The Role of Provincial Government Spending Composition in Growth and Convergence in China

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Abstract

China's development policy since 1978 has differed across regions. With rapid aggregate growth has come widening regional inequality. The 1994 fiscal decentralisation reforms shifted political pressure onto provincial officials to boost local growth through local public investments. These investments affect regional convergence by counteracting regulatory frictions in factor accumulation, and can also determine steady-state growth. However, the effect of public spending allocations across physical and human capital on growth and convergence processes is empirically unexplored for Chinese provinces. We take provincial time-series data on public spending by category, finding local public spending and its components augment convergence rates differently across regions. Spending on education and health contributes significantly more to growth and convergence than capital spending, confirming that the public capital-spending bias is not a local growth-optimising strategy. We suggest a policy of aligning local government promotion incentives to human capital targets to correct local resource misallocation.

Keywords: China, growth convergence, fiscal policy, capital expenditure, public spending composition

JEL Codes: E62, O11, O47, O53

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1. Introduction

It is now over four decades since the reforms of 1978 in China. Between 1978 and 2016, the size of China's economy grew by a multiple of 26, while real GDP per capita quintupled. Accompanied as this growth has been by market-oriented reforms, many have looked for convergence in income per capita among the regions and provinces of China, following the neoclassical prediction that factors flow to poorer areas in search of the highest marginal returns. Compared with cross-country samples, such convergence seems *a priori* more likely among regions within countries, often argued to be more homogeneous in preferences, institutions and technology (Barro and Sala-i-Martin, 1999; Gennaioli et al, 2014).

However, China's rapid growth conceals a widening regional disparity in economic development (Table 1).[1] Our interest is in the role of local public spending in this phenomenon, particularly in the period following fiscal reforms in 1994. Official classification of provinces separates them into three geo-economic regions; Coastal, Middle, and Western (Figure 1). We depict below in Figure 2a how the coastal regions of China have pulled away from the rest since 1970. Another way of thinking about this is to compare average real GDP per capita in each region relative to Shanghai in 1990 and in 2016. This is seen in Figure 3a. Average real GDP per capita in the coastal region moves closer to the Shanghai level in 2016 than in the other two regions. This illustrates the fact that average GDP per capita in the coastal region grew faster than the average for the middle and western regions. Figure 3b shows the ratio of government spending to GDP by each region for 1997 (the year that full fiscal data is available for all provinces) and 2016. The share of government spending in each region rises between 1997 and 2016 but the rise is particularly pronounced in the western region.

Since the 1994 reforms, most public expenditure responsibility lies at the local government level via the heavily decentralised fiscal system. Central government prefers to correct regional inequality through this mechanism rather than by special resource transfers to poor areas, which may appear to reward failure while reducing growth in richer provinces (Dollar and Hofman, 2008; Chen, 2010). Significant pressure to show local growth improvements therefore now falls on provincial officials, and officials in poorer regions are challenged to enhance local growth and facilitate catch-up through their spending decisions.

In this paper, we investigate the importance of local government spending in the dynamics of *beta*-convergence ('catch-up') in real income per capita growth between 1991 and 2016 for 31 provinces in China. We ask two related questions about club-convergence in China. First, does local fiscal expenditure help or hinder growth and convergence, if indeed it plays a role at all? Second, what type of public spending has had the greatest effect on growth and convergence rates? We have not discovered other studies that do this for China at the province level.

In a modified Barro and Sala-i-Martin (1992) framework, we allow a role for provincial government spending in dynamic growth and convergence. We further examine whether this role differs across different categories of spending and across three geographical regions of

[1] While real income per person grew at an average rate of 9 percent annually between 1978 and 2016, the growth rates of the fastest- and slowest-growing provinces were 10.9 per cent and 7.2 per cent respectively.

China, looking for evidence of regional convergence clubs in terms of club-specific steady states and convergence rates.

Our hypothesis is that government spending counteracts frictions in the accumulation of diminishing returns factors driving convergence in the Neo-classical growth model (cf. Gennaioli et al., 2014). In China, insufficient market incentives slow private sector investment-driven capital accumulation within the province, while restrictions on cross-border capital movements slow convergence through capital seeking higher returns. Such frictions are both alleviated by provincial government spending, both overall and targeted towards certain types of investment. Particularly interesting is spending on education and healthcare, i.e. human capital investment[2]. Many studies have investigated the regional or cross-country income convergence effects of migration barriers restricting human capital flows (e.g. Delogu et al, 2018). Regulatory restrictions on worker movements (*hukou*) undermine human capital mobility within China (Cai et al. 2002). Public investments in human capital accumulation *in situ* therefore become more important in supporting regional convergence in the particular context of China.

We also give a role to provincial government spending as a steady-state determinant of dynamic growth, following the endogenous growth literature (Barro, 1990; Futagami et al, 1993). This is appropriate for China's managed market economy with provincially decentralised spending.[3] The still-significant share of the public sector in China's provincial economies make public resource allocation a key consideration for the supply side.

A key contribution of this study is the emphasis on public spending allocation across categories, following the literature on imbalances arising due to political incentive structures. Promotion possibilities for provincial government officials within the Communist party hierarchy are aligned principally with GDP per capita in their jurisdiction (Li and Zhou, 2005; Xu, 2011).[4] Where local officials have discretion, such incentives may affect how funds are allocated across categories. Key public spending categories in this context are i) public investments in physical capital and infrastructure (often referred to as 'capital spending') and ii) spending on public goods like healthcare and education. Time series plots of these key spending categories for our dataset are provided in Figure 8 below (see Section 3.3). The point of contention is whether this second category constitutes government consumption (i.e. 'welfare transfers') or productive investment.

It has been noted elsewhere that if public spending types differ in growth-augmenting potential, the objective of local officials to maximise local growth may deviate from local residents'

[2] Human capital is an intangible asset embodied in workers, reflecting worker quality or capacity in production. These cover (at the very least) basic health and skills. Here we focus on its accumulation via investments in publicly funded education and healthcare.

[3] Tax rate-setting and revenue-allocating powers remain with the central government. However, the spending side of the provincial budget constraint is not strictly tied to local tax revenue.

[4] As well as specific targets such as economic construction (Tsui and Wang, 2004). Party literature suggests that such targets account for 60-70% of performance evaluation, with the remainder linked to factors such as political loyalty (See Xu, 2011).

utility, leading to capital spending biases and welfare-inferior outcomes (Jia et al, 2014; Yin and Zhu, 2012). This literature recognises the welfare value of education and healthcare provision as a consumption good but ignores its productive value, while capital and construction spending are viewed as the most important growth-driver by local officials (Yin and Zhu, 2012, Li and Liu, 2011). There is, however, a strong case for spending on health and education to play a role in China's provincial growth process via the accumulation of human capital (Fleisher et al. 2010). If provincial officials target maximum growth but have in mind the wrong growth model (ignoring the productive value of education and healthcare, for example), public spending allocations across categories could then be distorted even from the optimal growth perspective. Moreover, following Devarajan et al. (1997), if human and physical capital have low substitutability then reallocating public spending towards human capital may be a growth-enhancing policy even if its direct production elasticity is lower.

In this paper we exploit provincial time-series data on public spending broken down by category, and as yet under-investigated in the empirical literature on China, to investigate the role of provincial public spending in convergence and growth. We explore whether, in this dataset, the bias in local public spending towards physical capital represents a dynamic misallocation of resources, with implications for regional convergence and growth. The purpose of this line of inquiry is to recommend an improved set of promotion incentives for local government officials in China that align local spending decisions better with the sustainable growth and welfare goals of the country.

On beta-convergence, our results confirm the consensus finding of regional club-convergence. However, we show that local public spending and, moreover, the composition of public spending affects growth in the short-term and aids convergence with differential effects across regions[5]. We find that so-called 'welfare' spending on education and health contributes significantly more to growth and convergence than capital spending, in line with related work on human capital-driven growth in China (e.g. Fleisher et al. 2010; and Zhu et al, 2014). This undermines the logic driving the well-known bias in public capital spending arising in the pursuit of maximum growth by local officials.

Given the result that human capital spending dominates capital and infrastructure spending in terms of growth and convergence effects, the policy recommendation is a rebalancing of public spending towards the former. In practice, this requires the integration of human capital investment targets into Party promotion procedures.

The rest of the paper is organised as follows. The next section discusses literature on fiscal policy, capital-bias and provincial growth convergence in China. Section 3 discusses data, sigma-convergence and the categories of fiscal spending. Empirical work follows in Section 4, including robustness tests for cross-sectional dependence and alternative clustering (clubs). Section 5 concludes.

[5] For full characterisation of our data on public spending and its composition, see Section 3.3 and Appendix A.

Table 1 here

Figure 1 here

Figure 2a and 2b here

Figure3a and 3b here

Provincial growth-convergence and fiscal policy in China

A large empirical literature investigates growth convergence among countries and regions following the predictions of the Neo-classical growth model (NCGM); for regions, this starts with Barro and Sala-i-Martin (1992). We preface this discussion with a brief recap of the theory.

In the NCGM, since the transitional growth rate depends on the initial income level, poorer economies grow faster than rich economies and 'catch up', provided they share a steady state. This *beta*-convergence follows from diminishing returns to factors of production as they accumulate. However, steady-state determinants including TFP endowments may vary across economies. Conditional convergence then depends on the distance of each economy from its own steady state. While long-run income per capita will not equalise, the distribution stabilises once all economies reach steady-state if all share an exogenous TFP growth rate. *Sigma*-convergence is the narrowing of the cross-economy income distribution over time, a natural corollary of transitional *beta*-convergence.

It may be that a large group of economies do not share a rate of convergence, even conditionally. However, convergence 'clubs' may exist, a club being a subgroup of economies which converge at the same rate to their steady state(s). Conditional factors capture heterogeneous steady states, while club-convergence captures heterogeneity in convergence rates along transition; clubs may also share steady-state conditioning features.

Our focus is on the role of local public spending in driving club convergence, nevertheless, we provide a brief review of empirical literature on provincial income convergence and regional clubs in China which has informed our modelling choices. There is some diversity of findings regarding provincial beta-convergence in China, depending on the samples and methodologies adopted, as well as on the theoretical framework within which empirical results are interpreted. Tian et al. (2016) provide a good overview.

Consensus exists for gradual convergence over the period 1953-1978, prior to the Open Door policy reforms (Maasoumi and Wang, 2008; Weeks and Yao, 2003). The post-reform period from 1978 to the early 1990s then saw widening provincial inequality as regional growth performances diverged due to regionally preferential government policy.[6] The literature has therefore focused on club-convergence post-1978. Until 1990, the fast growth of coastal provinces reduced income dispersion at the top of the distribution, as they approached the

[6] See, among others, Yang (2002), Chang (2002), Wan and Zhang (2006), Andersson et al. (2013), Fleisher et al. (2010), and Pedroni and Yao(2006). We do not focus on the extensive rural-urban gap literature here; for discussion, see (Zhang et al. 2011).

richest provinces from below in per capita level terms (Démurger, 2001). However, coastal growth rates appear to have accelerated after 1990, prompting strong sigma-divergence across provinces and regions (Figures 3-6). In an augmented NCGM framework, Fleisher and Chen (1997) find beta-convergence in GDP per capita for 25 provinces, 1978-93, conditional on significant regional TFP differences, investment shares and employment growth. They find that foreign direct investment (FDI) and human capital explain much of the large implied coast-non-coast TFP gap.[7]

More recently, Anderson et al. (2013) use time-series decomposition to show long-run provincial convergence over 1978-2009 but find short- to medium-run divergence between coastal and non-coastal provinces. Using entropy measures to investigate convergence in growth rates across provinces and within-time cluster analysis to identify clubs, Maasoumi and Wang (2008) reject nationwide convergence but find convergence clubs for both pre- and post-reform periods for 1953-2003 data. Tian et al. (2016) apply the logt test of Phillips and Sul (2007) and identify two clusters of provinces in contrast to the widely accepted three; for 1978-2012 they find no evidence of convergence for the whole economy but strong evidence of club convergence. Zhang, Fu and Ju (2019) use time-series methods to investigate club convergence in income per capita among the counties of Henan province. To reiterate, our interest here is in the role of public spending and its components in convergence and growth across Chinese provinces[8].

Building on the empirical literature on neoclassical convergence in China, therefore, the contribution of the present study is to consider the role of government spending in that process, exploiting provincial data on public spending overall and by category. First, we propose a convergence-enhancing effect for government spending within a modified NCGM, following a logic similar to Gennaioli et al. (2014). They explore regional convergence and the role of capital movements across regions in the presence of marginal product differentials, adding an exogenous mobility friction varying across economies. Mobility frictions impede capital from accumulating where relative marginal products alone would predict, and therefore reduce the regional convergence speed in GDP per capita. In a panel of 83 countries (1,528 regions), they find evidence for slow regional convergence within-country, due to various proxies for national market institutions and government transfers included as interaction variables with lagged regional GDP.

[7] In a similar framework, Démurger (2001) explains regional disparities in terms of openness, geography, and infrastructure endowments resulting from the pre-reform era, again emphasizing coast-non coast differences. See also Yao and Zhang (2001b) and Choi and Li (2000).

[8] For an application of time-series methods to club convergence in state-local public expenditure across US states for 1957 to 2008, see Mahdavi and Westerlund (2017). The length of our annual dataset on public spending components does not make such an approach viable here, though it is a direction for future work as more data becomes available. Mahdavi and Westerlund (2017) emphasise the importance of local public spending for regional growth and income convergence in the US, the issue we address here for China.

In the context of provincial convergence in China, this mechanism seems relevant; in particular, regional human capital mobility (a convergence-promoting force) is severely restricted by the *hukou* system. We contend that local government spending on education and healthcare would counteract the effect of such frictions, increasing the rate at which economies within regional 'clubs' converge to steady state.

Moving away from the NCGM, if TFP growth rates vary endogenously based on local features or variables then each economy may have a different long-run growth path; even so, they may converge to their own growth path at the same rate as others in their club. However, the implications for the income distribution over time (i.e., *sigma*-convergence) are then less clear. If policy variables are robustly related to long-run TFP growth determinants, reforms can have a significant impact on the long-run distribution.

Since Arrow and Kurz (1970), a strand of growth theory has allowed government investments a role in the production side of the economy such that they affect convergence to steady state, or endogenously determine the long-run growth rate (Barro, 1990). In Barro (1990), government spending is productive (hence a growth determinant) if it enters the production function as an input complementary with private capital, or non-productive if it appears as a consumption good in the household utility function (hence negatively associated with growth via taxation). Devarajan et al. (1997) allow for two or more types of government spending, all inputs to final production and complementary with private capital. A shift in the mix between types of government expenditure affects the long-term growth rate, however. Expenditure types are denoted 'productive' ('unproductive') depending on whether a marginal change in the share of one increases (decreases) the growth rate. The direction depends on initial spending shares relative to their optimal level, which in turn rests on the production substitutability of inputs: a marginal increase in one investment type will not increase growth if its share of resources is already 'too high.' The takeaway for our context is that public spending skewed indefinitely towards one type of capital investment may lead to suboptimal growth outcomes. We address this directly in our model.

Empirical studies on government spending composition categorise public spending into productive and non-productive types. Productive spending generally includes all infrastructure spending and physical capital investment but might or might not include spending on healthcare and education. Several recent studies on the public spending mix find in favour of a growth-boosting effect from reallocation of spending towards education and welfare (Gupta et al. 2005; Gemmell et al. 2014; Fournier and Johanson, 2016), including Bose et al. (2007) who investigate ratios of spending types to GDP in the context of developing economies and find the strongest effects from education spending. However, in China the perception of government spending on healthcare and education as 'productive' is far from universal; physical capital is regarded as the dominant source of China's growth (Yusuph et al. 2007) and public spending on physical capital and infrastructure is still the commonly preferred stimulus. A strand of political economy literature investigates this capital bias in Chinese local public spending (see Jia et al. 2014).

Yin and Zhu (2012) differentiate between two types of government spending (productive vs consumption) in a Barro (1990)-type growth model. Local officials set the share of productive

expenditure to optimise their promotion opportunities which are, in turn, closely linked to the local growth rate. They target maximum economic growth, resulting in a spending bias towards 'productive' capital. The spending misallocation results in a welfare distortion from the local resident perspective, but the strategy is assumed to maximise growth.

In Yin and Zhu's (2012) analysis, spending on healthcare and education is explicitly perceived by the official as government consumption. This perception conflicts with evidence relating human capital investment to provincial growth and convergence, both for developing economies and for China. Such a link may rest on neoclassical-type factor accumulation or on externalities to human capital investments. Fleisher et al. (2010) investigate human capital driven TFP growth and regional inequality in China. In their framework, human capital affects TFP growth both directly (through purposeful innovation activity) and indirectly (via spill over to TFP growth); cf Benhabib and Spiegel (1994). Human capital accumulation can aid TFP adoption and diffusion, hence promoting convergence in TFP and income per capita (Nelson and Phelps, 1966). Fleisher et al. (2010) argue that systematically preferential government policy has created inequality between coastal provinces and other regions; policy projections of direct government investment in human capital in non-coastal regions show significantly reduced inequality. Notably, they find similar effects for direct government investment in infrastructure, concluding that policy can play a significant role in correcting regional inequality.[9]

In this paper, we contribute to a growing research literature on the role of government spending on growth, and growth convergence. We focus on the relationship of local government spending and composition of spending with growth and growth convergence, a question not yet addressed for the provinces of China.

3. Stylised Facts and Data

3.1 Overview

Our regional focus is motivated by past preferential central government economic policy, differentiated by region (Figure 1; see Appendix for province-region list). The clearly-labelled 'Coastal Area Development Strategy' advantaged the coastal region most strongly from 1978 until the early 1990s, when benefits began to extend towards the interior.[10] There is clear evidence that provinces entered the 1990s with regionally distinct endowments of infrastructure, capital inputs, FDI and TFP (Démurger, 2001; Westerlund et al., 2010; Fleisher et al., 2010; Andersson et al., 2013), leading us to expect different long-run growth paths by region. Furthermore, the government's initial clustering of provinces rested on geographical features that lead marginal products to differ significantly by region (Démurger et al., 2002). We therefore adopt the official geographical demarcation of provinces into regions, coastal

[9] Our empirical work is reduced form and may pick up effects of this nature.

[10] Only from 2000 was a Western Development Region Strategy launched, with underwhelming effects on regional inequality (Grewal and Ahmed, 2011).

region 1 being the most developed and western region 3 the least developed. Figure 2, panels A and B, reveals distinct paths for income per capita in the three regions. Figure 2A shows that since 1990, the coastal provinces as a geo-economic group grew faster than the all-province average in terms of real GDP per capita (our calculations reveal that coastal provinces grew by almost 1% faster per annum). Figure 2B shows distinct patterns for the average GDP per capita of the Western and Middle regions relative to average GDP per capita of the coastal region; only in recent years do they start to catch up. *Sigma*-convergence is also discernible by geo-economic region (Section 3.2). Against this regional backdrop, we are interested in whether local government spending policy is related to the growth and convergence rates of provinces or regional clubs.

All data are obtained from a single online source; Epsnet in association with WIND (http://www.epsnet.com.cn/) and manipulated according to instructions in the *Manual of government budgetary accounts reform* of the *Ministry of Finance*, China. Table 2 shows descriptive statistics of real GDP and total government spending as a proportion of GDP by all provinces and regions. Notably, maximum public spending over GDP is above unity in some provinces, particularly in poorer Western provinces such as Tibet. This is partly a scale effect, since transfers from the centre are high in region 3 relative to its low GDP. We discuss the breakdown of provincial government spending by category in Section 3.3.

Table 2 here

3.2 Sigma-Convergence

As a preliminary to our regional analysis of the role of public spending in provincial club *beta*-convergence, we investigate *sigma*-convergence overall and broken down by region. This analysis provides further support for the chosen regional classification and motivates our empirical modelling choices in Section 4.

Though much of the convergence literature focusses on *beta*-convergence, this is well-known not to be a sufficient condition for *sigma*-convergence (Barro and Sala-i-Martin, 1992). Indeed, sigma-convergence is equally interesting as it provides a direct picture of the regional income distribution (Quah, 1993; Friedman, 1992). Following this line of reasoning, we first report the distribution of real GDP per capita across all provinces for the period 1978-2016. Figure 4 plots the year-on-year cross-sectional standard deviation of the logarithm of real GDP per capita across all provinces. Three distinct regimes seem apparent: sigma-convergence from 1978 to the early 1990s, then divergence until 2006, and convergence for 2006-2016. These dates mark significant changes of direction in central government policy: Deng Xiaoping's South Trip in 1992 and the Party Congress in 1993 set in motion reforms to nation-wide institutions to align incentive structures with market socialism (e.g. reforms to fiscal and financial systems and to the state-owned sector), reforms not restricted to coastal provinces. In 2006, Harmonious Society was added as a State Policy goal (Hofman and Wu, 2009), marking a formal acknowledgement of inequality issues. It is likely that this post-2006 policy shift has

manifested through the fiscal decentralisation system[11], and this leads us consider local public spending as a driver of regional growth and club-convergence.

Figure 4 here

Figures 5-7 plot dispersion measures separately for the three regions. These figures indicate clear heterogeneity in growth convergence across regions and within regions over time. Our hypothesis is that province-level government spending plays a role in generating these patterns, and this is the subject of our empirical investigation in Section 4.

Figures 5 – 7 here

3.3 Regional Spending and its Composition:

We now turn to the measures of public spending, its composition and transfers from central to regional government levels. These are the key variables of interest in our study and we focus on their role in provincial growth and club-convergence.

China has a decentralised fiscal system along with a highly centralised political system. On its path to a market-oriented economy, China has gone through a series of reforms to its economic and financial institutions. Fiscal relations between the central and provincial governments have similarly undergone reform, principally to the revenue-sharing rules. Tax revenues were centralised in 1994 with the share of revenues remitted to the centre from the provinces rising from an average of 22.0% in 1993 to 55.7% in 1994 (Jia et al. 2014). Revenue centralisation has left local governments fewer direct resources, while their spending responsibilities have increased. The fiscal gaps arising from this process are plugged partly by transfers from the centre to provincial governments.

Table 3 presents descriptive statistics on government spending as proportion of local GDP decomposed into 'productive' capital spending, and 'welfare' spending (education and health)[12]. Greater detail on this breakdown is provided in Appendix A (Table A2). In categorising fiscal expenditure, we follow the nomenclature often used in the literature on Chinese public spending categories and capital-bias (see Section 2), separating it into 'productive' and 'welfare' categories, with the remainder going on 'maintenance.' Broadly stated, 'productive' expenditure is capital spending; welfare relates to education and health (public human capital investment). The remainder, 'maintenance,' is predominantly spending on foreign affairs, defence and public security. Table 3 also shows the transfers from central

[11] For discussions of fiscal decentralisation and provincial growth and inequality, see Jin and Hou (2005) and Zhang (2006). On the relationship between provincial inequality and growth more broadly, see Wan et al. (2006) and Chen (2010).

[12] The public budgetary account experienced a major reform in 2007. In order to bridge the data of budget items throughout the reform, we follow the instruction in *Manual of government budgetary accounts reform* of the *Ministry of Finance*, China. See further discussion in Appendix A.

government to the provincial governments in the form revenue rebates, which account for spatially redistributive transfers.

Table 3 here

What is clear from Table 3 is the high rate of rebates and transfers from the centre to the Western regions indicating the redistributive policies of the government across space, but also the higher rates of 'productive' and 'welfare' spending partly through higher spending and lower GDP per capita.

Figure 8 (Panels A to C) provides times series plots by region for total spending and for 'productive' and 'welfare' components, all as proportions to GDP. As these plots indicate, capital and infrastructure spending tend to dominate the 'welfare' category for most of the sample.

Figure 8 (Panels A to C) here

4. **Empirical work**

4.1 Econometric specifications

Here we model the short-run growth and convergence effects of total provincial government expenditure and its 'productive' and 'welfare' components. We first estimate a benchmark model of provincial growth convergence with and without regional heterogeneity but excluding fiscal expenditure and composition. In the second stage, we explicitly allow growth and convergence-augmenting roles for total fiscal expenditure and its components at province level, allowing for regional heterogeneity.

Following the basic NCGM, the growth rate of income per capita in transition towards steady state depends positively on the steady state itself (call this x) and negatively on the starting level:

$$\Delta y_i = x_i + \beta y_{i,0}$$

Where y_i is the log of income per capita, and Δ is the difference operator. The steady state depends on the long run investment rates in relevant factors of production presumed fixed over the long-run and on the long-run behaviour of TFP, which may itself have endogenous determinants (including capital externalities; see Chen et al. 2014).[13] The first stage benchmark

[13] Our regression model is a reduced form which may capture effects consistent with several growth models, such as those in which capital spill-overs drive growth or TFP-convergence (Benhabib and Spiegel, 1994; Fleisher et al., 2010). We do not claim to test a specific growth model conclusively, but to provide evidence for a government-spending channel for growth and convergence in China.

model allows for dynamics that may exist empirically but not specified in theory. The basic equation is:

$$\Delta y_{it} = \alpha_0 + \alpha_1 \Delta y_{it-1} + \gamma_1 D_1 + \gamma_2 D_2 + \beta_1 y_{it-2} + \varphi_1 D_1 * y_{it-2} + \varphi_2 D_2 * y_{it-2} + \varepsilon_{it} \quad (1)$$

where y_{it} is the log of provincial ($i = 1, 2, ..., 30$) real per capita GDP, D_1 and D_2 are dummy variables taking a value of unity for regions one (coastal) and two (mid-central), respectively, and zero otherwise; these capture regional differences in steady state growth.[14] The lagged dependent variable captures dynamics. A negative and significant β_1 coupled with insignificant φ_1 and φ_2 imply homogeneous growth convergence across all 31 Chinese provinces. However, statistically significant β_1 , φ_1 and φ_2 such that $\varphi_1 \neq \varphi_2$ imply heterogeneity in convergence across the coastal, middle and western regions. As argued in Barro (2015), the 'Hurwicz bias' associated with fixed effects can bias convergence estimates upwards (cf. Gennaioli et al. 2014). Hence, we avoid fixed provincial effects and use regional dummies to identify coastal and mid-central provinces as separate regional clubs. Exclusion restrictions on these dummy variables and their interactions reduce equation (1) to a benchmark model of provincial convergence. [15]

We can rewrite equation (1) distinguishing steady state factors from convergence effects as:

$$\Delta y_{it} = (\alpha_0 + \gamma_1 D_1 + \gamma_2 D_2) + (\beta_1 + \varphi_1 D_1 + \varphi_2 D_2) * y_{it-2} + \alpha_1 \Delta y_{it-1} + \varepsilon_{it} \quad (1a)$$

To assess the role of total government expenditure and of 'productive' and 'welfare' components in provincial growth and convergence, we augment specification (1) as follows:

$$\Delta y_{it} = \alpha_0 + \alpha_1 \Delta y_{it-1} + \gamma_1 D_1 + \gamma_2 D_2 + \beta_1 y_{it-2} + \lambda_1 E_{it-2} + \lambda_2 E_{it-2} * y_{it-2} + \kappa_1 D_1 * E_{it-2} * y_{it-2} + \kappa_2 D_2 * E_{it-2} * y_{it-2} + \varepsilon_{it} \quad (2)$$

In equation (2), $E_{it} \in (g_{it}, p_{it}, w_{it})$ where g_{it} , p_{it} and w_{it} denote, respectively, total provincial government expenditure and its productive and welfare spending components, all ratios to provincial GDP. We can rewrite equation (2) for ease of interpretation within the growth

[14] Cf Yao and Zhang, 2001b.

[15] The regional dummy variables control for geographical differences as well as conditioning variables commonly used for the pre-1990 period in the literature, which resulted in regionally different endowments of e.g. physical and knowledge capital due to FDI (Démurger, 2001). This model does not allow directly for technological spill-overs between provinces (cf. Kim, 2019). This may be an angle for future work. To an extent, regional dummy interactions should capture spatial effects in the model.

framework $\Delta y_{it} = \widetilde{x_{it}} + \beta y_{it-2}$, where the dynamic steady state $\widetilde{x_{it}}$ of province *i* is composed of a constant shared at the regional level (for regions k=1,2,3) and a variable part depending on province-level government spending (i.e. $\widetilde{x_{it}} = x_k + x_{i,t}$):

$$\Delta y_{it} = (\alpha_0 + \gamma_1 D_1 + \gamma_2 D_2 + \lambda_1 E_{it-2}) + (\beta_1 + \lambda_2 E_{it-2} + \kappa_1 D_1 E_{it-2} + \kappa_2 D_2 E_{it-2}) * y_{it-2} + \alpha_1 \Delta y_{it-1} + \varepsilon_{it} \quad (2a)$$

We thus allow for all three types of government expenditures to exert dynamic growth effects, as well as convergence-augmenting effects[16], following the theoretical discussion of Section 2.[17]

Estimating the effects of these fiscal expenditure variables in turn, a positive and significant λ_1 implies the expenditure measure in question is a relevant steady-state conditioning variable, while negative λ_2, κ_1 and κ_2 support convergence effects. Statistically significant $\kappa_1 \neq \kappa_2$ imply heterogeneous convergence effects of expenditure flows across region-clubs. An additional area of heterogeneity is $\lambda_2 E_{it-2}$, where government spending as a proportion of local GDP will vary for each province. As before, region-specific conditioning constants capture steady-state features shared by club-members (γ_1, γ_2).

4.2 Estimation Methods:

We first apply OLS in a panel framework with clustering to address intra-province error correlation. Although OLS with clustering is simple and intuitively appealing, nonetheless, it leaves the issues of endogeneity and cross-sectional dependence open. The conventional IV (instrumental variable) estimator is consistent under endogeneity if the instruments used are relevant and orthogonal to residuals. It nevertheless becomes inefficient under heteroscedasticity, an omnipresent issue in panel regressions. In this situation, the prevailing popular approach in addressing endogeneity as well as heteroscedasticity of unknown form in a panel is the generalized method of moments (GMM) of Hansen (1982). Pagan and Hall (1983) propose a test of heteroscedasticity valid in IV regressions which helps decide between the conventional IV or GMM estimators. If the Pagan and Hall test suggests heteroscedasticity in the conventional IV regressions, then GMM is preferable. However, instrument relevance and validity are equally pertinent to the GMM estimator. In specifications (1) and (2), the suspect

[16] We emphasise the explanation of friction-reducing effects on broad capital accumulation for the neoclassical convergence effect, though this framework could also accommodate convergence effects occurring in an endogenous growth framework with leaders and followers, via an impact of local government spending on TFP adoption and regional diffusion (see e.g. Barro and Sala-i-Martin, 1997; also discussion in Section 2 regarding human capital).

[17] Our categorisation of public spending includes under 'productive' many types of spending that could potentially have innovation and TFP effects e.g. spending on science and technology promotion. If present, we would expect such spill-overs to boost the estimated effects of productive spending in the regressions.

endogenous regressor is the lagged dependent variable. [18] As a precursor, we employed the conventional IV estimators but ultimately preferred GMM due to significant heteroscedasticity (Pagan and Hall test results available on request).

Two variants of GMM estimators are popular in the empirical panel literature. One is the dynamic panel data (DPD) system GMM estimator (Arellano and Bond, 1991; Blundell and Bond, 1998) which stacks the first difference and level data and uses progressively increasing internally generated instruments to address endogeneity. This estimator is consistent and efficient under certain moment conditions. However, it quickly runs into the problem of instrument glut, compromising its efficiency. Nevertheless, there are ways to truncate the number of internally generated instruments.

The second type is the feasible efficient two-step GMM estimator which, unlike system GMM, uses instruments analogous to that of the generalized instrumental variable estimator (GIVE) but exploit the optimal weighting matrix that minimizes the asymptotic variance of the estimator (see Davidson and MacKinnon (1993) and Hayashi (2000) for discussion). The efficiency gain relative to conventional IV/GIVE estimators is derived from the optimal weighting matrix, over-identifying restrictions, and relaxation of the i.i.d. assumption. A variety of two-step feasible GMM procedures exist in the literature, essentially differing on the methods of computing residual series for the weighting matrix. The most prominent are the arbitrary heteroscedasticity-robust variant (Hayashi, 2000; Davidson and MacKinnon, 1993, p. 599), continuously updated GMM (Hansen et al. 1996), and the feasible efficient two-step GMM with clustering (White 1984, Wooldridge, 2002), all of which produce efficient coefficient estimates and consistent standard errors. Here we employ the system GMM as well as these three feasible efficient two-step GMM estimators, for the sake of robustness. However, we attach more importance to feasible efficient two-step GMM with clustering. Finally, we also assess the robustness of our GMM results to cross-sectional dependence by employing the pooled mean group estimator (PMGCD) proposed by Chudik and Pesaran (2015) and Chudik et al. (2016). PMGCD allows for complete cross-sectional parameter heterogeneity and cross-sectional dependence in panel estimation.

4.3 Results

All three feasible efficient two-step GMM estimators produce very similar results for models (1) and (2) above. The system GMM estimator, on the other hand, produced qualitatively similar parameter estimates but often failed the over-identifying test of instrument validity irrespective of our attempts to truncate the number of instruments. This failure of instrument validity in our dataset compromises the soundness of system GMM estimates. Hence, we focus on results based on feasible efficient two-step GMM with clustering.

[18] Economic theory also guides us that local government expenditure may respond to expected future growth in a feed-forward framework. However, in our specification the fiscal policy measures enter with a lag of two years hence the endogeneity of fiscal measures is less of an issue.

Table 4 presents the first stage regression results. Columns 1 and 3 report OLS results with cluster-robust standard errors across 31 provinces, with and without regional heterogeneity in convergence rates. Columns 2 and 4 report results from the efficient two-step GMM estimator robust to intra-region error clustering and arbitrary heteroscedasticity.[19]

Table 4 here

In Table 4, columns 1 and 2, where all 31 provinces are assumed to converge homogenously, results show slow global convergence; we attach more credence to GMM estimates. The convergence parameter (β_1) is negative and significant. However, allowing for regional heterogeneity in convergence, OLS estimates (column 3) suggest club-convergence for Eastern and Mid-Central regions (in terms of shared steady-state conditions and a distinct convergence rate for club members) but no convergence in the Western region. Our preferred GMM results show club-convergence for region 1 only (column 4). Sanderson-Windmeijer (2015) tests of model under-identification (UIT) and weak identification (WIT) both reject the respective null hypotheses, suggesting that the instrumental variables used are valid and relevant; additionally, the J statistic cannot reject the null of orthogonal instruments. Thus, our efficient two-step GMM estimates pass all the relevant diagnostics.

Overall, the benchmark model reveals a slow but significant convergence across all 31 Chinese provinces when regional heterogeneity is not modelled explicitly. However, once regional heterogeneity is allowed for, we find club convergence only among coastal provinces. No club convergence is detected robustly for regions 2 or 3 in this 1991-2016 sample.

We now turn to the regression results incorporating government spending and its composition (Table 5). GMM estimates in column 2 relate general government spending scaled by GDP positively to growth and indicate that it speeds up convergence. While β_1 is positive and significant, the remaining three convergence parameters associated with government spending are all negatively signed and significant, implying that general government spending reinforces convergence with regional and provincial heterogeneity. This is seen more clearly where the speed of convergence is defined by the term $[\frac{\beta_1+\lambda_2 E_{it-2}+\kappa_1 D_1 E_{it-2}+\kappa_2 D_2 E_{it-2}}{1-\alpha_1}]$, which shows that the heterogeneity is not only region-specific, defined by the geographical club, but also province-specific, defined by the provincial level fiscal expenditure-GDP ratio. Using the above expression, the long-run convergence parameters for 2016 values of total government spending per GDP by province gives regional averages of -.015 for the Coastal region, -.014 for the Mid region, and -.009 for the Western region. This result says that in 2016 the Western region was converging marginally slower than the other two.

[19] Reported results are also robust to continuously updated GMM and the Feasible Efficient two-step GMM Estimator.

Table 5 here

Columns 4 and 6 show results isolating 'productive' spending and 'welfare' spending separately. It is evident that both spending types are related to growth and convergence.[20] All GMM estimates reported in Table 5 pass two diagnostics (UIT and WIT) of model identification. However, J statistic marginally rejects the null of orthogonal instruments for total government spending, whereas it significantly rejects for the productive spending. The J statistic tests for the full set (both included and excluded) of instruments, so does not necessarily pin down the rejection to excluded instruments. Hence, in our context, UIT and WIT are more relevant tests than the J test. The results of Table 5 show that 'productive' and 'welfare' spending contribute to growth convergence, but they also provide insight into the discussion on the relative growth effects of provincial government spending types and the capital bias. Evaluating the estimated effects of 'productive' and 'welfare' government spending at the 2016 values reveals a stronger relationship between real GDP and health and education spending than real GDP and 'productive' capital spending, consistent with the findings of e.g. Ghosh and Gregoriou (2008). The average output elasticity of fiscal spending in the three regions for general government spending is, 1.07, 1.16, and 1.32 respectively and the equivalent elasticity for 'productive' spending and 'welfare' spending is, 1.1, 1.1, and 0.9; and 1.3,1.3, and 2.0 respectively (how these elasticities are derived is shown in the Appendix).

Overall, the results in Table 5 suggest three important findings. There is evidence of geo-regional convergence clubs. First, provinces within each of the three regions as traditionally defined by government appear to share steady-state features, reflected in the estimates for γ_1 and γ_2. Second, there is regional heterogeneity of short-run club-convergence rates, augmented by provincial government spending (λ_2, κ_1 and κ_2). Third, total, 'productive' and health and education spending by local governments all appear to increase the convergence rate in a manner heterogeneous across the three regions. However, contrary to the predictions of models influential among local government officials (see Yin and Zhu, 2012), health and education spending has a stronger effect on both growth and convergence, even over the short-run with the adopted lag-length of two years[21]. Furthermore, total provincial government spending, 'productive' spending and spending on health and education are all positively associated with future growth in provincial real GDP per capita (λ_1)[22].

Moving on to the modelling of the long run, the year-to-year volatility in growth and its drivers is smoothed by taking 5-year averages of available data points to construct five averaged data

[20] Estimating both types of fiscal spending together renders 'productive' spending insignificant due to collinearity. Greater precision is obtained from estimating the effects of each type of spending separately, as reported.

[21] In contrast, Lee et al. (2019) find a positive effect on growth from government spending on capital projects and health but a negative effect from spending on education.

[22] Interestingly, Zhu et al. (2014) argue that the one child policy (OCP) has resulted in greater investment in education and human capital development sustaining China's high growth rate which would be 4% less by 2025 in the absence of the OCP.

points for each variable in each province[23]. Independent variables are constructed similarly. The lag value of log real GDP per capita that captures convergence is taken as the first year of each five-year spell used in calculating the 5-year averages. Table 6 shows the results.

Table 6 here

The Table 6 results again provide robust evidence (across all specifications) for three region-specific steady states to which province club-members converge. Results in columns 1 and 2 for total government spending are qualitatively similar to the results in Table 5. General government spending has a significant province-specific effect on the long-run level of output per capita. Moreover, there is club convergence at regionally heterogeneous rates via the government spending channel. So, the estimated convergence parameters from Column 2 evaluated at the final time-period average are -.08, -.09, and -.06 for the Coastal, Middle, and Western regions.

Although some parameters appear imprecisely estimated vis-à-vis welfare spending and capital spending, nonetheless, results confirm earlier findings that the public sector welfare spending channel is more important for stimulating provincial convergence than public capital spending. Neither spending component exhibits a robust relationship with provincial steady state growth. However, particularly striking in column 6 is the significant presence of provincial convergence, which receives a strong additional boost via welfare spending in region 1. The UIT and WIT test statistics respectively reject the null hypotheses of model under-identification and weak identification. The J statistic rejects the null of instruments validity in column 6 but, as stated above, UIT and WIT are the more relevant tests.

We conduct two robustness tests regarding our results. First, we employ the pooled mean group estimator with cross-sectional dependence (PMGCD; Chudik and Pesaran (2015) and Chudik et al. (2016)) to assess the robustness of our GMM results of Table 5 vis-à-vis cross-sectional dependence and cross-sectional parameter heterogeneity. Second, we assess the main theme of our results that fiscal expenditure adds to growth and convergence for an alternative clustering of regions based on Tian et al. (2016). These results are discussed in the supplementary material. The results broadly support the finding that fiscal spending contributes to growth and augments convergence, but under cross-sectional dependence we do not find regional heterogeneity. The alternative clustering of provinces following Tian et al. (2016) also does not show heterogeneous convergence rates. However, while endogenous regional clusters based on the sample's time series properties are interesting, they do not necessarily reflect the

[23] These data points are 5-year averages to 1997, 2002, 2007, and 2012 respectively, and a four-year average for 2013-2016 for the provinces with available fiscal data before 1997. For Chongqing and Sichuan fiscal data is only available for 1997. This gives a panel of 5x29 plus 4x2 observations in total. The smoothed data is defined such that $X_T = \frac{1}{5}(X_t + X_{t-1} + X_{t-2} + X_{t-3} + X_{t-4})$.

fundamental properties of the data generating process[24]. At least, without a strong theoretical explanation for the clusters suggested in Tian et al. (2016) we prefer the three geo-economic clusters; due to their independent features, government development policy became differentiated explicitly across these three regions and they have, in turn, been further differentiated by that policy over four decades.

5. **Conclusion**

That provincial inequality was bound to result from spatially differentiated development policy was openly acknowledged by Deng Xiaoping in his Southern Tour of 1992: "If all of China is to become prosperous, some [areas] must get rich before others" (see e.g. World Bank, 2009). Nonetheless, unbalanced reforms were expected to lead to regional trickle-down rather than long-term divergence (Fan, 1997).

This paper has examined the role of the composition of province-level public spending in the dynamics of *beta*-convergence in China. For data on real GDP per capita for 31 provinces in China over the period 1991-2016, the results show heterogeneous convergence speeds for three clubs with distinct steady state paths. Local public expenditure augments the club-convergence process both in the short- and longer-run as well as the dynamic steady state growth rate, but the composition of local public expenditure appears key to all this. Specifically, our results suggest that the return to capital spending, in terms of boosting provincial growth and increasing the speed of convergence, is overstated. We find evidence that capital expenditure adds to provincial GDP per capita but spending on health and education has larger effects.

Figure 8 makes clear that government spending on capital and infrastructure projects outweighs human capital-type public investments as a proportion of GDP in all three regions for most of the sample investigated here. However, the data for 2014 onwards appear to reflect a reversal in this pattern in all three regions. Our results suggest this is a welcome direction of travel for the public spending mix, and one that should be pursued actively by policymakers.

How exactly to achieve this, given the institutional setup, is a political economy matter. Fiscal expenditure decentralization has fostered a political tournament among party officials who see their future elevation within the Communist Party as the reward for hitting economic criteria in the provincial economies. The selectiveness of these criteria may in turn contribute to the observed bias towards capital spending, the existence of which is well-recognised in the literature. Indeed, economic construction has been included as a specific performance target for local government officials in the past (Tsui and Wang, 2004).

The over-provision of capital goods potentially creates a serious misallocation of resources. Under-provision of education and health goods is welfare inferior. However, the potential allocative inefficiency of the composition of fiscal expenditure can be viewed as rational from the perspective of the local government official. Spending on education and health is mostly

[24] Other findings using the same methodology and using a more organic level of aggregation have found 6 and 4 convergence clubs (see Zhang, Xu and Wang, 2019, and Li et al., 2018)

non-discretionary and follows trends in population growth, whereas infrastructure spending is discretionary, high profile and immediate. Political competition for places in the upper levels of the party hierarchy creates the conditions for the capital bias in local public spending, unless promotion criteria can be adjusted to give due credit for human capital investments.

The short to medium-run effect of public spending raises relevant questions about the sources of financing and the role of credit markets in funding local public sector spending. Recent work has highlighted the differential effect of formal against informal financing on local economic growth (Cheng and Degryse, 2010). The growth in shadow bank activity since 2012 has been linked to the overhang of the 2009 fiscal stimulus package of four trillion RMB in response to the Global Financial Crisis (Chen et al. 2017). Our results suggest that fiscal policy does have a positive effect on growth and such a stimulus package from the centre would have been pushing on an open door for local government. However, the implications of excessive infrastructure spending on the local economy and the rapid growth of the shadow banking in financing this expenditure are yet to be assessed. This paper has shown that, while there is a general perception that capital spending contributes to growth, a rebalancing of local spending away from physical and infrastructure capital and towards human capital investments is likely to yield higher local growth returns and also to increase club-convergence rates. The way for Central government to achieve this would be through modification of political promotion incentives for local officials to give credit for such human capital investments. This policy shift would be in keeping with State commitment to ‘Harmonious Society’ since our results suggest significant opportunity costs attached to a failure to invest publicly in human capital, particularly in western provinces, with implications for regional inequality in future.

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Appendix

This appendix consists of three parts: (i) robustness checks, (ii) data description, and (iii) construction of fiscal elasticities from parameter estimates.

I. **Robustness Checks**

We report two robustness checks vis-à-vis our results. First, we employ a pooled mean group estimator with cross-sectional dependence (PMGCD; Chudik and Pesaran (2015) and Chudik et al. (2016)) and assess if our GMM results of Table 4 are robust to cross-sectional dependence and parameter heterogeneity across provinces. Second, we utilise an alternative clustering of regions, based on Tian et al. (2016), and gauge if the main theme of our results that fiscal expenditure adds to growth and convergence is robust.

The PMGCD estimator allows for inter-cluster correlations (cross-sectional dependence) between model variables as well as parameter heterogeneity across clusters (all provinces). Table A.1 summarises our results. The interesting finding from PMGCD is that while it supports the evidence of overall convergence showed by the GMM estimators, it also removes the regional heterogeneity evidenced in convergence. This is not surprising as the regional slope dummies that capture regional heterogeneity and the cross-sectional means of model variables, which enter as regressors in the PMGCD estimation to control for cross-sectional dependence, are likely to be highly correlated. Two point estimates of parameters associated with $\frac{\partial \Delta y_{it}}{\partial p_{it-2}}$ and $\frac{\partial \Delta y_{it}}{\partial w_{it-2}}$ appear very high in their magnitudes. PMGCD effectively estimates separate regression for each province and computes mean parameter values for the panel. Given that we have only 26 data points for each province and the estimator is quite demanding in terms of degrees of freedom because it must allow for cross-sectional dependence across model variables, we suggest caution regarding PMGCD results and only read them as broadly supporting our overall growth and convergence-augmenting effects of government's fiscal policy.

Table A.1 here

Turning to the alternative categorisation of regional clubs, we utilize the results of Tian et al. (2016). In their study of regional club convergence in China, they apply the logt test of Phillips and Sul (2007), to identify regional clubs for data 1978-2013. They identify two clubs – a coastal club of eight provinces that excludes Beijing but includes Inner Mongolia and the rest. This classification, while novel, conflicts with the consensus categorisation derived from theory and past Chinese economic development policy. Indeed, other studies using the same method with county level data (Li et al., 2018) or prefecture level city region data (Zhang, Xu and Wang, 2019) find six or four convergence clubs showing no geographic regularity. However, given the commonality of the data used in this study and Tian et al. (2016), we can be confident in using the latter's identified clusters unaltered. A zero-unity dummy variable is defined where $D_4 = 1$ for a high-income club (Shanghai, Tianjin, Jiangsu, Zhejiang,

Guangdong, Shandong, Fujian, and Inner Mongolia) of Tian et al. (2016), and zero for the rest. Table A.2 summarises the results.

The results from this alternative categorisation of clubs are mixed. In general, the results confirm the existence of a high-income club, but there is no evidence of heterogeneity in convergence speed. There is some evidence of homogeneous club convergence and that general government spending and spending on health and education aids this process. Productive spending appears not to play a significant part in either growth generation or convergence. Columns 5 and 6 confirm that spending on health and education has strong impacts on growth and convergence.

Table A.2 here

II. **Data Description**

This part presents and discusses the data in more detail. Table A3 confirms the graphical intuition of Figure 2. In the initial period, except for a few provinces on the coast, the growth of GDP per capita is in the same order for all. In the second period, mostly the coastal regions and a few mid-central provinces race ahead. In the final period, there is a stronger catch-up from the non-coastal province.

Table A.3 here

Table A4 presents the definitions of the constituent components of public spending before and after the re-categorization that occurred in 2007. The shaded areas represent the data extracted from the public finance statements taken to represent broadly capital expenditure (before and after 2007) and welfare spending on health and education (before and after 2007).

Table A.4 here

Here a few words about the data are warranted. Total government spending at the provincial level is available in a consistent manner through to 1979; however, a detailed compositional breakdown is only available from 1991 to 2006, when capital and infrastructure spending is separated in each province, as is education and health spending. However, from 2007, capital expenditure was distributed non-uniformly across other spending categories allowing different provinces to adopt local accounting conventions. Therefore, it is possible that health will include spending on new building that would normally be in the capital spending category pre-2007, and education to include new construction of schools that would previously be in capital expenditure. We have done our best (See Table A2) to identify the relevant categories of

government expenditure that separate capital (production-oriented) spending from education and health (welfare).

III. **Calculation of the Fiscal Elasticities**

Let $y = lnY$ and $g = (\frac{G}{Y})$. Here *Y* represents real GDP per capita, and *G* represents real total government spending per capita.

Ignoring the subscripts $\{i, t\}$, the steady-state representation of equation (2) can be expressed as;

$$\alpha_0 + \gamma_1 D_1 + \gamma_2 D_2 + \beta_1 y + \lambda_1 g + (\lambda_2 + \kappa_1 D_1 + \kappa_2 D_2) gy = 0 \qquad \text{(A.1)}$$

Totally differentiating expression A.1we have;

$$0 = \beta_1 dy + \lambda_1 dg + (\lambda_2 + \kappa_1 D_1 + \kappa_2 D_2)[(y)dg + (g)dy]$$

$$\frac{dy}{dg} = -\frac{\lambda_1 + (\lambda_2 + \kappa_1 D_1 + \kappa_2 D_2) y}{\beta_1 + (\lambda_2 + \kappa_1 D_1 + \kappa_2 D_2) g} = \varphi_1 \quad \text{(A.2)}$$

Expressing A.2 as below and multiplying both sides by $g = (\frac{G}{Y})$, *gives* A.3

$$\frac{dlnY}{d(\frac{G}{Y})} = \varphi_1$$

$$\frac{dlnY}{d(\frac{G}{Y})/(\frac{G}{Y})} = \varphi_1 \left(\frac{G}{Y}\right) = \varphi_2 \qquad \text{A.3}$$

$$\frac{dlnY}{dlnG - dlnY} = \varphi_2$$

$$\frac{dlnG - dlnY}{dlnY} = \frac{1}{\varphi_2}$$

$$\frac{dlnG}{dlnY} - 1 = \frac{1}{\varphi_2}$$

$$\frac{dlnG}{dlnY} = \frac{1}{\varphi_2} + 1$$

Therefore, the elasticity is given by the expression A.4

$$\frac{dlnY}{dlnG} = \frac{\varphi_2}{1+\varphi_2} \qquad \text{A.4}$$

Expression A.4 can be evaluated for corresponding values of $\{y, g\}$. We arrive at our estimates by first using the results of column 2 of Table 5 and calculating the elasticities for each province using the 2016 values for $\{y_i, g_i\}$ for each province and then take the average for each region.

Figure 1: Coastal, Middle and Western Regions of China

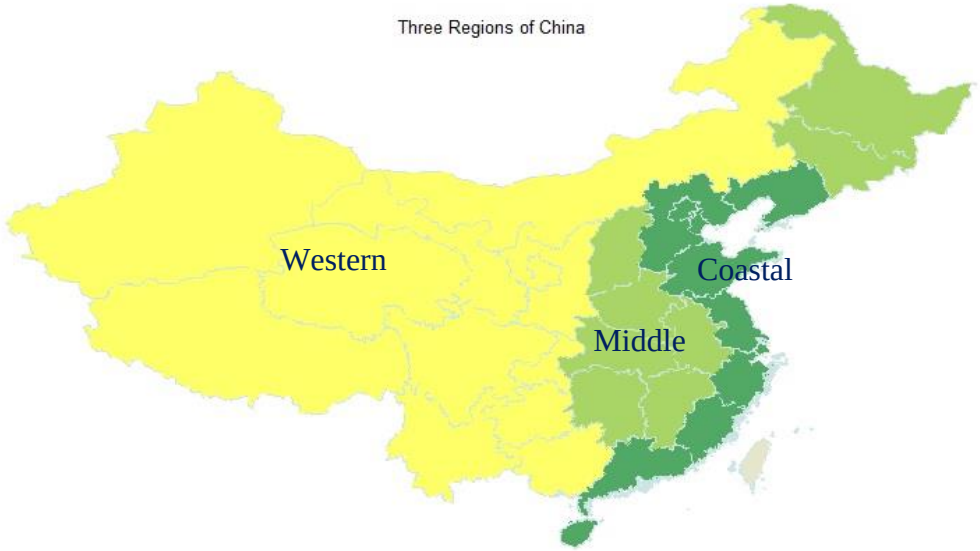


Figure 2: Real GDP per capita (Yuan, 1978 prices)

Panel A

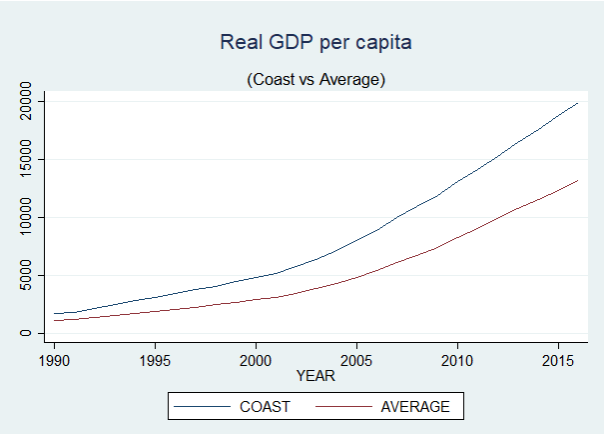


Figure 3a: Average Real GDP per capita

Panel B

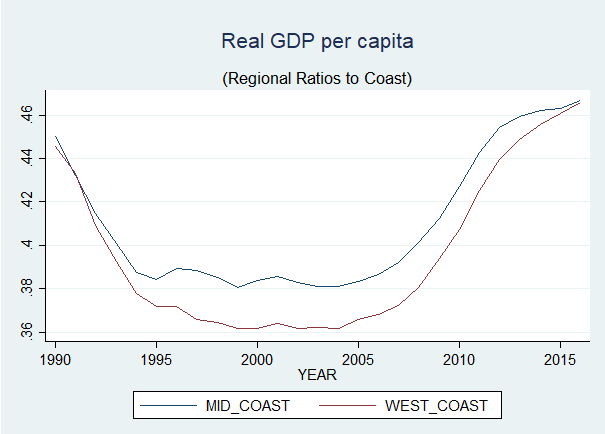
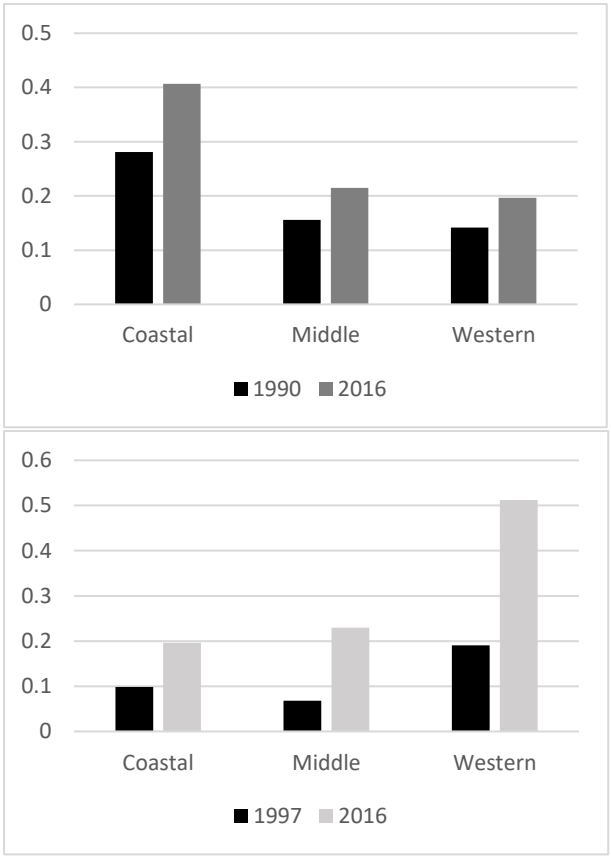


Figure 3b: Average government spending

relative to Shanghai



relative to GDP

Figure 4: Standard deviation of log real GDP per capita 1978-2016

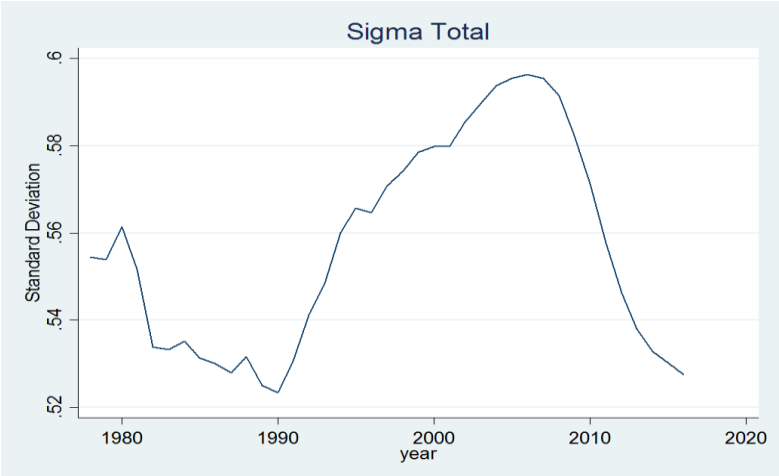


Figure 5: Sigma Costal Region

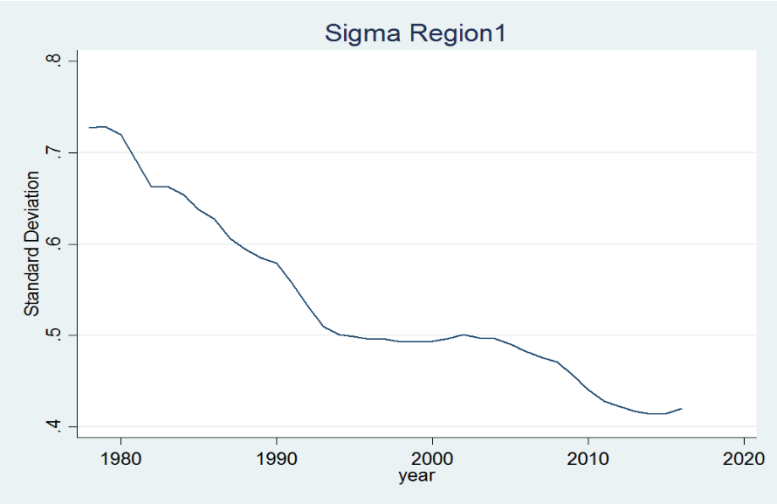


Figure 6: Sigma Mid-Central Region

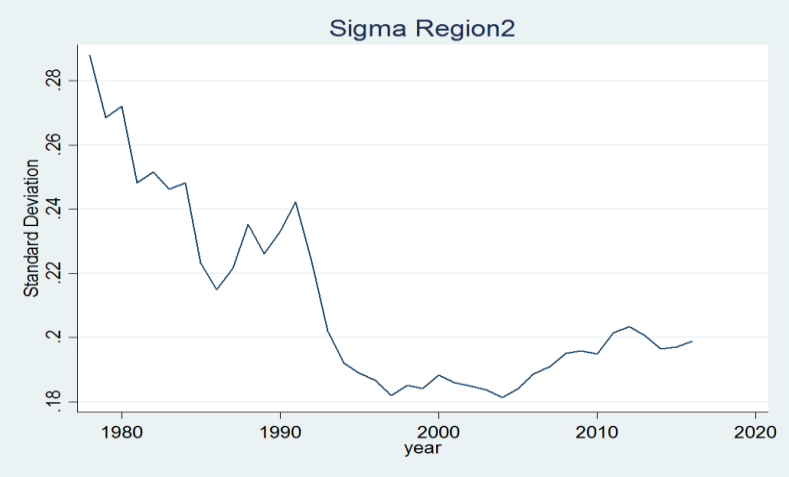


Figure 7: Sigma Western Region

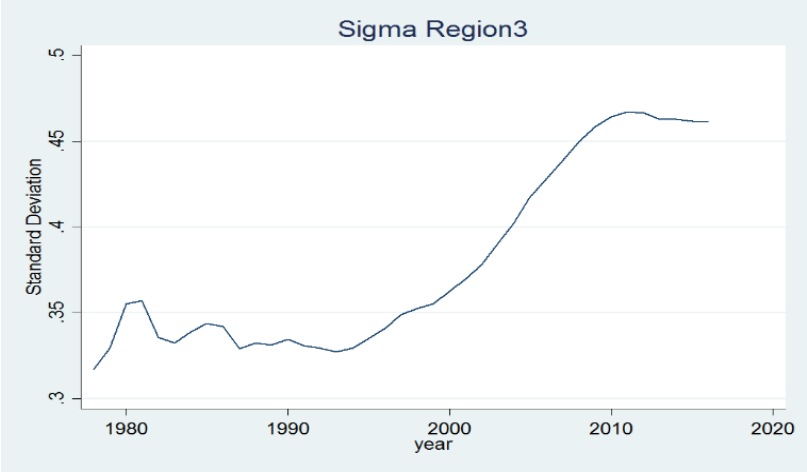
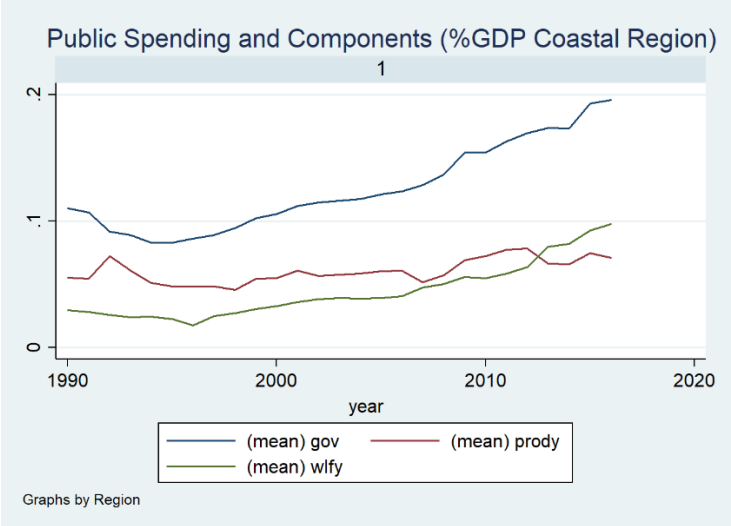
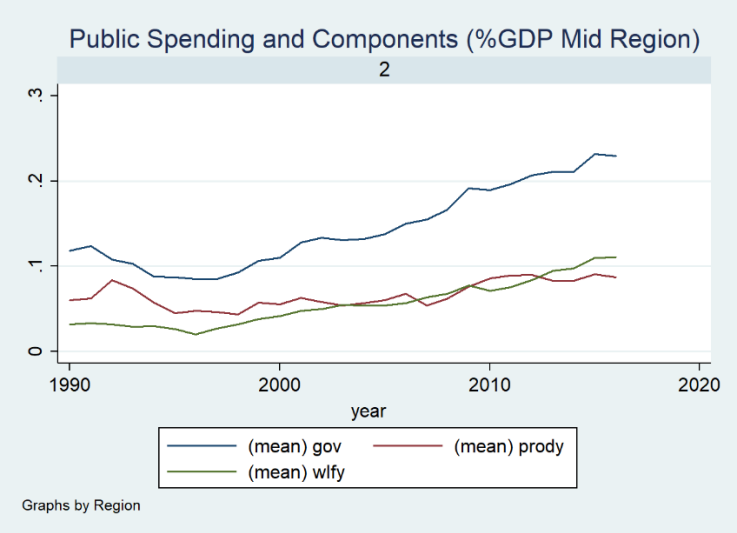


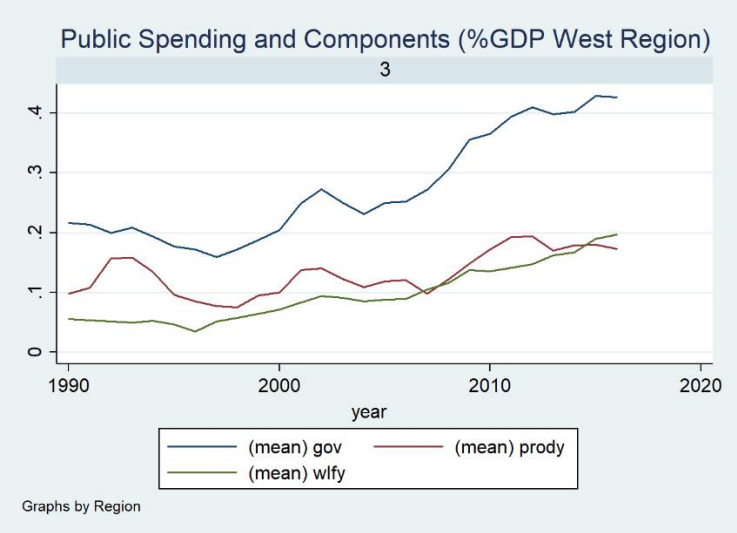
Figure 8: Provincial public spending and its key components as proportion of province GDP, averaged across provinces in region. Panel A shows coastal region averages; Panel B shows mid region averages; Panel C shows the west region averages.



Panel A



Panel B



Panel C

Table 1: Provincial Inequality in China since 1978. Real GDP per capita in 1978 Yuan by province, rows ordered by the ratio to the Shanghai level in 1978 from largest to smallest.[25]

Province	Region	1978 level	Ratio to Shanghai, 1978	Ratio to Shanghai, 1990	Ratio to Shanghai, 2016	Average Growth of real GDP per capita 1978-1990 (fraction)	Average Growth of real GDP per capita 1990-2016 (fraction)
Shanghai	Coastal	2485	1.00	1.00	1.00	0.06	0.09
Beijing	Coastal	1257	0.51	0.59	0.45	0.07	0.08
Tianjin	Coastal	1133	0.46	0.46	0.72	0.06	0.11
Liaoning	Coastal	680	0.27	0.30	0.35	0.07	0.09
Heilongjiang	Middle	564	0.23	0.22	0.24	0.06	0.09
Jiangsu	Coastal	430	0.17	0.27	0.56	0.10	0.12
Qinghai	Western	428	0.17	0.19	0.20	0.07	0.09
Jilin	Middle	381	0.15	0.19	0.28	0.08	0.10
Tibet	Western	375	0.15	0.15	0.21	0.06	0.10
Guangdong	Coastal	370	0.15	0.26	0.38	0.11	0.10
Ningxia	Western	370	0.15	0.17	0.16	0.07	0.09
Shanxi	Middle	365	0.15	0.16	0.18	0.08	0.09
Hebei	Coastal	364	0.15	0.16	0.24	0.07	0.10
Gansu	Western	348	0.14	0.15	0.19	0.07	0.10
Hubei	Middle	332	0.13	0.17	0.28	0.08	0.11
Zhejiang	Coastal	331	0.13	0.23	0.41	0.11	0.11
In Mongolia	Western	317	0.13	0.17	0.39	0.08	0.12
Shandong	Coastal	316	0.13	0.17	0.35	0.09	0.12
Hainan	Coastal	314	0.13	0.20	0.27	0.10	0.10
Xinjiang	Western	313	0.13	0.18	0.16	0.09	0.08
Shaanxi	Western	291	0.12	0.15	0.22	0.08	0.11
Hunan	Middle	286	0.12	0.12	0.17	0.06	0.10
Jiangxi	Middle	276	0.11	0.13	0.18	0.07	0.10
Fujian	Coastal	273	0.11	0.17	0.34	0.10	0.12
Sichuan	Western	261	0.11	0.13	0.21	0.08	0.11
Chongqing	Western	269	0.11	0.13	0.27	0.08	0.12
Anhui	Middle	244	0.10	0.12	0.20	0.08	0.11
Henan	Middle	232	0.09	0.13	0.20	0.08	0.11
Yunnan	Western	226	0.09	0.12	0.13	0.08	0.09
Guanxi	Western	225	0.09	0.08	0.13	0.05	0.10
Guizhou	Western	175	0.07	0.09	0.11	0.08	0.10

[25] As neoclassical theory predicts, among the slowest growing provinces for 1990-2016 are Beijing and Shanghai, the two richest provinces in 1978, while some initially poorer provinces register high growth rates (e.g. Inner Mongolia). However, as Table 1 illustrates, the general relationship between initial income and growth is more complex. Jiangsu and Qinghai are interesting examples: in 1978, they were side by side in the income distribution with 430 and 428 Yuan per capita respectively (7th and 8th richest in the distribution, though just 17% of the income per capita of Shanghai). However, by 1990, Jiangsu on the coast had 27% of the income per capita of Shanghai, while Qinghai had 19%. Between 1990 and 2016, Jiangsu grew on average at 12 per cent while Qinghai in the western region grew at 9%.

Table 2: Variable Definitions and summary statistics; 1991-2016

Variable	Definition	Obs	Mean	SD	Min	Max
Δy_{it}	Change in log real GDP per capita, 1978 prices	806	.097	.030	-.034	.329
y_{i90}	log real GDP per capita in 1990	31	6.83	.520	6.023	8.495
Log real GDP per capita, 1978 prices (By region)						
y_{it}	Coast	286	8.698	0.866	6.765	10.675
	Mid	208	7.902	0.785	6.352	9.399
	West	312	7.753	0.804	6.098	9.725
	Total	806	8.127	0.926	6.098	10.675
Total government spending as proportion of GDP (By region)						
g_{it}	Coast	286	.126	.053	.049	.340
	Mid	208	.146	.052	.062	.275
	West	302	.278	.214	.075	1.379
	Total	796	.189	.155	.049	1.379

Notes: Real GDP per capita in 1978 prices for each province sourced from *The Comprehensive Statistical Materials on 60 Years of New China* and *China Statistical Yearbook.*

Table 3: Fiscal Policy Measures, ratio of local GDP. Average values 1991-2016

Variable	Definition	Mean	SD	Min	Max
p_{it}	Public spending on capital projects (All provinces)	.028	.034	.003	.334
	Coast	.018	.011	.003	.066
	Mid	.016	.008	.004	.037
	West	.048	.052	.007	.333
w_{it}	Public spending on welfare (health and education) (All)	.046	.032	.001	.258
	Coast	.030	.013	.011	.090
	Mid	.036	.015	.010	.076
	West	.067	.041	.001	.258
tr_{it}	Transfers from Centre, including tax rebate* (All)	0.115	0.154	0.017	1.297
	Coast	.044	.028	.017	.165
	Mid	.082	.032	.027	.180
	West	.202	.218	.031	1.297

Notes: Central fiscal transfer and tax rebate data taken from the *China Finance Year Book*. *Transfer measures (including tax rebate and discretionary transfers) are for 1994-2016

Table 4: Results from Baseline Convergence Estimates (1991-2016)

$$\Delta y_{it} = \alpha_0 + \alpha_1 \Delta y_{it-1} + \gamma_1 D_1 + \gamma_2 D_2 + \beta_1 y_{it-2} + \varphi_1 D_1 * y_{it-2} + \varphi_2 D_2 * y_{it-2} + \varepsilon_{it}$$

	Homogeneous		Regional Heterogeneity	
	1	2	3	4
Regressors	OLS	GMM	OLS	GMM
Constant	0.070*** (0.007)	0.049*** (0.008)	0.041*** (0.008)	0.037*** (0.008)
Δy_{it-1}	0.684*** (0.032)	0.661*** (0.058)	0.658*** (0.033)	0.646*** (0.058)
D_1	0.006*** (0.002)	-0.001 (0.002)	0.072*** (0.015)	0.026** (0.014)
D_2	0.001 (0.002)	-0.000 (0.01)	0.016* (0.010)	0.017 (0.012)
y_{it-2}	-0.005*** (0.0008)	-0.002*** (0.0008)	-0.001 (0.001)	-0.0004 (0.001)
$D_1 * y_{it-2}$	-	-	-0.008*** (0.001)	-0.003** (0.002)
$D_2 * y_{it-2}$	-	-	-0.002*** (0.001)	-0.002 (0.002)
R^2	0.524	0.591	0.533	0.592
UIT ($\chi^2(3)$)	-	[0.000]***	-	[0.000] ***
WIT (F(3,29)		[0.000] ***	-	[0.000] ***
J statistic		[0.266]	-	[0.149]
Obs	837	744	837	744

Notes: (.) are standard errors of parameters and [.] denotes P-values of test statistic under null. Superscripts ***, **, * respectively denote significance at one, five and ten percent levels. For efficient two-step GMM estimates in columns 2 and 4, three lags of the lagged dependent variable are used as instruments, providing two over-identifying restrictions for each. UIT and WIT test statistics respectively denote Sanderson-Windmeijer (2015) tests of under-identification and weak identification in the model. Since we have only one endogenous regressor, these tests are equivalent to Kleibergen-Paap (2006) rk-Wald statistic which is cluster-robust. Significant UIT and WIT respectively reject the null of model un-identification and under-identification. J Statistic of Hansen (1982) is the over-identifying restriction test. The null of J statistic is that all (excluded and included) instruments are valid i.e. satisfy the exogeneity assumption. D_1 and D_2 are impulse dummy variables taking a value of unity for regions one (coastal) and two (mid-central), respectively, and zero otherwise. All other variables are defined as in Tables 2 & 3.

Table 5: Fiscal Policy and Convergence

$\Delta y_{it} = \alpha_0 + \alpha_1 \Delta y_{it-1} + \gamma_1 D_1 + \gamma_2 D_2 + \beta_1 y_{it-2} + \lambda_1 E_{it-2} + \lambda_2 E_{it-2} * y_{it-2} + \kappa_1 D_1 * E_{it-2} * y_{it-2} + \kappa_2 D_2 * E_{it-2} * y_{it-2} + \varepsilon_{it}$						
	Total government spending		Productive spending		Welfare spending	
	1	2	3	4	5	6
Regressors	OLS	GMM	OLS	GMM	OLS	GMM
Constant	0.055*** (0.015)	-0.017 (0.014)	0.063*** (0.012)	0.012 (0.008)	-0.015 (0.015)	-0.025* (0.014)
Δy_{it-1}	0.674*** (0.031)	0.639*** (0.061)	0.638*** (0.050)	0.658*** (0.061)	0.692*** (0.051)	0.635*** (0.060)
D_1	0.012*** (0.003)	0.006** (0.003)	0.001*** (0.004)	0.007** (0.003)	0.007 (0.004)	0.006 (0.004)
D_2	0.002 (0.003)	0.010*** (0.003)	0.013*** (0.003)	0.014*** (0.003)	0.010*** (0.003)	0.011*** (0.004)
y_{it-2}	-0.003* (0.002)	0.006*** (0.002)	-0.004** (0.001)	0.003*** (0.001)	0.005** (0.002)	0.007*** (0.002)
E_{it-2}	0.037 (0.056)	0.268*** (0.067)	-	-	-	-
$E_{it-2} * y_{it-2}$	-0.004 (0.007)	-0.032*** (0.008)	-	-	-	-
$D_1 * E_{it-2} * y_{it-2}$	-0.007*** (0.002)	-0.009*** (0.002)	-	-	-	-
$D_2 * E_{it-2} * y_{it-2}$	-0.001 (0.003)	-0.008*** (0.002)	-	-	-	-
p_{it-2}	-	-	0.045 (0.088)	0.177*** (0.051)	-	-
$p_{it-2} * y_{it-2}$	-	-	-0.006 (0.010)	-0.023*** (0.006)	-	-
$D_1 * p_{it-2} * y_{it-2}$	-	-	-0.014*** (0.005)	-0.021*** (0.006)	-	-
$D_2 * p_{it-2} * y_{it-2}$	-	-	-0.023*** (0.005)	-0.029*** (0.006)	-	-
w_{it-2}					1.121*** (0.316)	1.450*** (0.361)
$w_{it-2} * y_{it-2}$					-0.144*** (0.037)	-0.173*** (0.036)
$D_1 * w_{it-2} * y_{it-2}$					-0.033*** (0.007)	-0.036*** (0.008)
$D_2 * w_{it-2} * y_{it-2}$					-0.031*** (0.009)	-0.035*** (0.009)
R^2	0.529	0.601	0.498	0.603	0.610	0.605
UIT ($\chi^2(3)$)	-	[0.001]***	-	[0.000]***	-	[0.000***]
WIT-Pvalue	-	[0.000]***	-	[0.000]***	-	[0.000]***

J statistic	-	[0.103]	-	[0.035] **	-	[0.173]
Obs	821	734	760	734	734	734

Notes: Diagnostics and dummy variables are as defined in Table 4. Rest of the variables are defined as in Tables 2 and 3.

Table 6: Growth and convergence with fiscal expenditures (5-year averages)

$$\Delta\widetilde{y_{\iota T}} = \theta_0 + \theta_1 D_1 + \theta_2 D_2 + \theta_3 \widetilde{E_{\iota T}} + \theta_4 y_{it-5} + \theta_5 \widetilde{E_{\iota T}} y_{it-5} + \theta_6 D_1 \widetilde{E_{\iota T}} y_{it-5} + \theta_7 D_2 \widetilde{E_{\iota T}} y_{it-5} + \epsilon_{it}$$

	Total government spending		Productive spending		Welfare spending	
	1	2	3	4	5	6
Regressors	OLS	GMM	OLS	GMM	OLS	GMM
Constant	.048 (0.033)	.122* (.068)	.128*** (.031)	0.275*** (0.041)	.057* (.034)	.224*** (.054)
D1	.032*** (.010)	.022** (.011)	.018** (.008)	0.011 (0.011)	.040** (.015)	.047*** (.016)
D2	.019** (.008)	.037*** (.014)	.019*** (.007)	0.025** (0.010)	.017 (.011)	.031* (.016)
$\widetilde{E_{\iota T}}$	.271*** (.084)	0.519** (.261)	-	-	-	-
y_{t-5}	.005 (.004)	-.003 (.009)	-.005 (.004)	-0.021*** (0.005)	.003 (.004)	-.016*** (.006)
$\widetilde{E_{\iota T}} * y_{t-5}$	-.032*** (.010)	-.062** (.031)	-	-	-	-
$D1 * \widetilde{E_{\iota T}} * y_{t-5}$	-.027** (.010)	-.019** (.007)	-	-	-	-
$D2 * \widetilde{E_{\iota T}} * y_{t-5}$	-.013** (.006)	-.025*** (.009)	-	-	-	-
$\widetilde{p_{\iota T}}$	-	-	.047 (.462)	0. 260 (0.677)		
$\widetilde{p_{\iota T}} * y_{t-5}$	-	-	.001 (.059)	-0.031 (0.082)		
$D1 * \widetilde{p_{\iota T}} * y_{t-5}$			-.067* (.039)	0.010 (0.038)		
$D2 * \widetilde{p_{\iota T}} * y_{t-5}$			-.101** (.039)	-.125*** (0.044)		
$\widetilde{w_{\iota T}}$	-		-	-	1.25*** (.427)	.921 (0.764)
$\widetilde{w_{\iota T}} * y_{t-5}$	-		-	-	-.138*** (.047)	-.106 (.089)
$D1 * \widetilde{w_{\iota T}} * y_{t-5}$				-	-.105** (.047)	-.083** (.039)

$D2 * \widetilde{w_{iT}} * y_{t-5}$				-	-.030 (.026)	-.052 (.036)
R^2	.193	.408	.104	.390	.178	.400
UIT($\chi^2(3)$)		.000***		.011**		0.000***
WIT-Pvalue		.000***		.002***		0.000***
J statistic		. 096		0.596		0.004***
Obs.	153	91	153	91	153	91

Dependant variable $is\ \Delta\widetilde{y_{iT}} = \frac{1}{5}(y_t - y_{t-5})$. $\widetilde{E_{iT}}$ indicates 5-year average, starting at time t-4. For GMM results in column 2 the first and second order lagged values of $\widetilde{g_{iT}}$ and the second order lag of average openness are used as instruments. Likewise, for column 4, the first and the second order lagged values of $\widetilde{p_{iT}}$ and the second order lag of openness are used. For column 6, the first and the second order lags of $\widetilde{w_{iT}}$ and the second order lag of openness are used. For variable definitions, please refer to notes to Tables 4 and 5.

Tables for Appendix

Table A.1: Pooled Mean Group Estimator with Cross-Sectional Dependence (31 Provinces)

	1	2	3
Regressors	Total Govt Spending	Productive Spending	Welfare Spending
Constant	-.484*** (.167)	-.355*** (.099)	-.484*** (.153)
Δy_{it-1}	.175** (.090)	-.324** (.121)	-.081 (.127)
y_{it-2}	-.348** (.107)	-.545*** (.131)	-.546*** (.108)
g_{it-2}	2.922** (1.40)	-	-
$g_{it-2} * y_{it-2}$	-.076* (.041)	-	-
$D_1 * g_{it-2} * y_{it-2}$	-.227 (.153)	-	-
$D_2 * g_{it-2} * y_{it-2}$	-.071 (.068)	-	-
p_{it-2}		3.067 (2.078)	-
$p_{it-2} * y_{it-1}$		-.289 (.241)	-
$D_1 * p_{it-2} * y_{it-1}$		#	-
$D_2 * p_{it-2} * y_{it-1}$		#	-
w_{it-2}		-	9. 787*** (3.466)
$w_{it-2} * y_{it-2}$		-	-.204 (.180)
$D_1 * w_{it-2} * y_{it-2}$		-	-.511 (.333)
$D_2 * w_{it-2} * y_{it-2}$		-	-.336** (.166)
R^2	.710	.720	.720
Obs	790	712	703

Dependent variable is Δy_{it}. # Parameters of regional variations in convergence vis-à-vis productive spending could not be computed under Mean Group Cross-sectional Dependence Estimator due to their high collinearity with cross-sectional means, which appear as regressors. For details please refer to the notes to Table 4 in the main text.

Table A.2: Fiscal Policy and Convergence with alternative club classification. Standard errors in parenthesis (31 Provinces)

	Total government spending		Productive spending		Welfare spending	
	1	2	3	4	5	6
Regressors	OLS	GMM	OLS	GMM	OLS	GMM
Constant	.068*** (.012)	.029* (.015)	.086*** (.013)	.054*** (.010)	.015 (.016)	.014 (.017)
Δy_{it-1}	.674*** (.033)	.655*** (.065)	.630*** (.049)	.648*** (.062)	.689*** (.058)	.647*** (.065)
y_{it-2}	-.005*** (.001)	.000 (.02)	-.006*** (.001)	-.003*** (.001)	.001 (.002)	.002 (.002)
D_4	.011*** (.003)	.005 (.004)	.008** (.004)	.005 (.003)	.009** (.004)	.011*** (.004)
g_{it-2}	.009 (.046)	.197*** (.061)	-		-	-
$g_{it-2} * y_{it-2}$	-.001 (,005)	-.023*** (.007)	-		-	-
$D_4 * g_{it-2} * y_{it-2}$	-.003 (.003)	.000 (.004)	-		-	-
p_{it-2}	-	-	-.017 (.095)	.083* (.043)	-	-
$p_{it-2} * y_{it-1}$	-	-	.002 (.012)	-.011** (.004)	-	-
$D_4 * p_{it-2} * y_{it-2}$	-	-	-.001 (.006)	.002 (.005)	-	-
w_{it-2}	-	-	-		1.025*** (.313)	1.166*** (.277)
$w_{it-2} * y_{it-2}$	-	-	-		-.121*** (.035)	-.137*** (.033)
$D_4 * w_{it-2} * y_{it-2}$	-	-	-		-.019 (.014)	-.023 (.015)
R^2	0.532	0.601	0.499	0.596	0.606	0.604
UIT-Pvalue	-	[0.000]***	-	[0.000]***	-	[0.000]***
WIT-Pvalue	-	[0.000]***	-	[0.000]***	-	[0.000]***
J statistic	-	[0.432]	-	[0.421]	-	[0.372]
Obs	821	734	760	734	760	734

See notes to Table 4 in the main text.

Table A.3: Growth of real GDP per capita by province, 1978-2016

Province	Region	1978-1990	1990-2006	2006-2012	2013-2016	1978-2016
Beijing	Coast	6.9	8.5	5.4	5.4	7.2
Tianjin	Coast	5.7	10.7	10.7	6.8	8.7
Hebei	Coast	6.5	10.9	9.6	6.2	8.8
Liaoning	Coast	6.5	9.4	11.5	3.7	8.2
Shanghai	Coast	5.6	9.6	6.6	6.3	7.5
Jiangsu	Coast	9.2	12.2	10.9	8.0	10.6
Zhejiang	Coast	10.0	12.4	8.5	7.1	10.5
Fujian	Coast	9.3	11.6	11.5	8.3	10.5
Shandong	Coast	6.7	12.7	11.3	7.5	10.2
Guangdong	Coast	10.1	11.2	8.6	6.8	10.0
Hainan	Coast	9.6	9.6	10.5	7.2	9.5
Jilin	Mid	7.5	9.3	13.1	6.8	9.1
Heilongjiang	Mid	5.5	8.3	11.0	6.3	7.7
Shanxi	Mid	6.4	9.6	9.1	4.7	8.0
Anhui	Mid	7.4	9.9	12.8	8.1	9.4
Jiangxi	Mid	7.1	9.2	11.3	8.5	8.8
Henan	Mid	8.1	10.4	11.3	7.9	9.5
Hubei	Mid	7.7	9.9	12.5	8.4	9.4
Hunan	Mid	6.0	9.3	11.7	7.9	8.5
Guanxi	West	5.1	9.9	11.7	7.4	8.4
In Mongolia	West	7.9	11.7	14.2	7.3	10.4
Sichuan	West	7.6	10.4	13.7	7.4	9.8
Guizhou	West	7.3	7.8	12.5	10.1	8.6
Yunnan	West	7.7	7.9	11.0	8.4	8.4
Tibet	West	5.5	9.8	10.4	8.7	8.4
Shaanxi	West	7.4	9.4	13.0	8.3	9.2
Gansu	West	6.4	8.7	10.7	8.1	8.3
Qinghai	West	6.4	7.9	11.2	7.8	7.9
Ningxia	West	6.6	7.6	10.5	7.1	7.7
Xinjiang	West	8.6	7.7	8.9	7.2	8.1
Chongqing	West	7.5	11.1	14.4	9.9	10.3

Table A.4. Provincial Public Spending Categories in China

		Before the budget accounts reform in 2007	After budget accounts reform in 2007
Total Expenditure	Maintenance Spending	Expenditure for National Defence	Expenditure for National Defence
		Expenditure for Government Administration	Expenditure for General Public Service
		Expenditure for Foreign Affairs	Expenditure for Foreign Affairs
		Expenditure for Armed Police Troops	Expenditure for Public Security
		Expenditure for Public Security Agency Procuratorial Agency and Court of Justice	
		Expenditure for Specified Underdeveloped Areas	
	Productive Spending	Expenditure for Capital Construction	
		Expenditure for Innovation Enterprises	Expenditure for Science and Technology Promotion
		Expenditure for Geological Prospecting	Expenditure for Geological Prospecting
		Expenditure for Science and Technology Promotion	Expenditure for Interest of Public Debt
		Expenditure for Circulating Funds	Expenditure for Expense of Bond Issuing
		Expenditure for Supporting Agriculture Production	Expenditure for Food Production Security
		Expenditure for Comprehensive Development of Agriculture	Expenditure for Country Land and Ocean Preservation
		Expenditure for Operating Expenses of Agriculture，	Expenditure for Agriculture，

		Forestry，Water Conservancy and Meteorology	Forestry，Water Conservancy and Meteorology
		Expenditure for Operating Expenses of Departments of Industry & Transportation	Expenditure for Industry and Transportation
		Expenditure for Operating Expenses of Department of Commerce	Expenditure for Commerce
		Expenditure for City Maintenance	Expenditure for Banking Finance
		Expenditure for Price Subsidies	
		Expenditure for Developing Land and Sea Area	Expenditure for Developing Land and Sea Area
		Expenditure for Special Items	Expenditure for Housing
		Other Expenditure	Other Expenditure
	Welfare Spending	Expenditure for Operating Expenses of Departments of Culture，Sport & Broadcasting	Expenditure for Culture, Sports and Media
		Expenditure for Culture, Education & Health	Expenditure for Education & Health
		Expenditure for Operating Expenses of Department of Science	Expenditure for Energy Saving and Environment Protection

Notes: The public budgetary account experienced a major reform in 2007. In order to bridge the data of budget items throughout the reform, we follow the instruction in *Manual of government budgetary accounts reform* of the *Ministry of Finance*, China.