ORIGINAL PAPER

Fiscal decentralization, regional disparity, and the role of corruption

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Abstract

In this study, we examine how efforts taken by states to combat corruption act as a mediator in the relationship between fiscal decentralization and regional income disparities. Fiscal decentralization may affect regional disparities via access to funding, but corruption could limit the ability to efficiently transfer fiscal resources. India is one of the most decentralized nations of the world and also exhibits high regional disparities. Under this scenario, we estimate whether institutions, in the form of anti-corruption efforts by the states, interact with fiscal decentralization and affect divergence across states of India. We find that fiscal decentralization reduces the disparity across states, and the effect of fiscal decentralization is stronger under efforts to control corruption by state vigilance bodies. The results are robust across different specifications of fiscal decentralization and alternate estimation methods accounting for endogeneity. From the policy perspective, in order to harness the potential benefits of decentralization to reduce regional income disparities, governments should focus on improving the quality of institutions through control on corruption at the sub-national level.

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1 Introduction

Over the last few decades, there has been a substantial rise in decentralization reforms in developed, developing, and transitional countries across the world (Bojanic 2020). The devolution of fiscal, political, and administrative power from national to regional governments has garnered a great deal of attention among scholars and policy makers alike. A significant motivation behind the global trend of decentralization reforms follows from the early seminal works of scholars such as Tiebout (1956) and Oates (1972). These works argue that, since sub-national governments remain in closer proximity to local citizens than a national government can be, sub-national governments have more awareness and better accountability in public goods and services provision, owing to their superior ability to match citizen's needs and preferences. More transparent, specific, and precise policies should then be a key driving factor in reducing inequalities existing within a region (Oates 1993).

However, the literature on the impact of fiscal decentralization on regional disparity is mixed. The theoretical literature is split between a side claiming that fiscal decentralization is a useful mechanism to reduce rising within-region disparities, and a side claiming that fiscal decentralization widens those same inequalities. Studies in favor of decentralization argue that the local jurisdiction, apart from being in a position to better meet the preferences and demands of the citizens, is also relatively more accountable due to the inter-jurisdictional competition among them for better resources (Brenan and Buchanan 1980; Qian and Weingast 1997). One counterargument is that decentralization might disrupt the redistributive capacity of the central government, where wealthier regions can outperform the poorer regions through stronger fiscal resources (Prud'homme 1995; Keen and Marchand 1997). Both schools of thought conclude that the quality of governance or efficiency of public service officials involved in the local jurisdiction drives the efficacy of decentralizing mechanisms. At the same time, institutional quality is sensitive to the country's stage of development. Given the economic resources at disposal, a developed country is in a relatively better position to administer and monitor the working mechanisms of the local administration in order to ensure efficient public service delivery. In other words, the effectiveness of decentralized policies is conditioned by both the stage of development and the quality of institutions (Prude'homme 1995; Bardhan and Mookherjee 2000; Bardhan 2002).

In general, regional disparities are much larger in magnitude in developing countries (Myrdal 1957; Krugman 1986). According to data collected by Garman et al. 2001, out of the 75 developing nations analyzed, more than 80% of the countries were undergoing decentralization of some authority by the beginning of millennium. It is important, then, to understand the effectiveness of decentralization in rapidly transitioning economies. Among the rapidly developing economies of the world, India's federal constitution is characterized with a relatively higher extent of fiscal decentralization (Rao 2002). At the same time, the Indian economy has emerged as a poster boy of a fast-growing nation, registering an

Fig. 1 Rising Regional Income Disparities in the Indian Economy. Source: Handbook of Statistics on Indian States, Reserve Bank of India

Ratio of Income of Top 3 to Bottom 3 States

Source: Handbook of Statistics on Indian States, Reserve Bank of India
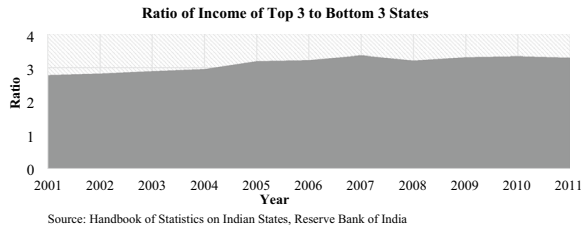
average annual growth rate of over 7 percent over the last two decades. While this growth at the national level is promising and is a well-researched area, the same cannot be said about comparative economic performance across regions or states in India. The income gap between India's top three richest states and its bottom three poorest states has widened, contrary to what classical economic theory postulates (see Fig. 1). This observation finds support in the works of Rao, Shand, and Kalirajan (1999), Singh et al. (2003), Kumar and Subramanian (2012), Ghate and Wright (2013), Cherodian and Thirwall (2015), and Chakravarty and Dehejia (2016); all of whom have voiced concern over large disparities in income across regions in India.

The Indian government has undertaken public policy measures to reduce cross-regional disparities in the form of providing infrastructure to economically deprived regions, redistributing income through effective taxation, improving the regulatory environment, and increased public spending (Iyer et al. 2010). These policies are geared toward helping to sustain higher economic growth in poorer regions and improving convergence (Tabellini 2005; Tanzi 2005). One such policy measure is giving more political power to local governments in the form of decentralization, so these regions can implement policies that are more suitable for local conditions. Since 1991, the transition of the economy from centralized planning into market-oriented resource allocation has increased the emphasis on the role of sub-national governments in providing the necessary policy outcomes (Rao et al. 1999).

In India, policy focusing on decentralizing resources from being controlled centrally to being controlled by states and local bodies came into prominence after the passage of two constitutional amendments in 1993 and 1994. These amendments extend the role and extent of government intervention in the form of the transfer of funds to improve the economic condition of states. Despite these policies, the income gap between the rich and the poor states is not narrowing. This may be evidence that fiscal decentralization alone is not a sufficient tool to improve regional convergence. Given the vast ethnic heterogeneity in the population of the Indian subcontinent, the effectiveness of decentralized mechanisms would depend to a large extent upon how efficiently the local government administration is able to meet the needs of the varying preferences among people. In the lesser developed or uncompetitive regions, the local administration might have the incentive to indulge in opportunist and corrupt practices, which would result in under-provision of public goods (Bardhan and Mookherjee 2000; Cai and Treisman 2004). The lack of efficiency in local governance or corruption could be

a potential channel through which the intended benefits of a decentralized government could not be fulfilled. In this case, decentralizing forces would promote divergence among regions in India.

This paper re-examines how the impact of government intervention on regional convergence is conditioned by government quality, specifically government intervention in the form of transfer of resources from the center to states. We study the impact of fiscal decentralization on regional disparity in the Indian subcontinent, by using an indicator of government quality which is one of the first of its kind in the Indian context. The indicator is the state-level effort to fight corruption, which takes into account the incidence of corruption practices, unlike perceived corruption measures, which have in the previous literature been used more often. A state-level, time-varying "corruption control" index is constructed for this purpose and then interacted with the key explanatory variable, i.e., fiscal decentralization.

The primary hypothesis is that corruption will mediate the effect of fiscal decentralization on regional disparity. Fiscal transfers to states with controlled corruption are unlikely to be used in productive ways. We test this hypothesis using a panel dataset of eighteen major non-special category[1] Indian states over the period of 2001 to 2015. We find strong evidence that (1) overall, fiscal decentralization is negatively associated with regional disparity, supporting decentralization as a device to reduce regional disparity, and (2) fiscal decentralization has a larger negative impact on the disparity in states with a higher control on tackling corruption. These results are robust across alternative econometric specifications and subsamples.

The paper is organized as follows: Sect. 2 reviews the related literature and discusses the potential role of corruption in the nexus between fiscal decentralization and regional income disparity. Section 3 proposes the empirical methodology and discusses the data. Section 4 presents the empirical results; Sect. 5 provides additional robustness checks. Finally, Sect. 6 concludes the paper.

2 Literature review

2.1 Fiscal decentralization and regional income disparities

The theoretical literature surrounding the impact of fiscal decentralization on regional convergence is dominated by two opposing viewpoints. The first strand of

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[1] The National Development Council of India has characterized the states into special category states (SCS) and non-special category states (NSCS). Special category states include the following features:1. hilly and difficult terrain, 2. low population density and/or sizeable share of tribal population, 3. strategic location along borders with neighboring countries, 4. economic and infrastructural backwardness, and 5. non-viable nature of state finances. Till now, 11 states are part of SCS (Arunachal Pradesh, Himachal Pradesh, Manipur, Meghalaya, Mizoram, Sikkim, Tripura, Jammu and Kashmir, Assam, and Nagaland). The NSCS are Andhra Pradesh, Bihar, Chhattisgarh Goa, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand, and West Bengal. Since the special category states get preference in terms of financial transfers from the Central government, only non-special category states have been included in our analysis.

literature revolves around the arguments in favor of fiscal decentralization as a significant factor for fostering regional convergence. According to public choice theory, which has roots in the neoclassical school of thought, fiscal decentralization may reduce regional disparities because more local levels of government tend to have more specific information about local people's needs and can adjust policies accordingly (Oates 1972). Lower levels of government have a greater capacity to tailor policies and the provision of services to the preferences of the population, thereby maximizing individual and collective welfare and making the supply of public goods and services more efficient (Musgrave 1959). This literature emphasizes administrative efficiency and proximity of the local jurisdiction toward the citizens, which are plausibly higher under decentralization. Under fiscal decentralization, the local jurisdiction is able to gather better awareness regarding the citizen's needs, grievances, and preferences and accordingly can adjust outputs of public services and policies to respond to those concerns (Tiebout 1956; Oates 1972). Apart from the motivation of increasing efficiency in public goods provision, fiscal decentralization also generates strategic competition among regions for fiscal resources assuming that citizens can enter and exit competing jurisdictions freely and costlessly (Rodríguez-Pose and Bwire 2004; Kappeler and Välilä 2008; Kyriacou et al. 2017). This acts as a constraint on local governance's inefficiency and lack of competency, thereby resulting in increased public input provision (Brennan and Buchanan 1980; Qian and Weingast 1997). Furthermore, in the process of increasing competency among public service officials, there is a creation of higher transparency and more efficiency across jurisdictions, which helps in curbing interregional disparities between jurisdictions (Rodríguez-Pose and Bwire 2004; Martinez-Vazquez and Timofeev 2008; Beland and Lecours 2010; Liu et al. 2017).

From a political perspective, decentralization stresses the importance of participation in the policy-making process and of increased accountability. Centralized systems may create unequal distributions of public resources by favoring politically important jurisdictions (Canaleta et al. 2004). Higher centralization could lead to a higher concentration of private investment. Investors seeking closer ties with politicians and the administration might tend to choose capital regions. Also, decentralization provides power to the sub-national government officials to pursue economic development policies better suited for the local needs and capabilities which may include granting tax privileges and offering other forms of assistance to businesses willing to locate in a particular jurisdiction. Moreover, local governments could be removed if they failed to achieve standards of wealth and economic growth comparable with those in the rest of the country (Canaleta et al. 2004). By bringing the government closer to the people, decentralization may increase citizen participation, transparency, and the accountability of political processes while reducing the cost of cooperation. Greater political transparency, it is argued, reduces bureaucratic complexity and increases citizens' monitoring capacity, stimulating further efficiency gains from devolution (Rodríguez-Pose and Bwire 2004; Muringani et al. 2019).

The second strand of literature gives an alternate viewpoint on the way fiscal decentralization impacts regional inequality. It argues that fiscal decentralization has negative distributional consequences and increases regional disparity. Two mechanisms at play are, first, that decentralization gives high-income regions a way

to outperform the low-income regions, and second that decentralization may cultivate an environment of inefficient and opportunistic local administrations. Wealthier regions have a larger tax base than the poorer regions and will, therefore, collect more taxes and, in return, provide more local goods. This process may pull resources away from poorer regions, thereby increasing regional disparities (Prud'homme 1995, Oates 1999). In addition, local administration under fiscal decentralization may take advantage of their autonomy and lack of monitoring by the central government. This fosters institutional inefficiency, corruption, and rent-seeking activities, which would affect efficient provisions of public goods and also increase regional disparities, whereby the well-monitored regions outperform the lowly administered ones (Prude'homme 1995; Bardhan and Mookherjee 2000; Bardhan 2002). Tanzi (1998) argues that decentralization might lead to excessive regulation, higher administrative costs, or reduced quality of local bureaucrats, any of which could increase regional disparities, where the low income regions lag behind the high income regions.

Beyond institutional constraints, the effectiveness of decentralization is also driven by the level of economic development of a region. This can be attributed to differential resource endowments and especially territorial imbalances across regions at different stages of development. Rodriguez-Pose and Eczurra (2009) argue that in less developed countries, the existence of high territorial imbalances means that decentralization leads to growing inequalities, while in well-developed regions high imbalances mean the effect of decentralization is to reduce inequality or to have no effect. A significant determinant of this territorial inequality in this study is the quality of the institution that monitors the transfer of resources within jurisdictions. In our study, this is the justification we use to bring in governance quality as a key mediating variable. Also, that the stage of development conditions the strength of the working mechanism of fiscal decentralization is the reason behind considering the specific sample of the Indian subcontinent for our empirical investigation. Theoretical reasoning is further elaborated in the subsections below.

Empirical studies can be categorized into single-country case studies and cross-country studies which use data on highly developed and/or less developed countries. Single-country studies include Kim et al. (2003) for Korea; Kanbur and Zhang (2005), Qiao et al. (2008), and Song (2013) for China; Akai and Hosio (2009) for the USA; and Calamai (2009) and Torrisi et al. (2015) for Italy. China's decentralization policies are said to increase inequality in the geographical distribution of fiscal resources. However, Qiao et al. (2008) found that disparities were reduced through the use of extra-budgetary funds in the allocation of fiscal resources. In Korea, the effect is inconclusive, but in the USA and Italy, decentralization decreased regional inequalities by increasing the effectiveness of socioeconomic factors that drive the reduction in regional disparities. All in all, the evidence from single-country studies supports the theory that fiscal decentralization works as a commitment device that hardens the local government's budget constraint and promotes economic growth in poor areas.

Cross-country studies provide evidence of the differential impact of fiscal decentralization on regional disparity according to the level of economic development. Rodríguez-Pose and Ezcurra (2009) and Lessmann (2009, 2012) both find that

developing countries experience increasing regional inequalities in the decentralization process, while decentralization has contributed to regional convergence in developed economies. This reasoning is again attributed to institutional quality in developed countries relative to developing countries. Sacchi and Salotti (2014) look at this relationship the other way around, asking how regional disparities affect fiscal decentralization across 21 OECD countries between 2001 and 2015. They conclude that "high regional economic disparities call for lower fiscal decentralisation." They add that "this could be interpreted as the outcome of a bargaining process driven by the relative strength and different incentives of rich and poor regions. Thus, from a positive point of view, equity considerations seem to suggest the avoidance of fiscal decentralization processes in countries with significant regional economic disparities, notwithstanding the well-known efficiency gains" (Sacchi and Salotti 2014).

In the case of the Indian economy, the income gap between the poorest and the richest states has widened over the years. In an empirical investigation of the effect of fiscal decentralization on regional gaps, Dash (2014) finds that the gap in the year 2006–2007 has increased to nearly four-and-a-half times compared to that in the year 1980–1981, while fiscal decentralization reform in the period of 1993–1994 reduced the level of regional disparity across major Indian states. The effect depends upon the level of development of those states and are larger in low-income states than in middle-income and high-income group states. Higher fiscal decentralization has helped the low-income states to reduce the interstate income gaps among themselves. The group of low-income states have benefitted mostly from the policy intervention. The only other empirical study close to this topic is by Jin and Rider (2020) who investigate the impact of fiscal decentralization on economic growth of India and China for the period 1985–2005. They find that expenditure decentralization has a positive and statistically significant effect on fiscal equalization, whereby the fiscal disparities in sub-national jurisdictions are reduced. This in turn enhances long-run economic growth in India. Hence, going by these empirical studies for the Indian economy, it is observed that fiscal decentralization can act as a mechanism in impacting regional inequalities.

2.2 Institutional quality and regional disparities

According to La Porta et al. (1999), good institutional or governance quality stems from three areas: social, political, and cultural. Institutional and governance quality constitutes of high quality of bureaucracy, successful provision of essential public goods, effective spending, and democracy. In other words, the capacity of the state to efficiently protect property rights and provide public goods without indulging opportunist or corrupt practices indicates its efficient quality. In the last few decades, concerns about regional inequality have led decision-makers in many parts of the world to prioritize the quantitative as well as qualitative importance of public interventions aimed at reducing the regional disparities (Pike et al. 2012). The importance of public interventions stems from the fact that the effectiveness of regional development strategies is substantially connected to the manner in which policy is implemented and authority is exercised

by the government (Rodriguez-Pose 2013). A poorly functioning government administration reduces the potential of the public sector to implement and design policies effectively from the ground level, which would lead to market failure and eventually regional divergence (Ezcurra and Rodriguez-Pose 2014).

A considerable amount of literature has pursued these questions of governance quality. Gyimah-Brempong and de Gyimah-Brempong (2006) examine the distributional impact of corruption on the growth and income of 61 countries in different stages of development and find that the reduction in corruption had a significant positive impact on the distribution of income, with the impact being highest in African and Latin American countries and lowest in the OECD countries. Blackburn and Forgues-Puccio (2009), through theoretical modeling, suggest that corruption may be less harmful in countries where corruption is well organized. By considering a panel of 46 developed and developing countries, Ezcurra and Rodriguez-Pose (2014) find a statistically significant negative impact of the quality of government on spatial disparities. The relationship was present in both developed and developing countries, although the impact was greater in low- and middle-income countries. This finding has important policy implications given the higher level of spatial disparities in developing countries.

The necessity of institutional factors is supported by a fair amount of the empirical literature. For instance, Kyriacou et al. (2017) examine the potential interdependence between fiscal decentralization, regional disparity, and institutional quality or governance in a simultaneous equations model. Their joint interdependence is summarized by stating that there is "strong evidence of a positive impact of fiscal decentralization on governance as well as evidence that poorly governed countries will tend to be more centralized." Their conclusions are supported by robust evidence for the claim that worse-governed countries find it more difficult to reduce regional inequalities, as well as the claim that countries with large inequalities tend to be less well governed.

Similarly, Bonet (2006) identifies institutional inefficiency as one of the prime reasons why transferring more resources to a lower level of government increases regional disparities in Colombia. Lessmann (2012) also points out in his study that different effects of decentralization on regional disparity in developing economies in contrast to highly developed countries are due to the efficiency-enhancing effects of a better institutional environment), which may contribute to regional convergence. Kyriacou et al. (2015) find that fiscal decentralization promotes regional convergence in high government quality settings in OECD countries. However, they also find that decentralization leads to wider regional disparities in countries with weak governance. Their governance dimensions include corruption, law and order, and bureaucratic quality. However, results are consistent when using other measures of institutional quality, like higher transparency (Martinez-Vazquez and Timofeev 2008; Beland and Lecours 2010; Liu et al. 2017). Calamai (2009) explains that fiscal decentralization led to an increased regional disparity in regions in Italy with better social capital (a proxy of institutional quality).

Since India is a developing country with high levels of regional disparity despite being a fast-growing transition economy, institutional quality may be more

important for reductions in regional inequality than in other countries. However, the number of empirical studies on the topic in India is small.

Charron (2010) finds that the perceived and experienced levels of corruption in India are significant and negatively correlated with the level of development, measured either in economic or in education terms. Another closely related study in a similar context is that of Kar and Saha (2013), who examine the effect of institutional quality on prevailing inequality in 19 selected Asian countries across a decade. By using the "Corruption Perception Index" and the "ICRG" index as an indicator of institutional quality, they find that corruption leads to increased income inequality in Asia's developing countries, particularly in South Asian countries. However, accounting for the prevalence of shadow economies reduces income inequality irrespective of the rise in corruption. Furthermore, the theoretical reasons for the detrimental effects of poor institutional quality on economic outcomes in a country like India arise from the fact that India is the world's largest democracy. Studies like You and Khargram (2004) show that in case of democracies, there is a two-way causal relationship between institutional quality and inequality. In democracies, the wealthier classes are forced to rely on corrupt practices rather than repression of the masses, harming the quality of administration in the region, which has a negative bearing on the allocation of public resources to the citizens. Given the wide-scale disparities in income across the Indian states, differences in institutional quality across public administration jurisdictions are likely to exist. The quality of institutions is a likely factor impacting the implementation of policies concerned with the distribution of resources across regions in India.

2.3 Fiscal decentralization, regional convergence, and the role of institutional quality: bringing the three factors together in the Indian context

The previous two sections support the reasoning that devolution of fiscal autonomy rarely delivers the targeted economic returns alone and requires several other institutional features to be in place. Since regional governments are not always efficient and accountable in the provision of public goods provision, the success of decentralization reforms in shaping up regional convergence depends substantially on the competency and caliber of the local governance in undertaking the task efficiently (Rodríguez-Pose and Gill 2004; Muringani et al. 2019).

There are three important reasons to focus on India when examining the mediating effect of institutional quality on the relationship between fiscal decentralization and regional inequality. First, India's federal structure has relatively higher magnitude of fiscal decentralization compared to the other developing economies (Rao 2002). Second, India is a developing country with a rapidly growing economy, but also a widening degree of regional inequality (Dash 2014). Third, according to several sources ranking countries on institutional quality, India generally falls in the middle to lower half of the ranks, despite being a transitioning country with a stable democracy. This implies India has a moderate to large degree of corruption relative to most countries (Quah 2008). Summing up the above three reasons, a developing country like India might be an excellent test case of the proposition that "the
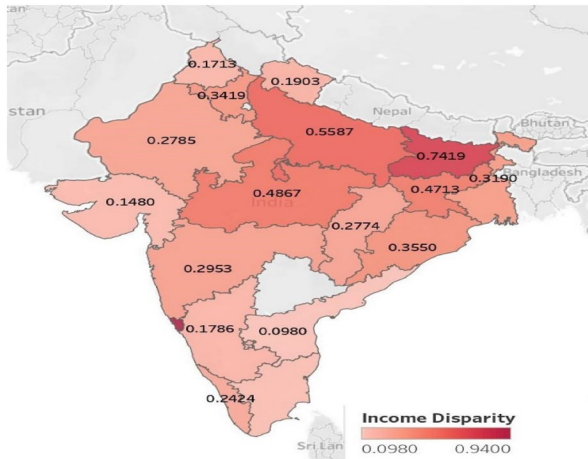
Fig. 2 Income disparity across the states*

Fig. 3 Corruption control efforts*
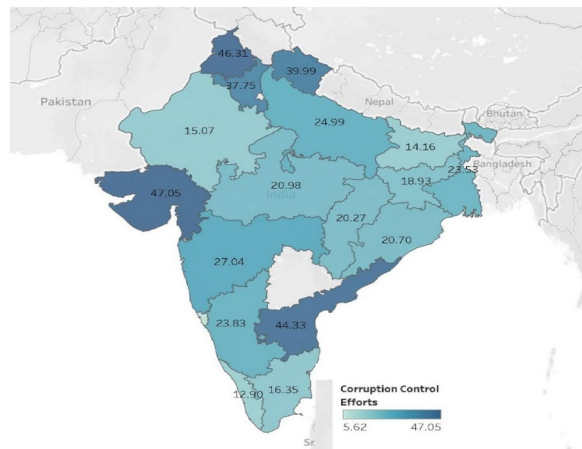
impact of fiscal decentralization on regional convergence is conditioned by the quality of institutions which governs it," as well as the claim that decentralization has more important policy implications for developing countries with higher existence of regional disparities (Ezcurra and Rodriguez-Pose 2014).

India holds potential for understanding the policy implications of decentralization reforms. It also has decentralization reforms to study in the form of two constitutional amendments in 1993 and 1994, which delegated some central power to local governments. To the best of our knowledge, no study thus far has tested the link between fiscal decentralization and regional disparity through the lens of corruption control in India. In this paper, we test the hypothesis that "the efforts in combating corruption at the regional level affect the relationship between fiscal decentralization and regional disparities within India." The three cardinal variables are represented in
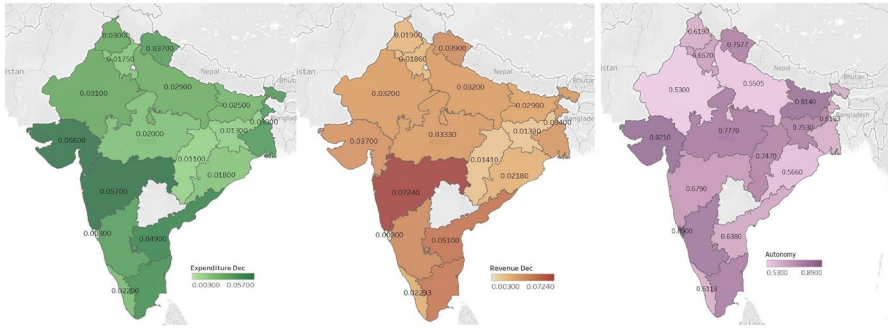
Source: Authors

Fig. 4 Fiscal decentralization across the states * Source: Authors. *The map indicates only those states that have been considered for this study

Figs. 2, 3, 4, highlighting the varying levels of regional disparity, corruption control efforts across the states, and fiscal decentralization, respectively, that have been considered for this study.

3 Empirical strategy and data

3.1 Econometric specification

We investigate the effect of fiscal decentralization and regional disparity, with a particular focus on the role of corruption control efforts. Our model is given by Eq. 1:

$$RD_{it} = a + \beta_1 FD_{it} + \beta_2 CC_{it} + \beta_3 FD_{it} * CC_{it} + \beta_4 X_{it} + \varepsilon_{it} \tag{1}$$

where RD_{it} is the regional disparity for state i in period t, measured as income in that state relative to the country. FD_{it} is the fiscal decentralization, defined in three ways as the ratio of fiscal expenditures in the state to overall fiscal expenditures. Definitions of the variables are discussed in the next section. CC_{it} is the corruption control efforts, and X_{it} is a vector of control variables. A key part of the model is the interaction term $FD_{it} * CC_{it}$, which allows the effect of decentralization to vary depending on the level of corruption control. We center the key variables for ease of interpretation, which is a standard practice in interaction models. Based on our previous theoretical and empirical illustrations, fiscal decentralization might or might not lower regional disparity across states, such that $\beta_1 < 0 \text{ or } \beta_1 > 0$. The interaction effect of fiscal decentralization and corruption control on regional disparity given by β_3 would be determined primarily by the sign of β_1.

We also include a control for the size of the public sector. Kuznets (1955) states that inequality rises in the early stage of economic development and decreases in the later stage. Richer countries are more likely to have better redistributive policies aimed at reducing regional disparities (Lessmann 2009). Part of that relationship may be due to a larger public sector being better endowed to address regional

disparities (Rodriguez -Pose and Ezcurra 2009, Kyriacou et al. 2015), or it could also be the possibility that a larger public sector implies greater corruption and rent-seeking activities which affect regional disparities (Tanzi 1998). For this, we take public investment as a share of state GDP. We also control for private investment as a share of GDP (Voitchosky 2005, Kyriacou et al. 2015). Another control is human capital endowment as a significant factor explaining economic growth (Barro 2001) and, hence, regional disparities. Regions rich in human capital are expected to develop faster than their less advantageous counterparts (Dash 2014). Following Kyriacou et al. (2015) we also control for real log national GDP per capita and its square.

3.2 Measuring key variables

We estimate the model in the previous section using a sample of eighteen major non-special category[2] states of India over the period 2001–2015. In this subsection, we discuss how the key variables in the model are measured, along with other indicators to explain the relationship between regional income disparities, fiscal decentralization, and corruption control. The reason for confining the analysis to non-special category states is that predominant proportions of economic activity in these states are determined by government expenditure.[3] These states are in the preferential lists of grants by the government.

3.2.1 Regional disparities

In order to construct a measure of regional income disparities across states (*RD*), we employ the relative income per capita formula following Bonet (2006), Qiao et al. (2008), and Dash (2014):

$$\text{RD}_{it} = \left| \frac{\text{PCSI}_{it}}{\text{PCNI}_t} - 1 \right| \tag{2}$$

where PCSI_{it} is the per capita income (state per capita gross domestic product) of the state i during year t and PCNI_t is the average per capita income of the major Indian states (included in sample) during that year. This measure is used to calculate the deviation from the national per capita income average based on the concept of relative per capita income. It ranges from 0 to 1, with 0 being perfect equality and 1 being perfect inequality. Data come from the Reserve Bank of India's Handbook of the Statistics of the Indian Economy and the Indian States. It is worth mentioning that though this measure of regional disparities is popular in the existing literature, it masks the changes in distribution of income at the state level.

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[2] These states are Andhra Pradesh, Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand, and West Bengal.

[3] See studies Chaudhuri, K., & Dasgupta, S. (2006), Dash, B. B., & Raja, A. V. (2012), Dash, B. B. (2014), Ganaie, A. A. et al. (2018), Bhat S.A. et al. (2018).
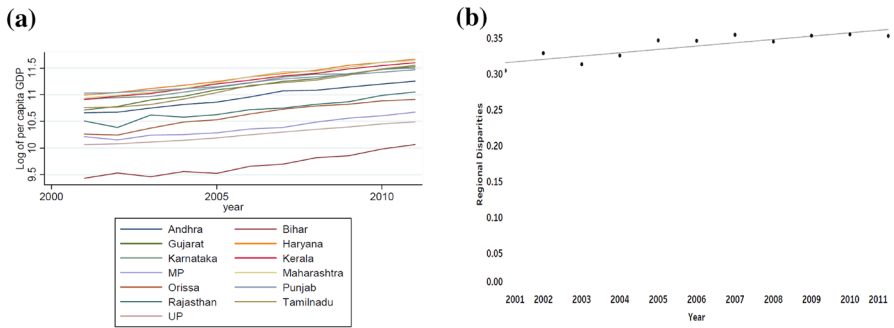
Fig. 5 a Trend of per capita GDP across states. **b** Standard deviation of state income. Data Source: EPWRF India Time Series Statistics

Per capita income across major Indian states is approximately moving together (Fig. 5a) but are not converging (Fig. 5b). To show this, we plot the "sigma" convergence, which involves calculating the standard deviation across the per capita incomes of all of the units (regions) at a given point in time and then plotting the resulting standard deviation over time (Fig. 5b). The sigma takes off positively, showing a widening disparity of income per capita across states at every point in time.

3.2.2 Fiscal decentralization

We calculate fiscal decentralization in three different ways, namely expenditure decentralization, revenue decentralization, and autonomy of states (Lessman 2012, Song 2013).

Expenditure decentralization is defined as a sub-national expenditure (excluding transfers to other governments) as a percentage of general government total expenditure.[4]

$$\text{Exp Dec}_{it} = \left(\frac{\text{total expenditure}_{it} - \text{capital as well as current transfers to other government}_{it}}{\text{general government expenditure}_t - \text{transfers}_t} \right)$$

Revenue decentralization is defined as sub-national revenues as a percentage of total revenues.

$$\text{Rev Dec}_{it} = \left(\frac{\text{total revenue}_{it}}{\text{general government revenue}_t} \right)$$

The first two measures denote the authority power of the states. Both measures come from IMF Government Finance Statistics[5] and are commonly used in the decentralization literature. However, these indicators do not necessarily reflect

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[4] General government includes the central government, the state government, and the local government.

[5] https://data.imf.org/?sk=1C28EBFB-62B3-4B0C-AED3-048EEEBB684F.

sub-national government autonomy in decision-making, since the central government may also decide to spend at the local level through its own legislation. To capture these effects, the third measure has been considered (autonomy of states). Higher autonomy power corresponds to a greater level of fiscal independence.

Autonomy of states is defined by the ratio of state fiscal revenue to provincial spending each year, which represents how the state maintains public spending at the state level. The larger the ratio is, the more fiscally independent the region/states are.

3.2.3 Corruption control index

The empirical literature on corruption is mostly based on data that measure corruption perception. This type of data is based on the perceived level of corruption based on public opinion and expert assessments. These perception indicators are subjective in nature and sensitive to the respondents. However, the extent of actual corruption cannot be inferred from such perception-based data.

For our work, we construct state-level corruption data following the rationale of Debroy and Bhandari (2012) who define corruption as an activity that is based on the process in curbing that rather than on the outcomes (which is difficult to measure). Hence, instead of corruption perception at the state level, we measure the effectiveness of anti-corruption agencies in tackling corruption in government offices.

The National Crime Record Bureau of India publishes (annually) the economic offense data at the state level that gives detailed information on how many public servants (includes A-graded and B-graded officers) who have been convicted when found guilty and have been punished under the category of white-/blue-collar crime, including bribery. Using data between 2001 and 2015, we calculate an aggregate composite index (state-wise) on a scale of 1–11 that includes the following aspects of actions taken by the state vigilance bodies in prosecuting corrupt officials.

1. Percentage of cases charge-sheeted out of the total number of cases investigated during a particular year.
2. Rate of competition of trials in courts.
3. Percentage of persons convicted to the total number of trials completed in courts.
4. The proportion of officers that includes both gazetted or equal status officers in public undertaking involved (group "A" officers and group "B" officers) and non-gazetted officers arrested under corrupt practices out of total persons arrested.

A higher value of this constructed "corruption control index" implies stronger efforts by the states in punishing the guilty in corruption-related activities. One might argue that higher convictions may be due to higher corruption in the states. The rationale behind taking higher convicts as a positive for anti-corruption efforts is that the rank correlation coefficient between conviction rates scores by states in our study and state's ranking (higher ranking equals higher corruption) by India's

Corruption Report 2005 (Centre for Media Studies 2005) is − 0.52 (also significant) which implies that the level of corruption is negatively correlated with conviction rates. From this, we can say that a higher conviction rate can be taken as a positive for anti-corruption effort.

As previously mentioned, measuring the extent of corruption in the public sector is intrinsically difficult. Most of the studies use perception-based data, but the extent of corruption itself is impossible to infer from the perception data. In such a scenario, the data on action taken by the anti-corruption agency against those accused of corruption can be far more fertile in terms of insights it can generate.

In this context, our study comes close to the corruption-related data and methodology followed by Rodríguez-Pose and Zhang (2019), who investigate the link between government institutions and the dynamics of urban growth in China. They proxy institution by fight against corruption by the government at the city level and the provincial level, and following the common practice in the corruption-related literature, they measure the total number of corruption cases prosecuted in each city. This is a "proxy about how seriously local authorities are tackling corruption amongst their employees" (Rodríguez-Pose and Zhang 2019).

Similar to the caveats mentioned by Rodríguez-Pose and Zhang (2019), we would like to highlight the potential limitations of using this kind of corruption data. It might be possible that in some areas where the extent of corruption is great, the reporting of offense is low. Also, the zeal with which various states address the issue of corruption might vary.[6] While we agree that the corruption control data might not be able to capture certain aforementioned dimensions, it is worth mentioning that any sudden drastic movement in corruption control effort at the sub-national level is not expected since "many authors working on the importance of institutions for economic development have highlighted that institutional quality in a given place changes very slowly with time, if at all" Rodríguez-Pose and Zhang (2019). Despite the limitation in measuring the anti-corruption efforts in tackling corruption, we should not overlook the importance of having data available on investigations conducted and charge sheets made against the culprits and how fast trials are completed in courts. Thus, we recognize the corruption control data-related limitation and continue employing it for our current work since this kind of data in the context of a developing economy and at the sub-national level has no better alternative.

4 Main empirical results

Table 1 presents the estimation results for the baseline model (Eq. 1), where fiscal decentralization is measured through its expenditure. Estimating the baseline model using ordinary least squares would leave several biases in the results. Most economy-specific variables like GDP growth rate, per capita income, inflation, etc., are unlikely to be lag-independent and may not be exogenous. Also, there could be heterogeneity across units that may not be accounted for by the independent variables.

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[6] We thank an anonymous referee who highlighted this feature related to corruption control efforts.

Table 1 Expenditure decentralization, regional income disparity, and corruption control

Dependent variable: regional income disparity	Expenditure decentralization		
	(1)	(2)	(3)
ln (GDPpc)	− 3.749***	− 3.933***	− 3.362***
	(0.652)	(0.641)	(0.653)
ln (GDPpc)^2	0.260***	0.269***	0.243***
	(0.0305)	(0.0300)	(0.0305)
Human capital	0.231***	0.227***	0.261***
	(0.118)	(0.116)	(0.115)
Public investment	− 0.223**	− 0.189**	− 0.183**
	(0.126)	(0.114)	(0.109)
Private investment	− 0.400*	− 0.495**	− 0.421*
	(0.237)	(0.235)	(0.229)
Expenditure decentralization	− 0.475***	− 0.674***	− 1.074***
	(0.191)	(0.290)	(0.403)
Corruption control	–	− 0.0084**	− 0.0090***
		(0.0033)	(0.0032)
Expenditure decentralization* Corruption control	–	–	− 0.413***
			(0.141)
Observations	270	270	270

Standard errors in parentheses. *, **, and *** measure statistical significance at the 10%, 5%, and 1% levels, respectively. All regressions report FGLS and include constant (not shown). Sample period: 2001–2015. Year and state effects included

Due to the violation of exogeneity and homoscedasticity assumptions, a traditional approach to estimating panel models using, for example, fixed or random effect models, is unreliable. Instead, all specifications are estimated using feasible generalized least square estimator (FGLS) to account for the presence of heteroscedasticity and autocorrelation (Parks 1967, Beck and Katz 1995). We address concerns about endogeneity in a later section.

To begin with, we examine the net effect of fiscal decentralization (expenditure decentralization) on regional disparity in Table 1 without considering the effect of control on corruption (column 1). The coefficient on expenditure decentralization is negative and statistically significant (− 0.475) at the 1% level, suggesting that a one percentage point increase in expenditure decentralization reduces regional disparity by 0.475 points. After adding corruption control (column 2), the estimated impact of a one percentage point change in expenditure decentralization on regional disparity increases to 0.674 points. The efforts taken by the government in tackling corruption act as a significant determinant of regional income disparity. The coefficient on corruption control is negative and significant, implying that the higher efforts to reduce corruption reduce regional income disparities. However, our main variable of interest is the interaction between fiscal decentralization and corruption control efforts (column 3). This interaction term allows us to evaluate how corruption control efforts influence the effect of fiscal decentralization on regional income disparity. As predicted, the estimated coefficient on the interaction term is negative and

Table 2 Average marginal effects

	Expenditure decentralization (1)	Revenue decentralization (2)	Fiscal autonomy (3)
Index = 1	− 1.074*** (0.403)	− 0.864*** (0.174)	0.220*** (0.117)
Index = 2	− 1.48*** (0.469)	− 1.191*** (0.435)	0.178 (0.131)
Index = 3	− 1.900*** (0.564)	− 1.518*** (0.519)	0.136 (0.139)
Index = 4	− 2.314*** (0.676)	− 1.845*** (0.614)	0.095 (0.164)

Standard errors in parentheses. *, **, and *** measure statistical significance at the 10%, 5%, and 1% levels, respectively. Index values are based on the standard deviation of the centered corruption control index. Index value = 1 depicts the value when the standard deviation equals zero and so on (Scaling by 1). Sample period: 2001–2015

significant. The negative effect of fiscal decentralization on regional income disparity gets stronger with additional efforts to curb corruption.

However, these coefficients should not be interpreted in isolation. For a more detailed picture, we look at the marginal impact of fiscal decentralization on regional income disparity for varying degrees of corruption control (Table 2). For expenditure decentralization (Table 2, column 1), the effect of decentralization is more negative for higher levels of the corruption control index. At each margin, an increase in corruption control is accompanied by stronger negative effects of decentralization.

Regarding the other control variables, the results are, in general, consistent with our prediction. The negative coefficient of the log of per capita GDP and positive coefficient of its square denotes disparity rising as GDP increases. The coefficients on public and private investment are negative, consistent with investment reducing regional income disparity across states. Another control is human capital endowment. Human capital is a significant factor explaining economic growth (Barro 2001). Regions rich in human capital develop faster than less advantageous regions (Dash 2014). Since human capital tends to be higher in regions that are already richer, this increases disparity.

As noted previously, fiscal decentralization is a multi-dimensional concept, and no single measure can capture all the dimensions. For this reason, we employ several other alternative forms of fiscal decentralization. In addition to expenditure decentralization as depicted in Table 1, we use revenue decentralization and the fiscal autonomy of states, defined in Sect. 3.2.2.

We re-estimate Eq. (1) using the two alternate measures of fiscal decentralization in Table 3. The estimated coefficient on revenue decentralization in column (1) is negative and significant, and its interaction with corruption control index is negative and significant. For autonomy of states in columns (4)–(6), the coefficient on autonomy is positive and significant in column (4). If we increase the autonomy power of states by one percentage point, regional disparities increase by 0.220 points. This

Table 3 Revenue decentralization, fiscal autonomy, regional disparity, and corruption control

Dependent variable: regional income Disparity	Revenue decentralization			Fiscal autonomy		
	(1)	(2)	(3)	(4)	(5)	(6)
ln (GDPpc)	− 3.815***	− 3.002***	− 3.397***	− 3.021***	− 3.137***	− 3.733***
	(0.651)	(0.642)	(0.653)	(0.614)	(0.631)	(0.632)
ln (GDPpc)^2	0.264***	0.273***	0.245***	0.225***	0.230***	0.211***
	(0.0305)	(0.0300)	(0.0305)	(0.0283)	(0.0290)	(0.0292)
Human capital	0.219***	0.222***	0.270**	0.206***	0.225***	0.253***
	(0.120)	(0.118)	(0.115)	(0.0773)	(0.0821)	(0.0850)
Public investment	− 0.220**	− 0.190**	− 0.172	− 0.865***	− 0.917***	− 0.812***
	(0.127)	(0.111)	(0.112)	(0.152)	(0.157)	(0.157)
Private investment	− 0.394*	− 0.480**	− 0.409*	− 0.449**	− 0.583***	− 0.537***
	(0.238)	(0.236)	(0.230)	(0.180)	(0.184)	(0.186)
Decentralization	− 0.260***	− 0.450***	− 0.864***	0.246***	0.239***	0.220***
	(0.141)	(0.155)	(0.174)	(0.119)	(0.114)	(0.117)
Corruption control	−	− 0.0083**	− 0.0093***	−	− 0.0043*	− 0.0039*
		(0.0033)	(0.0032)		(0.0023)	(0.00236)
Decentralization* Corruption control	−	−	− 0.327***	−	−	− 0.0414**
			(0.126)			(0.0233)
Observations	270	270	270	270	270	270

Standard errors in parentheses. *, **, and *** measure statistical significance at the 10%, 5%, and 1% levels, respectively. All regressions report FGLS and include constant (not shown). Sample period: 2001–2015. Year and state effects included

might be due to the fact that states are not able to pass the benefits in the form of increased expenditure to the poorer regions out of their own revenues. This, in turn, increases regional inequality. The interaction effect is negative, which means corruption is a crucial factor in linking fiscal autonomy and regional income.

Columns 2 and 3 of Table 2 show the marginal effects of revenue decentralization and fiscal autonomy at different values of corruption control, finding similar results, and even similar coefficients for revenue and expenditure decentralization.

5 Robustness of results

5.1 Endogeneity

One further methodological issue is endogeneity and reverse causality. Either can bias the estimated impact of our key variables. States with more significant regional disparities tend to move toward greater centralization in order to improve redistributive capacity. That is one possible reason for measures of fiscal decentralization being endogenous (Lessmann 2012). Also, higher disparities may crowd out policies aiming toward more efficient government at the central and federal level

(Kyriacou et al. 2015). To address these issues, we conduct system GMM estimation and instrumental variable estimation.

5.1.1 System GMM estimation

The system GMM approach suggested by Arelleno and Bover (1995) and Blundell and Bond (1998) is being employed to tackle this issue. There are two GMM versions: the difference GMM (diff-GMM) and the system GMM (sys-GMM). The difference GMM developed by Arellano and Bond (1991) uses past values of the regressor in levels as instruments of the differenced dependent variable. However, Arellano and Bover (1995) and Blundell and Bond (1998) show that in the case of persistent regressors—such as institutional variables—lagged levels of the variables are weak instruments for the first-differenced regressors. They propose the more efficient system, GMM estimator. This method utilizes instruments in levels and first differences to improve efficiency.

The system GMM results are presented in Table 4. The results are in line with FGLS results (Tables 1, 2,3).

5.1.2 Instrumental variable approach

As an additional robustness check, we employ the instrumental variable approach to look into the issue of causality. For this purpose, with the assumption that fiscal decentralization is an endogenous variable, we select an instrument at the state level that is correlated with fiscal decentralization but not with regional disparity. We propose that "inclusiveness" at the state level is a potential instrument, whereby "inclusiveness" is a composite index consisting of the acceptance of gay and lesbian rights, extent of discrimination and violence against minorities, equality of political power by gender, equality of political power by socio-economic position, and equality of political power by social group. These data are provided as a part of the state-level Social Progress Index of India available at https://socialprogress.in/spi-states-of-india-2017/. The rationale for the choice of this variable as an instrument is governed by the fact that diversity and heterogeneity in population affect fiscal decentralization. As pointed out by Bodman et al. (2010), greater diversity might lead to a need for higher fiscal decentralization as an integrating factor (Panizza 1999). Conversely, excessive fragmentation might lead to separatism, in which case centralization might be a binding force (Tanzi 2000; Campbell 2003). Either way, since the extent of diversity affects fiscal decentralization, we conjecture that "inclusiveness" is a potential instrument. At the same time, it is less likely that inclusiveness would be correlated with income disparity across states.

The results of the instrumental variable estimation are presented in Table 5. For our specifications, the F-statistics are well above 10, which suggests the relevancy that this instrument is indeed strong. The Sargan statistic for over-identification restriction is in all cases above 0.10, thereby implying that we cannot

Table 4 Fiscal decentralization, regional disparity, and corruption control: System GMM

Dependent variable: Regional income Disparity	Expenditure decentralization			Revenue decentralization			Fiscal autonomy		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Disparity$_{t-1}$	0.202* (0.104)	0.206** (1.00)	0.114 (0.141)	0.199*** (0.095)	0.206** (0.0922)	0.0733 (0.142)	0.277*** (0.085)	0.284 (0.0804)	0.244 (0.0951)
ln (GDPpc)	−2.171*** (0.545)	−2.662*** (0.664)	−2.702*** (0.652)	−2.215*** (0.537)	−2.202*** (0.663)	−2.347*** (0.654)	−2.979*** (0.547)	−2.334*** (0.636)	−2.623*** (0.784)
ln (GDPpc)^2	0.375*** (0.0465)	0.269*** (0.0350)	0.243*** (0.0346)	0.264*** (0.0289)	0.273*** (0.0350)	0.245*** (0.0346)	0.271*** (0.0291)	0.278*** (0.0342)	0.258*** (0.0361)
Human capital	0.214*** (0.0371)	0.212*** (0.0363)	0.274*** (0.054)	0.228*** (0.0377)	0.223*** (0.0361)	0.170* (0.0872)	0.208** (0.0871)	0.189** (0.0846)	0.210** (0.0869)
Public investment	−1.081*** (0.181)	−1.289*** (0.169)	−1.096*** (0.161)	−1.186*** (0.102)	−1.154*** (0.170)	−1.234*** (0.133)	−1.059*** (0.120)	−0.872*** (0.113)	−0.861*** (0.107)
Private investment	−0.253** (0.151)	−0.289** (0.165)	−0.343** (0.161)	−0.320** (0.182)	−0.380** (0.170)	−0.432*** (0.161)	−0.692*** (0.190)	−0.680*** (0.183)	−0.605*** (0.177)
Decentralization	−0.816*** (0.178)	−0.848*** (0.175)	−1.124*** (0.272)	−0.376*** (0.126)	−0.427** (0.127)	−0.897*** (0.284)	0.361*** (0.0547)	0.343*** (0.0471)	0.338*** (0.0488)
Corruption control	–	−0.0030*** (0.0010)	−0.0030*** (0.0013)	–	−0.0030*** (0.0010)	−0.0036*** (0.0013)	–	−0.0035** (0.00297)	−0.0060*** (0.00137)
Decentralization *Corruption control	–	–	−0.317** (0.0790)	–	–	−0.286*** (0.070)	–	–	−0.0481** (0.0114)
Observations	270	270	270	270	270	270	270	270	270
Hansen test	0.761	0.884	0.714	1.00	1.00	1.00	0.952	0.937	1.00
AR (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	0.269	0.165	0.199	0.118	0.145	0.814	0.157	0.268	0.134

Standard errors in parentheses. *, **, and *** measure statistical significance at the 10%, 5%, and 1% levels, respectively. All regressions report FGLS and include constant (not shown). Sample period: 2001–2015. Year and state effects included

Table 5 Fiscal decentralization, regional disparity, and corruption control: Instrumental variable approach

Dependent variable: regional Income Disparity	Expenditure decentralization			Revenue decentralization			Fiscal autonomy		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln (GDPpc)	− 2.009***	− 2.766***	− 2.462***	− 2.204***	− 2.109***	− 2.493**	− 2.745***	− 2.721***	− 2.623***
	(0.915)	(0.890)	(1.499)	(0.976)	(0.960)	(1.524)	(0.554)	(0.536)	(0.784)
ln (GDPpc)^2	0.266***	0.301***	0.197***	0.274***	0.316***	0.197***	0.271***	0.278***	0.258***
	(0.0423)	(0.0411)	(0.0686)	(0.045)	(0.044)	(0.0704)	(0.0291)	(0.0342)	(0.0361)
Human capital	0.416***	0.406***	0.453***	0.477***	0.468***	0.485***	0.309***	0.389**	0.410***
	(0.141)	(0.134)	(0.178)	(0.165)	(0.156)	(0.182)	(0.106)	(0.146)	(0.169)
Public investment	− 0.559***	− 0.489***	− 0.367***	− 0.496***	− 0.411***	− 0.328**	− .559***	− 0.772***	− 0.851***
	(0.168)	(0.163)	(0.182)	(0.186)	(0.184)	(0.195)	(0.120)	(0.113)	(0.107)
Private investment	− 0.184	− 0.246	− 0.154	− 0.090	− 0.158	− 0.126	− 0.192	− 0.180	− 0.205
	(0.268)	(0.258)	(0.268)	(0.290)	(0.276)	(0.279)	(0.170)	(0.163)	(0.154)
Decentralization	− 0.732***	− 0.856***	− 1.152***	− 0.459***	− 0.523***	− 1.020***	0.582***	0.572***	0.338***
	(0.262)	(0.313)	(0.553)	(0.253)	(0.267)	(0.515)	(0.324)	(0.301)	(0.187)
Corruption control	–	− 0.0022***	− 0.0042***	− 0.0034***	–	− 0.0039***	–	− 0.0045**	− 0.0053***
		(0.001)	(0.0013)	(0.0015)		(0.0019)		(0.0019)	(0.0016)
Decentralization *Corruption control	–	–	− 0.527**	–	–	− 0.315***	–	–	− 0.0682**
			(0.0790)			(0.0729)			(0.0214)
Observations	270	270	270	270	270	270	270	270	270
R-Square	0.601	0.636	0.614	0.53	0.577	0.570	0.600	0.578	0.57

Standard errors in parentheses. *, **, and *** measure statistical significance at the 10%, 5%, and 1% levels, respectively. All regressions use system GMM. Sample period: 2001–2015. Year and state effects included

Table 6 Expenditure decentralization, regional disparity, and corruption control: Income-wise

Dependent variable: regional income disparity	High-income states			Low-income states		
	(1)	(2)	(3)	(4)	(5)	(6)
ln (GDP$_{pc}$)	− 1.643*** (0.821)	− 1.468*** (0.734)	− 1.139*** (0.568)	2.838*** (1.731)	2.270** (1.078)	2.151** (1.048)
ln (GDP$_{pc}$)^2	0.0498*** (0.0249)	0.0411*** (0.0205)	0.0181*** (0.001)	− 0.218*** (0.0345)	− 0.143*** (0.0520)	− 0.136*** (0.0506)
Human capital	0.224*** (0.0822)	0.309*** (0.0803)	0.314*** (0.0804)	0.652*** (0.115)	0.803*** (0.146)	0.786*** (0.142)
Private investment	− 0.322*** (0.112)	− 1.256*** (0.212)	− 1.209*** (0.223)	− 0.706*** (0.113)	− 0.659*** (0.205)	− 0.642*** (0.201)
Public investment	− 1.190*** (0.231)	− 1.517*** (0.268)	− 1.529*** (0.268)	− 0.743*** (0.123)	− 0.789*** (0.221)	− 0.830*** (0.102)
Decentralization	− 0.236 (0.165)	− 0.513* (0.304)	− 0.635** (0.361)	− 1.247*** (0.696)	− 1.481*** (0.681)	− 1.886*** (0.698)
Corruption control	−	− 0.0065** (0.0027)	− 0.0074** (0.0029)	−	− 0.0073** (0.0031)	− 0.0078** (0.0030)
Decentralization* Corruption control	−	−	− 0.0932 (0.141)	−	−	− 0.367** (0.123)
Observations	135	135	135	135	135	135

Standard errors in parenthesis. *, **, *** measures statistical significance at the 10%, 5%, and 1% levels, respectively. All regressions report FGLS and include constant (not shown). Sample period: 2001–2015. Year and state effects include

reject the null hypothesis of no correlation between the instruments and the error term in the regressions.

5.2 Sub-sample (income-wise)

It is possible that the relationship between decentralization, corruption control, and convergence depends on the income level of the state. If our results do not hold in a low-income subsample, or if results are stronger in high-income states than in low-income states, then our mechanism of interest may not be correct. To address this issue, we divide the eighteen major Indian states into two income categories—high-income category states and low-income category states.

The results for expenditure decentralization across different income groups are presented in Table 6. The findings suggest that decentralization has helped the low-income states to reduce regional disparity as compared to the high-income states (excluding the corruption control variable). The results are consistent with Dash (2014). According to Dash (2014), all high-income states follow very similar expenditure policies, and the local governments in these states were established around the same time period. Low-income states have benefitted most from the policy intervention. The

interaction effect is negative throughout all the decentralization measures across all categories of states (high-income vs low-income). But it is significant across low-income groups only, implying the importance of reducing corruption as a useful tool for improving the effects of decentralization in low-income states. Similar findings are noted for the other two indicators of fiscal decentralization, viz. revenue decentralization and fiscal autonomy, in Table A1 and A2 in the Appendix section.

5.3 Alternate estimation measure

In this sub-section, we examine the statistical robustness of our findings. We re-estimate the model using a modification of the full GLS-Parks estimator called panel-corrected standard error (PCSE) (Beck and Katz 1995) model. PCSE preserves the weighting of observations for autocorrelation but uses a sandwich estimator to incorporate cross-sectional dependence when calculating standard errors. It also accounts for heteroscedastic errors, contemporaneously cross-sectionally correlated errors, and autocorrelated AR (1) errors. The results are reported in Table 7. We have also calculated the results for the income sub-sample (Appendix Tables A3–A5). All results are in line with the main findings reported earlier, thereby indicating the robustness of our findings across sub-sample and estimation methods.

6 Conclusion

In this paper, we examine the extent to which state efforts to control corruption mediate the effect of fiscal decentralization on regional disparities. While a section of the existing literature is of the view that fiscal decentralization may contribute toward the reduction in regional disparities because it empowers better-informed subcentral governments, it is also possible that regional convergence may not materialize because of governance and transparency problems at lower levels of government.

The history of Indian federalism has potential implications for decentralization reforms. Given the duality of the fast growing Indian economy along with rising regional income gap among its states, we explore the nexus between fiscal decentralization, regional income disparity, and governance in the form of efforts taken by the states in combating corruption for the eighteen major Indian states from 2001 to 2015. We find that (1) fiscal decentralization is a crucial factor in reducing regional income disparities among the regions; (2) efforts to combat corruption are another crucial factor in reducing the gap between high-income and low-income states; (3) the effect of fiscal decentralization policy on reducing income gaps gets stronger when efforts to combat corruption are higher. Our findings are maintained when we explicitly deal with the possibility of reverse causality along with other robustness checks.

Table 7 Fiscal decentralization, regional disparity, and corruption control: Robustness check

Dependent variable: regional income disparity	Expenditure decentralization			Revenue decentralization			Fiscal autonomy		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (GDP$_{pc}$)	− 3.574***	− 3.933***	− 3.362***	− 3.581***	− 3.6002***	− 3.397***	− 3.599***	− 3.1344***	− 3.694***
	(0.645)	(0.764)	(0.752)	(0.637)	(0.763)	(0.754)	(0.647)	(0.746)	(0.703)
Log (GDP$_{pc}$)^2	0.260***	0.269***	0.243***	0.264***	0.273***	0.245***	0.271***	0.278***	0.160***
	(0.0293)	(0.0350)	(0.0346)	(0.0289)	(0.0350)	(0.0346)	(0.0291)	(0.0342)	(0.0328)
Human capital	0.231***	0.227***	0.161*	0.219**	0.222***	0.170**	0.189**	0.0696	0.0480
	(0.0864)	(0.0845)	(0.0892)	(0.0877)	(0.0863)	(0.0872)	(0.0846)	(0.0912)	(0.0924)
Private investment	− 0.400*	− 0.495**	− 0.421**	− 0.394**	− 0.480**	− 0.409**	− 0.481**	− 0.852***	− 0.848***
	(0.189)	(0.200)	(0.176)	(0.184)	(0.196)	(0.174)	(0.188)	(0.201)	(0.195)
Public investment	− 0.223	− 0.189	− 0.143	− 0.220	− 0.180	− 0.132	− 0.180	− 0.971***	− 0.978***
	(0.181)	(0.169)	(0.161)	(0.182)	(0.170)	(0.161)	(0.183)	(0.108)	(0.109)
Decentralization	− 0.475***	− 0.674***	− 1.074***	− 0.230**	− 0.450***	− 0.897***	0.252**	0.221**	0.217**
	(0.165)	(0.182)	(0.319)	(0.131)	(0.177)	(0.284)	(0.122)	(0.101)	(0.123)
Corruption control	–	− 0.0084***	− 0.009***	–	− 0.0083***	− 0.0093***	–	− 0.007**	− 0.0085***
		(0.00312)	(0.00314)		(0.00319)	(0.0032)		(0.0029)	(0.0030)
Decentralization*corruption Control	–	–	− 0.413**	–	–	− 0.367***	–	–	− 0.0444*
			(0.166)			(0.136)			(0.0212)
Observations	270	270	270	270	270	270	270	270	270
R-squared	0.543	0.563	0.588	0.539	0.559	0.585	0.541	0.555	0.563

Note: Standard errors in parentheses. *, **, and *** measure statistical significance at the 10%, 5%, and 1% levels, respectively. All regressions report PCSE. Sample period: 2001–2015. Year and state effects included

Our work lends credence to some concerns about the impact of fiscal decentralization and have important implications for how decentralization policy is carried out. Attempts at fiscal decentralization should be performed in tandem with, or at least be aware of the presence of, corruption control attempts to ensure that the effects of decentralization can actually be enjoyed. Decentralization is an attempt to shift funds where they can be used most effectively and reduce gaps. But the appropriate institutions must be in place for those funds to be used wisely and effectively.

Appendix

See (Tables 8, 9, 10, 11, 12).

Table 8 Revenue decentralization, regional disparity, and corruption control: Income-wise

Dependent variable: regional income disparity	High-income states			Low-income states		
	(1)	(2)	(3)	(4)	(5)	(6)
ln (GDP$_{pc}$)	− 1.839***	− 1.937***	− 1.687***	2.725***	2.671***	2.555***
	(0.912)	(0.968)	(0.853)	(0.0698)	(0.896)	(0.832)
ln (GDP$_{pc}$)^2	0.152***	0.170***	0.300***	− 0.212***	− 0.160***	− 0.152***
	(0.008)	(0.008)	(0.15)	(0.0033)	(0.0436)	(0.00402)
Human capital	0.0338***	0.0306***	0.307***	0.0606***	0.0587**	0.0490**
	(0.0169)	(0.0153)	(0.079)	(0.0127)	(0.0131)	(0.0177)
Private investment	− 0.215***	− 0.244***	− 0.480***	− 0.717***	− 0.672***	− 0.486***
	(0.107)	(0.122)	(0.230)	(0.0107)	(0.0580)	(0.0501)
Public investment	− 0.363***	− 0.527***	− 0.541***	− 0.765***	− 0.847***	− 0.931***
	(0.182)	(0.2635	(0.275)	(0.115)	(0.132)	(0.115)
Decentralization	− 0.202	− 0.491*	− 0.639**	− 0.344***	− 0.618***	− 0.770***
	(0.266)	(0.282)	(0.323)	(0.172)	(0.339)	(0.328)
Corruption control	–	− 0.0070***	− 0.0087***	–	− 0.0036***	− 0.0077***
		(0.0028)	(0.0043)		(0.0018)	(0.0027)
Decentralization *Corruption control	–	–	− 0.206	–	–	− 0.0367***
			(0.147)			(0.105)
Observations	135	135	135	135	135	135

Standard errors in parentheses. *, **, and *** measure statistical significance at the 10%, 5%, and 1% levels, respectively

All regressions report FGLS and include constant (not shown). Sample period: 2001–2015. Year and state effects included

Table 9 Fiscal autonomy, regional disparity, and corruption control: Income-wise

Dependent variable: regional income Disparity	High-income states			Low-income states		
	(1)	(2)	(3)	(4)	(5)	(6)
ln (GDP$_{pc}$)	− 1.655***	− 1.361***	− 1.777***	2.630**	1.935*	1.535**
	(0.827)	(0.681)	(0.598)	(1.862)	(1.041)	(0.871)
ln (GDP$_{pc}$)^2	0.0500***	0.0370***	0.146***	− 0.209**	− 0.174**	− 0.153***
	(0.0263)	(0.0185)	(0.073)	(0.042)	(0.0509)	(0.0429)
Human capital	0.345***	0.347***	0.326***	0.452***	0.484***	0.429***
	(0.0829)	(0.0845)	(0.0809)	(0.117)	(0.125)	(0.107)
Private investment	− 1.287***	− 1.359***	− 1.278***	− 0.834***	− 0.834***	− 0.684***
	(0.208)	(0.206)	(0.208)	(0.118)	(0.210)	(0.179)
Public investment	− 1.382***	− 1.400***	− 1.299***	− 0.838***	− 0.867***	− 0.887***
	(0.278)	(0.272)	(0.276)	(0.123)	(0.181)	(0.116)
Decentralization	0.0358	0.0439	0.328	0.152	0.126	0.0439
	(0.113)	(0.118)	(0.273)	(0.148)	(0.186)	(0.181)
Corruption control	–	− 0.0052**	− 0.0066***	–	− 0.0065**	− 0.0092***
		(0.0028)	(0.0029)		(0.0036)	(0.00292)
Decentralization* Corruption control	–	–	− 0.0740*	–	–	− 0.0774***
			(0.0449)			(0.0204)
Observations	135	135	135	135	1358	135

Standard errors in parentheses. *, **, and *** measure statistical significance at the 10%, 5%, and 1% levels, respectively. All regressions report FGLS and include constant (not reported). Sample period: 2001–2015. Year and state effects included

Table 10 Expenditure decentralization, regional disparity, and corruption control: Robustness check

Dependent variable: regional income disparity	High-income states			Low-income states		
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(GDP_{pc})$	− 0.643***	− 0.468***	− 0.399***	2.590***	2.227***	2.094***
	(0.0692)	(0.0675)	(0.0878)	(0.673)	(0.669)	(0.630)
$\ln(GDP_{pc})^2$	0.0498***	0.0411***	0.0481***	− 0.159***	− 0.141***	− 0.133***
	(0.0078)	(0.0035)	(0.0013)	(0.0324)	(0.0321)	(0.0304)
Human capital	0.338***	0.309***	0.317***	0.829***	0.760***	0.745***
	(0.0802)	(0.0817)	(0.0850)	(0.130)	(0.125)	(0.121)
Private investment	− 1.224***	− 1.246***	− 1.209***	− 0.721***	− 0.648***	− 0.594***
	(0.267)	(0.257)	(0.254)	(0.157)	(0.159)	(0.147)
Public investment	− 1.490***	− 1.525***	− 1.529***	− 0.585***	− 0.710***	− 0.710***
	(0.171)	(0.178)	(0.193)	(0.125)	(0.134)	(0.126)
Decentralization	− 0.226	− 0.473**	− 0.635**	− 1.306***	− 1.366***	− 1.652***
	(0.176)	(0.236)	(0.306)	(0.281)	(0.272)	(0.354)
Corruption control	–	− 0.0055**	− 0.0070***	–	− 0.0074***	− 0.0076***
		(0.0026)	(0.0027)		(0.0026)	(0.0025)
Decentralization *Corruption control	–	–	− 0.0932	–	–	− 0.251**
			(0.130)			(0.114)
Observations	135	135	135	135	135	135
R-Squared	0.549	0.673	0.674	0.896	0.905	0.910

Standard errors in parentheses. *, **, and *** measure statistical significance at the 10%, 5%, and 1% levels, respectively. All regressions report PCSE and include constant (not reported). Year and state effects included

Table 11 Revenue decentralization, regional disparity, and corruption control: Robustness check

Dependent variable: regional income disparity	High-income states			Low-income states		
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(GDP_{pc})$	− 0.839***	− 0.937***	− 0.973***	2.553***	2.193***	2.140***
	(0.0366)	(0.0379)	(0.0397)	(0.655)	(0.674)	(0.601)
$\ln(GDP_{pc})^2$	0.0586***	0.0621***	0.0300***	− 0.157***	− 0.140***	− 0.136***
	(0.0046)	(0.0047)	(0.00387)	(0.0315)	(0.0323)	(0.0290)
Human capital	0.338***	0.306***	0.307***	0.834***	0.770**	0.772***
	(0.0784)	(0.079)	(0.0801)	(0.137)	(0.133)	(0.128)
Private investment	− 1.222***	− 1.244***	− 1.180***	− 0.780***	− 0.700***	− 0.610***
	(0.266)	(0.256)	(0.253)	(0.152)	(0.156)	(0.150)
Public investment	− 1.468***	− 1.527***	− 1.541***	− 0.609***	− 0.747***	− 0.784***
	(0.165)	(0.187)	(0.189)	(0.129)	(0.137)	(0.128)
Decentralization	− 0.202	− 0.491**	− 0.625**	− 1.017***	− 1.125***	− 1.618***
	(0.150)	(0.198)	(0.277)	(0.288)	(0.279)	(0.417)
Corruption control	–	− 0.0070***	− 0.0076***	–	− 0.0079***	− 0.0081***
		(0.00269)	(0.00281)		(0.0027)	(0.0027)
Decentralization*Corruption control	–	–	− 0.106	–	–	− 0.258**
			(0.111)			(0.117)
Observations	135	135	135	135	135	135
R-Square	0.649	0.675	0.678	0.889	0.899	0.906

Standard errors in parentheses. *, **, and *** measure statistical significance at the 10%, 5%, and 1% levels, respectively. All regressions report PCSE and include constant (not reported). Year and state effects included

Table 12 Fiscal autonomy, regional disparity, and corruption control: Robustness check

Dependent variable: regional income disparity	High-income states			Low-income states		
	(1)	(2)	(3)	(4)	(5)	(6)
ln (GDP$_{pc}$)	− 0.328*** (0.0523)	− 0.320*** (0.0416)	− 0.311*** (0.0405)	2.599*** (0.647)	2.134** (0.746)	2.148*** (0.832)
ln (GDP$_{pc}$)^2	0.0348*** (0.0052)	0.0351*** (0.00417)	0.0341*** (0.00408)	− 0.271*** (0.0291)	− 0.278*** (0.0342)	− 0.135*** (0.0411)
Human capital	0.332*** (0.0876)	0.337*** (0.0847)	0.336*** (0.0851)	0.764*** (0.252)	0.789*** (0.258)	0.732*** (0.139)
Private investment	− 1.221*** (0.235)	− 1.248*** (0.236)	− 1.299*** (0.258)	− 0.848*** (0.146)	− 0.852*** (0.166)	− 0.775*** (0.129)
Public investment	− 1.256*** (0.250)	− 1.269*** (0.291)	− 1.315*** (0.194)	− 0.610** (0.234)	− 0.641** (0.249)	− 0.643*** (0.223)
Decentralization	0.0720 (0.0630)	0.0641 (0.0606)	0.0500 (0.0630)	0.152 (0.121)	0.0902 (0.120)	0.0383 (0.119)
Corruption control	–	− 0.0062** (0.00251)	− 0.0075** (0.00262)	–	− 0.00701** (0.00297)	− 0.00852*** (0.00304)
Decentralization* Corruption control	–	–	− 0.0587* (0.029)	–	–	− 0.0444*** (0.0212)
Observations	135	135	135	135	135	135
R-Squared	0.649	0.673	0.674	0.889	0.897	0.903

Standard errors in parentheses. *, **, and *** measure statistical significance at the 10%, 5%, and 1% levels, respectively

All regressions report PCSE and include constant (not reported). Sample period: 2001–2011. Year and state effects included

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