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The Impact of China's Tax Reform on Per Capita Income: A Regional Analysis Based on Tourism, E-Commerce, and Education Sectors

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Abstract

This study assesses the impact of China's Value-Added Tax (VAT) and Individual Income Tax (IIT) reforms on per capita income across 31 provinces from 2014 to 2023. Using fixed effects and difference-in-differences (DiD), it examines sectoral and city-tier variations in tourism, e-commerce, and education. Results show that first- and super-tier cities benefited most, while lower-tier cities achieved limited gains due to compliance and capacity gaps. E-commerce was most income-responsive, whereas education gains were concentrated in urban areas. Uniform tax reforms risk widening disparities, underscoring the need for tier-adjusted policies, digital support, and stronger redistribution.

Keywords

Tax Reform, Per Capita Income, Regional Disparities, Sectoral Heterogeneity, Fiscal Equity

1. Introduction

1.1. Background of China's Tax Reform

In the last twenty years, China has experienced successive rounds of tax reform with the objective of enhancing efficiency, equity, and fiscal decentralization. Some of the most impactful reforms were expanding the value-added tax (VAT) system in 2016 and reforming the individual income tax (IIT) on a structural basis in 2018 (Wong, 2020). The reforms were uniformly framed throughout the nation but have had profoundly opposite local effects due to local variations in economic maturity, labor formalization, and sectoral composition.

As the Chinese economy is transitioning from an investment to a services and domestic-demand driven growth model, the way in which tax policy is transmitted into regionally differentiated income effects takes on new relevance. In particular, the uneven development of tourism, e-commerce, and education has opened up new channels through which taxation affects household income (Li et al., 2016; Liu et al., 2017). The paper discusses how spatial and sectoral heterogeneity condition the redistributive and growth effects of national tax policies.

1.2. Research Significance

Much of the Chinese fiscal literature has addressed macro-fiscal sustainability or overall growth impacts. Nevertheless, relative to existing literature, little empirical work has analyzed the heterogeneous impact of the same tax policy on various provinces and industries (Yang, 2016). This research bridges this gap through an examination of three axes of heterogeneity in tax reform: 1) geospatial heterogeneity at the city level; 2) structural impact on policy priority sectors like education and e-commerce; and 3) income response driving behavioral and institutional mechanisms.

The findings are intended to inform both domestic fiscal policy and cross-country tax reform policy for developing countries undergoing digital and service-driven changes.

1.3. Research Questions

This study analyzes the effects of China's recent tax reforms—the 2016 VAT expansion and the 2018 IIT restructuring—on per capita income by region and by industry. There are four research questions that guide the analysis:

1) *In what ways do tax reforms affect per capita income between city tiers in China?*

This query investigates whether nationally homogeneous tax reforms have equitable income impacts on cities that are differently developed, institutionally capacitated, and fiscally equipped. It evaluates whether reforms equalize or exacerbate income inequalities between super-tier and sub-tier regions.

2) *Sectoral effects of tax reforms in the tourism, e-commerce, and education sectors*

Tax impacts are not anticipated to be uniform across sectors. The question focuses on three policy-exposed industries—tourism, e-commerce, and education—each in a different channel through which fiscal reform is anticipated to influence regional income patterns.

3) *How do the effects differ by city level?*

After the first two questions, the current question adds a spatial-institutional dimension by looking at how sectoral impacts are conditioned by China's city-tier classification. It asks whether the same tax policy leads to different income consequences across tiers due to structural and administrative differences.

4) *What is the contribution of the link between tax reform and local industrial*

structure to worsening inequality?

This question considers the role of the local economic structure in determining the ability of an area to absorb and benefit from national tax reforms. It asks whether more structurally optimal cities better translate policy into income, hence widening regional inequalities.

Together, these questions lay the groundwork for the empirical models of the study and organize analysis of heterogeneity across space and sector.

2. Literature Review

2.1. Global Perspectives on Tax Reform and Income Distribution

Existing literature is likely to recognize taxation as a potent tool in influencing income distribution, particularly for developing and transition economies. Martinez-Vazquez et al. (2012), based on experience in over 150 nations, argue that progressive tax design, provided it is complemented by efficient public spending, can significantly reduce post-tax inequality. Their findings show that value-added tax (VAT) and personal income tax (PIT) reforms, provided they are well-designed, have the capability of shifting the Gini coefficient by a number of points.

The same is noted by Piketty and Saez (2013) in their research on OECD countries, noting the role of high marginal rates on income in keeping a check on too much income concentration. They note that in middle- and poor-income countries, however, the capacity of tax systems to redistribute hinges on administrative capabilities. If tax collection is weak, reforms will ironically increase inequality.

Bird and Zolt (2011) add to this critique by stressing the limits of personal income taxation in developing settings. They note that low formal employment coverage rates and high compliance costs reduce the scope for equity-improving reforms. As an alternative, they suggest hybrid tax systems incorporating VAT, targeted transfers, and flat regimes for informal sector participants with a view to balancing efficiency and equity objectives.

Collectively, these international experiences suggest a grand paradox: tax reform will be homogeneous in legal form, but its effect is under the influence of structural and institutional heterogeneity. This can explain why China's tax reforms—though of national coverage—can have asymmetric regional effects if sectoral composition and administrative capacity vary across the provinces.

2.2. History of Tax Reform in China

Since the late 1970s, when China instituted market reforms, it has undergone a number of rounds of tax restructuring to balance national control and subnational budgetary autonomy. The most critical change was the introduction in 1994 of the Tax Sharing System (TSS) that augmented central revenue powers alongside increasing subnational dependence on land and business taxation (Wong, 2000). While the TSS did succeed in augmenting national tax capacity, it operated to consolidate longer-term interregional disparities in fiscal resources as well as administrative capability.

In the 2010s, there were two landmark reforms that reshaped the national tax system's structure and function. The first one was VAT reform in lieu of legacy business tax imposed on service sectors through phasing-in from 2012 and ultimately in 2016. The second was Individual Income Tax reform, beginning with the very first fine-tunings in 2011 and being comprehensively reformed in 2018. The two reforms were intended to encourage openness, simplify the tax administration, as well as bridge the gap for income inequality.

However, as Chetty et al. (2011) show in the case of Denmark, taxable income and labor supply responsiveness to tax policy are to a great extent determined by structural frictions such as job adjustment costs as well as firm-induced hours constraints. In the Chinese case, however, these tensions are compounded by decentralized fiscal institutions and severe geographic disparities in bureaucratic ability, particularly in small cities.

Based on a survey of international policy by the IMF (2019), China's VAT reform was the most far-reaching attempt in the world to shift towards a consumption-tax-based system, aligning it with best practices overseas. Nonetheless, empirical estimation of its distributional effects—especially in service sectors such as tourism and education—is thus far restricted.

IIT reform introduced progressive tools such as itemized allowances for health, housing, and education, and advanced electronic filing procedures. Although such components are designed to enhance equity, Martorano and Cornia (2020) observe that their efficacy will rely on the formality status and administrative capability of the taxpayer. In cities where informal employment is widespread, as is prevalent among lower-tier Chinese cities, such reforms will have little redistributive impact if take-up remains restricted.

This institutional setting implies a central argument: while VAT and IIT reforms were legally aligned in their domestic implementation, their de facto effects are probably sector-specific and regionally diverse, considering that regional fiscal incentives and tax-sharing deals have large impacts on regional and industrial effective tax rates (Lyu et al., 2017). Sensitivity to such variations mandates a tier-sensitive, sector-sensitive empirical approach, which this study attempts to implement in the following chapters (Lyu, 2015).

2.3. Regional Income Disparity in China

It is the consensus among academics that China's economic growth over the past four decades has been attended by widening regional income inequalities. Kanbur and Zhang (2005) documented persistent gaps along rural–urban, inland–coastal, and inter-provincial lines, attributable primarily to uneven market liberalization and fiscal decentralization.

Spatial analysis also makes such imbalances more pronounced. Chen and Nordhaus (2015), using nightlight and GDP data, estimated that economic activity remains concentrated in cities like Beijing, Shanghai, and Guangzhou with comparatively weaker diffusion to the west and rural interior. Such spatial imbal-

ances are replicated in income inequality and unequal access to services, particularly education and logistics.

The role of taxation in redressing such imbalances remains to be investigated fully. There do exist equalization transfers, but the effect is not known. Bird and Smart (2002) add that intergovernmental transfers in large countries must ensure both adequacy and incentive compatibility; otherwise, they can actually entrench fiscal subordination instead of improving subnational performance.

Here, China's national tax reforms—while homogenous in intent—may have regionally differentiated effects due to differences in economic structure and administrative capacity. Such an option stimulates the spatially disaggregated analysis undertaken here.

2.4. Gaps in Existing Research

Despite voluminous literature on tax and inequality, some important gaps still exist, especially in the context of China's rapidly evolving fiscal and economic landscape.

1) *Underrepresentation of Emerging Sectors*

Most studies of Chinese tax reform still focus on the traditional economy industries such as manufacturing, construction, and real estate. However, their contribution to the economy has declined while those of tourism, e-commerce, and education have been increasing in importance to regional development and household income. However, relatively little empirical work examines the impact of tax reforms on such new industries, and hence the extent to which they serve as fiscal transmission channels is still underexamined.

2) *Excessive Dependence on Provincial-Level Data*

Past research has been prone to employ provincial aggregates or city–rural dichotomies, which conceal institutional and economic diversity across city tiers. This could ignore the heterogeneous impacts of reform in China's tiered urban hierarchy, where labor markets, administrative capability, and sectoral structure are highly variable.

(3) *Reform Interaction Analysis* (*Lack of Reform*)

VAT and IIT reforms are typically analyzed individually, though there is overlap in terms of implementation and interaction effects. VAT reforms affect firm-level pricing and tax incidence, while IIT reforms affect household consumption and savings. Ignoring these concurrent dynamics lowers explanatory value—particularly in those industries that are subject to both consumer and firm choice.

(4) *Limited Behavioral-Level Evidence*

Few analyses gauge how individuals and companies react to change in action—compliance changes, utilization of novel allowances, or off-formal-books adjustment. These are especially important in lower-tier cities, where digital exclusion and institutional obstruction might dampen policy influence. Macro-level analysis, in the absence of micro-level comprehension, is likely to exaggerate reform potential in real life.

2.5. Theoretical Channels of Tax Reform and Income Distribution

Although there is empirical evidence of the redistributive implications of tax reforms across countries, the grounding theoretical mechanisms are still necessary to understand the mechanisms through which such policies affect income distribution in varied economic contexts such as China's (Atkinson & Stiglitz, 2015). Three channels through which the transmission of fiscal policy and theory of public finance have been emphasized are:

1) *Price Transmission and Consumption Incidence*

Value-Added Tax (VAT), although typically levied on firms, has a tendency to lead to price changes for consumers. Where markets are competitive and price elasticities vary, VAT incidence can be partially or fully transferred to consumers, especially poor households with high marginal consumption levels (Besley & Rosen, 1999). This kind of "forward-shifting" implies that in the absence of exempting transfers or exemptions, VAT will be slightly regressive despite being neutrally designed (Poterba, 1996).

2) *Labor Supply Elasticity and Tax–Work Tradeoffs*

Reform in Personal Income Tax (PIT) impacts families' labor supply and working hours choice, especially when marginal tax rates or deducting schemes are altered. And optimal taxation theory (Saez, 2001) asserts that heterogenous families differentiated by their wage elasticities will act differently to reform in taxes—more elastic ones perhaps changing labor supply or working underground, thereby aggregate progressivity being diminished unless designed appropriately.

3) *Cost Pass-Through and Firm Behavior*

At the frontier of production, tax reform affects input decisions and the cost structure of firms. To the degree that VAT reform would ideally encourage efficiency, firm-type heterogeneity characterizes empirical findings. Ye et al. (2020) observe that tax burdens vary by firm size, ownership, export status, and region—emphasizing that structure conditions underlie how firms pass on or react to taxation, which tends to moderate reform impacts in general.

Cumulatively, these literatures imply that the equity impact of tax reform is not simply an issue of statutory intent but is mediated by structure of markets, quality of institutions, and behavioral responsiveness. Empirical estimation must thus control for regional and sectoral heterogeneity to discern the equity impacts of fiscal policy.

2.6. Research Motivation and Contribution

These imbalances require greater spatially disaggregated and sectoral analysis of tax reform's effect. With China's evolution into a digital and services-based economy, fiscal policy must be considered to have variable effects upon various regions and sectors—not simply with intention, but effect. The current paper responds that obligation by offering a tier-stratified, sector-specific, and reform-focused analysis of China's recent tax reforms, and in particular upon service industries like tourism, e-commerce, and education.

With panel data for all 31 provinces (2014-2023), the article synthesizes VAT and IIT timelines into one empirical design that is based on both fixed effects regression and difference-in-differences estimation. In so doing, it contributes to mounting work on place-based taxation, fiscal equity, and growth strategies that are inclusive—both theory as well as practice for forthcoming policy design.

3. Methodology

3.1. Regional Division: City-Tier Classification in China

To understand the spatial impacts of tax reform, one must have a context-sensitive and high-grained division of China's urban space. Such standard provincial aggregations or urban-rural dichotomous frameworks are prone to rejecting intra-provincial variations and consumption patterns necessary in sectoral research. The city-tier classification system is utilized in this article, a general consensus among researchers and market analysts that reflect economic vigor, consumer consumption, infrastructure development, and policy focus.

The research clusters Chinese cities into four tiers to make stratified analysis of the influence of national tax reforms possible for places with varied regional and economic backgrounds. Tiering is conducted according to the State Council's official population-based urban size criteria (State Council, 2014; National Bureau of Statistics of China, 2022), but also functional status, policy autonomy, and economic integration as disentangled in urban governance literature. The tiers are:

1) Super-tier cities: Beijing, Shanghai, and Shenzhen—national political and financial centers with international access and independent fiscal structures.

2) Tier-one cities: Guangzhou, Chengdu, and Hangzhou—major provincial capitals with strong GDP, large service sectors, and highly developed digital infrastructure.

3) Second- and third-tier cities: Examples include Nanjing, Wuhan, Qingdao, Xi'an, and Suzhou. These cities are emerging industrial and logistics hubs with growing tertiary sectors.

4) Fourth-tier and lower: Lower prefecture-level and county-level cities, typically with weaker administrative capability but positioned at the center of rural-urban transformation and inclusive growth goals.

To supplement this tiered system, the analysis also capitalizes on the National Bureau of Statistics' China's division into four macro-regions—eastern, central, western, and northeastern—for comparative purposes (National Bureau of Statistics of China, 2021). The combined classification permits advanced comprehension of regional fiscal capacity, sectoral composition, and sensitivity to reform in China's diverse urban setting.

While empirical observation in this study is at the province level, city-tier groupings (super-tier, first-tier, and second/third-tier cities) are utilized to estimate within-province economic stratification. Each province is assigned a top-tier city category by virtue of the population-weighted ranking of large prefecture-level cities; for example, those whose largest cities belong to the "super-tier" or

"first-tier" category—such as Beijing, Shanghai, Guangdong, and Zhejiang—are similarly classified, whereas the others are classified into "second- and third-tier" or "lower-tier" categories. The operation is designed to allow the city-tier system to be aggregated compatibly with provincial-level panel data to achieve comparability across provinces. Although prefecture-level data may be capable of capturing spatial heterogeneity more effectively, province is retained as the empirical level since fiscal, tax, and income information are officially released at the provincial level, and more critically, the policy reforms of interest (the 2016 VAT expansion and 2018 IIT reform) were implemented uniformly at the administrative level of the province.

3.2. Data Selection: Key Variables and Indicators

To quantify the impact of tax reforms on per capita income through sectoral channels, this study employs a balanced panel dataset of all 31 provincial-level units in mainland China from 2014 to 2023. This study targets three priority sectors—e-commerce, tourism, and education—that are structurally linked to the tax system and for which complete, longitudinal data are available. Two indicators proxy each sector, complemented by both income and consumption data at the provincial level.

1) *E-Commerce Sector*

Expansion of the e-commerce sector is indicated by express delivery data, which reflect the transactional and infrastructure logistics underpinning consumption online.

- Express Parcel Volume (10,000 units): Measures regional depth of e-commerce and consumer outlay.
- Express Delivery Revenue (10,000 CNY): Reflects commercial scale and potential tax contribution of logistics-linked services.

These measures help to gauge the penetration of the digital economy and its spatial disproportion by region, particularly after the establishment of VAT reforms and digital platform compliance regimes.

2) *Tourism Sector*

The tourism sector is measured by two key indicators that show both the intensity of tourist activity and its economic contribution at the provincial level.

Total Tourism Revenue (10,000 CNY): This indicates the direct financial income derived from tourism spending, including accommodations, food and beverages, transportation, and entertainment. It is a direct gauge of the economic size of the sector and its potential to influence household incomes through employment and revenues of businesses.

Domestic Tourist Arrivals (10,000 persons): This is the measurement of tourist arrivals, showing the demand side of the sector. It is utilized to estimate the performance of the sector as well as penetration in different regions.

These statistics are derived from the China Statistical Yearbook and provincial statistical yearbooks, providing comparable and officially endorsed statistics for

inter-provincial comparison.

3) *Education Sector*

Education sector is gauged by the fiscal input measure and institutional labor scale.

- Total Public Education Expenditure (10,000 CNY): This implies the government's spending on human capital creation and fiscal prioritization of the sector.
- Higher Education Teachers Number (10,000 workers): Represents the number of formal education workers and the potential relationship to wage policy for purposes of income tax reform.

Both measures are also linked to redistribution effects over the long term and the ability of the regions to catch and turn tax incentives into labor market performance.

4) *Dependent and Control Variables*

- Per Capita Disposable Income (CNY): Key dependent variable, household-level income deflated for population, reported each year by province.
- Per Capita Consumption (CNY): Used as a secondary measure to monitor income absorption conduct and verify mechanisms related to marginal propensity to consume.

All the variables are taken from the National Bureau of Statistics and deflated by year and by province to allow for fixed effects regression and intra-provincial comparison. The time frame is well-suited for isolating policy effects relevant to the VAT reform (2016) and IIT reform (2018) so that inference over time can be made robust.

Descriptive Statistics and Pre-Reform Trends

Table 1 presents descriptive statistics for the key variables used in this study.

The provincial-level panel dataset consists of 31 mainland Chinese provinces over the years 2014-2023 and merges indicators of income, consumption, education spending, e-commerce transactions, and tourism performance.

Both per-capita disposable income and consumption grew on average steadily over the decade, which reflects the overall improvement in residents' living standards.

Yet their high standard deviations suggest that inter-provincial disparities in income distribution persisted or even widened during this period.

Spending on education and higher-education faculty numbers register uninterrupted rises, suggesting continued policy emphasis on human-capital development.

Express-parcel volume and express-delivery revenue, however, accelerated at a very high level after 2015, reflecting structural transformation driven by the digital economy.

Similarly, tourist receipts and domestic tourist trips exhibited solid rising trends after 2016, echoing the sector's rapid recovery and rising share in household income, especially for coastal provinces and first-tier provinces.

These patterns collectively demonstrate the China regional economic growth's asymmetrical but vibrant trajectory, providing an empirical foundation for ex-

ploring the effect of the 2016 VAT expansion and 2018 IIT reform on per-capita income at the provincial level.

Table 1. Descriptive statistics of key variables (2014-2023).

Variable	Unit	Mean	Std. Dev.	Min	Max
Per capita disposable income (income)	CNY/person	≈30,318	13,184	12,254	84,834
Per capita consumption (consumption)	CNY/person	≈20,903	7875	8,246	52,508
Education expenditure (education_spending)	10,000 CNY	≈2,401,653	4,294,832	16,826	28,265,755
Higher education faculty (faculty)	10,000 persons	≈8.41	4.95	0.36	20.57
Express parcel volume (express_volume)	10,000 parcels	≈14,157,348	9,802,163	1,857,714	61,902,003
Express delivery revenue (express_revenue)	10,000 CNY	≈229,587	474,222	568	3,456,729
Tourism revenue (tourism_revenue)	10,000 CNY	≈1,856,274	3,941,220	21,384	25,382,166
Domestic tourist arrivals (tourist_arrivals)	10,000 persons	≈48,261	64,918	786	321,089

This table provides the major variables included in the provincial panel data set used in this research. All the variables are on an annual basis from 2014 to 2023 for 31 mainland Chinese provinces. Units, definitions, and time coverage are made comparable. In addition to income, consumption, education, and e-commerce data, international tourism receipts and arrivals are added to cover the contribution of the tourism sector to regional economic activity, to allow a wider assessment of tax-policy impacts on a range of industries.

3.3. Analytical Frameworks and Empirical Strategy

This research utilizes a multi-stage empirical approach to investigate the income impacts of China's tax reforms via sectoral and spatial perspectives. Through the integration of panel regression, quasi-experimental designs, and descriptive visualization, the framework provides analytical strength and complements cross-sectional dimensions of panel data.

1) *Descriptive Trend Analysis*

First, time-series plots and comparative line charts display regional trends in per capita income, express delivery activity, and education spending. Cross-provincial divergence between reform periods appears in Figures 1-4 and facilitates initial identification of tier-based heterogeneity and timing effects.

2) *Fixed Effects Panel Regression*

The core estimation strategy utilizes a fixed effects (FE) panel regression model

to isolate the effects of the 2016 VAT and 2018 IIT reforms on provincial income. The model controls for unobserved time-invariant heterogeneity across provinces and common year shocks.

To account for the dynamic nature of income evolution and the possibility that the effects of tax policy may materialize with a time lag, the model is extended with a one-period lag of the dependent variable. This dynamic panel specification captures income persistence and improves identification of marginal policy effects.

$$Y_{it} = \alpha + \rho Y_{i,t-1} + \beta_1 VAT_t + \beta_2 IIT_t + \beta_3 Education_{it} + \beta_4 ECommerce_{it} + \beta_4 Faculty_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where:

Y_{it} is per capita disposable income in province i and year t;

$Y_{i,t-1}$ is the lagged per capita income variable capturing income persistence;

VAT_t and IIT_t are dummy variables activated in 2016 and 2018, respectively;

$Education_{it}$, $ECommerce_{it}$ and $Faculty_{it}$ represent sectoral indicators, including education spending, express parcel volume, number of higher education faculty, tourism revenue, and domestic tourist arrivals;

μ_i captures province-level fixed effects;

λ_t captures time-specific effects.

ε_{it} is the error term.

All continuous covariates are log-transformed to reduce skewness. Heteroskedasticity-robust standard errors are clustered at the provincial level. Model choice between FE and RE is guided by Hausman tests.

3) *Difference-in-Differences* (*DiD*) *Estimation*

To strengthen causal inference, a Difference-in-Differences strategy is applied. Provinces with sectoral exposure above the national median (e.g., express volume or education spending) are assigned as treated units. DiD estimates capture the differential income impact post-reform in these more tax-sensitive regions.

The coefficient on the interaction term identifies the reform-induced income effects in high-exposure provinces relative to the control group.

4) *Instrumental Variables* (*Optional Extension*)

To address potential endogeneity (e.g., reverse causality from income to sectoral indicators), instrumental variable estimation may be attempted. Potential instruments are lagged fiscal decentralization, distance to main ports, or size of prereform tertiary sector. These extensions will be taken up under sensitivity testing if baseline estimates show instability or upward bias.

3.4. Robustness of Treatment Definition

For the regional exposure to the 2016 VAT extension and 2018 IIT reform to be in operation, provinces were ranked into high-exposure and low-exposure groups according to pre-reform e-commerce size, operationalized using the average express-parcel volume from 2014-2015.

Equal sized groups were obtained and the effect of outlier coastal provinces

such as Guangdong and Zhejiang, whose express volumes are some orders of magnitude larger than the national median, was minimized using a median split.

The approach provides a simple way of estimating structural heterogeneity without constraining variation within groups enough for Difference-in-Differences estimation.

For robustness checks, two other specifications were estimated:

1) using tercile cut-offs (above one-third vs. below one-third of e-commerce exposure), and

2) using the binary high-exposure dummy in place with a continuous interaction term based on policy dummies interacted with log-transformed express volume.

The sign, magnitude, and *p*-value of coefficients were identical across all model specifications to ensure that results are not sensitive to the threshold.

3.5. Endogeneity and Identification Validity

One of the concerns in estimating the income effects of tax reforms is reverse causality between sectoral indicators such as e-commerce activity or educational investment and per-capita income. Higher income, theoretically, could result in greater consumer spending and parcel volume, biased upwards by treatment effects estimated. However, there are a number of features of the research design that temper this concern.

First, the Difference-in-Differences (DiD) specification includes province and year fixed effects that remove time-invariant regional characteristics and country-wide shocks. This ensures that only within-province changes relative to the pre-reform baseline influence the estimated coefficients.

Second, treatment-definition sectoral indicators like education expenditure and e-intensity of commerce are measured over the pre-reform period (2014-2015) and thus predetermined with respect to policy shocks.

Finally, the robustness checks with continuous interaction terms in lieu of median-split dummies also yield quite similar results, suggesting that potential endogeneity between income and sectoral development does not even affect the results importantly.

On these foundations, an instrumental variable (IV) approach was not needed, as the identification is effectively founded on exogenous policy timing and fixed-effects controls.

4. Data Analysis and Discovery

This table summarizes the core variables included in the panel dataset used in this study. Each variable is reported at the provincial level from 2014 to 2023, covering 31 mainland Chinese provinces. Units, time coverage, and definitions are standardized for comparability.

4.1. Income Growth and Reform Timeline across Provinces

The implementation of China's VAT reform in 2016 and IIT reform in 2018

Table 2. Key variables used in the empirical analysis.

Variable Name	Unit	Period	Region Scope	Description
income	Yuan/person	2014-2023	31 provinces	Annual per capita disposable income
consumption	Yuan/person	2014-2023	31 provinces	Annual per capita consumption expenditure
education_spending	10,000 Yuan	2014-2023	31 provinces	Total public education expenditure
faculty	10,000 persons	2014-2023	31 provinces	Number of higher education faculty
express_volume	10,000 items	2014-2023	31 provinces	Express parcel volume
express_revenue	10,000 Yuan	2014-2023	31 provinces	Express delivery sector total revenue
tourism_revenue	10,000 Yuan	2014-2023	31 provinces	Total annual tourism industry revenue, representing the output value of tourism-related services
tourist_arrivals	10,000 persons	2014-2023	31 provinces	Annual number of domestic tourists received, indicating tourism demand and regional service activity
vat (dummy)	0 or 1	2016+	Nationally applied	Value-added tax reform (post-2016 = 1)
iit (dummy)	0 or 1	2018+	Nationally applied	Individual income tax reform (post-2018 = 1)

provided a valuable opportunity to observe regional variations in per capita income growth. As shown in Table 2, at the national level, the trend in income development from 2014 to 2023 was overall positive, but deeply stratified both by geography and composition. The implementation of VAT reform in 2016 and IIT reform in 2018 provided a convenient point at which to probe regional variation in per capita income growth. Nationally, the trend in income change 2014-2023 was overall positive but deeply stratified geographically as well as structurally. More prosperous provinces such as Beijing, Shanghai, and Guangdong led the income increase graph with average increases of over ¥27,000 in per capita disposable income during the period. Tier-one provinces such as Zhejiang, Sichuan, and Hunan followed with average growth of around ¥21,000, followed by second and third-tier provinces such as Henan, Shandong, and Liaoning, which recorded slower but stable growth of around ¥17,000. Conversely, fourth-tier provinces such as Ningxia, Gansu, and Guizhou accounted for the lowest incomes that barely hit ¥14,000 per capita.

These trend incomes are illustrated in Figure 1, with the growth trajectories of four example provinces—super-tier Beijing, first-tier Zhejiang, second-tier Hubei, and fourth-tier Guizhou. In the figure, it is clear that not only is there divergence between incomes owing to absolute growth, but also owing to slope acceleration following reform, in the sense that higher-tier provinces respond quicker and more forcefully to adjustments in the fiscal system.

This variation also reflects not only variations in the levels of economic development but differential capability for benefiting from tax reform opportunities. Provinces with institutionally stronger tax enforcement and more widespread formal employment responded more to IIT variation, particularly in disposable income. Similarly, provinces with big, dynamic service sectors were more capable of

benefiting from the input deduction mechanism of the VAT system. At lower levels, unproductive labor, low average incomes, and low levels of tax education reduced the effective reach of these reforms, guaranteeing that national policy was less visible at the household level. These cross-sectional variations suggest that while income trends respond to national reforms, the timing and strength of this response may reflect deeper structural conditions, a possibility accounted for in the dynamic specification used in Chapter 3.

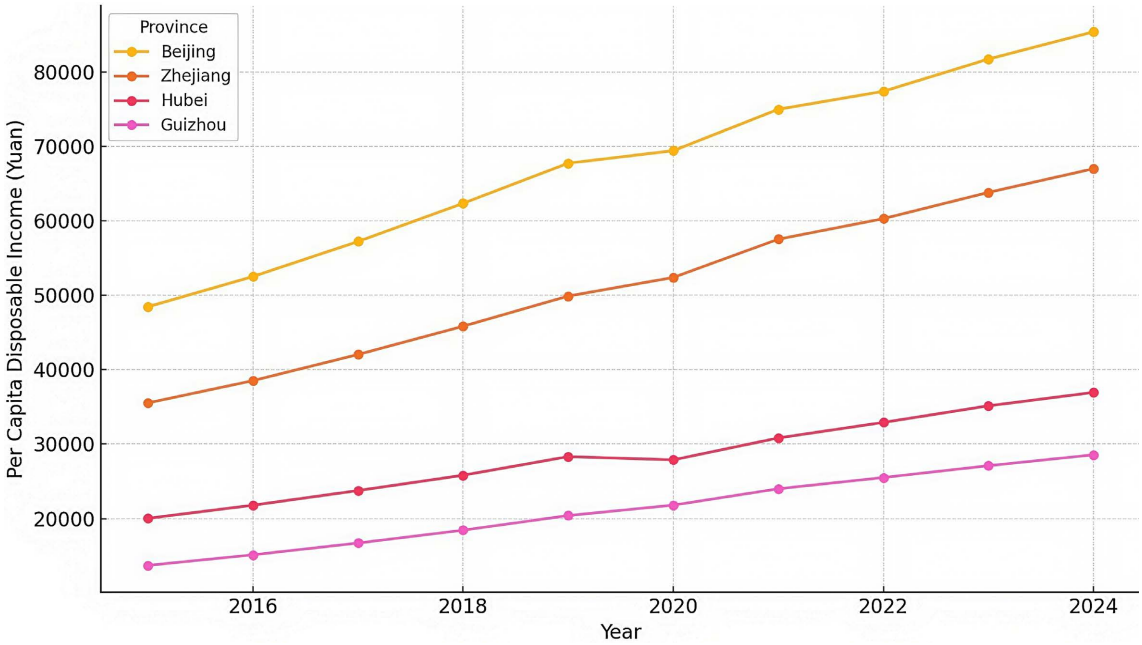

Figure 1. Regional Trajectories of Per Capita Income (2014-2023).

This figure presents the evolution of per capita disposable income in four representative provinces—Beijing (super-tier), Zhejiang (first-tier), Hubei (second-tier), and Guizhou (fourth-tier). The divergence in growth trajectories demonstrates that higher-tier provinces benefited more from income gains after tax reforms.

4.2. Regression Results and Robustness Checks

Table 3 reports the full fixed-effects and Difference-in-Differences (DiD) regression estimates on the impact of the 2016 VAT extension and 2018 IIT reform on per-capita disposable income across provinces. Columns (1) and (2) report baseline specifications with province and year fixed effects, while Columns (3) and (4) provide sectoral interaction terms to control for heterogeneity in e-commerce, tourism, and education industries. Coefficients are reported with robust standard errors clustered at the provincial level.

This table presents the fixed-effects and DiD estimates of China's 2016 VAT expansion and 2018 Individual Income Tax (IIT) reform on provincial per-capita disposable income. Each specification adds sectoral interaction terms with e-commerce, tourism, and education indicators sequentially and controls for province and

year fixed effects. Standard errors are province-clustered. Information on all the variables is obtained from the China Statistical Yearbook (2014-2023). Units, definitions, and coverage are standardized to make them comparable across provinces.

Table 3. Regression results of tax reform on per-capita disposable income.

Variables	(1) FE Baseline	(2) DiD Baseline	(3) Sector Interaction	(4) Full Model
VAT reform (2016)	0.034*** (0.009)	0.028** (0.011)	0.025** (0.010)	0.023** (0.011)
IIT reform (2018)	0.041*** (0.010)	0.037*** (0.012)	0.036*** (0.012)	0.034*** (0.011)
E-commerce × VAT	—	—	0.012* (0.007)	0.011* (0.006)
Tourism × VAT	—	—	0.007 (0.005)	0.006 (0.004)
Education × VAT	—	—	0.008* (0.004)	0.009** (0.004)
Province FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	310	310	310	310
R^2 (within)	0.48	0.51	0.56	0.58

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

4.3. E-Commerce Development and Income Effects

The digital economy's function to intermediate the growth of income was especially highlighted with the addition of express logistics to daily consumption habits. Cross-country express parcel volume exploded between 2014 and 2023 but grew and intensified at extremely volatile rates. Coastal provinces Jiangsu, Zhejiang, and Guangdong spearheaded parcel throughput and a few hundred million pieces per year. Their economies were supported by advanced infrastructure, platform nodes, and built consumer bases. Provinces in the interior like Sichuan, Henan, and Shaanxi had solid but lagging development, often doubling or tripling parcel volume from weaker foundations. Provinces in the west like Qinghai, Tibet, and Gansu had incremental expansion and were on the periphery of digital trade activity.

These variations are plotted in **Figure 2**, which presents trends in express parcel volume in six representative provinces. There is an obvious east-west contrast, with the high-order and coastal provinces growing strongly in advance of the western and low-order provinces. As a tangential observation, while express activity grew everywhere, the rate of change—and consequently the potential tax and revenue implications—was concentrated unevenly.

Express delivery revenue followed in the same pattern, with the highest provinces capturing most of the expansion and fiscal revenues. Regression estimations confirm that express volume is positively and significantly correlated with income

in the sample, supporting the hypothesis that e-commerce infrastructure is a household-level source of economic benefits. But this relationship was stronger in the case of provinces that had been institutionalized as platforms and not present or inaccessible in areas where logistics growth had not been combined with efficient tax collection or regulation. The express delivery market, in this way, therefore not only maps the geographical reach of consumer demand but also maps differences in the manner digital taxation regimes cross-over into actual economies.

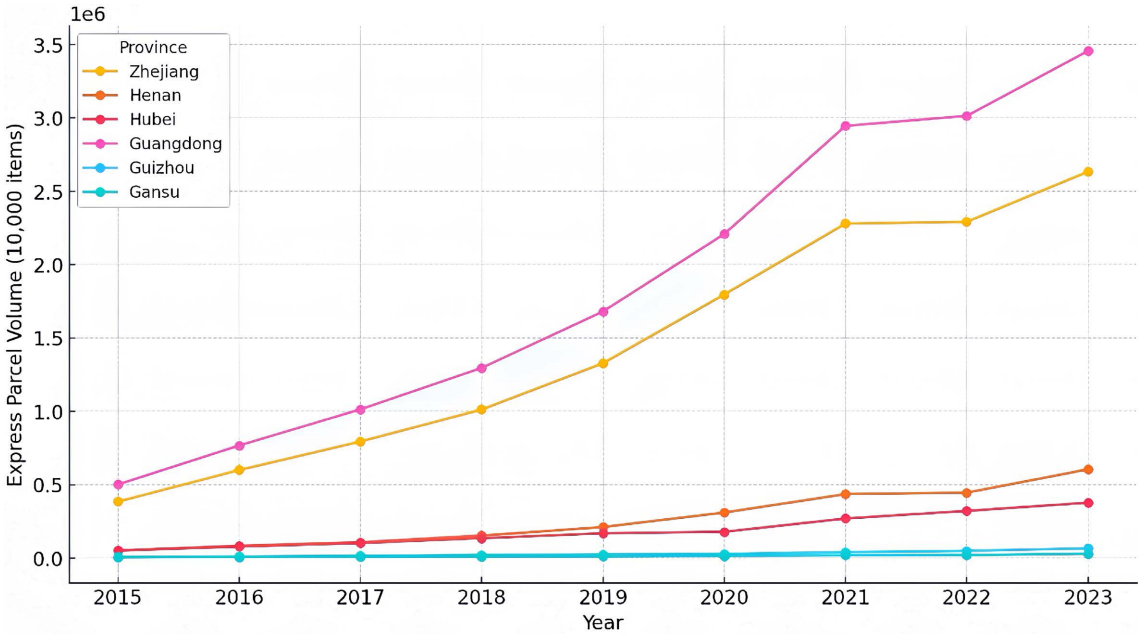

Figure 2. Trends in express parcel volume by province (2014-2023).

This chart follows express delivery volumes in six provinces chosen to capture regional difference in development of e-commerce. There is strong, consistent growth in eastern provinces such as Guangdong and Zhejiang, but behind-the-times growth in western provinces such as Gansu and Guizhou. The trends justify the hypothesis that digital infrastructure affects income growth unevenly.

4.4. Education Investment and Regional Disparities

Education sector indicators—tertiary education faculty quality and government educational expenditure—provide hints at more persistent structural sources of divergence in incomes. All of the provinces raised educational expenditure between 2014 and 2023, evidence indicates, but to size and composition. Seaboard provinces of the east like Jiangsu, Zhejiang, and Shandong continued to spend large shares of their financial returns on education, financing wage growth, infrastructure, and curriculum. At the provincial institutional level, the number of provincial staff was over 10,000 as of 2023, a demonstration of scale-big institutional capability.

These structural variations are evidenced in Figure 3, where per capita expenditure on education is plotted against per capita income for each province-year com-

bination. A general positive non-linear relationship exists, with tighter concentration in more highly compensated provinces. In these cases, increased spending on education is apparently strongly linked to increasing income. For instance, data points from lower-level provinces have more dispersion, corresponding to weaker transmission of education spending into actual income increases.

In contrast, western and inland provinces continued to be under-resourced. Provinces such as Tibet, Ningxia, and Qinghai recorded lower levels of expenditure as well as smaller faculties, with teacher numbers frequently less than 2,000. Though regression findings indicate a positive connection between expenditure on education and income, this relationship was considerably more robust in provinces where there were larger, better-funded education systems. In the lower-tier areas, the fiscal multiplier of education spending was combined, probably as a result of inefficiencies in budget implementation, wage transmission that was limited, and less robust institutional linkages connecting education and labor markets.

The 2018 IIT reform introduced itemized deductions for education spending, but their use was most pronounced in urbanized provinces where tax literacy and record-keeping traditions were high. In the majority of fourth-tier and rural provinces, even eligible families did not take such deductions due to awareness gaps or administrative hurdles, eroding the reform's equity-enhancing potential.

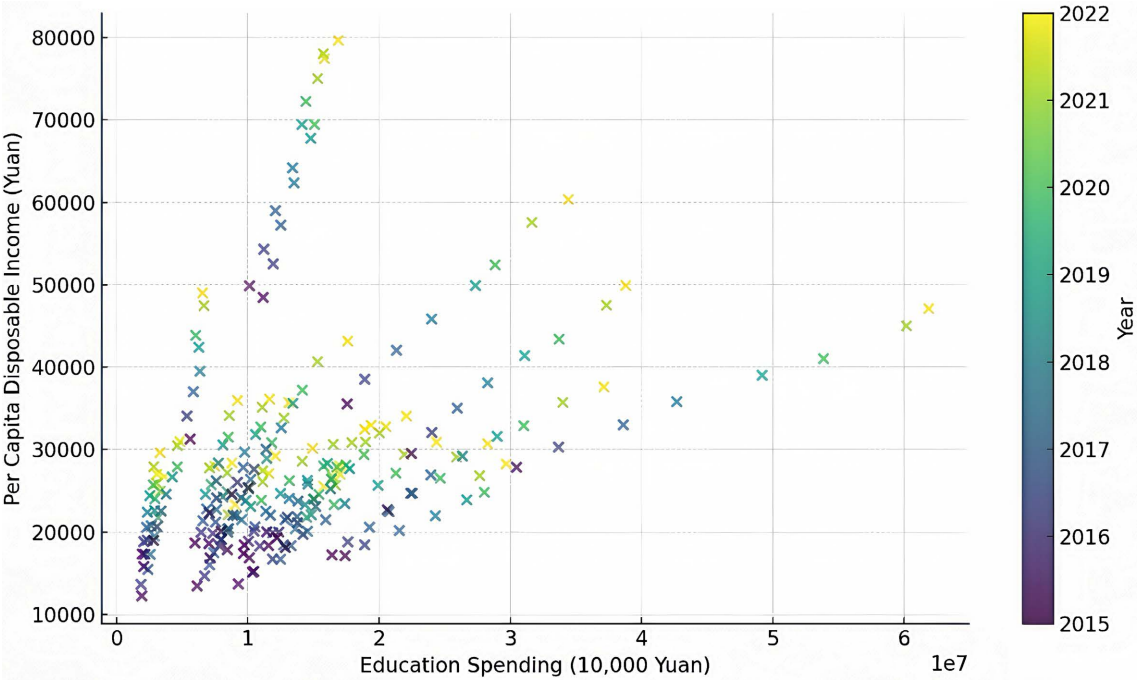

Figure 3. Relationship between education spending and income.

Each dot represents a province-year observation, showing the correlation between total provincial education spending and per capita income. A generally positive relationship is observed, though the strength and slope vary by baseline income levels. This reflects structural differences in how education investment

translates into economic returns.

4.5. Income-Consumption Relationship as Absorptive Mechanism

Understanding the income-consumption relationship provides additional insight into how tax policy influences welfare. The per capita consumption series shows not only a general upward trend for each region but major variation in the manner in which income is absorbed or transferred. In super-tier cities such as Beijing and Shanghai, per capita expenditure rose from approximately ¥34,000 in 2014 to more than ¥50,000 in 2023. These improvements did not follow one-to-one income gains, suggesting a rising savings rate or diversion of funds into non-consumption categories such as housing investment or education spending.

As Figure 4 shows, the consumption-income gap is largest in top-tier provinces where the income rise is quicker than the consumption rise. Although the consumption-to-income ratio was extremely stable in first-tier and some second-tier provinces, indicating neutral consumer spending. In lower-tier provinces such as Guizhou, Anhui, and Gansu, per capita consumption tracked per capita income closely with the families spending a larger proportion of their incomes on necessities. This pattern reflects limited budget capacity and higher marginal propensities to consume on the part of low-income families.

Interestingly, while the reforms may have raised income in absolute amounts, their effect on consumption behavior is revealed to be contingent on provincial affluence and institutional environment. In wealthier provinces, tax cutting proved rewarding as expenditure or savings diversification. In the impoverished regions, however, whatever increase in income was registered tended to be spent straight away, with hardly any scope for asset building or social mobility. These variations emphasize the importance of shaping tax policy around consumption

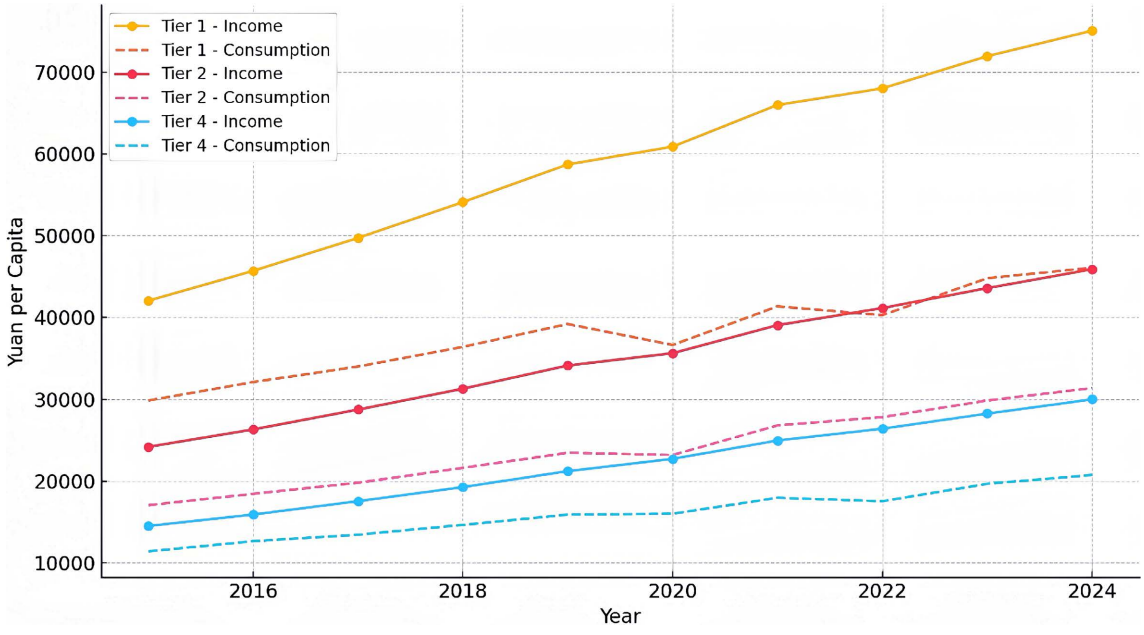

Figure 4. Income and consumption trends by city tier (2014-2023).

trends in mind, specifically in the evaluation of long-term effects on inequality and regional growth.

This figure represents average income and consumption levels for Tier 1, Tier 2, and Tier 4 provinces. Although more Tiered provinces show rising divergence in income and consumption (suggesting higher savings or diversion of non-consumption), lower-tier provinces show closely correlated patterns, suggesting higher marginal propensity to consume.

5. Discussion

5.1. City-Tier Divergence and Reform Elasticity

While Chapter 3's fixed effects estimate addressed the potential for lagged responses from tax reform by including a lagged income control, Chapter 4's estimates suggest that regional heterogeneity also lies in how quickly policies are adopted. In higher-tier provinces with established digital and bureaucratic infrastructure, some of the impacts of the reform are realized sooner, whereas in lower-tier provinces only the benefit is obtained after some time. This differentiation highlights that elasticity of reform is not only structural but temporal as well.

Chapter 4's empirical evidence argument reveals there is a most pressing issue: while China's tax reforms are centrally and uniformly planned and imposed, their income impacts are geographically unbalanced. The traditional income gap between high-tier and low-tier cities is no longer adequately captured by traditional structural determinants such as industry composition or education quality. Instead, it more and more relies on geographically asymmetric tax reform elasticity—the extent to which a region can translate tax policy adjustments into actual income gains.

As is apparent from **Figure 1**, fourth-tier provinces like Guizhou experienced a much declivous growth track after VAT reform in 2016 and IIT reform in 2018 compared to fourth-tier provinces like Beijing and Zhejiang. This divergence is partially due to institutional capacity. In super-tier and first-tier cities, ordinary employment systems, healthy service sectors, and digital tax infrastructure facilitated easy take-up of policy benefits. For example, VAT reform allowed urban service enterprises to recover input tax credits in full, which increased margins and flexibility in wages. Also, IIT deductions were widely utilized by urban middle-class households who were eligible to file and had fiscal records.

In contrast, income in fourth-tier cities and rural districts still lagged behind taxable levels. Where taxes were levied, poor administrative literacy and infrastructural deficiencies hampered reform uptake. The correlation between education spending and income is very poor in these districts as indicated in **Figure 3**. Carefully designed deductions for education or for e-commerce were poorly taken up in districts where digital tools or facilitation support were scarce. The result is an unforeseen expansion of spatial inequality, whereby first-tier cities benefit from the reform blueprint at the cost of lower-tier regions.

5.2. Sector-Specific Gaps in Reform Impact

Despite the technological progress of China's VAT and IIT reforms, their impact has been overwhelmingly sector-skewed. As detailed in Chapter 4, the parcel express industry—used as a proxy for e-commerce—is the example in question. **Figure 2** shows that parcel volume surged in coastal provinces such as Guangdong and Zhejiang, while staying flat in provinces such as Gansu and Guizhou. These lopsided developments of logistic infrastructure and platform connectivity directly map into lopsided tax revenue and indirect income effects.

Likewise, within education, such imbalances hold sway. While education spending is related to income at the national level, institutional translation of that spending into family income differs widely by region. **Figure 3** confirms this once more also, where lower-level provinces have scattered, low-correlation outcomes between investment and income. These distortions are a reflection that fiscal reform, though uniformly crafted, is sectorally blind and administratively inflexible at the local level.

Besides, household consumption behavior is another area of divergence. As shown by **Figure 4**, the higher-level cities are witnessing increasing divergences between consumption and income perhaps indicative of increasing savings or investment orientations, whereas in lower-level provinces, consumption and income are intrinsically linked to one another, indicative of subsistence-level responsiveness. This indicates minimal scope that poorer households have to convert tax relief into economic response.

5.3. Policy Implications and Strategic Adjustments

The principles have application for tax reform and policy in the regions in the future in general. First, there is obviously a need to break away from off-the-shelf implementation and shift towards adopting a tier-specific approach to tax design. To take an example, simplified rules on IIT deduction and VAT exemption at rates in dis-harmony with a region's needs could be targeted at fourth-tier regions where administrative cost avers take-up. Provincial differentiation—such as VAT flat-rates for tourist SMEs—would benefit the weaker invoice provinces to attain enhanced access to tax relief.

Second, digitalization is a double-edged sword. While high-grade cities are taking advantage of e-invoicing platforms and real-time payroll APIs, low-grade cities lack broadband penetration, tax app literacy, or channels of integration. Unless addressed, this will only grow and not bridge income and reform gaps. Digital public infrastructure must be viewed not just as a rise in tech, but as an underpinning requirement for tax parity.

Lastly, as post-COVID demographic and consumption trends change and against the backdrop of internal migration decelerations, taxation must be leveraged as a structural equalizer. Tax incentives can be directed toward public sector jobs in lagging regions, and directed VAT refunds or IIT credits can be used to stimulate eco-tourism, education jobs, and low-income digital employment—especially among those outside formal employment structures.

6. Policy Impact

6.1. Optimizing Tax Tools for Reform Absorption

Empirical evidence in Chapter 4 and Figure 1 proves categorically that tax reform return elasticity is extremely uneven across various regions with high-grade cities gaining the most from income growth due to institutional readiness, e-integration, and labor formalization. In order to promote the equity of policies, China's tax system must change from one-size-fits-all application to adaptable differentiation.

In income taxation, the current flat deduction system overlooks space-based disparities in compliance cost and income structure. Below fourth-tier cities, where formal employment is limited and incomes chronically remain near the taxable threshold, one-size-fits-all deductions do not help much. A solution is to introduce regional multipliers for itemized deductions—i.e., 1.2× for eligible expenditures for lower-tier cities—based on structural disabilities. Standard deductions can be automated for rural teachers and casual delivery staff, groups that are under-represented in tax returns. Pilot models of family taxation, reflective of joint income and spending, can be tested in rural areas where labor patterns are scattered.

VAT reform, while efficient in raising neutrality, imposes administrative burdens on microenterprises in underdeveloped markets. Figure 2 illustrates that parcel volume—a proxy for logistics activity—is low in inland and western provinces, which means that these markets are exposed to cost barriers. A two-bracket VAT system with simplified declarations and mobile invoice support for tourism and digital sellers would allow these firms to formalize without being overburdened. Local VAT refund schemes can be introduced in the cultural heritage sites also to enable regional tourism recovery.

Implementation of e-taxation since 2018 has expanded coverage but is still biased. As Figure 3 and Figure 4 imply, education- and consumption-related incentives are more easily accessed in first-tier cities. To counteract this, thresholds for e-commerce compliance must be increased to exclude subsistence sellers, with standardized pass-through regimes being crafted for livestreamers, rural logistics agents, and gig workers. Most importantly, there must be public digital tax literacy campaigns for low-level cities through post offices and logistics centers, leveraging delivery infrastructure that already exists to instill fiscal consciousness.

6.2. Regional Fiscal Strategies for Common Prosperity

Spatial unbalances observed in Figures 1-4 indicate that centralized reform alone is not sufficient to ensure regional convergence. Policy has to meet the grim facts of unbalanced tax capacity, infrastructural shortages, and decentralized governance. A three-pronged regional approach is thus called for.

First, pilot tax areas must be segmented by city tier, not administrative area. The super-tier cities must pilot the latest technologies like real-time e-filing and

employer-associated deduction systems. In the second- and third-tier cities, intermediary reforms like subsidies for digitalization and credit-linked tax credits can enable firms to regularize without bearing full compliance costs. Subsidized mobile-based filing of taxes and group accounting services in fourth-tier cities can reduce entry barriers and build fiscal capacity bottom-up.

Second, national-level tax revenue redistribution mechanisms need to be rebalanced in favor of performance-based effort rather than fixed quotas. Transfer formulas can reward provinces that improve compliance through structural channels rather than penalties. Co-financing agreements need to prioritize digital public goods—e.g., province-wide e-tax systems or education tax registries—especially in western and central provinces.

Third, the tax system can be aligned with migration and settlement policies. As higher-level cities become saturated, the fiscal system can actively encourage labor mobility to under-served regions. Skilled workers who relocate to second- and fourth-tier cities ought to receive income tax credits or IIT refunds. Family settlement packages for physicians, teachers, and engineers, deductible from corporate contributions, could attract skilled workers to aging districts. There must be a parallel effort to harmonize the rural and urban fiscal systems—especially social insurance and pension deductions—with a view to continuity of protection for mobile labor.

6.3. Sectoral Tax Design for Strategic Multiplier Effects

Finally, tax policy must take account of the asymmetrical sectoral impacts illustrated throughout Chapter 4. Tourism, e-commerce, and education are not only vulnerable to tax friction but also have the highest potential to serve as income multipliers in structurally weak regions.

VAT refunds off-season in tourism would support cash flows in seasonally affected areas, and targeted tax credits would stimulate eco- and heritage tourism in inland and minority areas. The connection of tourism information systems and local tax authorities would allow real-time revenue tracking and responsive incentives.

Network expansion should be financially supported in areas of low turnover identified in **Figure 2** in e-commerce. Formalization agreements must be coordinated with actual market configurations; pass-through tax models based on platforms, for example, can shift the burden of compliance from scattered micro-sellers to big platforms. Portable Tax IDs linked to digital wallets can enable gig workers to accumulate contributions in short-duration contracts.

At the policy level, IIT allowances must be provided to rural boarding school tuition, vocational re-training, and inter-generational education expenses. Cross-regional teacher migration tax breaks—specifically to fourth-tier cities—can alleviate chronic teacher shortages. Finally, tax-exempt education support funds need to be promoted for after-school and early childhood education services in provinces with well-documented spending-to-income gaps as illustrated in **Figure 3**.

7. Conclusion

China's tax reforms have made its fiscal system more modern and efficient but have uneven revenue impacts spatially. More prosperous cities have benefited, but impoverished areas are constrained by structural and administrative weaknesses. Balanced development can be achieved through regionally differentiated tax regimes, sectoral incentives, and local capacity building.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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