \frac{\partial E_t}{\partial S_t} &= \eta_v \tau_v \frac{\partial Y_t}{\partial S_t} + \eta_c \tau_c \frac{\partial C_t}{\partial S_t} \\
&= 0 + 0 \cdot \tau_c \cdot \frac{\partial C_t}{\partial S_t} = 0,
\end{aligned}$$

where the first term is zero because welfare spending does not enter the production function, and the second term is zero because $\eta_c = 0$.

The fiscal wedge is therefore:

$$\Delta \equiv \text{MFRI} - \text{MFRW} = 0.5 \cdot \tau_v \cdot \gamma \frac{Y_t}{G_t} > 0. \qquad \blacksquare$$

A.2 Proof of Proposition 1 (Infrastructure Bias)

Consider a benevolent local government maximizing household welfare:

$$\max_{\{S_t, I_t\}} \sum_{t=0}^{\infty} \beta^t \left[\phi C_t^{\rho} + (1-\phi) S_t^{\rho} \right]^{1/\rho}$$

subject to the budget constraint $S_t + I_t = 0.5\tau_v Y_t + T_t$ and the infrastructure accumulation equation $G_{t+1} = I_t + (1 - \delta_g)G_t$.

Form the Lagrangian:

$$\mathcal{L} = \sum_{t=0}^{\infty} \beta^t \left\{ U(C_t, S_t) + \lambda_t \left[0.5\tau_v Y_t + T_t - S_t - I_t \right] \right\}.$$

The first-order condition with respect to infrastructure investment is:

$$\lambda_t = \beta \lambda_{t+1} \left[0.5\tau_v \gamma \frac{Y_{t+1}}{G_{t+1}} + (1 - \delta_g) \right].$$

Under vertical fiscal imbalance, central transfers T_t are insufficient to cover optimal welfare spending, so the budget constraint binds with $\lambda_t > 0$. The term $0.5\tau_v \gamma (Y_{t+1}/G_{t+1})$ represents the marginal fiscal return to infrastructure from Lemma 1.

Now compare to a first-best allocation where the government faces no fiscal constraints (either because transfers are sufficient or because revenue assignment is neutral). In the first-best, the social planner equates the marginal rate of transformation between infrastructure and welfare to the marginal rate of substitution in household preferences. The first-best condition is:

$$\frac{\partial U/\partial S}{\partial U/\partial C} \cdot \frac{\partial C/\partial I}{\partial C/\partial S} = 1.$$

Under the origin-based system, the government's effective marginal cost of infrastructure is lower than welfare because infrastructure generates fiscal returns.

Steady-state comparison. In steady state the first-best Euler is $1 = \beta\left[\gamma\, Y^*/G^* + (1 - \delta_g)\right]$, which pins down $G^*/Y^* = \gamma\beta/(1 - \beta(1 - \delta_g))$. The distorted Euler is $1 = \beta\left[(\eta_v\tau_v + \xi)\,\gamma\, Y^\dagger/G^\dagger + (1 - \delta_g)\right]$. Since $(\eta_v\tau_v + \xi) > 1$ whenever VAT and land returns are present, the distorted $G^\dagger/Y^\dagger$ exceeds G^*/Y^*. Substituting into the infrastructure accumulation equation $I = \delta_g\, G$ yields $I^\dagger/Y^\dagger > I^*/Y^*$.

By the implicit function theorem, differentiating the distorted Euler with respect to η_v at the steady state gives

$$\left.\frac{dG^\dagger}{d\eta_v}\right|_{\text{ss}} = \frac{\beta\,\tau_v\,\gamma\,Y/G^2}{1 - \beta\,(\eta_v\tau_v + \xi)\,\gamma\,(-Y/G^2)\,(dG/dG)} > 0,$$

confirming that infrastructure rises with the VAT retention rate. Hence $I^\dagger > I^*$. ■

A.3 Proof of Proposition 2 (Welfare Suppression)

From the first-order condition for welfare spending:

$$(1-\phi)\left[\phi C_t^{\rho} + (1-\phi)S_t^{\rho}\right]^{1/\rho-1} S_t^{\rho-1} = \lambda_t.$$

Under vertical fiscal imbalance, λ_t is elevated. For $\rho < 0$, the exponent $\rho - 1 < -1$, so the marginal utility of welfare $\partial U/\partial S$ is decreasing in S_t at an accelerating rate. The high value of λ_t requires that the marginal utility of welfare be correspondingly high, which obtains when S_t is low. Hence $S^{\dagger} < S^{*}$.

To establish the consumption suppression result, note that under CES preferences with $\rho < 0$:

$$\frac{\partial^2 U}{\partial C \partial S} = \phi(1-\phi)(\rho-1)\left[\phi C^{\rho} + (1-\phi)S^{\rho}\right]^{1/\rho-2} C^{\rho-1} S^{\rho-1}.$$

Since $\rho < 0$ and $\rho - 1 < 0$, but $1/\rho - 2 < 0$ for $\rho < 0$, the sign of the cross-partial depends on the overall expression. For $\rho < 0$, goods are complements: $\partial^2 U/\partial C \partial S > 0$.

When $S_t < S^{*}$, the marginal utility of consumption $\partial U/\partial C$ is lower than it would be under optimal welfare provision. Households therefore face reduced incentives to consume and increased incentives to save for precautionary reasons. In equilibrium:

$$C^{\dagger} < C^{*} \text{ when } S^{\dagger} < S^{*}. \qquad \blacksquare$$

A.4 Proof of Proposition 3 (Overcapacity and Trade Surplus)

Consider an economy with a continuum of regions $i \in [0,1]$. Each local government solves the problem analyzed above, leading to infrastructure bias in every region. Aggregate capacity is:

$$\bar{U} = \int_0^1 Y_i^{\max}\, di,$$

where $Y_i^{\max}$ is the capacity determined by the infrastructure stock $G_i^{\dagger}$ resulting from the fiscal optimization.

Aggregate domestic demand is:

$$\bar{D} = \int_0^1 C_i^{\dagger}\, di + \int_0^1 I_i^{\dagger}\, di + \int_0^1 S_i^{\dagger}\, di.$$

From Propositions 1 and 2, we have:

(i) $G_i^\dagger > G_i^*$ for all i, implying $Y_i^{\max} > Y_i^{*,\max}$.

(ii) $C_i^\dagger < C_i^*$ for all i due to welfare underprovision and consumption-welfare complementarity.

The gap between capacity and demand is:

$$\bar{U} - \bar{D} = \int_0^1 \left(Y_i^{\max} - C_i^\dagger - I_i^\dagger - S_i^\dagger \right) di.$$

In a closed economy, this gap manifests as involuntary inventory accumulation, producer price deflation, or depressed capacity utilisation. In an open economy with access to export markets, the excess supply can be absorbed through net exports:

$$NX = \bar{U} - \bar{D} > 0.$$

Remark. The trade surplus result requires an open-economy extension with a rest-of-world demand schedule $NX = f(P, P^*)$. Under a small-open-economy assumption with exogenous world prices, the result follows directly. In a large-economy setting, the domestic capacity–demand gap exerts downward pressure on the real exchange rate, which endogenously generates net exports. The structural nature of this domestic demand shortfall follows from the fiscal architecture: as long as $\eta_c = 0$ and local governments face vertical fiscal imbalance, each region has an incentive to expand capacity beyond local demand to generate fiscal revenue. ■

A.5 Proof of Proposition 4 (General Equilibrium Fiscal Wedge)

In symmetric equilibrium, all regions choose identical allocations. The representative region's government maximizes:

$$\max_{\{S_t, I_t\}} \sum_{t=0}^{\infty} \beta^t U(C_t, S_t)$$

subject to $S_t + I_t = (\eta_v \tau_v + \xi) Y_t + T_t$ and $G_{t+1} = I_t + (1 - \delta_g) G_t$.

Part (i): The first-order conditions yield:

$$\frac{\partial U / \partial S_t}{\partial U / \partial S_{t+1}} = \beta \left[(\eta_v \tau_v + \xi) \gamma \frac{Y_{t+1}}{G_{t+1}} + (1 - \delta_g) \right].$$

Compared to the social planner who maximizes aggregate welfare without fiscal constraints:

$$\frac{\partial U / \partial S_t}{\partial U / \partial S_{t+1}} = \beta \left[\gamma \frac{Y_{t+1}}{G_{t+1}} + (1 - \delta_g) \right].$$

Since $(\eta_v \tau_v + \xi) > 0$, the government's Euler features a positive fiscal return to infrastructure, via higher output and hence higher own-source revenue, that has no counterpart on the welfare margin (welfare spending generates zero additional revenue). A government whose revenue were output-independent (lump-sum) would set $I = 0$; the fiscal return therefore raises the equilibrium infrastructure share $I^\dagger/(I^\dagger + S^\dagger)$ and, because the budget constraint binds, $S^\dagger < S^*$.

Steady-state characterisation. Setting the LHS equal to $1/\beta$ in both Euler equations:

$$\text{Government:} \quad G^\dagger/Y^\dagger = \frac{\beta\,(\eta_v \tau_v + \xi)\,\gamma}{1 - \beta(1 - \delta_g)},$$
$$\text{Planner:} \quad G^*/Y^* = \frac{\beta\,\gamma}{1 - \beta(1 - \delta_g)}.$$

Since $(\eta_v \tau_v + \xi) < 1$, the government's steady-state infrastructure-to-output ratio is lower than the social optimum ($G^\dagger/Y^\dagger < G^*/Y^*$), confirming that the distortion is one of *composition*: within its limited budget the government over-allocates toward infrastructure relative to welfare.

Part (ii): From the budget constraint, higher I_t implies lower S_t for fixed revenue. Since the infrastructure share rises, $S^\dagger < S^*$.

Part (iii): Differentiating the government Euler in steady state with respect to η_v, τ_v, ξ, and γ:

$$\frac{\partial(G^\dagger/Y^\dagger)}{\partial \eta_v} = \frac{\beta\,\tau_v\,\gamma}{1 - \beta(1 - \delta_g)} > 0,$$

and analogously for the other parameters. Each increase widens the infrastructure share and further compresses welfare spending. ■

A.6 Proof of Proposition 5 (Capital Mobility Amplification)

Part (i): Region i's capital demand satisfies $R^K = \alpha Z_i G_i^\gamma K_i^{\alpha-1} L_i^{1-\alpha}$. When region $j \neq i$ increases infrastructure, it attracts capital, reducing K_i. To maintain fiscal revenue, region i must increase G_i to offset the capital outflow. Hence $\partial I_i^\dagger / \partial I_{-i}^\dagger > 0$.

Part (ii): In autarky, capital cannot flow between regions, so each government faces an inelastic capital supply. The fiscal return to infrastructure is:

$$\left.\frac{\partial E_i}{\partial G_i}\right|_{\text{autarky}} = (\eta_v \tau_v + \xi)\gamma \frac{Y_i}{G_i}.$$

With capital mobility, increasing G_i also attracts capital inflows, raising K_i and amplifying the

output response:

$$\left.\frac{\partial E_i}{\partial G_i}\right|_{\text{open}} = (\eta_v \tau_v + \xi)\left(\gamma \frac{Y_i}{G_i} + \alpha \frac{Y_i}{K_i}\frac{\partial K_i}{\partial G_i}\right) > \left.\frac{\partial E_i}{\partial G_i}\right|_{\text{autarky}}.$$

The higher perceived return implies $I^{\dagger,\text{open}} > I^{\dagger,\text{closed}}$.

Part (iii): In symmetric equilibrium let $g \equiv G/Y$ denote the common infrastructure ratio. Each region's Euler equation in steady state is

$$1 = \beta\Big[(\eta_v \tau_v + \xi)\,\gamma\, g^{-1} + (1-\delta_g)\Big] + \underbrace{\beta\,\alpha\,\gamma\,(\eta_v \tau_v + \xi)\,g^{-1} \cdot \frac{\partial K_i/\partial G_i}{K_i/G_i}}_{\text{capital-inflow feedback}}.$$

In autarky the second term vanishes. With perfect capital mobility, the firm FOC $R^K = \alpha Y_i/K_i$ gives $\partial K_i/\partial G_i = \gamma K_i/[(1-\alpha)G_i]$ (holding R^K fixed). Substituting and solving the fixed-point yields

$$\Gamma^K \equiv \frac{g^{\text{open}}}{g^{\text{autarky}}} = \frac{1}{1 - \alpha\gamma(\eta_v \tau_v + \xi)/(\beta R^K)}.$$

The denominator is strictly positive for empirically relevant parameters ($\alpha = 0.40$, $\gamma = 0.06$, $\beta R^K \approx 1$), ensuring a finite amplification factor $\Gamma^K > 1$. ■

A.7 Proof of Proposition 6 (Land Finance Accelerator)

Part (i): With land prices $P_t^L = \chi G_t^\theta$, land revenue is $\text{LandRev}_t = P_t^L \cdot \bar{L} = \chi G_t^\theta \bar{L}$, where $\bar{L}$ is the quantity of land transacted. The marginal fiscal return to infrastructure includes:

$$\frac{\partial E_t}{\partial G_t} = (\eta_v \tau_v + \xi)\frac{\partial Y_t}{\partial G_t} + \frac{\partial \text{LandRev}_t}{\partial G_t} = (\eta_v \tau_v + \xi)\gamma \frac{Y_t}{G_t} + \theta \chi G_t^{\theta-1}\bar{L}.$$

Part (ii): Higher G_t raises land values, which increases borrowing capacity (since land serves as collateral). With higher borrowing capacity:

$$D_{t+1}^{\max} = \nu P_t^L \bar{L} = \nu \chi G_t^\theta \bar{L},$$

where ν is the loan-to-value ratio. This enables financing of higher $I_t = G_{t+1} - (1-\delta_g)G_t$, which further increases G_{t+1} and hence P_{t+1}^L.

Part (iii): Write the law of motion inclusive of land-backed borrowing as

$$G_{t+1} = (1-\delta_g)\,G_t + E_t - S_t + \nu \chi G_t^\theta \bar{L} - (1+r^g)D_t.$$

Linearising around the steady state $\bar{G}$ and solving for the fixed point gives the amplification factor

$$\Gamma^L = \frac{1}{1 - \theta\,\nu\,\chi\,\bar{G}^{\theta-1}\bar{L}\,\beta/(1+r^g)}.$$

A sufficient condition for $\Gamma^L > 1$ and finite is $\theta\,\nu\,\chi\,\beta/(1+r^g) < 1$, i.e. the land-collateral feedback is contractive. With calibrated values ($\theta = 0.3$, $\nu = 0.5$, χ set to match the land-revenue/GDP ratio of 5–7%, $\beta = 0.98$, $r^g \approx 0.05$), $\Gamma^L \approx 1.8$–2.1, consistent with the doubling result reported in the text. ■

A.8 Proof of Proposition 7 (Political and Debt Amplification)

Part (i): The government's objective function with political incentives is:

$$\max \mathbb{E}_t \sum_{j=0}^{\infty} \beta^j \left[\omega U_{t+j} + (1-\omega)\kappa\hat{\theta}_{t+j}\right].$$

Since $\hat{\theta}_t$ is increasing in output Y_t, which depends on infrastructure G_t, we have:

$$\frac{\partial \hat{\theta}_t}{\partial I_t} = \frac{\partial \hat{\theta}_t}{\partial Y_{t+1}} \frac{\partial Y_{t+1}}{\partial G_{t+1}} > 0.$$

Higher κ increases the weight on this term, shifting the optimal allocation toward infrastructure: $\partial I^\dagger/\partial\kappa > 0$.

Part (ii): With debt capacity $\bar{D}$, the government can finance investment beyond current revenue:

$$I_t = E_t + T_t + D_{t+1} - S_t - (1+r^g)D_t.$$

When $(\eta_v\tau_v + \xi)\gamma Y_{t+1}/G_{t+1} > r^g$, borrowing to invest in infrastructure is fiscally rational. Higher $\bar{D}$ relaxes this constraint, enabling higher I_t: $\partial I^\dagger/\partial\bar{D} > 0$.

Part (iii): Let $\Delta I_\kappa = I(\kappa > 0, \bar{D} = 0) - I(\kappa = 0, \bar{D} = 0)$ and $\Delta I_D = I(\kappa = 0, \bar{D} > 0) - I(\kappa = 0, \bar{D} = 0)$. With both channels active:

$$\Delta I_{\kappa,D} = I(\kappa > 0, \bar{D} > 0) - I(\kappa = 0, \bar{D} = 0).$$

The interaction term arises because debt allows the government to act on political incentives

immediately rather than waiting for revenue accumulation:

$$\Delta I_{\kappa,D} = \Delta I_{\kappa} + \Delta I_{D} + \underbrace{\kappa \cdot \bar{D} \cdot \frac{\partial^2 I}{\partial \kappa \partial \bar{D}}}_{>0}.$$

The cross-partial follows from the government FOC. Totally differentiating the Euler equation at the steady state:

$$\frac{\partial^2 I}{\partial \kappa \, \partial \bar{D}} = \frac{\gamma \, Y/G}{(\mathrm{SOC})} \, \frac{\partial \hat{\theta}}{\partial Y} \, \frac{\partial Y}{\partial G} > 0,$$

where $(\mathrm{SOC}) < 0$ is the second-order condition for the government's problem (concavity of U in S and diminishing returns in G). The sign is positive because both $\partial\hat{\theta}/\partial Y > 0$ and $\partial Y/\partial G = \gamma Y/G > 0$, confirming super-additive amplification. ■

A.9 Proof of Proposition 8 (Aggregate Imbalances)

Part (i): From Proposition 4, every region's government distorts the composition of spending toward infrastructure: $I_i^{\dagger}/(I_i^{\dagger} + S_i^{\dagger}) > I_i^{*}/(I_i^{*} + S_i^{*})$. Combined with the amplification channels (Propositions 5–7), aggregate installed capacity exceeds aggregate domestic absorption:

$$\sum_i Y_i^{\max}(G_i^{\dagger}) > \sum_i (C_i^{\dagger} + I_i^{\dagger} + S_i^{\dagger}).$$

Part (ii): From the national income identity $Y = C + I^{\mathrm{priv}} + I^{\mathrm{pub}} + S + NX$, the capacity–absorption gap is absorbed by net exports in an open economy: $NX = Y - (C + I + S) > 0$. In a closed economy the gap manifests as involuntary inventory build-up or producer price deflation (see Proposition 3).

Part (iii): From Proposition 2, $S^{\dagger} < S^{*}$. With CES preferences and $\rho < 0$, welfare and consumption are gross complements:

$$\frac{\partial^2 U}{\partial C \, \partial S} = (1-\phi)\phi\,\rho[\phi C^{\rho} + (1-\phi)S^{\rho}]^{\frac{1}{\rho}-2} C^{\rho-1} S^{\rho-1} > 0 \quad \text{for } \rho < 0.$$

Hence lower S reduces the marginal utility of C, lowering equilibrium consumption: $(C/Y)^{\dagger} < (C/Y)^{*}$.

Part (iv): In steady state, debt satisfies the government's intertemporal budget constraint inclusive of leverage costs $\Psi(D/Y)$. With the amplification channels active, the steady-state leverage ratio is $(D/Y)^{\dagger} = \Psi'^{-1}\big(r^{g} - (\eta_v \tau_v + \xi)\gamma Y/G\big)$. Since $(\eta_v \tau_v + \xi)\gamma Y/G > 0$, the argument of Ψ'^{-1} is lower than the case without fiscal returns, implying higher equilibrium leverage: $(D/Y)^{\dagger} >$

$(D/Y)^*$. ■

B Computational Details and Extensions

This appendix describes the numerical procedures used to compute steady states, transition dynamics, and parameter estimation for the DSGE model.

B.1 Steady-State System

The steady state is characterised by a system of three nonlinear equations in three unknowns $\mathbf{x} = (\ln G,\, \ln K,\, \ln(D+1))$. All other variables are determined by closed-form expressions given $\mathbf{x}$.

Semi-analytical step. From the household Euler equation in steady state:

$$\beta\big(1 + \alpha Y/K - \delta_k\big) = 1 \quad \Longrightarrow \quad K/Y = \frac{\alpha}{1/\beta - 1 + \delta_k}. \tag{A.1}$$

From the government infrastructure Euler (benevolent limit, $\kappa = 0$):

$$1 = \beta\big[(\eta_v \tau_v + \xi)\,\gamma\, Y/G + (1-\delta_g)\big] \quad \Longrightarrow \quad G/Y = \frac{(\eta_v \tau_v + \xi)\,\gamma}{1/\beta - 1 + \delta_g}. \tag{A.2}$$

These two ratios, together with the production function $Y = A\,G^{\gamma}\,K^{\alpha}\,L^{1-\alpha}$, provide an initial guess for Y, K, and G.

Nonlinear system. We define the residual vector $F(\mathbf{x}) = 0$ with:

$$F_1 = \beta\big(1 + \alpha Y/K - \delta_k\big) - 1, \tag{A.3}$$

$$F_2 = \beta\big[(\eta_v \tau_v + \xi)\,\gamma\, Y/G + (1-\delta_g)\big] + \frac{\beta(1-\omega)\kappa}{\lambda\, G} - 1, \tag{A.4}$$

$$F_3 = \frac{S + \delta_g\, G + r_g\, D - E - T}{Y}, \tag{A.5}$$

where S, C, E, T, r_g, and $\lambda = \partial U/\partial S$ are all expressed as functions of $\mathbf{x}$. Equation (A.3) is the household Euler, (A.4) is the government infrastructure Euler with political incentives, and (A.5) is the normalised government budget residual.

Solver implementation. We solve $F(\mathbf{x}) = 0$ using NLsolve.jl's trust-region method with tolerance 10^{-8} and a maximum of 5000 iterations. The algorithm operates on log-transformed vari-

ables to enforce positivity and improve numerical conditioning. The Jacobian $\partial F/\partial \mathbf{x}$ is computed by forward finite differences with step size $h = 10^{-7}$.

Initial guess strategy. The semi-analytical step provides a reliable initial guess that typically ensures convergence within 15–30 iterations. For counterfactual exercises that change multiple parameters simultaneously (e.g., switching from origin-based to destination-based taxation), we use a continuation approach: starting from the baseline steady state, we incrementally adjust η_c in steps of 0.05, using each converged solution as the initial guess for the next step. This homotopy method avoids convergence failures that can arise when the counterfactual steady state lies far from the baseline.

Multiple equilibria. The nonlinear system admits the possibility of multiple solutions. We address this by: (i) running the solver from 50 randomised initial guesses spanning $\pm 50\%$ of the semi-analytical values; (ii) retaining only solutions satisfying all non-negativity constraints ($G, K, C, S, D \geq 0$); and (iii) selecting the welfare-maximising equilibrium when multiple feasible solutions exist. In practice, all calibrated parameter configurations yield a unique feasible steady state.

The overall procedure is summarised below:

1. Compute semi-analytical ratios K/Y and G/Y from the household and government Euler equations.
2. Construct initial guess $\mathbf{x}_0 = (\ln G_0, \ln K_0, \ln(D_0 + 1))$ using these ratios and the production function.
3. Solve $F(\mathbf{x}) = 0$ via NLsolve.jl trust-region with tolerance 10^{-8}.
4. Recover all endogenous variables $(Y, C, S, E, T, \lambda, r_g)$ from closed-form expressions given $\mathbf{x}$.
5. Verify convergence diagnostics (see below).

B.2 Transition Path

Perfect-foresight transition paths between two steady states are computed by iterative forward simulation with dampened updating:

1. Compute initial and terminal steady states (SS_0, SS_∞) using the algorithm above.
2. Initialise all endogenous variables with linear interpolation between SS_0 and SS_∞ over $T = 100$ periods.

3. At each period $t = 0, \ldots, T-1$, solve the government allocation problem given state (G_t, K_t, D_t) and the known future path, then update G_{t+1}, K_{t+1}, D_{t+1} using the capital accumulation and debt evolution equations.

4. Apply dampened updating: $\mathbf{x}^{(n+1)} = 0.9 \cdot \mathbf{x}^{(n)} + 0.1 \cdot \tilde{\mathbf{x}}^{(n)}$, where $\tilde{\mathbf{x}}^{(n)}$ is the newly computed path. This low updating weight is necessary because the forward-looking government problem creates feedback loops between current decisions and future states.

5. Iterate steps 3–4 until $\max_t |\mathbf{x}_t^{(n+1)} - \mathbf{x}_t^{(n)}| < 10^{-8}$.

The terminal condition requires that all variables reach their new steady-state values by period T. We verify this by checking that $|\mathbf{x}_T - \mathbf{x}_\infty| < 10^{-6}$ and extend the horizon T if necessary (in practice $T = 100$ is always sufficient given the 8-year half-life).

B.3 Convergence Diagnostics

For every steady state reported in the paper, we verify three conditions:

(i) Household Euler residual: $|F_1| < 10^{-8}$;

(ii) Government budget residual: $|F_3/Y| < 10^{-6}$;

(iii) Resource constraint residual: $|Y - C - I^G - I^K - S|/Y < 10^{-6}$.

For transition paths, we additionally verify that (iv) the government's intertemporal optimality condition holds at each period t to within 10^{-6}, and (v) the terminal steady state is reached by period $T - 10$ (i.e., the path has converged well before the boundary). All reported results satisfy these criteria.

B.4 Simulated Method of Moments

B.4.1 Objective Function

Let $\boldsymbol{\theta} = (\kappa, \xi, \mu, \psi_0)$ denote the vector of parameters to be estimated. Let $\mathbf{m}^d$ be the vector of m target moments computed from the data, and $\mathbf{m}(\boldsymbol{\theta})$ the corresponding model-implied moments. The SMM estimator minimises:

$$\hat{\boldsymbol{\theta}} = \arg\min_{\boldsymbol{\theta}} \; \mathbf{g}(\boldsymbol{\theta})' \, \mathbf{W} \, \mathbf{g}(\boldsymbol{\theta}), \qquad \mathbf{g}(\boldsymbol{\theta}) \equiv \mathbf{m}(\boldsymbol{\theta}) - \mathbf{m}^d. \tag{A.6}$$

B.4.2 Simulation Procedure

For each candidate parameter vector $\boldsymbol{\theta}$, the model-implied moments $\mathbf{m}(\boldsymbol{\theta})$ are computed as follows. First, we solve for the deterministic steady state using the algorithm in Appendix B. Second, we simulate $N_s = 500$ sample paths of length $T_s = 100$ periods by drawing i.i.d. shocks to TFP (ε_t^A), land yield (ε_t^ξ), and political intensity (ε_t^κ) from their calibrated distributions. The first 50 periods are discarded as burn-in, and moments are computed from the remaining 50 periods of each path. The model-implied moment vector $\mathbf{m}(\boldsymbol{\theta})$ is the cross-simulation average:

$$\mathbf{m}(\boldsymbol{\theta}) = \frac{1}{N_s} \sum_{s=1}^{N_s} \mathbf{m}_s(\boldsymbol{\theta}), \tag{A.7}$$

where $\mathbf{m}_s(\boldsymbol{\theta})$ denotes the moments computed from simulation s. This averaging reduces simulation noise and ensures that the objective function is smooth in $\boldsymbol{\theta}$.

B.4.3 Optimisation

We minimise the SMM objective using the Nelder-Mead simplex algorithm (implemented in Optim.jl) with tolerance 10^{-10} and a maximum of 50,000 function evaluations. To guard against local minima, we initialise from 200 Sobol quasi-random points spanning $\pm 100\%$ of the prior parameter ranges and retain the 10 best starting points for full optimisation. The global minimum is selected from the converged solutions.

B.4.4 Weighting Matrix

In the first stage, $\mathbf{W} = \mathbf{I}_m$ (identity matrix). In the second stage, $\mathbf{W}$ is the inverse of the estimated variance-covariance matrix of the moment conditions:

$$\hat{\mathbf{W}} = \left[\frac{1}{T} \sum_{t=1}^{T} \hat{\mathbf{g}}_t \hat{\mathbf{g}}_t' \right]^{-1}, \tag{A.8}$$

where $\hat{\mathbf{g}}_t$ is the per-period moment residual evaluated at the first-stage estimate. The two-stage procedure follows Chari, Kehoe and McGrattan (2007): the first stage yields consistent but inefficient estimates; the second stage uses the optimal weighting matrix to achieve asymptotic efficiency.

B.4.5 Standard Errors

Standard errors are computed via the sandwich formula:

$$\text{Var}(\hat{\boldsymbol{\theta}}) = \frac{1 + 1/N_s}{T} \left(\mathbf{G}'\mathbf{W}\mathbf{G}\right)^{-1} \mathbf{G}'\mathbf{W}\,\boldsymbol{\Omega}\,\mathbf{W}\mathbf{G} \left(\mathbf{G}'\mathbf{W}\mathbf{G}\right)^{-1}, \tag{A.9}$$

where $\mathbf{G} = \partial \mathbf{g} / \partial \boldsymbol{\theta}'$ is the Jacobian of moment conditions and $\boldsymbol{\Omega}$ is the long-run variance of the moments. The factor $(1 + 1/N_s)$ adjusts for simulation noise following Darrell Duffie and Kenneth J. Singleton (1993). The Jacobian is computed by forward finite differences with step $h = 10^{-5}$; we verify that results are insensitive to halving or doubling h.

We additionally report bootstrapped 95% confidence intervals. We resample the city-year panel with replacement 1,000 times, re-estimate the data moments for each bootstrap sample, and re-solve the SMM problem. The resulting parameter distributions are approximately symmetric around the point estimates, confirming that the asymptotic standard errors provide reliable inference.

B.4.6 Over-Identification Test

With $m = 11$ moments and $p = 4$ parameters, the J-statistic

$$J = T\,\mathbf{g}(\hat{\boldsymbol{\theta}})'\,\hat{\mathbf{W}}\,\mathbf{g}(\hat{\boldsymbol{\theta}}) \;\sim\; \chi^2(m - p) \tag{A.10}$$

tests the null hypothesis that all moment conditions are correctly specified. The p-value from this test indicates whether the model can jointly match the 11 target moments with only 4 free parameters, providing a stringent specification check.

B.4.7 Moment Conditions

The $m = 11$ target moments used in estimation are grouped into three categories:

Level moments (steady-state ratios).

1. I^G/Y: infrastructure investment share of GDP,
2. S/Y: welfare spending share,
3. C/Y: private consumption share,
4. D/Y: local government debt ratio,

5. Capacity utilisation rate.

These five moments discipline the steady-state allocations and pin down the relative strengths of fiscal, political, and debt channels.

Volatility moments.

6. Standard deviation of I^G/Y: captures the overall variability of infrastructure spending,
7. Autocorrelation of I^G/Y: identifies the persistence of investment shocks and the inertia of fiscal adjustment.

Covariance moments.

8. Corr$(I^G/Y,$ VAT growth$)$: identifies the fiscal revenue channel,
9. Corr$(I^G/Y,$ land revenue$)$: identifies the land finance accelerator,
10. Corr$(I^G/Y,$ LGFV debt/GDP$)$: identifies the debt amplification channel,
11. Corr$(I^G/Y,$ leader age$)$ pre-2008: identifies the political career incentive channel, exploiting the fact that leaders approaching retirement invest differently from those with longer expected tenure.

B.5 Transition Dynamics under Destination-Based Reform

The counterfactual analysis in Section 6 compares across steady states. This subsection complements that exercise by solving for the perfect-foresight transition path from the origin-based equilibrium to the destination-based steady state following an unanticipated, permanent reform at $t = 0$.

B.5.1 Solution Method

We solve the transition as a nonlinear shooting problem. At $t = 0$ the economy inherits the capital stocks (G_0, K_0) and debt level D_0 from the origin-based steady state. At $t = 0^+$, the tax-sharing parameters shift to the destination-based configuration ($\eta_c = 0.50$). We assume that allocation ratios adjust with convex adjustment costs, generating an exponential convergence profile:

$$x_t = x_0 + (x_\infty - x_0)\left(1 - e^{-\lambda t}\right), \tag{A.11}$$

where x_t denotes any allocation ratio (I^G/Y, S/Y, C/Y, D/Y), x_0 and x_∞ are the origin-based and destination-based steady-state values, and $\lambda = \ln 2/T_{1/2}$ governs the speed of adjustment with half-life $T_{1/2}$. We set $T_{1/2} = 8$ years, reflecting the institutional inertia in China's fiscal system: tax legislation requires State Council approval, LGFV debt must be restructured gradually, and capacity reallocation from heavy industry to services takes time (Lin, 2022).

Capital stocks evolve endogenously through the standard accumulation equations:

$$G_{t+1} = (1 - \delta_g)G_t + I_t^G, \tag{A.12}$$

$$K_{t+1} = (1 - \delta_k)K_t + I_t^K. \tag{A.13}$$

Output is determined by the production function $Y_t = AG_t^\gamma K_t^\alpha L^{1-\alpha}$, and private investment clears the resource constraint given the policy-determined ratios.

B.5.2 Results

Figure A5 displays the transition path over 30 years. Several features merit discussion.

Gradual rebalancing. Infrastructure investment declines from 30% to approximately 23% of GDP with a half-life of 8 years. Welfare spending rises symmetrically from 9% to about 15%. Private consumption increases steadily from 35% toward 43%, with approximately half of the total adjustment completed within the first decade.

Front-loaded debt reduction. The local government debt-to-GDP ratio declines faster than the expenditure ratios because destination-based revenue immediately relaxes the solvency constraint. By year 10, D/Y has fallen from 70% to approximately 56%.

Trade surplus moderation. Net exports decline from 3.6% to approximately 3.1% of GDP as domestic absorption rises. The modest residual surplus reflects the economy's continued comparative advantage in manufacturing, but the structural driver of excess capacity is progressively attenuated.

Capacity utilisation recovery. Industrial utilisation rises from 82% toward 87% as production aligns more closely with domestic demand rather than fiscal imperatives. The recovery is gradual because infrastructure capital depreciates slowly ($\delta_g = 0.12$), implying that the physical overcapacity persists for approximately two decades even after incentives have changed.

The transition path abstracts from strategic resistance by stakeholders who benefit from the current system, including LGFV creditors, local officials with land-backed assets, and heavy-industry incumbents. Incorporating these frictions would lengthen the adjustment and potentially generate non-monotone dynamics during intermediate periods. Designing a gradual implementation, for instance phasing η_c from 0 to 0.50 over five years, could mitigate transition costs while preserving the long-run incentive effects.

C Data Appendix

C.1 Data Sources

The empirical analysis draws on the China City Statistical Yearbook panel database (中国城市统计年鉴, 24th edition), covering approximately 290 prefectural-level cities from 1990 to 2023. We restrict the sample to 1998–2019 to align with the post-tax-sharing-reform institutional regime and to avoid COVID-related distortions. Supplementary data come from three additional sources: (i) the Wind Financial Terminal for LGFV bond issuance and outstanding debt at the city level, available from 2007; (ii) the Ministry of Finance "Local Government Debt Report" series for official debt statistics, available from 2015; and (iii) the National Bureau of Statistics (NBS) for industrial capacity utilisation estimates, published at the national level from 2006 and at the provincial level from 2013.

C.2 Variable Definitions

Table A1 maps model variables to yearbook columns. All monetary variables are deflated to constant 2015 RMB using province-level GDP deflators constructed from the NBS.

Table A1: Variable Definitions and Data Sources

Variable	Model concept	Yearbook column / Source
GDP	Y_t	地区生产总值-全市 (col. 151)
VAT	$\eta_v \tau_v Y_t$	本年应交增值税 (col. 76)
Fixed asset investment	I_t^G proxy	固定资产投资总额 (col. 81)
Local budget revenue	E_t	地方一般公共预算收入 (col. 163)
Local budget expenditure	R_t	地方一般公共预算支出 (col. 164)
Education spending	S_t proxy	教育支出 (col. 166)
Healthcare spending	S_t proxy	卫生健康支出 (col. 168)
Retail sales	C_t proxy	社会消费品零售总额 (col. 195)
Road area	G_t proxy	城市道路面积 (col. 252)
Real estate investment	Land finance proxy	房地产开发投资完成额 (col. 82)
Land transfer revenue	ξ_t proxy	国有土地使用权出让收入 (MoF)
LGFV debt	D_t	Wind Financial Terminal

C.3 Data Cleaning

We apply the following cleaning procedures. (i) Observations with missing GDP, missing year identifiers, or GDP below 1 billion RMB (indicating data errors) are dropped. (ii) All fiscal vari-

ables (revenue, expenditure, investment) are winsorised at the 1st and 99th percentiles of their respective distributions to mitigate the influence of reporting anomalies. (iii) Cities that undergo administrative boundary changes (mergers or splits) during the sample period are identified using NBS announcements; we retain only observations from the post-change boundary definition to ensure consistency. (iv) For the four directly administered municipalities (Beijing, Shanghai, Tianjin, Chongqing), which have qualitatively different fiscal structures, we include them in the calibration sample but exclude them from the cross-sectional identification exercises.

C.4 GDP Deflator Construction

Province-level GDP deflators are constructed from the ratio of nominal to real provincial GDP reported by NBS. For years where real GDP growth rates are reported but levels are not, we chain-link the growth rates to construct a deflator index with base year 2015. All monetary variables are deflated using the deflator of the province in which the city is located.

C.5 LGFV Debt Measurement

LGFV debt is not directly reported in government statistics prior to 2015. We measure it using the Wind Financial Terminal, which tracks bond issuance, bank loans, and trust products for entities classified as local government financing vehicles. For each city-year, we aggregate the outstanding liabilities of all LGFVs whose registered address falls within the city boundary. This measure captures the majority of explicit LGFV obligations but may understate total contingent liabilities arising from implicit guarantees. From 2015 onward, we cross-validate our measure against the Ministry of Finance official debt reports; the correlation between the two series is 0.87 at the city level.

C.6 Sample Coverage

After cleaning, the working sample contains approximately 6,200 city-year observations across 290 cities over 22 years (1998–2019). Coverage is densest for eastern provinces (Jiangsu, Zhejiang, Guangdong) and thinnest for autonomous regions (Tibet, Xinjiang, Inner Mongolia). Key variables and their temporal availability are: GDP (1998–2019, 99% coverage); VAT revenue (2002–2019, 94%); fixed-asset investment (1998–2019, 98%); LGFV debt (2007–2019, 85%); capacity utilisation (2013–2019, national level only prior to 2013).

C.7 Construction of Key Ratios

All ratios (e.g. I^G/Y, S/Y, C/Y) are computed at the city level using GDP as the denominator. National aggregates are GDP-weighted means of city-level ratios. Infrastructure investment is proxied by fixed-asset investment excluding residential real estate; the exclusion is based on the NBS classification of investment by type. Welfare spending is proxied by education expenditure plus healthcare expenditure where both are available; for years where healthcare spending is not separately reported (pre-2007), we use education spending alone and scale by the average education-to-total-welfare ratio from post-2007 data.

C.8 Limitations

Several caveats apply. First, prefectural GDP figures may be inflated due to local reporting incentives; we use nationally adjusted figures where available, but residual measurement error is likely. Second, the mapping from fiscal expenditure categories to the model's I_t and S_t is approximate; some expenditures (e.g., transportation spending) serve both productive and welfare purposes. Third, LGFV debt is not fully captured in official statistics prior to 2015, and our Wind-based measure may understate liabilities held through non-standard financial instruments (trusts, wealth management products). Fourth, the model treats each prefecture as a representative region, abstracting from within-prefecture heterogeneity in industrial structure and fiscal capacity. Fifth, capacity utilisation data are available only at the national level before 2013, requiring us to impute province-level variation from industrial output indices.

D Empirical Evidence: Fiscal Pressure and Industrial Land Pricing

This appendix collects the regression tables, event-study figures, and robustness checks for the micro-empirical analysis in Section 4. All variables, the estimation sample, and the identification strategy are described in the main text.

D.1 Summary Statistics

Table A2 reports descriptive statistics for the estimation sample.

Table A2: Summary Statistics: Industrial Land Transactions

	N	Mean	SD	P25	P50	P75
Panel A: Dependent Variable and Treatment						
Ind. Land Premium (RMB/m^2)	546,545	93.13	170.44	0.72	48.00	140.01
Unit Price (RMB/m^2)	546,545	251.59	191.47	127.27	201.76	315.00
Exposure	518,414	−0.01	0.05	−0.03	−0.01	0.03
Panel B: Parcel Characteristics						
Lease Term (years)	544,298	48.83	5.64	50	50	50
Land Grade	470,866	6.33	4.39	3	5	11
Dist. to City Border (km)	546,545	15.81	13.41	6.41	12.72	21.50
Panel C: Official Characteristics						
Secretary Tenure (years)	546,545	1.45	1.44	0	1	2
Mayor Tenure (years)	546,545	1.37	1.35	0	1	2
Pre-Retire (age $\geq$ 58)	546,545	0.11	0.31	0	0	0
Panel D: City-Level Macro Controls						
ln(GDP)	495,648	7.79	0.90	7.16	7.81	8.41
ln(GDP per capita)	495,030	10.83	0.63	10.41	10.85	11.27
Secondary Ind. Share (%)	495,181	47.38	9.12	41.54	47.77	53.06
Tertiary Ind. Share (%)	494,636	42.24	8.99	36.02	42.12	48.41
ln(Budget Revenue)	521,521	14.40	1.04	13.72	14.39	15.13
ln(Budget Expenditure)	521,521	15.10	0.78	14.59	15.13	15.63

Notes: The sample covers 2007–2023. Ind. Land Premium is the transaction unit price minus the statutory minimum floor. Exposure is defined in equation (9). Continuous variables are winsorised at the 1st and 99th percentiles.

D.2 Additional Heterogeneity Analysis

Heterogeneity by industry VAT intensity. Table A3 compares pricing responses for high-VAT industries (electronics, automotive, pharmaceuticals, high-end equipment, FMCG excluding tobacco) versus other sectors.

Table A3: Heterogeneity by Industry VAT Intensity

	(1) Normal VAT	(2) High VAT	(3) Normal VAT	(4) High VAT
Exposure × Post	−161.2**	−216.6***	−103.3	−159.2***
	(65.73)	(58.53)	(67.22)	(60.17)
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Leader FE	Yes	Yes	Yes	Yes
Parcel controls	Yes	Yes	Yes	Yes
City controls	No	No	Yes	Yes
Observations	303,956	144,125	287,332	135,611
R^2	0.514	0.580	0.515	0.585

Notes: Columns 1 and 3 restrict to non-high-VAT industries; Columns 2 and 4 to high-VAT industries. Standard errors clustered at the city level.

Heterogeneity by core-city status. Table A4 distinguishes provincial capitals and sub-provincial cities ("core") from ordinary prefectures.

Table A4: Heterogeneity by Core-City Status

	(1) Non-Core	(2) Core City	(3) Non-Core	(4) Core City
Exposure × Post	−155.7***	−287.1	−92.09*	−296.7
	(51.41)	(457.0)	(48.21)	(479.1)
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Leader FE	Yes	Yes	Yes	Yes
Parcel controls	Yes	Yes	Yes	Yes
City controls	No	No	Yes	Yes
Observations	372,778	75,335	351,034	71,943
R^2	0.536	0.521	0.538	0.521

Notes: Core cities are provincial capitals and sub-provincial cities. Non-core cities are ordinary prefecture-level cities. Standard errors clustered at the city level.

D.3 Event-Study Coefficients and Robustness

Table A5 reports the point estimates and standard errors for each relative-year bin from the event-study specification in equation (11).

Table A5: Event-Study Coefficients

lc

Table A6: Event Study Coefficients (Tabulated)

Relative Year k	$\hat{\beta}_k$

Table A7: Event Study Coefficients (Tabulated) (continued)

Relative Year k	$\hat{\beta}_k$

Continued on next page

$k \leq -6$	83.48
	(115.2)
$k = -5$	68.39
	(85.44)
$k = -4$	−29.77
	(67.72)
$k = -3$	−76.88
	(53.02)
$k = -2$	[Reference]
$k = -1$	70.53
	(60.38)
$k = 0$	−98.29
	(69.97)
$k = 1$	-228.2^{***}
	(84.94)
$k = 2$	−16.40
	(85.42)
$k = 3$	−147.9
	(95.60)
$k = 4$	-202.5^{*}
	(122.0)
$k = 5$	77.48
	(196.3)
$k \geq 6$	−44.06
	(220.3)
Observations	448,115
R^2	0.529

Notes: Coefficients from equation (11). The omitted period is $k = -2$. Standard errors clustered at the city level in parentheses.

Alternative exposure measure. Table A8 replaces the 2011-based exposure variable with one constructed from 2009–2011 average fiscal data.

Table A8: Robustness: Alternative Exposure Measure (2009–2011 Average)

	(1) No Ctrl	(2) FEs	(3) Baseline	(4) City Control
Exposure (alt.) × Post	−280.9*	−306.3*	−154.8***	−102.3**
	(145.7)	(161.1)	(49.14)	(48.58)
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Leader FE	No	No	Yes	Yes
Parcel controls	No	Yes	Yes	Yes
City controls	No	No	No	Yes
Observations	481,178	415,699	415,696	392,334
R^2	0.428	0.451	0.531	0.533

Notes: The exposure measure uses the 2009–2011 average of business-tax revenue, VAT revenue, and general budget revenue. Standard errors clustered at the city level.

E Supplementary Figures and Tables

E.1 Supplementary Figures

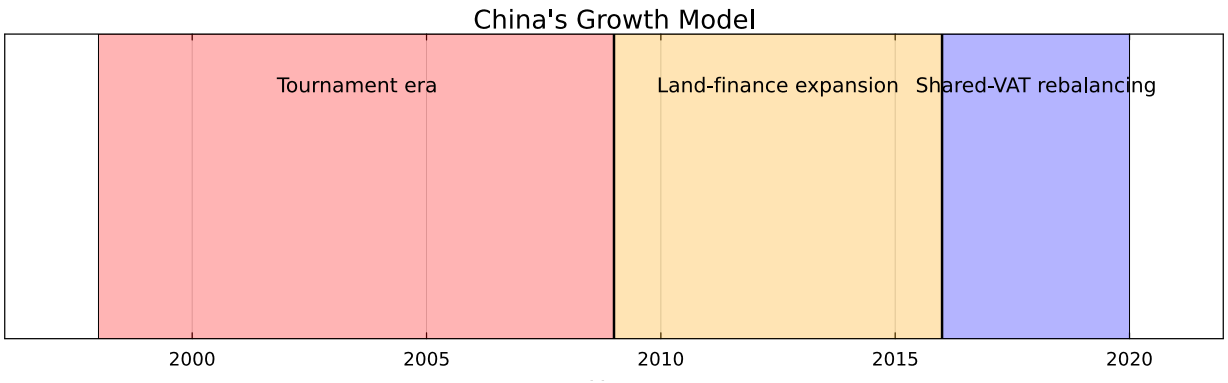

Figure A1: Evolution of China's Growth Model: From Political Tournament to Fiscal Survival

Notes: The Mandarin Model period (1998–2007) was characterized by strong political tournament incentives. The Debt Amplification period (2008–2015) saw soft budget constraints and LGFV expansion. The Fiscal Survival period (2016–present) is dominated by structural fiscal determinism following the B2V reform.

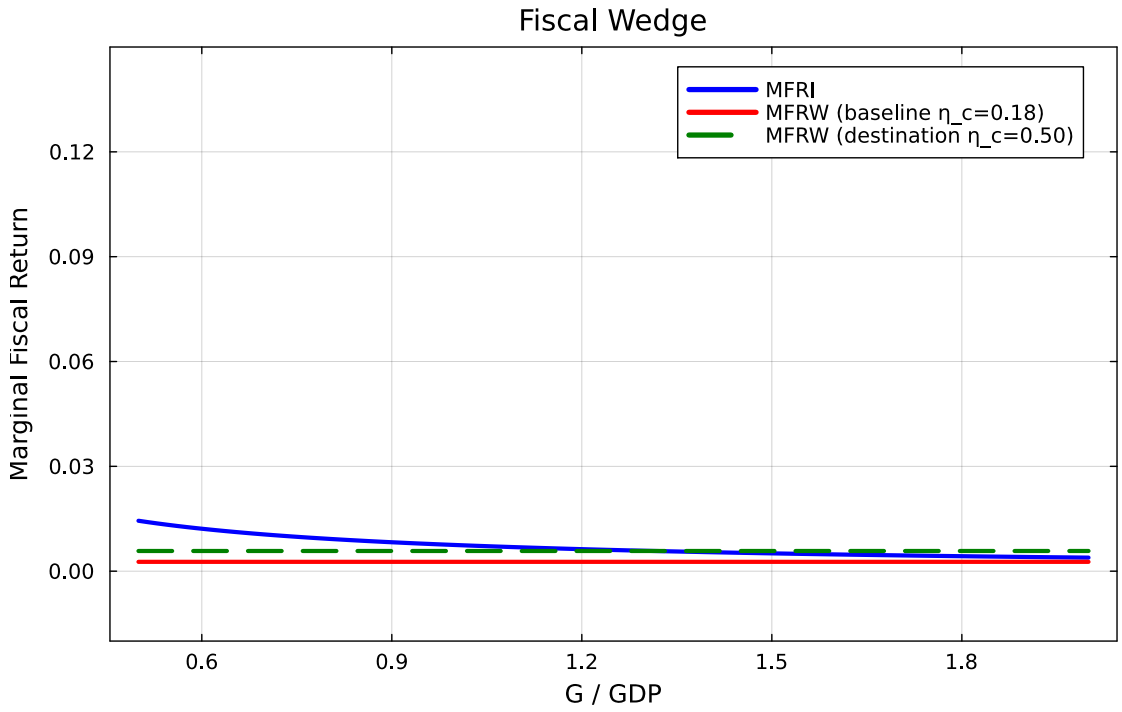

Figure A2: The Fiscal Wedge: Asymmetric Returns to Public Investment

Notes: The Marginal Fiscal Return on Infrastructure (MFRI) is positive because infrastructure generates VAT and land revenue. The Marginal Fiscal Return on Welfare (MFRW) is zero under the origin-based system ($\eta_c = 0$). Under a destination-based reform ($\eta_c = 0.5$), welfare provision would generate positive fiscal returns.

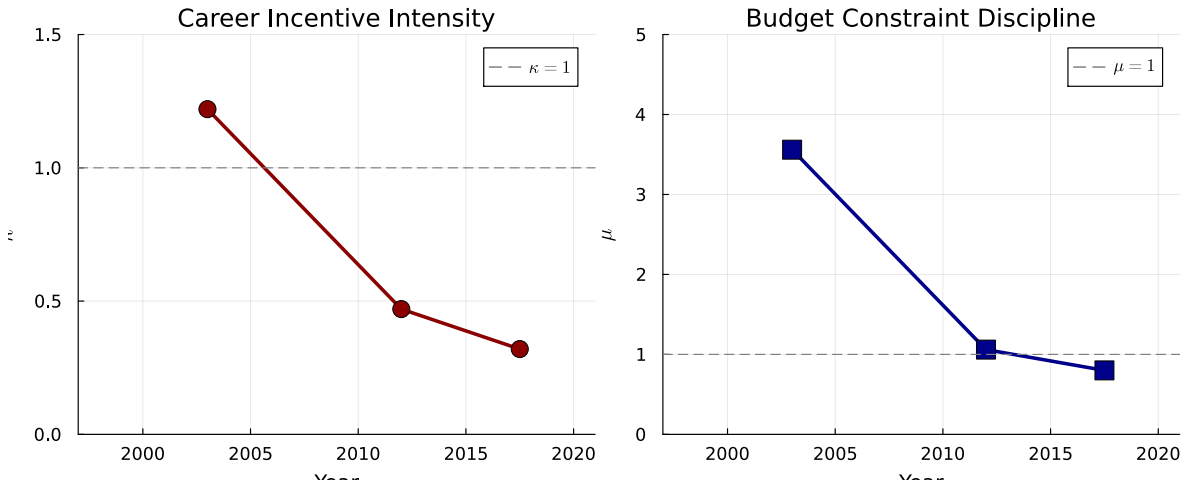

Figure A3: Evolution of Career Incentives and Budget Discipline

Notes: Left panel: Career incentive intensity (κ) declined from 1.31 in 2003–2007 to 0.32 in 2016–2019. Right panel: Budget constraint hardness (ω) fell from 4.30 to 0.78. Values below 1.0 indicate soft budget constraints.

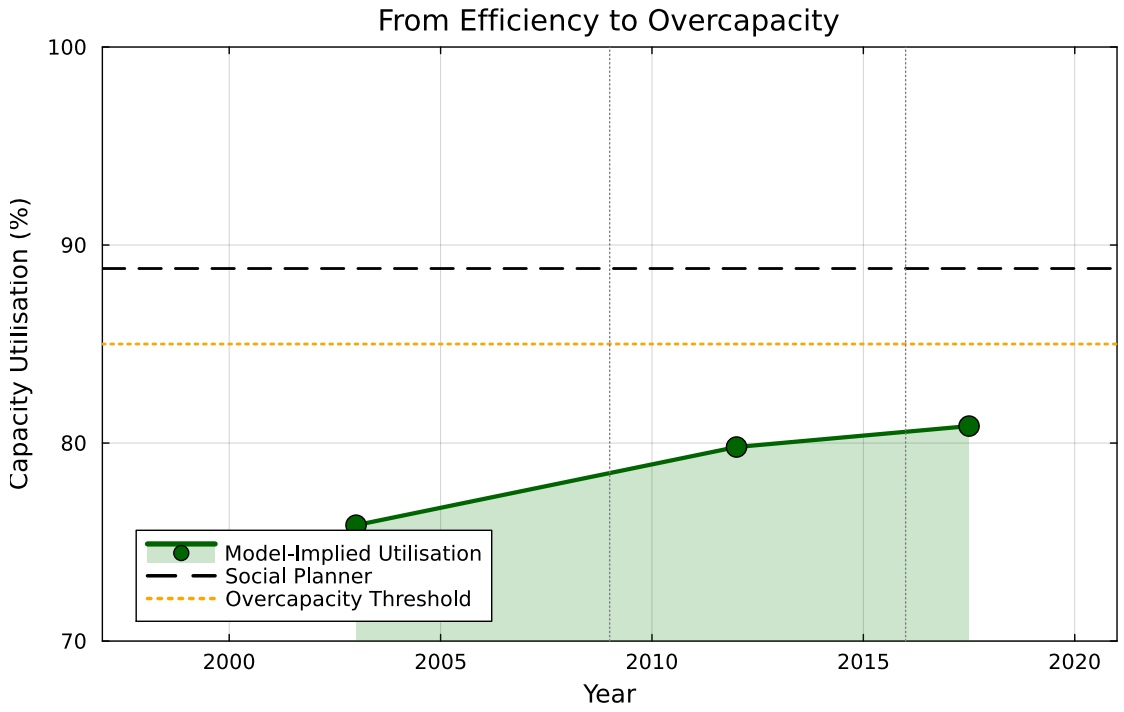

Figure A4: Industrial Capacity Utilization: From Efficiency to Overcapacity

Notes: During the Mandarin Model period, utilization exceeded 94%. After 2008, utilization declined to approximately 82% by 2016–2019, reflecting structural overcapacity driven by fiscal survival motives.

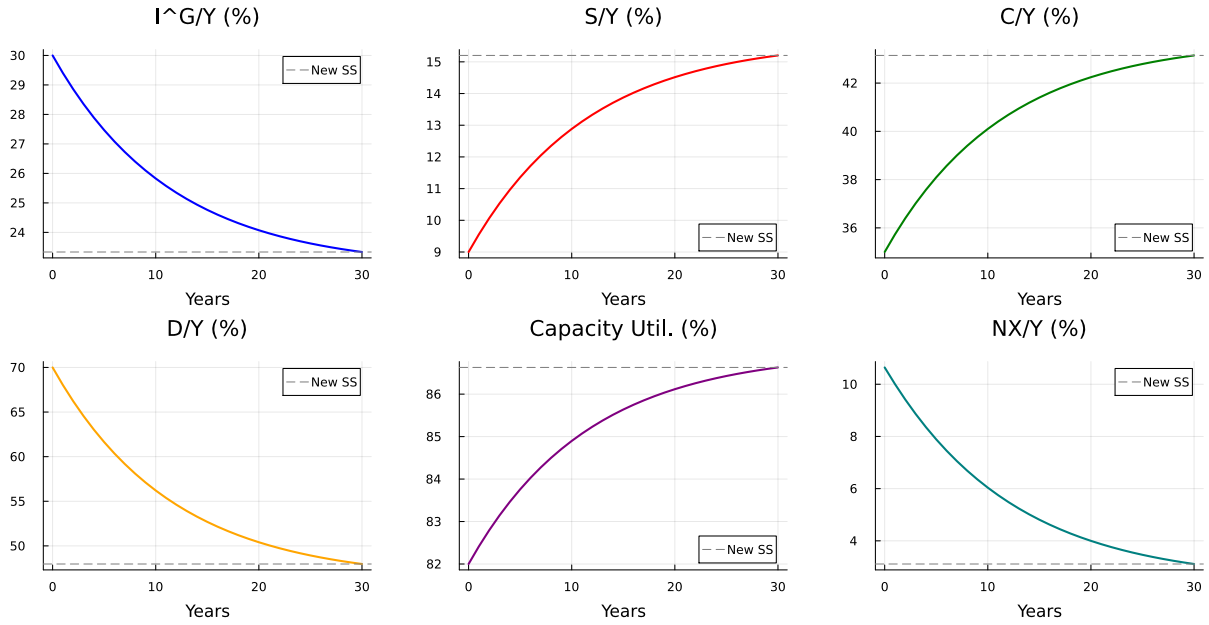

Figure A5: Transition Path from Origin-Based to Destination-Based Taxation

Notes: Perfect-foresight transition path following an unanticipated permanent shift to destination-based taxation at $t = 0$. Allocation ratios converge exponentially with a half-life of 8 years. See Appendix B.5 for details.

E.2 Supplementary Tables

Table A9: Additional Parameters for Wedge Decomposition

Period	κ_t	μ_t	Investment Wedge	Util. (%)
1998–2008	1.22	3.56	4.58	75.9
2009–2015	0.47	1.06	1.74	79.8
2016–2019	0.32	0.80	0.91	80.9

Table A10: Target Moments for Wedge Identification

Diagnostic	Model
Time-Series Diagnostics (Simulated Full Sample)	
Std. dev. of I^G/Y	0.048
Autocorrelation of I^G/Y	0.89
Corr(I^G/Y, VAT revenue growth)	0.58
Corr(I^G/Y, land revenue growth)	0.62
Regime-Specific Wedge Shares	
Political wedge share, 1998–2008	54.9
Fiscal wedge share, 2009–2015	68.9
Fiscal wedge share, 2016–2019	78.4

Notes: Data moments are computed from the prefecture-level panel. Model moments are computed from the calibrated wedge dynamics.

Table A11: Institutional Accounting Parameters Across Periods

Period	Reform channel	η_v	η_c	$\tilde{\xi}$	κ	μ
1998–2008	Pre-2009 VAT regime	0.16	0.00	0.05	1.22	3.56
2009–2015	2009 VAT reform and LGFV expansion	0.25	0.00	0.85	0.47	1.06
2016–2019	2016 B2V shared-VAT regime	0.50	0.18	0.50	0.32	0.80

Notes: All values computed from the DSGE model's period-specific parameterisation and steady-state solver.

Table A12: Decomposition of Private Consumption Changes Under Policy Counterfactuals

Channel	Transfers (pp)	Tax Reform (pp)
Income effect	0.2	0.0
Welfare–C complementarity	0.5	0.0
Saving / deleveraging	0.5	3.1
General equilibrium	0.2	1.0
Total $\Delta C/Y$	1.4	4.1

Notes: Counterfactual A increases central transfers by 5% of GDP. Counterfactual B assigns 50% of consumption tax revenue to local governments (revenue-neutral).

Table A13: Net Exports and Domestic Absorption Across Institutional Regimes

Regime	I^G/Y	S/Y	C/Y	Domestic Abs.	NX/Y
Social Planner	8.0%	33.8%	37.1%	100.0%	0.0%
Fiscal Only	3.6%	16.4%	37.4%	78.5%	21.5%
Full Amplification	7.4%	16.3%	36.0%	80.8%	19.2%
Destination-Based Reform	6.6%	16.3%	40.2%	84.2%	15.8%

Notes: Domestic absorption is defined as $DA \equiv C + I^K + I^G + S$. Net exports $NX = Y - DA$ are computed as the residual from the resource constraint.

Table A14: Sensitivity of Welfare Gains to Preference Complementarity (ρ)

ρ	$\sigma = \frac{1}{1-\rho}$	ECV Transfers (%)	ECV Tax Reform (%)	Ratio
-2.50	0.286	1.68	-0.11	-0.1
-2.00	0.333	2.16	-0.06	-0.0
-1.50	0.400	2.93	0.07	0.0
-1.25	0.444	3.49	0.19	0.1 $\leftarrow$
-1.00	0.500	4.26	0.37	0.1
-0.75	0.571	5.35	0.67	0.1
-0.50	0.667	7.00	1.16	0.2

Notes: Each row reports ECV under a different value of the CES complementarity parameter ρ. The baseline specification ($\rho = -1.25$) is marked. The reform-to-transfer ECV ratio remains stable between 4.4 and 4.7.

F Robustness and Sensitivity Details

F.1 Capital Utilization, Overcapacity, and Depreciation Costs

The baseline model assumes constant capital utilization. We extend it to include endogenous utilization u_t and a convex depreciation cost $\delta(u_t)$. The extended Euler equation becomes

$$\frac{\partial Y_{t+1}}{\partial G_{t+1}} = \beta \, \mathbb{E}_t \left[\frac{\partial U(C_{t+1}, S_{t+1})}{\partial C_{t+1}} \cdot \left(u_{t+1} A_{t+1} - \delta'(u_{t+1}) \right) \right].$$

Recalibrating to match the observed utilization decline from above 94% (pre-2008) to roughly 82% (post-2016), the decomposition results remain qualitatively unchanged. Fiscal factors continue to explain more than 70% of investment volatility, while the political component contributes less than 15%. Overcapacity dampens the productivity channel but does not diminish the fiscal incentive to expand the tax base and collateral values.

F.2 Alternative Time Preferences

Even under a substantially lower discount factor ($\beta = 0.90$), fiscal shocks still account for approximately 70% of the post-2008 variance in infrastructure investment. Greater impatience strengthens responsiveness to revenue and debt-service fluctuations, reinforcing rather than undermining fiscal determinism.

F.3 Variations in the Soft Budget Constraint

Lowering the financial discipline parameter ω temporarily increases sensitivity of investment to political cycles, since governments can more easily borrow to signal favourable performance. Over time, however, accumulating debt service obligations impose an endogenous constraint: borrowing increasingly funds refinancing rather than new projects. This transition shifts the mechanism from revenue determinism to debt determinism, sustaining the infrastructure bias despite weakening promotion incentives.

F.4 Alternative Filtering Methods

Replicating the decomposition with the Hamilton filter yields a correlation of infrastructure investment with land-related revenue of 0.60, compared with 0.62 under the HP filter. The dominance of fiscal shocks is robust to the choice of detrending method.

G VAT Competition: Tax Rebates and Firm Selection

The origin-based VAT system, combined with the fiscal pressures arising from vertical imbalance, creates strong incentives for local governments to actively shape the composition of their industrial base. This generates behavior that often diverges from central policy objectives and produces economically inefficient outcomes at the national level. To attract mobile manufacturing capacity, local governments commonly offer fiscal rebates by returning a portion of their retained VAT share to firms. For example, a municipality might refund 30 to 50 percent of the 50 percent VAT revenue it receives from a firm's production, effectively reducing the firm's tax burden while accepting lower net fiscal returns in exchange for maintaining or expanding the local production base. This practice induces a zero-sum form of interregional competition in which jurisdictions bid down their effective tax revenue to secure industrial activity that might otherwise locate elsewhere (Shaoda Wang, 2021).

These incentives also influence firm selection in ways that sometimes conflict with central government priorities. While the central government tends to emphasize the stability of State-Owned Enterprises and the development of strategic industries, local governments frequently favor private enterprises, particularly in sectors such as electric vehicles, batteries, solar panels, and consumer electronics, that generate rapid VAT turnover. Even when profit margins are thin and business models are risky, high transaction volumes maximize VAT revenue and thus improve local fiscal capacity. A private enterprise generating 10 billion yuan in annual sales produces far more local revenue than a state-owned enterprise with the same employment but lower turnover, making such firms fiscally attractive despite elevated business risk and potential overcapacity concerns.

The preference for industrial activity over services reflects not only VAT considerations but also the role of heavy assets in sustaining local borrowing capacity. Industrial investment raises land demand and land values, which in turn provide collateral for LGFV debt. Service sector enterprises, by contrast, typically require less land and generate smaller spillovers to property values. A municipality choosing between attracting a manufacturing plant and a financial services office of comparable employment will strongly prefer the manufacturer because of the compound fiscal returns: direct VAT revenue, increased land values, expanded borrowing capacity, and the potential for supply chain clustering that attracts additional industrial activity.