Growth versus Equity:
The Effects of Centralised Fiscal Transfers on Chinese Provinces

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Abstract

Centralised fiscal transfers to the provinces are the principal means of reducing income inequalities in China. The coastal provinces are the main transfer donors to the poorer provinces. We evaluate if the equity objective sacrifices aggregate growth using four PVARs for four geographical regions of Chinese provinces. The PVARs are estimated for centralised transfers, government spending, taxes, and output from 1994 to 2018. Whether transfers sacrifice growth or not depends on geography. Transfers reduce inequality and generate growth in the middle provinces; reduce inequality but sacrifice growth in the western provinces; worsen inequality and sacrifice growth in the northeast provinces.

JEL: C32, E62, H61, R11

Keywords*:* regional growth, regional inequalities, fiscal multipliers, fiscal transfers, decentralisation, China

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1. Introduction

Since the opening and economic reform in the late 1970s, China has experienced an unprecedented annual growth rate of beyond 10% a year, for forty years to 2018. This progress however has not been even over all the regions of China. In keeping with Deng Xiaoping's declaration in 1985 'let some regions and some people get rich first', the prosperous coastal region of China led the way, creating a widening regional gap with the rest of the country. The second part of Deng Xiaoping's statement is less well quoted – 'and help other regions and people, and gradually achieve common prosperity'. The purpose of unleashing the economic dragon in some parts of China is so that the rest of the country could be pulled up in its flight path.

The process of 'catch-up' took a while. Before 1995, regional income inequality widened between the fast-growing coastal provinces and the rest of the economy. Income inequality plateaued over the next decade, but there has been a significant catch-up since 2006 (Luintel et al., 2020). Fiscal transfers from the centre may have played a role in this process. In the period 1983-1994, the fiscal contracting system was exemplified by the Chinese saying *fēn zào chī fàn* (serving meals to different diners from different pots –Fan & Wan, 2017). Local governments were incentivised to foster economic growth and maximise fiscal revenue by separating local from central budgets. The beneficial role of the 'helping hand' favoured the coastal areas (Zhang, 2006) but did little to close the inequality gap (Y. Song, 2013). Partly to help poorer provinces through fiscal transfers and reverse the decline in central tax revenues, the government instituted the tax-sharing reform in 1994. This system strengthened the power of the central government to disburse central tax revenues via fiscal transfers to the provinces on the political economy basis of *hui kū de hái zi yǒu nǎi chī* (the crying child has milk, but the sensible child gets no attention).

We pose two research questions. First, do centralised transfers help or hinder the economic growth of these provinces since the tax-sharing reform in 1994? Second, do the regional equality objectives of the centralised transfers come at the cost of economic growth for the whole of China? We use the data—centralised transfers, government spending, taxes and outputs—of 29 mainland Chinese provinces from 1994 to 2018. We estimate four Panel Vector Auto-Regressions (PVAR)—four geographical regions—of centralised transfers, government spending, taxes and outputs for 29 Chinese provinces between 1994 and 2018. Centralised transfer policies are formulated based on these four regions across China. We then simulate the effect on total GDP when transferring funds from rich coastal provinces to provinces of another region, keeping the transfer budget constant.

Here we address the intra-country growth-equity trade-off from redistributive transfers. We add to a growing literature that models the interaction between regional income inequality and growth as in Panzera and Postiglione, (2022), who take a spatial econometric approach EU NUTS-2 regions. China studies often examine the growth (Ma & Mao, 2018) or the equity objectives (Liu et al., 2017) of centralised transfers. We evaluate both by using heterogeneous panel VARs by regions that jointly model the dynamics of the fiscal variables (provincial spending and centralised transfers), taxes and output. Elsewhere, Kyriacou et al. (2017) examine the joint determination of fiscal decentralisation, regional income inequalities and the quality of government for a panel of 23 OECD countries in simultaneous equations models. Similarly, Sorens (2014) examines whether fiscal federalism promotes regional inequality with an empirical analysis of primary sub-national jurisdictions in 25 OECD countries. To our knowledge, no studies have examined the aggregate growth effects of transfers.

Fan et al. (2020) look at the effects on regional inequality and growth but not aggregate growth. Yang et al. (2021) evaluate the cost of transfers in terms of aggregate economic growth, but they use a theory-first approach. We here use a data-first—a model agnostic approach. Like in this paper, Qiao et al. (2008) also look at the effects of decentralisation on aggregate growth and regional inequality. However, they examine the policy regime of decentralisation (1985 - 98) before the centralised tax-sharing reform (1994-). Consistent with their finding that re-centralisation costs growth, we highlight the heterogeneous effects on provinces across regions.

This paper also connects to the issue of political and fiscal centralisation on economic growth and inequality. Ezcurra and Rodríguez-Pose (2013) find no association between political decentralisation and economic growth but a positive association with regional disparities; the latter finding is consistent with the fiscal decentralisation and regional inequalities patterns within China. In contrast, using data for 21 OECD countries in the years following the Great Recession, Beramendi and Rogers (2020) find that fiscally decentralised nations saw lower redistribution and lower interregional inequality. Relatedly, Goodspeed (2020) finds that fiscally more centralised economies show a more positive response to intra-country social protection expenditures, which supports the assignment of redistribution function to the central government. This finding aligns with our study here, where centralisation increases redistribution within China. We examine its effects on growth and inequality, where the trade-off depends on geography. Our contribution adds to the economic geography perspective of Krugman (2020), and McCann (2020) that evaluates the trade-off between growth and equity of intra-country transfers.

Studies have looked at the heterogeneous effects of transfers by type (Huang & Chen, 2012) but assume that transfers have homogeneous economic effects

across provinces. This is unlikely given the heterogeneity of provinces across China —geography, topography, and comparative advantages—and we have found that the transfer multipliers—the cumulative effects of the transfer on the economy—are highest in the middle provinces, followed by coastal, western and northeast provinces. The population-weighted average of the multipliers is consistent with the estimates in the literature (Li & Zhou, 2021); our paper unmasks the heterogeneous effects of transfers across the four regions of China. Using more disaggregate data (county level), Gao et al. (2022) find that rural income inequalities are clustered at the province level, and the unequal regions are geographically gathered.

Using the heterogeneous estimates, we simulate a one yuan transfer from the coastal to other provinces and weigh the net effects on output with population weights of the giving and receiving provinces. Centralised transfers reduce income inequality in two cases—from coastal to middle and western provinces. It narrows provincial income dispersion at the cost of aggregate growth. Because of higher transfer multipliers in the middle than the coastal provinces, transfers to it reduce dispersion and raise aggregate growth. The northeast provinces are an odd case —due to estimated negative transfer multipliers in the northeast provinces, transfers worsen regional inequality and cost aggregate growth. Whether the estimates reflect exogenous impulses —if two identifying assumptions are met, which we describe in the text—or endogenous responses we cannot be sure, it is likely a combination of both. Some evidence supports our findings that state-owned zombie enterprises financed by centralised transfers crowd out private enterprises in northeast and western provinces (Shen & Chen, 2017), corroborating our results of low and negative multipliers in the provinces of those regions.

The literature has studied the role of human capital and amenities in narrowing regional disparities (Chung et al., 2020; H. Song et al., 2016) and promoting

innovation (C.-H. Yang & Lin, 2012) by learning from openness to trade. Similarly, Crane et al. (2018) explore how special economic zones could be used to reduce regional disparities. Cui et al. (2020) study province-level differences in attracting and retaining foreign direct investments and multinational enterprises; they find both are drawn to regions with favourable economic conditions and low state intervention. The centralised transfers in our paper are used to finance amenities and state-owned enterprises, which can explain the regional differentials based on the above pathways.

This paper proceeds as follows. The next section describes the background of the centralised fiscal transfers following the fiscal reform in 1994 and reviews the literature. Section 3 describes the data. Section 4 describes the econometric modelling and computations. Section 5 presents and discusses the results before concluding in Section 6.

2. Context and Literature Review

Mainland China is made up of 31 administrative provinces. We follow official thinking— the *Overall Strategy for Regional Development* (16th CPC National Congress released in June 2011)—to group provinces into four regions (Figure 1). The literature has also grouped provinces by regions in studying economic convergence and income inequality in China (Luintel et al., 2020; Sicular et al., 2020; Xie & Zhou, 2014; Zhang, 2021). The provinces in each region are:

- Coastal (10): Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan
- Northeast (3): Jilin, Heilongjiang, Liaoning
- Middle (6): Shanxi, Anhui, Jiangxi, Henan, Hubei, Hunan
- West (12): Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang

The regions capture heterogeneity across provinces in formulating regional developmental policies. This grouping recognises the broad homogeneity of the provinces' geographical, resource endowment and developmental strategies within each region. The coastal region is the wealthiest and the first to benefit from the opening-up policy; it leads in finance, shipping, international trading and technology. The northeast region concentrates on heavy industry, raw oil, auto and steel production. The middle region leads in food production and transportation. The western part is the least developed but leads in chemicals and energy; it suffers however from frequent environmental shocks.

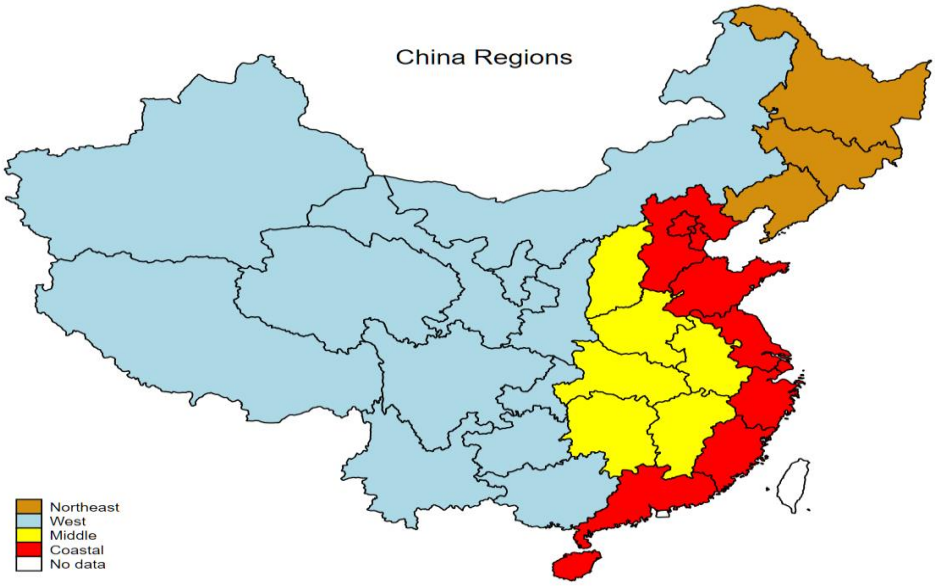


***Figure 1**: The Four Regions of China*

Notes: This figure shows the four regions in China according to the *Overall Strategy for Regional Development* http://www.gov.cn/node_11140/2006-03/18/content_230135.htm.

Before the 1994 tax revenue centralisation policy, fiscal systems were highly devolved to the provincial government level. Further reform in 1988, *cái zhèng bāo gān* (fiscal contracting), gave greater powers to local governments that favoured efficiency over equity, leaving the revenue sharing to be negotiated with the central government (Zhao, 2009). The revenue-sharing transfer system

was softly managed with little legal and binding institutional backing. Described as "the more you cry, the more you get," every province, rich or poor, would lobby the Ministry of Finance in Beijing. While this policy injected vigour into local development, the arrangement favoured the coastal provinces because of their superior political leverage (Shen et al., 2012). It is generally accepted that fiscal decentralisation boosted growth significantly and widened fiscal resource inequality (Qiao et al., 2008). The period from 1978 to 1994 saw the coastal region grow rapidly, leaving the rest of China behind. Table 1 shows the ratio of real GDP *per person* of a representative province in one of the four regions examined relative to Shanghai, the richest province-level municipality. The coastal provinces had strongly pulled away from the middle, northeast, and western provinces.

Table 1: Ratio of provincial real GDP per person to Shanghai province.

Province	Region	1978	1994	2006	2018
Guangdong	Coast	0.15	0.31	0.31	0.40
Henan	Middle	0.09	0.12	0.13	0.23
Jilin	N. East	0.15	0.18	0.17	0.30
Sichuan	West	0.11	0.13	0.13	0.24

Source: Wind Database

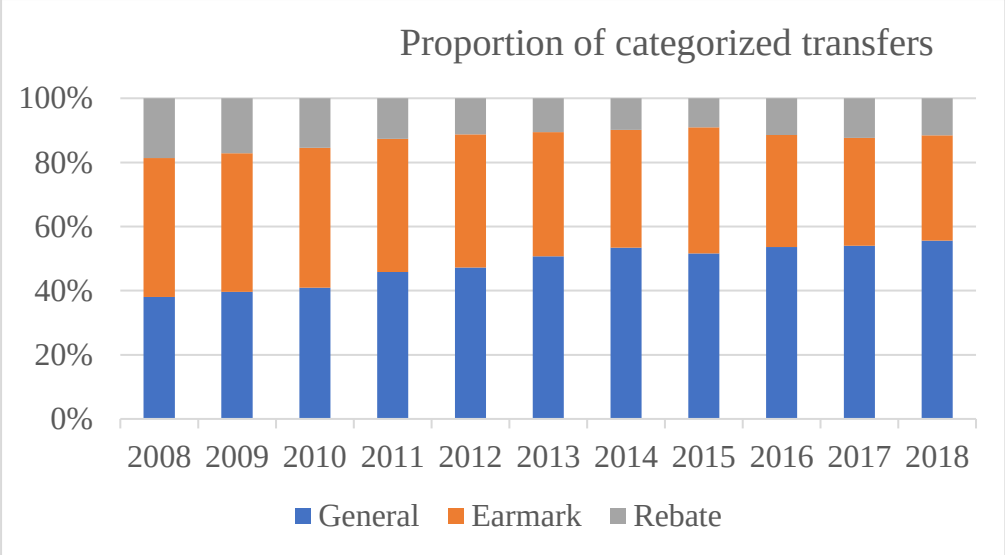
Notes: This table picks a representative province from each region and compares it with Shanghai, the richest province by income per person. Source: Wind Database.

The reform of *fēn shuì zhì* (tax assignment) in 1994 addressed the shortcomings of falling central tax revenue and widening regional disparity. It strengthened the macroeconomic management of the centre. Consequently, most tax revenues were gradually centralised but provincial spending remained within the remit of provincial governments. This created a vertical imbalance: the central government enjoys most of the revenue but less spending responsibility,

whilst the opposite is true for the provincial government. Whilst tax revenues become centralised, provincial spending remains decentralised.

Although we model the effect of total transfers, there are three types: general transfers, earmarked transfers, and tax rebates. First, general transfers—also known as discretionary transfers—fill the gap between provincial expenditure and taxes and is the primary reason for centralised transfers. To date, general transfers remain the largest category of transfers (>50% in 2018). Second, the earmarked transfers are stipulated projects by the central government, including compulsory education, environmental protection, and agricultural expenditure. Third, tax rebate—the smallest category (12% in 2018)—acts as an incentive bonus: the higher the local taxes collected, the higher are the centralised transfers refunded from the central to provincial governments. Figure 2 shows the evolution of the transfer types. The widening gap between local government spending and revenues occupies an increasing share. Notably, the proportion of tax rebates—that reward local revenue productivity—has been falling.

***Figure 2**: Composition of Transfers 2008-2018*



Notes: We average the transfer types across the provinces. Source: Wind Database

We can distinguish the literature between studies on the growth and equalising effects of centralised transfers. Guo et al. (2016), and Wang et al. (2020) examine the growth effects of fiscal transfers. Ma and Mao (2018) find that a fiscal decentralisation reform boosts local economic growth through a lower tax burden on firms and higher infrastructure spending. Those who argue that centralised transfers failed to contribute to regional convergence among others include, Dong (2013), and Ma and Ren (2017). While Zhao and Fu (2017) argue that it had a marginal effect, others (for example Gong & Li, 2016; Tu, 2013) find a significant equalising impact. In contrast, Song (2013) finds that fiscal decentralisation, greater spending autonomy, and revenue gathering by provincial governments led to greater regional inequality. Liu et al. (2017) examine the effects of fiscal decentralisation and equalisation at the country-level on intra-provincial inequality in China. They find that fiscal decentralisation between 1995 and 2009 widens regional inequality.

Huang and Chen (2012) differentiate between the transfer types, recognising that there are conflicting forces between the tax rebate and earmarked transfers. They show that the largest equalisation effects come from rebate reduction. Fan et al. (2020) argue that the greater share of centralised tax revenue has disincentivised local governments, leading to lower growth. However, increased centralised transfers reduced interregional income inequality—for urban incomes—and increased growth convergence. Neither study however studies the cost of aggregate output loss for the economy.

This issue is picked up by Yang et al. (2021) who use a Dynamic Stochastic General Equilibrium (DSGE)[2] framework to investigate the role of fiscal

[2] Wang et al. (2020) also use a DSGE framework to explain the responses of government investment, social investment and household consumption across regions to an increase in centralised transfers established in a single PVAR.

decentralisation on regional inequality and growth across the three main regions of China using data from a representative province of each region. Allowing for differential effects from tax rebates and equalisation transfers, they find that higher transfers ease fiscal pressure on local governments, and lower transfers lead them to raise non-tax levies on businesses, which affect the enterprise environment of the region, contributing to regional productivity divergence.

3. Data

We use data—government expenditure, centralised transfers, taxes, and GDP—for 29 mainland Chinese provinces (excluding Tibet and Xinjiang) from 1994 to 2018. The Data Appendix details the sources of each variable. We decompose provincial government expenditure (*GOV*) into centralised transfers (*TR*) and the residual, which we denote as internal government expenditure (*IGE*):

$$IGE_t = GOV_t - TR_t \qquad (1)$$

Table 2 shows the unweighted province averages for each fiscal variable (% of GDP) by each region for the sample. While coastal provinces generated the highest tax revenue, centralised transfers remained constant as a proportion of income. Centralised transfers, however, increased more than income in other regions. They grew in the northeast and middle provinces, albeit not as steep as in the western provinces (see Figure 3).

Table 2: Regional fiscal components

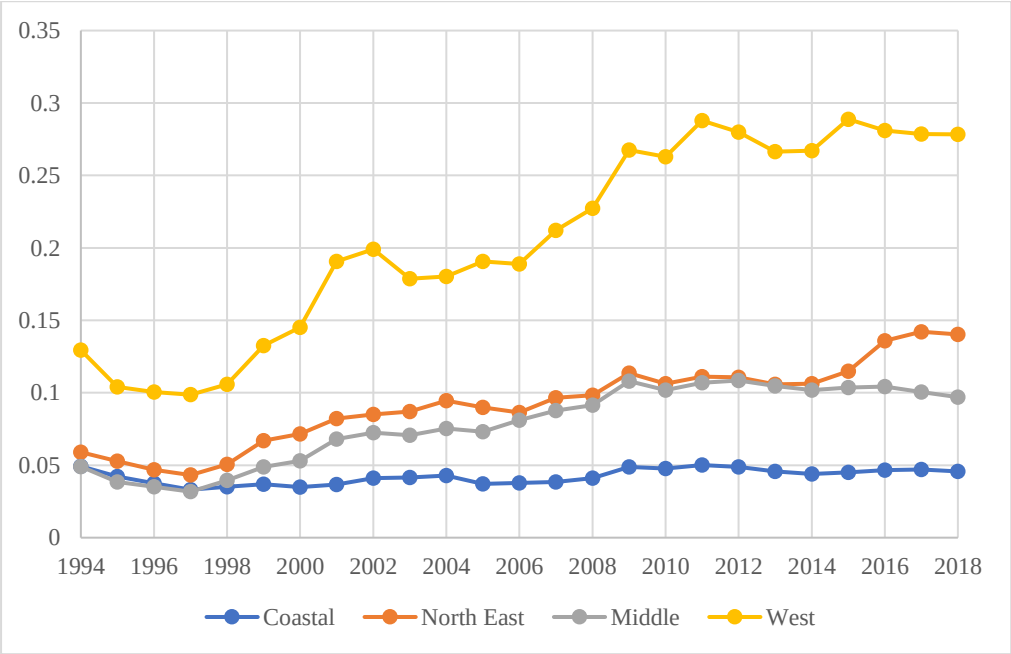
Variable	Region	1994	2018	Mean	S.D.
TR(%)	Coastal	4.9	4.6	4.2	0.5
	North East	5.9	14.0	9.2	2.8
	Middle	4.9	9.7	7.8	2.6
	West	13.0	27.8	20.6	6.8

IGE(%)	Coastal	3.1	14.8	9.1	3.6
	North East	3.3	10.9	7.2	2.2
	Middle	3.5	12.2	7.2	2.8
	West	4.6	14.3	8.6	3.6
TAX(%)	Coastal	11.5	22.9	18.3	5.1
	North East	10.9	12.9	11.6	1.3
	Middle	8.1	13.7	10.6	2.4
	West	12.3	16.5	13.3	2.7
GDP78	Coastal	2851.6	21749.5	10501.7	6236.7
	North East	1650.2	13858.2	6365.9	4179.5
	Middle	989.8	10098.3	4184.0	2901.3
	West	968.4	9643.5	4003.4	2824.4

Source: Author estimates

Notes: This table presents the beginning and end of sample values for regional averages of fiscal variables relative to incomes across provinces. Source: Author estimates.

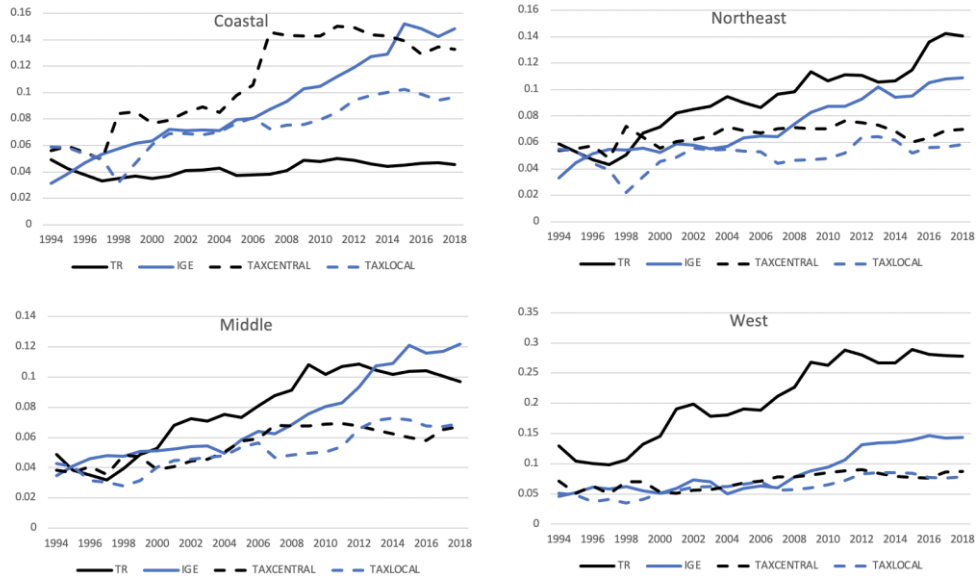
***Figure 3**: Transfers-to-GDPs across Regions*



Notes: The regional figures are averages of the transfers-to-GDP across provinces in each region.

Figure 4 distinguishes taxes retained and remitted to the central government, revealing the coastal provinces as the cash cow for the remaining provinces of other regions. Coastal provinces send more taxes to the central government than the transfers they receive. The opposite is true in other regions. In coastal provinces, centralised taxes rose sharply in 2007 before stabilising, but transfers remained flat as a share of income. In other provinces, centralised taxes rise moderately while transfers rise faster.

***Figure 4**: Transfers Received from Central versus Taxes Remitted to Central*



Notes: This figure compares how much is received from the central government (TR) with how much is remitted to the central government (TAXCENTRAL).

Internal government expenditure—not financed by transfers—rose fastest in the coastal and middle provinces. Still, fiscal expenditures were driven by centralised transfers in the northeast and western provinces (Figure 5). Until 2013, centralised transfers dominated fiscal spending in middle provinces, but internal expenditure overtook centralised transfers that fell moderately. The underdeveloped state of the western provinces limits the scope for extracting

either centralised or local taxes, and internal government expenditure rises only moderately.

[Insert Figure 5 about here]

Figure 5*: Centralized Fiscal Transfers versus Internal Government Spending*

Notes: This figure compares fiscal spending financed by the central government (TR) with fiscal spending not financed by transfers (IGE).

4. Econometric Modelling and Transfers Multipliers

4.1 PVAR

We use a VAR to model the dynamics of centralised transfers, internal government expenditure, taxes, and real GDP. We recognise these variables are endogenously determined therefore use the unexpected shocks to centralised transfers to tease out exogenous impulses. The endogenous variables are akin to the three-variable government spending VAR of Blanchard & Perotti (2002) but here we separate government spending into centralised transfers and internal government expenditure and thus have an additional variable. We identify the centralised transfer shocks by ordering centralised transfers as the first variable in the VAR via the Cholesky decomposition on the covariance matrix of the residuals. The identifying assumption is that the province-level expenditure does not respond to the rest of the endogenous variables within each year. This is plausible because centralised transfers are pre-determined at the beginning of each fiscal year or the calendar year (Shen et al., 2012). Zhang (2020) uses a similar identification assumption to identify local government spending shock.

Although centralised transfers are predetermined, if the government has expectations about shocks that the model does not predict, we would capture both the exogenous and endogenous responses of centralised transfers. The endogenous response could be that when the government anticipates an economic decline in certain provinces, the government will increase transfers to support the economy. If expectations cannot be formed from history, we cannot rule out the possibility of the endogeneity issue, which dodges any policy tool (Ramey, 2019).

Given the short time series (25 years), estimating a 4-variable VAR for each province may produce unreliable estimates. We, therefore, group the provinces into four regions in line with centralised transfer policies described in section 2. We estimate four panel VARs for provinces of each region. Pooling the observations by regions strikes the best balance between efficiency and bias reduction. It is more efficient than province-level VARs but probably avoids some of the omitted variable bias risked by a single, pooled PVAR for the whole country. We validate the groupings of the provinces empirically. We use the Schwarz Bayesian Information Criteria (BIC)[3] to select a model from four PVARs, three PVARs—three regions as in Luintel et al. (2020)— and one PVAR (transfers have homogeneous effects across twenty-nine provinces). Four PVARs have a much lower, i.e., better BIC (-39.20) than the one PVAR (-10.58; See Table A2 in the Appendix)

Consider the period 1994 - 2018, and t denotes the year. We have four regions, $q = 1, 2, 3, 4$. For provinces $i = 1,2, \dots, 29$, allow the parameters to vary over regions but not provinces in four PVARs of the endogenous variables—log

[3] The trade-off between bias and variance is central in econometrics. Adding parameters reduces bias but increases variance. The model selection criteria consider both fit and parsimony (having fewer parameters). We use the Schwarz Bayesian Information Criteria (BIC), which selects a more parsimonious model than the Akaike Information Criteria (AIC) (Smith and Fuertes, 2020).

centralised transfers (*TR*), log internal government expenditure (*IGE*), log total taxes (*TAX*) and log output (*GDP78*) [4]

$$y_{it} = \sum_{k=1}^{p} \mathrm{A}_k^q y_{it-k} + \alpha_i + \lambda_t^q + u_{it} \tag{2}$$

where y_{it} is $(TR,\ IGE, TAX, GDP78)'$, A_k^q(s) are the matrices of VAR(p) coefficients, α_i is the province fixed effects, λ_t is the time fixed effects and u_{it} is the error term. α_i captures time-invariant differences across provinces whilst λ_t captures the common factors to the provinces over time. The information criteria (AIC and BIC) selected a two-lagged PVAR with both province and time fixed effects against its restricted versions. A two-lagged VAR in log-levels would nest both the stationary and non-stationary data.

The PVAR can be thought of as a reduced form representation that which describes the contemporaneous relationship between the endogenous variables but is consistent with more than one structural model (X. Yang et al., 2021). Transfers may be based on *expected* future GDP and the provincial governments may form expectations based on what they receive in the previous periods. The PVAR framework is consistent with a rational expectations model of transfers based on expected future GDP as well as an adaptive expectations version and is agnostic about the underlying model structure. Expected future GDP conditional on current or past information can be expressed as a time-series representation of past values of which the PVAR is a special case. The novelty of the PVAR relative to a structural model is its data-first approach; and it accommodates both stationarity and non-stationarity data, when shocks could change the steady states of a model whereas a linearized model—typical of the

[4] Xinjiang and Tibet have negative values of IGE in some years so we exclude these two provinces, Negative values of IGE implies that the centralised transfers exceed the total provincial spending (GOV) that could be saved and spent in the subsequent years.

DSGE model approach—is stationary therefore only considers deviation from the steady states (Pesaran & Smith, 2018).

4.2 Province-level transfer multipliers

From the VAR representation on (2), we could write it as an infinite order Moving Average (MA) representation:

$$y_{it} = \sum_{j=0}^{\infty} \Phi_j^q u_{it-j} \tag{3}$$

where Φ_j^q (s) are the matrices of moving average coefficients, and equation (3) is the basis of the Generalized Impulse Response Function (GIRF) (Koop et al., 1996).

We consider a standard deviation shock to log centralised transfers in the system and collect the GIRF of log output and log centralised transfers over the horizon, h, to compute the transfer elasticity. The policy-relevant multipliers, i.e., the cumulative fiscal multipliers (Mountford & Uhlig, 2009; Ramey, 2019) that cumulate the bang over time for each buck are calculated and we scale the cumulative transfer elasticities by the average output-to-transfer within a region to obtain the cumulative transfer multipliers, m_{ih}^q.

$$m_{ih}^q = \frac{\sum_{h=1}^{n} dGDP_{ih}{}^q}{\sum_{h=1}^{n} dTR_{ih}} = \frac{\sum_{h=1}^{n} d\log GDP_{ih}{}^q}{\sum_{h=1}^{n} d\log TR_{ih}} \times \frac{\overline{GDP_{\iota t}}^q}{TR_{\iota t}} \tag{4}$$

The transfer multiplier varies over regions but not provinces. This construction goes towards answering the first research question.

4.3 The Aggregate Output Cost of a Transfer from Coastal to Other Provinces

The second research question asks whether transferring funds from coastal to other provinces, keeping the aggregate transfer budget unchanged, would reduce the size of the entire economy. What happens if the transfer equations were shocked in coastal and middle provinces (same but opposite units) with no other changes? We compute the impact on total GDP by weighting the provincial effects, i.e. the transfer multipliers of both the transferring and receiving provinces with the population weights in each region, respectively:

$$\Delta GDP = -(m_{ih}^{q=1} \times popweight_{it}^{q=1}) + m_{ih}^{q=2,3,4} \times popweight_{it}^{q=2,3.4} \quad (5)$$

Table 3 shows the population weights below. There is a notable increase in the share of the population in the Coastal region from other regions, with 0.33 in 1994 and 0.38 in 2018.

[Insert Table 3 about here]

Table 3: Population Shares of Each Region

Undertaking a policy simulation on an empirical model that fails to separate behavioural responses from policy responses faces the full force of the Lucas (1976) critique. The critique will apply if the exercise we consider induces changes in parameters or expectations. Still, we argue that it is a remote possibility given the marginal change we consider here. There is limited evidence of the Lucas critique except for a major global regime shift (Alogoskoufis & Smith, 1991)[5].

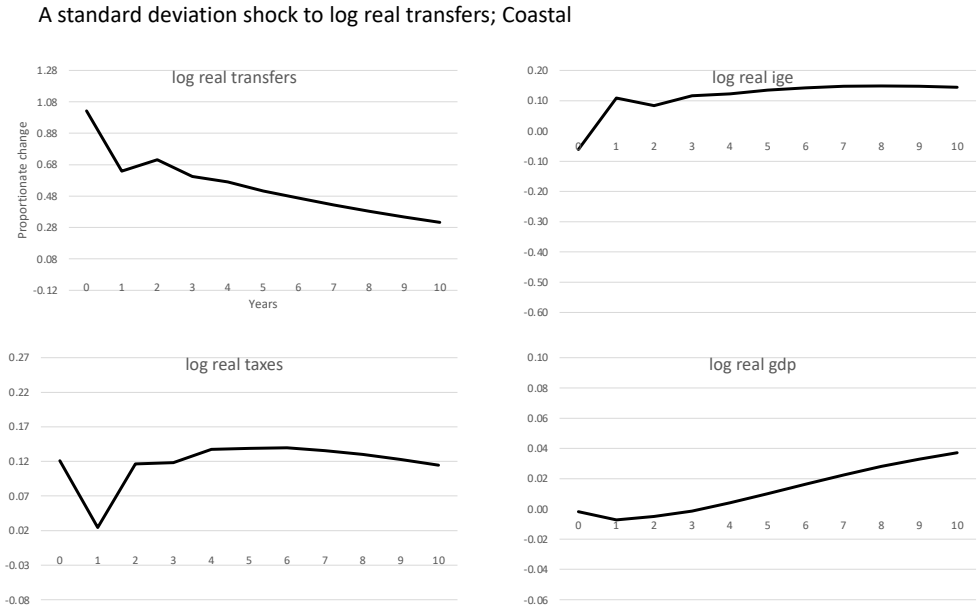
5. Results

How does output respond to a standard deviation shock in centralised transfers? The middle provinces react positively the strongest, but the northeast provinces react negatively (see Figure 6). The reactions are statistically different from

[5] See Rudebusch (2005) for U.S. monetary policy rules and Smith (2009) for the European Monetary Union.

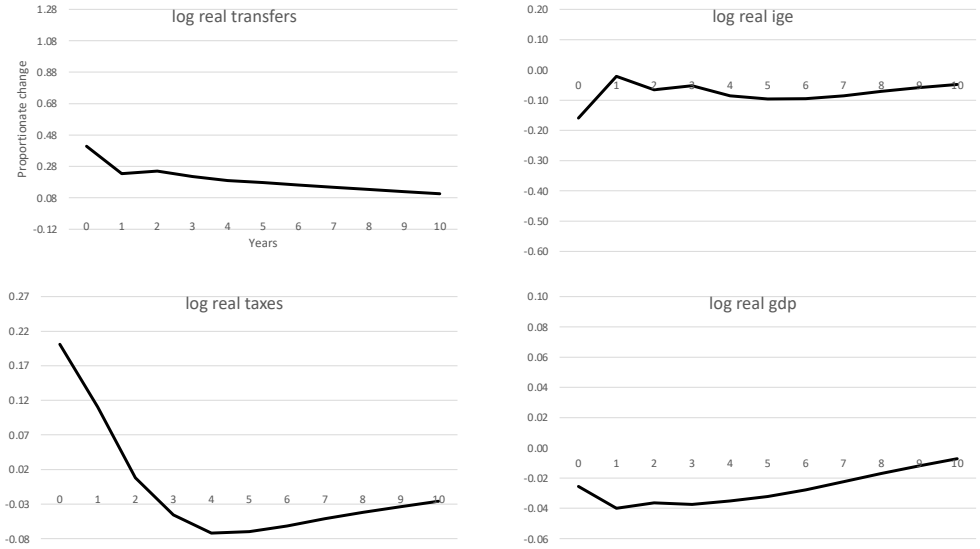
zero. The output responses are smaller in the coastal and western provinces (statistically different from zero in the medium run for the coastal provinces but insignificant from zero for the western provinces).

Figure 6: *Estimated Impulse Response Functions for a Shock to Centralized Transfers*



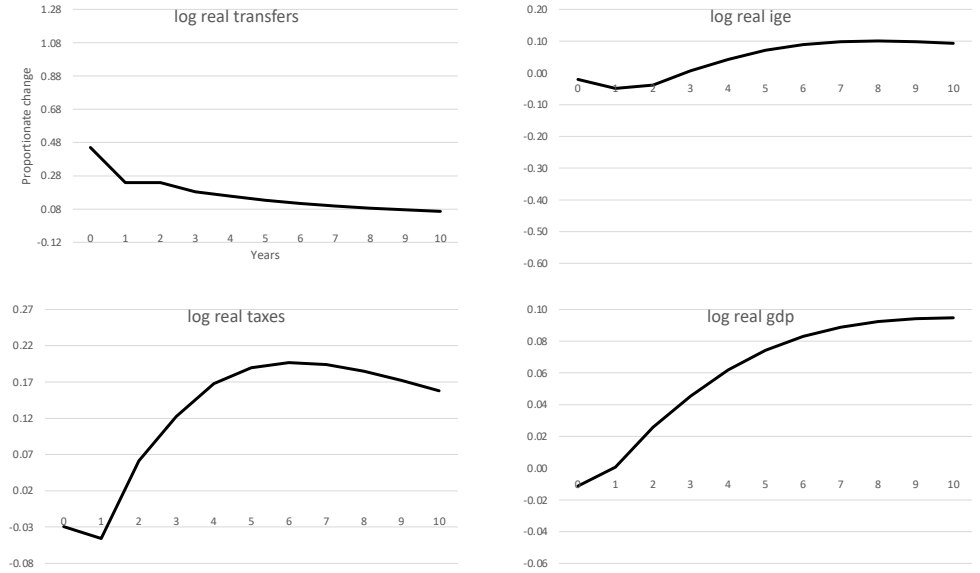
Northeast

A standard deviation shock to log real transfers; Northeast

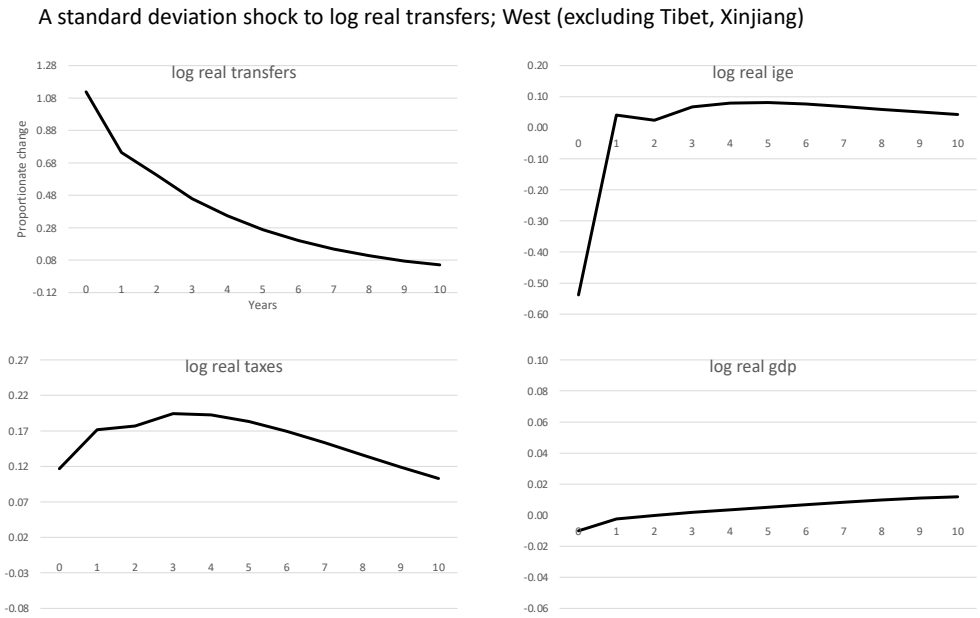


Middle

A standard deviation shock to log real transfers; Middle



West



Notes: This figure plots the impulse response function to a standard deviation shock in centralised transfers in the province of each region, based on the log-level functional form (68% confidence bands).

How much bang for each buck does a centralised transfer create in the provinces of each region? The impact multiplier is negative across four provinces groups (see Table 4). However, the cumulative fifth-year multiplier is positive for the middle provinces, and the cumulative tenth-year multipliers are positive, 0.54, 3.95 and 0.02 for the coastal, middle and western provinces, respectively, but negative for the northeast province, -1.48. In the coastal provinces, as the government sector—financed by centralised transfers—expands by one yuan, the non-government sector shrinks by about half a yuan, so the net effect is half a yuan. In the northeast provinces, as the government sector expands by one yuan, the non-government sector shrinks by more than one yuan, so the net effect is negative. In the middle provinces, as the government sector expands by one yuan, the non-government sector expands by more than that, so the net effect is 3.95 yuan. In the western provinces, as the government sector grows

by one yuan, the non-government sector shrinks by about the same amount, so the net effect is negligible.

The average effect on the economy of a yuan transfer to one province is shown in the last row of Table 4. This indicates that the aggregate multiplier is greater than unity and is consistent with the multiplier estimates (Li & Zhou, 2021), which includes transfers and local government expenditure. However, their estimates mask the heterogeneous multipliers across regions shown in this study. Centralised transfers generate the biggest bang for each buck in the middle province. It crowds-in the non-government sector in middle provinces but crowds out the non-government sector in other provinces.

Table 4: Cumulative Transfer Multipliers

Horizon (years)	0	5	10
Coastal	-0.04	-0.01	0.54
North East	-0.68	-1.52	-1.48
Middle	-0.32	1.79	4.52
West	-0.04	0.00	0.05

Notes: This table presents the cumulative transfer multipliers on impact, up to the fifth and tenth year, estimated based on the log-level functional form. The national province-level estimate weights four province-level transfer multipliers with the 2018 population shares of each region.

The finding of heterogeneous multipliers across regions and a negative multiplier for the northeast provinces warrants further comment. First, the result of a long-run negative multiplier is not unique in the empirical literature (Auerbach & Gorodnichenko, 2012; Ilzetzki et al., 2013). Furthermore, the economy of the northeast is dominated by an inefficient coal sector that has

suffered strongly from China's opening up. Arguably, transfers support zombie state-owned enterprises on social stability grounds that sustain unproductive sectors[6]. Shen and Chen (2017) find evidence of overcapacity through support for zombie firms in the northeast and western provinces. Tan et al. (2016) show that support for zombie firms worsens over-capacity and crowds out healthy firms.

Second, the middle provinces have transformed their economies from agriculture- to manufacturing-based, where their physical capital per person was the lowest among the four regions (Zhao & Wu, 2018). An increase in transfer-funded expenditure may induce a 'crowding-in' effect on private spending. Third, the social stability motives of transfers to the northeast and western provinces imply that the allocation is welfare driven rather than growth driven. These results raise questions on the mechanisms in which transfers affect output.

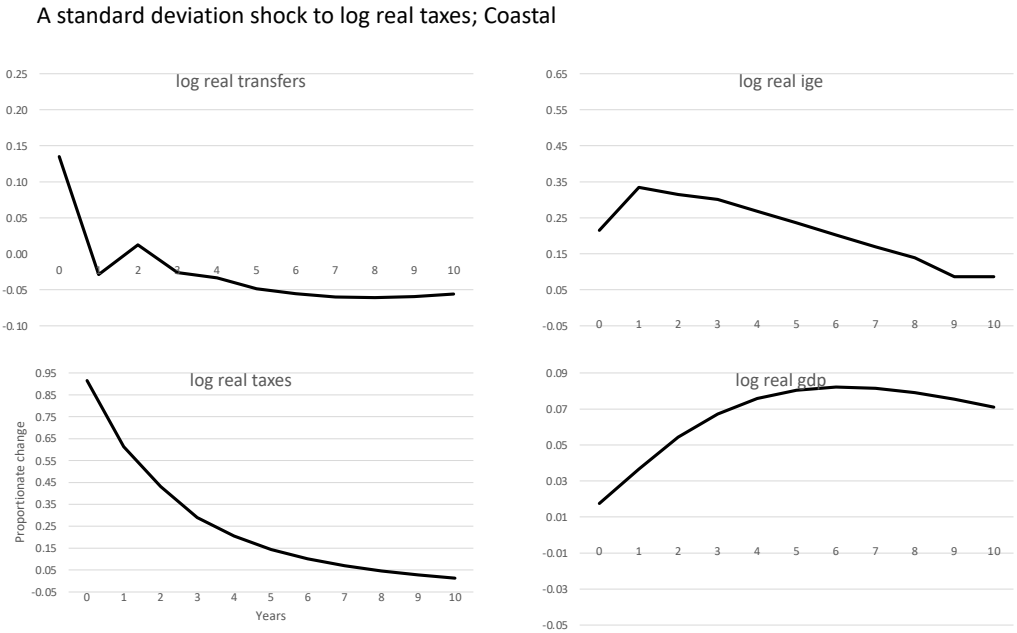
Figure 7 shows the IRFs to a standard deviation shock in taxes. In the coastal and middle provinces, an increase in taxes brings about an increase in internal government expenditure and a reduction in transfers. In the northeast and western provinces, both transfers and IGE react positively. The rise in IGE offsets the fall in transfers in the coastal province, resulting in a slightly positive reaction in GDP. In the northeast provinces, transfers and IGE expand, resulting in a positive GDP reaction. In the middle provinces, IGE increases and offsets the fall in transfers resulting in a zero-net effect on GDP. In the western

[6] We thank a discussant for making this point at a conference. The negative multipliers could also be due to a potential endogeneity issue. If the government anticipates an economic decline, it would increase transfers, inducing a negative coefficient. Output could have been much worse had it not been for the transfers, but the model doesn't have this information, thus output appears less negative from the model than what it would have been, so it is reflecting the endogenous response than the causal effect of transfer on the economy. The estimate could be a mixture of both effects - a displacement of the non-government sector and the endogenous response of the central government in anticipating an economic decline in the northeast.

provinces, transfers and IGE move inversely, but the impact on real GDP is positive and strong.

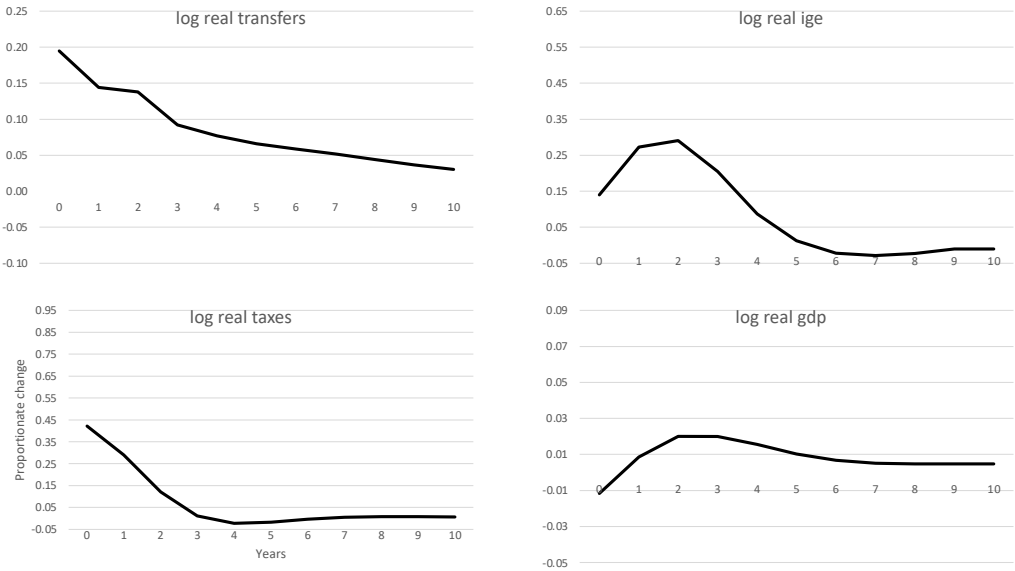
***Figure 7**: Estimated Impulse Response Functions for a Shock to Taxes*
***Figure 6**: Centralized Transfers, Internal Government Expenditure, Taxes and GDP to a Tax shock*

Coastal (one standard deviation shock to log real taxes)



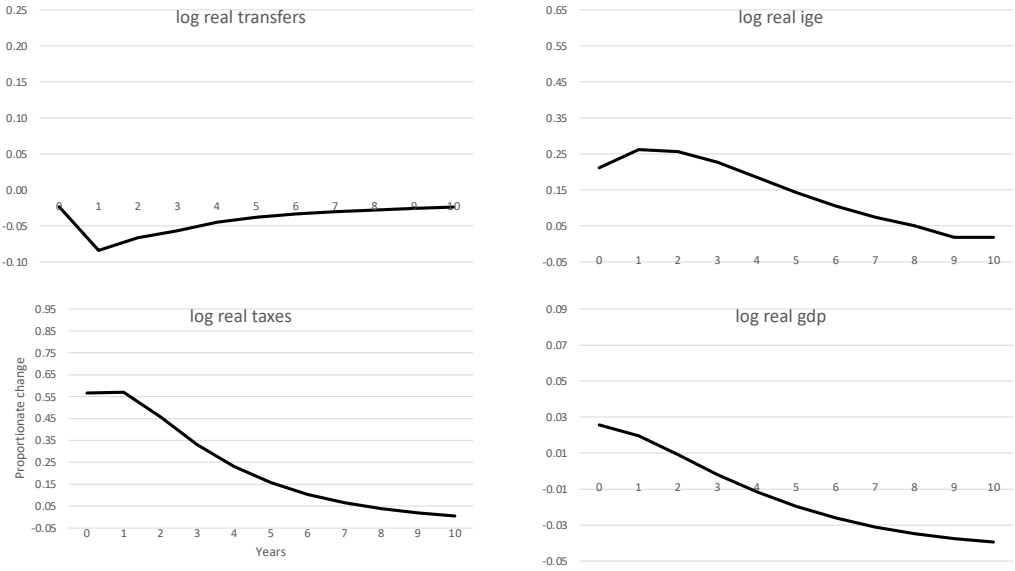
North East

A standard deviation shock to log real taxes; Northeast

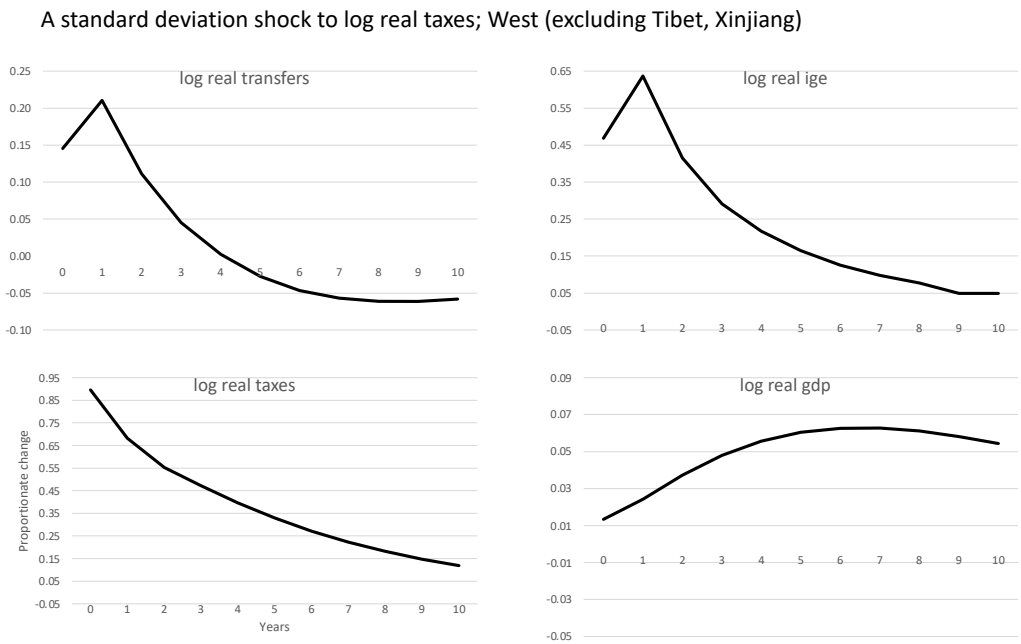


Middle

A standard deviation shock to log real taxes; Middle



West



Notes: This figure plots the impulse response function to a standard deviation shock in taxes in the province of each region, based on the log-level functional form (68% confidence bands).

The secondary question is, what is the effect of an increase in transfers funded by an equivalent increase in taxation in each province?[7] This is akin to a Keynesian-type balanced budget calculation. The IRFs of Figure 7—which show the effects of shocks to tax—reveal the cumulative tax multipliers, which, together with the transfer multipliers, provide an initial period tax-funded increase in transfers from the centre to each province of each region, shown in Table 5.

[Insert Table 5 about here]

Table 5: Cumulative Tax-funded Transfer Multipliers

Notes: The cumulative balanced budget multipliers are obtained by summing the cumulative tax and transfer multipliers. The national province-level estimate weights four province-level transfer multipliers with the 2018 population weight of provinces in each region.

[7] We thank an anonymous referee for raising this point.

Table 5 shows the multipliers from an increase in transfers to a specific province funded by an equivalent initial increase in tax in that specific province. The final row shows the implied multiplier for the aggregate economy, which is larger than the multipliers for the unfunded central transfer in Table 4. The reason for this is because an initial tax shock generates an endogenous positive response in transfers.

We now turn to the second research question; what happens to aggregate output when we simulate a one yuan transfer from coastal provinces to provinces of the other three regions – keeping the aggregate transfer budget the same? In other words, does changing the shares of the cake affect the size of the cake?

Table 6: A one-Yuan Transfer from provinces in the coastal region to provinces of another region

Horizon (years)	0	5	10
North East	-0.04	-0.12	-0.32
Middle	-0.07	0.48	0.99
West	0.01	0.00	-0.19

Notes: We use the tenth-year estimates of the transfer multipliers in Table 4 and the population weights of 2018 in Table 3. The effects on output of transferring a yuan from a coastal province to a middle province, $-(0.54)(0.38)$ plus $(3.95)(0.27)$, yielding 0.84.

Focussing on the tenth year following a shock, aggregate output falls when we redistribute one yuan from the coastal to the northeast and western provinces but rises when we redistribute one yuan from the coastal to the middle provinces (see Table 6). Aggregate output falls from a transfer from the coastal to the northeast provinces because transfer multipliers are positive in the former but

negative in the latter. Inter-provincial income inequality widens because the recipient province shrinks more than the donor province. As elaborated above, we conjecture that transfers to the northeast provinces do not finance productive activity. For the western provinces, centralised transfers cost aggregate output because the coastal provinces have higher transfer multipliers than the western provinces. Inter-provincial income inequality narrows because the donor province shrinks whilst the effects on the recipient province are negligible.

Only in one case does aggregate output rise. Despite the coastal output losses, this is more than compensated by the middle provinces' output gains, owing to higher transfer multipliers in the middle than in the coastal provinces. Inter-provincial income inequalities narrow because the recipient provinces grow whilst the donor province shrinks. Reorganisation of transfers produces an allocative efficiency gain that improves total output.

It can be argued that the failure to model the spatial spillover effects of an increase in transfers across provinces will bias the estimates of the multipliers. We examine the (29x29) correlation matrix of residuals from the PVARs between provinces for each variable (see Table A3 of the Appendix). From 406 possible correlations, 18/406 (0.044) are significant at the 1% for centralised transfers, 12/406 (0.030) are significant for internal government expenditures, 31/406 (0.076) are significant for taxes and 13/406 (0.032) are significant for output. While in principle the spillovers may be theoretically important, in practice they are empirically of second-order importance. Using more disaggregate—city-level—data, Li and Zhou (2021) find no significant spillover effects from the local fiscal multiplier, which includes transfers and internal government expenditure.

It may be argued that our model overstates the true multipliers because government spending-to-output is procyclical (Ramey, 2019a). This is a

recognised problem, and the literature has followed one of two transformations. Hall (2009) and Barro and Redlick (2011), divide both the change in government spending and the change in GDP by lagged GDP. While Gordon and Krenn (2010) divide both government spending and GDP by a measure of potential GDP. Ramey and Zubairy (2018) estimate the potential GDP with a polynomial trend; we follow their approach to re-estimate the models using a de-trended functional form.

The results are as expected. The multipliers diminish significantly (see Table A4 of the Appendix). Using the tenth-year horizon, the estimated multipliers are smaller in absolute values than the log-level case in the coastal, northeast, and middle provinces. The multipliers are similar for the west provinces across both functional forms. The difference in estimates across both functional forms can be seen from the IRFs. In response to a shock in transfers, the output responses are muted for all provinces in the long run with the de-trended case (see Figure 1 of the Appendix) but output responses are significantly different from zero for the coastal, northeast, and middle provinces in the long run with the log-level case. The muted output responses for the western province are similar across both functional forms. More than half of the centralised transfers are spent on welfare spending (social security and employment) and infrastructures such as high-speed trains that have long-run effects on growth and convergence, as Luintel et al. (2020) have found. Therefore, the log-level functional form is more appropriate.

A similar exercise of a transfer of one yuan from coastal provinces to provinces of other regions shows that aggregate output is unaffected. Inter-provincial inequality can be reduced without loss of aggregate output in this case (see Table A5 of the Appendix). Whether China is or is not at its full capacity output is an open research question. But it can be argued that China as a transitional economy (Hong, 2006) does not operate at its full capacity so its long-run

capacity growth rate is yet undetermined[8]. However, it is safe to say that the rapid progress of China's economy in the past three decades has pushed the economy closer to its long-run potential output path and we may view the de-trended multipliers as lower-bound estimates.

6. Conclusions

From Qiao et al. (2008), we know that fiscal decentralisation promoted aggregate growth at the cost of geographical income inequality. From reverse reasoning, they surmise that future reforms that redistribute from the rich to poorer provinces will hamper economic growth. Our findings suggest that equity objectives need not sacrifice growth, but geography matters.

This paper estimates centralised transfer multipliers for mainland Chinese provinces and poses the question, does the objective of equalisation come at the cost of economic growth? We take an empirical approach to this question. Unlike previous studies, we allow for heterogeneous effects of centralised transfers on provincial economies across four regions of China. Using data from 1994 to 2018 across 29 provinces, the evidence provides a mixed picture. When centralised transfers have long-run effects on output, it adds to output in the middle and coastal provinces but subtracts from the output in the northeast provinces. Consequently, re-distributing from the rich coastal provinces to the middle provinces raises overall output—increases the size of the cake—and decreases inequality. But the opposite holds if it were distributed to the northeast provinces. Both inequality and growth worsen – a decrease in the cake's size and a worsening of the cake's share. A distribution from the coastal

[8] Shan et al. (2020) highlight issues in estimating potential output in China when estimating a monetary Taylor rule.

provinces to the western provinces, decreases the size of the cake but improves the share of the cake.

Studies examine the growth or convergence implications of centralised transfers for the regions in question. Here we evaluate a hitherto rarely addressed question, namely the cost of the equity objectives of the centralised transfers in terms of aggregate output lost. We tread on the balance between bias and efficiency; we recognise the heterogeneous effects of transfers across regions but not provinces as it would consume excessive degrees of freedom for a VAR modelling framework given the data.

The strength of the PVAR approach is that it is agnostic about the underlying model that describes the Chinese economy; it establishes stylised facts from which we could search for economic explanations. This paper has established stylised facts on the effects of centralised fiscal transfers on provincial economies and the impacts on the aggregate economy in China. Policy focussed on greater equity of inter-provincial development has growth consequences and favours some provinces. This paper draws attention to this trade-off by quantifying the growth costs of centralised transfers and their differential effects on provinces according to geography. The scope and extent of centralised transfers will always be an issue of the political economy (Mackay, 2001), but recognising the costs makes better political decisions. The Chinese government must balance welfare objectives and with-it social stability, against growth objectives. But our findings suggest that the growth objective need not be sacrificed. Even an egalitarian distribution of one yuan from the provinces of the coastal region to each of the other regions increases output (sum of column 4 of Table 6). A more judicious distribution may be designed to meet both objectives.

Why centralised transfers promote greater equity and growth in the middle provinces, and why it does not work in the western provinces, or worse, why it reduces both inter-provincial inequality and aggregate growth in the northeast provinces, is a subject for further investigation. Yang et al. (2021) argue that rent-seeking or levies on local businesses to fund provincial government spending create a vicious circle of low growth and higher centralised transfers. The same methodology as in this paper could explore the differential effects of general-purpose, earmarked transfers and tax rebates on the local economy. The scope for centralised transfers and locally financed government spending to enhance regional productivity in the way of Barro (1990), has a strong policy resonance and is deferred to future research.

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