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The impact of macroeconomic policies on the growth of public health expenditure: An empirical assessment from the Indian states

Deepak Kumar Behera^{1*} and Umakant Dash¹

Abstract: The impact assessment of macroeconomic policies on public health expenditure is very relevant in Indian economy because of tax reform, fiscal consolidation, and expenditure policy reform. These have been undertaken after economic liberalization in order to sustain a high economic growth. Despite the several fiscal policy initiatives, there is a persistent slowing down of growth in public health expenditure and a huge disparity in the allocation of budget toward health care among the Indian states. Using the period 1990–2014, the study examines the dynamic relationships between public health expenditure and macroeconomic factors (economic growth, domestic revenue, domestic debt, fiscal balance, and central government transfer) of 15 major states of India. Our empirical result shows that state's revenue (i.e. tax revenue and indirect tax) and central transfer (i.e. tax devolution) are the major public providers for financing the health care of Indian states. Other sources of revenue of the government, namely non-tax revenue and direct tax show no impact on public health expenditure in the short run, while it shows a positive impact in the long run. As a consequence, we find that economic growth and fiscal balance lead to a favorable impact on public health expenditure in the

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PUBLIC INTEREST STATEMENT

The impact assessment of macroeconomic policies on public health expenditure is very relevant in Indian economy because of tax reform, fiscal consolidation and expenditure policy reform. These have been undertaken after economic liberalization in order to sustain a high economic growth. Despite these reforms, there is a consistent slower rate of growth in public health expenditure of the majority of Indian states, resulting in higher out-of-pocket expenditure and poor health care service across the Indian states. There are a number of studies that investigate the impact of economic growth on public health expenditure of Indian states but there is no existing literature that examines the impact of macroeconomic factors (economic growth, domestic revenue, domestic debt, fiscal balance, and central government transfer) on public health expenditure for the assessment of fiscal space for health. The result of this study would analyze the fiscal capacity of the state government toward health care financing in response to the changing scenario of macroeconomic policies over the period 1980–2014.

long run. The result suggests the improvement in revenue collection, increase in the tax base and the efficient utilization of central grants would generate fiscal space in the economy, and thereby the government can allocate more funds toward public health care.

Subjects: Health Policy; Health & Development; Economics and Development; Macroeconomics; Econometrics; Public Finance; Healthcare Management; Public Health Policy and Practice

Keywords: public health expenditure; economic growth; fiscal space; tax revenue, fiscal balance, domestic debt, central grants, economic liberalization, Indian states, Indian economy

AMS subject classifications: H50; I19; E6; H62; C5; O18; H71

1. Introduction

The health system¹ finance is the most important challenge for achieving Universal Health coverage² (UHC) in an emerging country like India (Duran, Kutzin, & Menabde, 2014). The health system of India as well as many low-income and middle-income countries, suffer lower growth of government health expenditure associated with higher dependency on out-of-pocket (OOP) expenditure for obtaining health care services (Mathauer & Carrin, 2011). The 2001 Abuja declaration³ proposed that these countries should spend at least 15% of total government expenditure and 5% of Gross Domestic Product (GDP) on public health in order to provide basic health care service to the people. It is noticed that the public health expenditure (PHE) as a percentage of GDP of India is 1.4% in 2014 which is 1% lesser than the low-income countries average health expenditure, while the PHE as a percentage of total government expenditure is 5% in 2014 which is 4.7% lesser than the average figure of low-income countries (NHA, 2015). Similarly, 62% of health expenditure is from OOP in India and that figure is even higher than the other low-income and middle-income countries such as Pakistan (56%), Indonesia (47%), Sri Lank (42%), Kenya (26%), and Bhutan (25%).

The pertinent factor for the slower growth of public expenditure on health care is due to less fiscal space in these economies (Durairaj & Evans, 2010; Tandon & Cashin, 2010). Fiscal space of a country refers to the government's ability and willingness to mobilize public revenues, which allows the government to spend resources on public services such as health care (Heller, 2006). Further, the "IMF-World Bank Spring Meeting-July 2016"⁴ and the "Addis Ababa Summit-July 2015"⁵ have declared domestic revenue mobilization⁶ as one of the most powerful ways to increase fiscal space for the health sector. The generation of fiscal space is essential for the health sector because, the greater the fiscal space of a country, the greater the potential for public expenditure on health. Also, greater public expenditure on health is associated with lower dependence on OOP expenditure for health care services, and consequently a lower financial burden on poor households (McIntyre & Kutzin 2016).

The fiscal space for health is influenced by the conducive macroeconomic environment such as sustained economic growth, higher mobilization of revenue, lower debt burden, and maintenance of fiscal balance (Heller, 2006; Tandon & Cashin, 2010). These macroeconomic factors are not independent of each other and they affect the growth of PHE in different channels. For instance, lower revenue generation creates a fiscal deficit (when current expenditure exceeds current tax revenue), thereby borrowings increase in order to finance the deficit. If the debt increases over a longer period of time, for the repayment of debt services, the government can squeeze the resources available to finance the developmental expenditure. Again, the high level of debt stock compels the government to adopt distortionary measures such as inflation tax for repaying the interest payments. Also, higher levels of inflation, are linked with macroeconomic instability due to fall in demand for money and decline in the tax revenue. As a result of the decline in government revenue, it would limit the fiscal space of the government and restrain any scheme to finance developmental activities (Meheus &

McIntyre, 2017). Tandon and Cashin (2010) describe the fiscal space for health function using the algebra of government's intertemporal budget constraint rule.

$$G_t + r_t B_{t-1} = T_t + B_t + A_t + O_t \quad (1)$$

Equation (1) says the use of budgetary sources (aggregate expenditure) must be equal to sources of budgetary resources (aggregate revenues). The left-hand side of Equation (1) represents the use of budgetary resources such as government non-interest expenditure (G_t) and non-discretionary debt (rB_t), while the right-hand side of Equation (1) represents sources of budgetary resources to finance spending such as tax revenue from different sources (T_t), total government borrowings (B_t), grants from national and international sources (A_t) and other sources of funds from non-tax revenue (O_t). After the generation of budgetary resources from different channels, the fiscal space for health depends on the priority assigned to the health sector from its gross domestic production, which would show the fiscal capacity of the government toward health spending.

The impact assessment of macroeconomic policies on PHE is more relevant in the context of Indian states for the period 1990–2014 for the following reasons. First, the provision of medical and public health services and allocation of the health budget is the primary responsibility of the state government of India. But the majority of the Indian states suffers from lower fiscal space and low prioritization of the health budget (Behera & Dash 2017a). Second, there is a consistent slower rate of growth in PHE of the majority of Indian states, resulting in higher OOP expenditure, and poor health care service (Behera & Dash, 2016). Third, there is a continuous increase of fiscal gap (current expenditure minus current revenue) among the states of India, which has led to the high fiscal deficit and a large debt stock. These create fiscal stress and consequently reduce the state's fiscal capacity to release finance for health sector (Prasad & Kishore, 2007). Fourth, various health reforms have been initiated in India since economic reforms, namely National Health Policy—2002, National Rural Health Mission (NRHM)—2005, Rashtriya Swasthya Bima Yojana health insurance scheme—2008, and High-Level Expert Group—2010 for the improvement of the health system. Despite several reforms, the PHE share with respect to GDP is around 1% and there is a huge difference in the achievement of health outcome (Duran, Kutzin, & Menabde, 2014). Fifth, the central government of India provides central transfer (tax devolution and central grants) to the state government for the improvement of state's fiscal capacity and for the social sector expenditure. But, the Indian states are unable to utilize the resources efficiently and most of the central government transfer is underutilized by the majority of Indian states (Chakraborty, 2015).

Using the period 1990 to 2014, the study examines the dynamic relationships between PHE and macroeconomic factors (economic growth, domestic revenue, domestic debt, fiscal balance, and central government transfer) of 15 major states of India. There are a number of studies investigating the impact of economic growth on PHE in the context of Indian states namely Behera and Dash (2016, 2017a, 2017b), and Hooda (2015). To the best of our knowledge, there is hardly any published research work that investigates the impact of macroeconomic factors on the growth PHE in perspective of fiscal space for health. This study would analyze the prioritization of the state government toward health care by the changing macroeconomic policies since economic liberalization.

Our empirical result shows that state's own revenue (i.e. tax revenue and indirect tax) and central government transfer (i.e. tax devolution) are the major public providers for financing the health care of Indian states. The result suggests policy implication for the generation of fiscal space toward health care across Indian states by improving revenue collection, enhancing tax base, and the judicious spending of central government transfer devolution in order to achieve universal health care finance.

The remainder of the study is structured as follows. Section 2 discusses the trends of public health expenditure and macroeconomic policies of India since economic liberalization. Section 3 discusses data and methods. Section 4 shows the empirical results and discussion. Section 5 Conclusion and policy implications.

2. Trends of public health expenditure and macroeconomic policies of Indian states

Figure 1 analyzes the trends of PHE since 1990s vis-à-vis changing trends of macroeconomic factors such as economic growth, domestic debt, fiscal balance, central government transfer, and revenue growth (tax revenue, direct tax, and indirect tax) of Indian states. It shows that the growth PHE has reduced from 0.9% in 1990 to 0.7% in 1996. Again it moved up to 0.8% in 2000 and moved down to 0.6% in 2004. Since 2005, it has been continuously increasing from 0.7% in 2009 to more than 1.0% up to 2014. Similar downward trends have also been seen in the growth of revenue and central government transfer from 1990 to 1995, which are recognized as the potential source of fiscal space for health. From 1995 to 2000, there was an increment in the growth of PHE due to a similar improvement that was seen in the growth of revenue collection and central government transfer. Despite the growth of domestic revenue and central government transfer during 2000–2004, the growth of PHE was reduced because during that period domestic debt and fiscal deficit were high for Indian states. From 2005 to 2008, the increment of PHE was due to the high growth of tax revenue (especially indirect tax) and lower fiscal deficit. From 2009 to 2011, the PHE has slightly reduced due to a reduction in tax revenue and central government transfer (especially tax devolution).

2.1. Macroeconomic policy reform and public health expenditure (1991–2004)

During the period 1990–1991 to 2003–2004, many macroeconomic policies were adopted at the state level in India in order to sustain a high economic growth. During the period 1998–1999 to 2002–2003, the fiscal position of the state government deteriorated sharply as compared to the period 1991–92. The fiscal deficit was 3.3% as share of GDP in 1991–1992 and it suddenly increased to 4.7% in 2002–2003, while the tax revenue witnessed marginal improvement from 5.3% of GDP in 1990–1991 to 5.8% in 2002–2003 due to higher tax devolution from the central government to states. The factors that contributed to the deterioration of fiscal position of states were higher expenditure on salaries and pension, huge burden of interest payments, untargeted subsidies, and lower revenue growth (Economic survey report, 2002).

Many reforms were introduced during the period 1991–2003 in order to improve the fiscal position of Indian states. First, the adoption of Fiscal Responsibility Budget Management (FRBM) act in 2003 at the central level. This ensures long-term macroeconomic stability through sufficient revenue growth, reduces the domestic debt, and improves the fiscal balance of states. Second, the implementation of the task force on direct and indirect taxes in 2002 to simplify and rationalize tax structure. Third, the introduction of the 10th Five-year plan (2002–2007), which suggested some fiscal policy initiatives such as the implementation of value added tax, improvement in the tax administration, and the expenditure reform commission. Fourth, the initiation of the debt-swap scheme in order to reduce the growing debt burden among the Indian states. Fifth, the introduction of the National Health Policy-2002 and Pradhan Mantri Swasthya Suraksha Yojana scheme. This scheme established the health management information system and launched the community-based universal health insurance scheme in 2003 (Economic survey report, 2003).

2.2. Macroeconomic policy reform and public health expenditure (2005–2014)

From Figure 1, we observe that PHE has increased since 2005. This shows the positive impact of macroeconomic policies on PHE derived from the reform that was introduced during the fiscal deterioration period 1999–2003. The reform was the implementation of FRBM legislation act for 18 states of India. The introduction of value added tax in 2005 of 25 states/UTs, and improvement in tax administration. As a consequence, state's own tax revenue increased from 5.6% to 6.3%, while the tax devolution increased from 7.9% to 9.0% during the period 2003–2004 to 2007–2008. Further, for the majority of Indian states the fiscal deficit declined to 2.3% of GDP and achieved revenue surplus budget due to the broader coverage of value added tax in 2007–2008.

During the period 2004–2005 to 2007–2008, PHE increased from 1.25 to 1.35%. It was possible partially due to the adoption of public policy reforms at the central government. These reforms include; the NRHM in 2005 which provides public health care facilities to the rural poor, the implementation of the recommendations of 13th Finance Commission in 2007 and thereby an increase in the

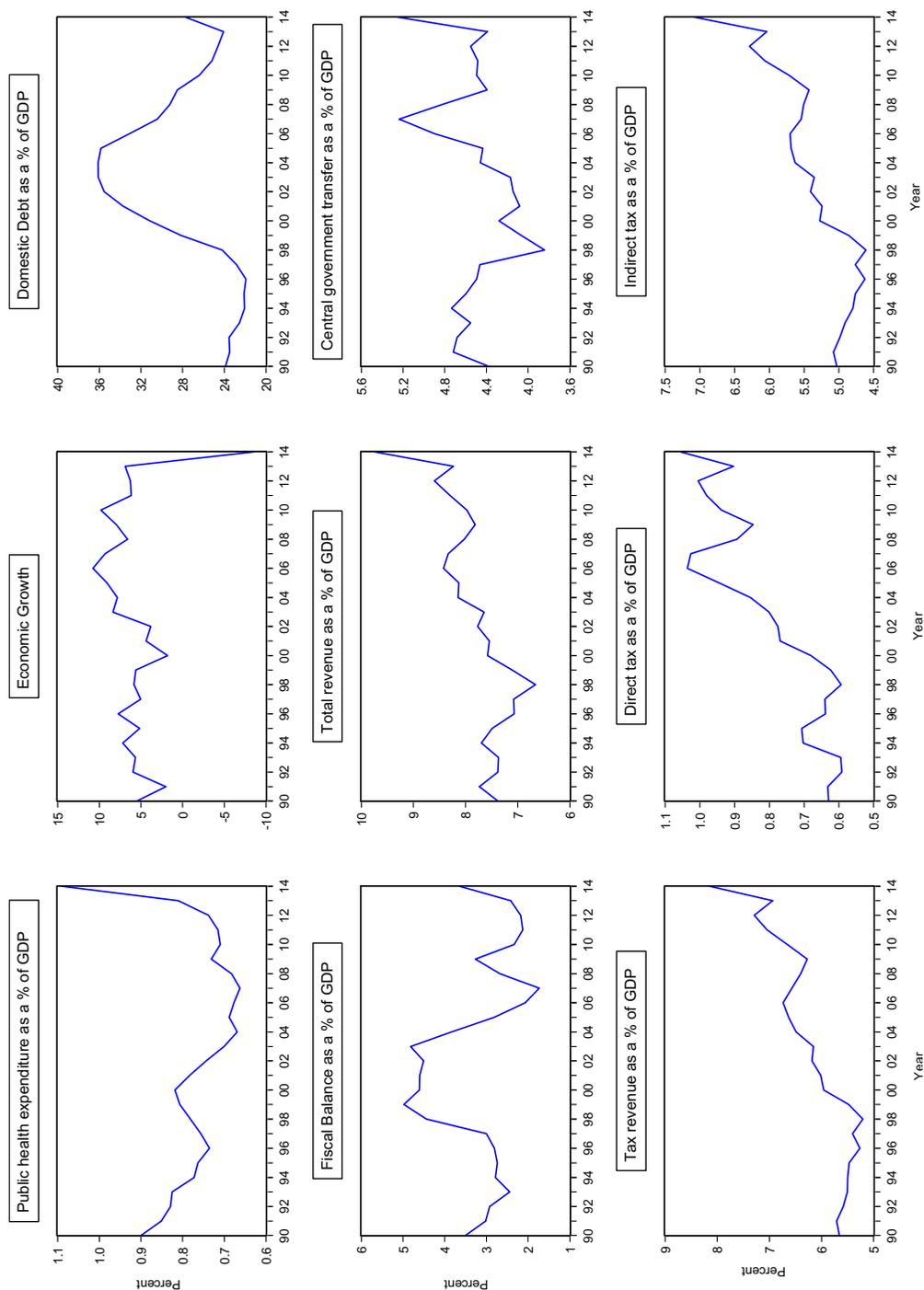


Figure 1. Trends in public health expenditure and macroeconomic factors of Indian states (1990–2014).

Source: Authors estimation.

allocation of central government transfer to the states for the period 2005–2010, and the 13th finance commission’s recommendation for the introduction of Goods & Service Tax (GST) bill to increase indirect tax base (Economic survey report, 2007).

During the period 2008–2009 to 2014–2015, the Indian economy has suffered many obstacles in order to sustain economic growth such as the global financial crisis in 2008–2009 and rising fiscal deficit from 1.5% in 2007–2008 to 2.9% in 2009–2010. Despite the global slowdown and fiscal imbalance in the state level, the Indian economy achieved a strong economic growth at 9.3% in both 2009–2010 and 2010–2011 (Economic survey report, 2012). Further, the fiscal deterioration in 2013–14 was due to the lower growth of revenue and fiscal imbalance. In order to improve the fiscal position of Indian states, the 14th Finance commission has increased the tax devolution from 32 to 42% and has facilitated the alternative sources of finance for developmental activities (Economic survey report, 2014).

Recently, in 2015–2016, the central government of India has introduced specific fiscal reforms in order to generate additional revenue and strengthen the fiscal capacity of the state government. First, the central government imposed taxes on coal, lignite, and polymer bags under the “Swachh Bharat” mission. Second, it introduced online auction for coal block allocation and generated non-tax revenue from the utilization of natural resources. Third, it introduced Jan-Dhan-Mobile schemes using the Aadhaar biometric information for the successful implementation of welfare schemes and the public distribution system. Fourth, the government removed untargeted subsidies on petroleum and LPG, and reduced the subsidy burden on state’s budget (Economic Survey report, 2015). The impact assessment of these fiscal policy initiatives on the generation of fiscal space for health would be the future policy analysis in the context of the Indian economy.

Figure 2 shows the state-wise growth trends of PHE vis-à-vis the growth trends of state’s revenue and central government transfer during the period 1991–2003. It would cover the initial economic reforms in the country and fiscal restructuring arrangements at the state level. The high-income states such as Gujarat, Haryana, and Punjab have a lower growth rate of PHE with the higher growth in revenue and central government transfer. The middle-income and low-income states such as Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Rajasthan, Uttar Pradesh, and Odisha have shown moderate growth associated with moderate revenue growth.

Figure 2. Trends in public health expenditure and source of revenue of major Indian states (1991–2003).

Source: Authors estimation.

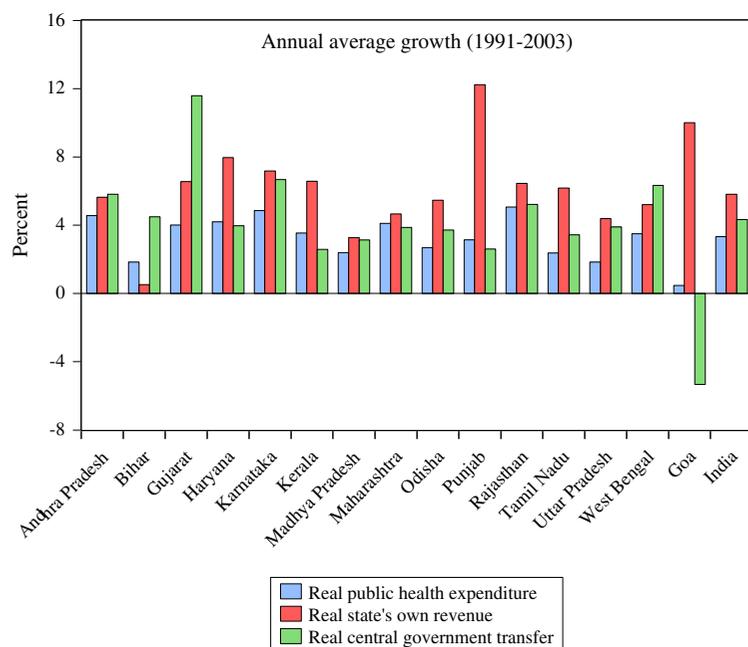


Figure 3. Trends in public health expenditure and source of revenue of major Indian states (2005–2014).

Source: Authors estimation.

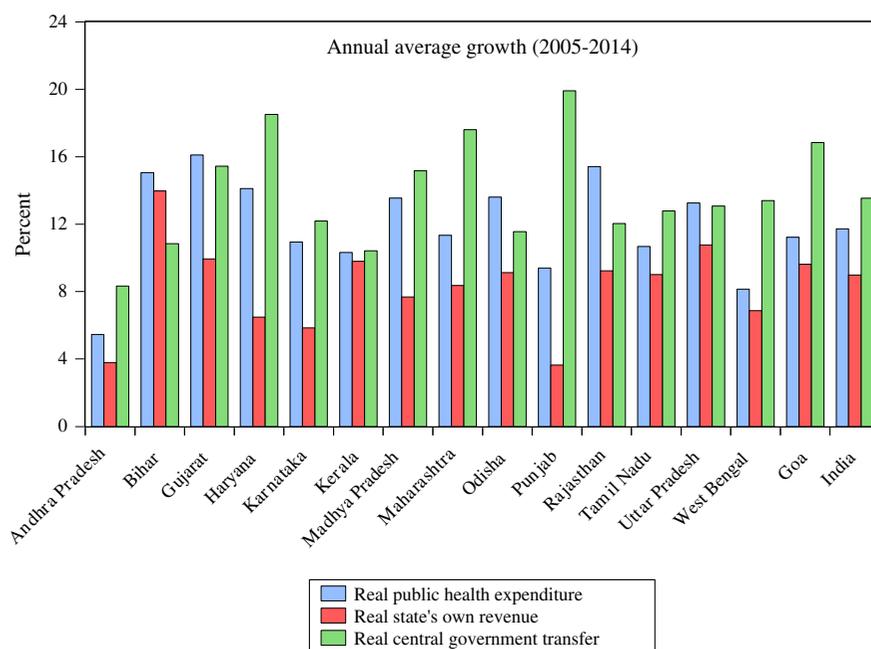


Figure 3 shows the state-wise growth trends of PHE vis-à-vis the growth trends of state’s revenue and central government transfer during the period 2005–2014. It would cover the implementation of NRHM in 2005 and the adoption of the FRBM legislation act in the major states of India. States like Andhra Pradesh, Karnataka, Tamil Nadu, Punjab, and Kerala generated more tax revenues and mobilized more funds for health financing since 2005 because central government contribution has become very low in these states. States like Bihar, Rajasthan, Uttar Pradesh, Odisha, and Madhya Pradesh performed better in health spending. Their source of revenue was mostly from the central government contribution in terms of grants and tax devolution. This was to compensate their low taxing capacity within states. In order to support their developmental activities, the central government has been giving importance to these lower income states since 2005 onward through the implementation of NRHM schemes.

The overall trend analysis exhibits a huge disparity among the states of India in the share of PHE with respect to macroeconomic factors. It implies that conducive macroeconomic environment is not a necessary condition to transform higher government expenditure on health care during the period 1991–2003. There has been a marginal increment in the growth of PHE since 2005 due to conducive macroeconomic policies in terms of sustained revenue growth and a higher allocation of central government grants to the states of India.

3. Data and methods

3.1. Data sources and variables

In this study, we have included 15 major states⁷ of India, namely Andhra Pradesh, Bihar, Goa, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal, for the period 1990–2014. Table 1 represents the summary statistics of variables that have been used in the empirical estimation. The mean of PHE is 0.86% while the mean of tax revenue is 6.93%. There is a huge difference in the maximum and minimum value of tax revenue and PHE, respectively. It shows that most of the tax revenue of states is derived from the low contribution of direct taxes to the state’s own domestic revenue. Table 1 also exhibits the correlation of PHE with other explanatory variables. It shows that PHE is positively correlated with the fiscal balance, domestic debt, state’s revenue, and central government transfer (tax devolution and central grants), while PHE is adversely affected by per capita Gross State Domestic

Table 1. Summary statistics

Variables	Description	Mean	Maximum	Minimum	Std. Dev.	Correlation
PHE	Public health expenditure as a percent of GSDP	0.865	2.343	0.378	0.302	1
Per capita GSDP	Per capita Gross State Domestic Product (INR)	33,538.130	150,413.600	6204.665	23,303.370	-0.154
Revenue	State's own revenue as a percent of GSDP	9.194	21.701	4.199	2.931	0.265
Tax Revenue	State's tax revenue as a percent of GSDP	6.938	14.709	3.447	1.914	0.138
Non-Tax Revenue	State's non-tax revenue as a percent of GSDP	2.255	14.456	0.253	1.965	0.260
Direct Tax	Direct tax as a percent of GSDP	0.829	1.972	0.295	0.320	-0.132
Indirect Tax	Indirect tax as a percent of GSDP	6.109	13.267	3.129	1.761	0.174
Domestic Debt	Total outstanding liabilities as a percent of GSDP	32.042	64.901	15.128	10.881	0.518
Fiscal Balance	Gross fiscal deficit/surplus as a percent of GSDP	3.641	11.527	-1.023	1.722	0.460
Tax Devolution	Central tax share to states (Crores)	4959.072	38,035.490	135.0335	5198.402	0.153
Central Grants	Central grant-in aid to states (Crores)	2930.936	25,034.630	57.0344	2860.301	0.040

Note: All variables are constant prices (INR) in 2004–05 base year.

Source: State finance budget report (2015), Reserve Bank of India.

Product (GSDP) and direct taxes. The data have been collected from the state finance budget report published by Reserve Bank of India (RBI) in 2015. All the variables are constant prices (INR) in the 2004–2005 base year. The definition of the variables is described in Table A1 (Appendix).

3.2. Empirical methods

This study examines the impact of macroeconomic factors on the growth of PHE in 15 major states of India using panel dynamic bias-corrected-least-squared-dummy-variable (LSDVC) model proposed by Bruno (2005). This model is more robust when T is moderately large compared to more traditional models such as generalized method of moment (GMM) estimates in which N only moderately large. The traditional models with moderately large N are severely biased with moderately large T samples. This biased corrected LSDVC model provides the bootstrap standard errors that are robust toward heteroscedasticity and autocorrelation. We used Blundell and Bond (1998) estimator to initialize the bias correction. We undertake 100 repetitions of the procedure to bootstrap the estimated standard errors. The baseline estimation model is as follows:

$$Y_{it} = \gamma Y_{i,t-1} + x'_{it}\beta + \mu_i + \lambda(t) + \varepsilon_{it} \tag{2}$$

where y_{it} is the dependent variables; x_{it} is the $((k - 1) \times 1)$ vector of strictly exogenous explanatory variables; μ_i is the time-invariant state-specific effects; ε_{it} is an unobserved white noise disturbance. Also, we added time-specific effects $\lambda(t)$ in order to examine the effects of macroeconomic policies on health expenditure at the state level since 1990's.

4. Empirical result and discussion

The empirical analysis of panel data in this study comprises the following five steps. First, we tested a panel unit root of eleven variables such as PHE, per capita GSDP, domestic debt, fiscal balance, tax devolution, central grants, revenue, tax revenue, non-tax revenue, direct tax, and indirect tax, employing four unit root tests such as LLC, IPS, Fisher-ADF, and Fisher-PP. Second, we applied Pesaran (2004) CD test for cross-section dependence. Third, we applied Westerlund (2007) error-correction-based test⁸ panel cointegration test to examine the long-run relationship between the variables. Fourth, we applied dynamic biased LSDVC regression model in order to estimate the short-run impact of macroeconomic factor (i.e. Per capita GSDP, domestic debt, fiscal balance, tax devolution, central grants, revenue, tax revenue, non-tax revenue, direct tax, and indirect tax) on the growth of PHE. Fifth, we employed the panel dynamic ordinary least square (DOLS)⁹ proposed by Kao and Chiang (2001) regression model to examine the long-run impact of macroeconomic factors (i.e. Per capita GSDP, domestic debt, fiscal balance, tax devolution, central grants, revenue, tax revenue, non-tax revenue, direct tax, and indirect tax) on the growth of PHE.

4.1. Panel unit-root and cross-section dependence test

The result in Table A2 (Appendix) shows that the variables, namely PHE, per capita GSDP, domestic debt, fiscal balance, tax devolution, central grants, revenue, tax revenue, non-tax revenue, direct tax, and indirect tax are panel non-stationary at the level in almost all model specification. After converting these variables into the first difference, we found that variables rejected the null of a unit root at 1% level of significance. It implies that variables are integrated of order one and the implication of non-stationarity at the level shows that these variables could be cointegrated in the long-run.

The Table A3 (Appendix) also presents the results of cross-section dependence (CD) test and it rejects the null of a cross section of independence. So, it implies that the variables are serially correlated and this type of correlation may arise from macroeconomic common shocks with heterogeneous impact across Indian states.

4.2. Panel cointegration test results

Table 4 (Appendix) shows the long-run relationships between PHE and macroeconomic factors separately such as Model 1 (PHE and Per capita GSDP), Model 2 (PHE and Domestic Debt), Model 3 (PHE and Fiscal Balance), Model 4 (PHE and Tax Devolution), Model 5 (PHE and Central Grants), Model 6 (PHE and Revenue), Model 7 (PHE and Tax Revenue), Model 8 (PHE and Non-Tax Revenue), Model 9 (PHE and Direct Tax) and Model 10 (PHE and Indirect Tax). The result from the Westerlund (2007) error correction model exhibits that variables reveal the long-run cointegrating relationships after rejecting the null of no-cointegration. In order words, both PHE and macroeconomic factors (i.e. per capita GSDP, domestic debt, fiscal balance, tax devolution, central grants, revenue, tax revenue, non-tax revenue, direct tax, and indirect tax) are moving together in the long run. It implies that the growth of public health expenditure would be sustained in the long run through the conducive macroeconomic factors such as higher economic growth, improvement of revenue generation, lower fiscal deficit, and lower debt burden in the Indian economy.

4.3. Short-run impact of macroeconomic factors on the growth of Public health expenditure

There are some case studies at country level such as South Africa, Nepal, Indonesia, as well as group of countries such as BRICS, developing countries, Asian countries that analyze the effects of revenue mobilization in the generation of fiscal space for health for achieving UHC (Basrin, 2013; Bitran, 2012; Jha et al., 2012; Marten et al., 2014; McIntyre, Doherty, & Ataguba, 2014; Rabi, 2014; Reich et al., 2016). The improvement in the revenue collection is seen in various countries in different channels such as tax policy and administrative reform in the case of South Africa; higher tax collection from payroll tax, VAT and excise duty in the case of Nepal; cutting high energy subsidy, reduce personal expenditure, expand tax base in the case of Indonesia; political commitment in order to prioritize health in the national budget in the case of 11 developing countries; and the imposition higher

Table 2. Panel Dynamic biased-corrected least square (LSDVC) regression model for short-run elasticity (Dependent: PHE)

Variables	(1)	(2)	(3)	(4)	(5)
lagged (PHE)	0.678***	0.651***	0.607***	0.575***	0.576***
	(0.0479)	(0.0524)	(0.0502)	(0.0485)	(0.0486)
ln (Per capita GSDP)	-0.168**	-0.159*			
	(0.0830)	(0.0835)			
Domestic Debt	0.000915	0.000483	-0.000387	-0.000518	-0.000555
	(0.00157)	(0.00153)	(0.00151)	(0.00151)	(0.00153)
Fiscal Balance	0.0292***	0.0308***	0.0352***	0.0357***	0.0359***
	(0.00547)	(0.00566)	(0.00574)	(0.00576)	(0.00586)
ln (Tax Devolution)		0.0769	0.135**	0.112**	0.112**
		(0.0592)	(0.0558)	(0.0561)	(0.0566)
ln (Central Grants)		0.0588**	0.0632***	0.0688***	0.0700***
		(0.0251)	(0.0240)	(0.0236)	(0.0242)
Revenue			0.0217***		
			(0.00436)		
Tax Revenue				0.0497***	
				(0.00838)	
Non-Tax Revenue				0.00748	0.00724
				(0.00550)	(0.00556)
Direct Tax					0.0428
					(0.0323)
Indirect Tax					0.0512***
					(0.0101)
State-fixed effects	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes
Number of states	15	15	15	15	15
Number of years	25	25	25	25	25

Notes: (1) Bootstrapped standard errors in parentheses. (2) Bootstrapped standard errors are robust toward heteroscedasticity and autocorrelation; we use 100 repetitions of the procedure to bootstrap the estimated standard error. (3) ln: Natural logarithm.

Source: Authors estimation.

*Statistical significant at 10% level.

**Statistical significant at 5% level.

***Statistical significant at 1% level.

tobacco taxes in the case of Asian countries. As a consequence, the improvement in budgetary resources from tax and non-tax revenue sources has led to higher PHE and health insurance schemes. Further, it has positive effects on reducing public debt and improves fiscal balance in these economies.

Table 2 represents the LSDVC regression results which examine the short-run impact of macroeconomic factors (Per capita GSDP, domestic debt, fiscal balance, tax devolution, central grants, revenue, tax revenue, non-tax revenue, direct tax, and indirect tax) on the growth of PHE. In the empirical estimation, we have controlled both state-specific and time effects in order to explain whether any specific year has positive or negative effects on the growth of PHE in the inception of macroeconomic policy changes in the India economy.

In Table 2, we found that lagged PHE shows positive and significant effects on the current health expenditure in all the model specification (column 1–5). The coefficient of lagged PHE ranged between 0.57 and 0.67%. Studies such as Barros (1998), Lu et al. (2010), and Landon, McMillan, Muralidharan, and Parsons (2006) have used lagged health expenditure as one of the explanatory variables in their empirical model and have found that previous year's health expenditure explains the current year expenditure. It argues that current realization of health spending depends on the past one-year budget allocation to the health sector due to slower budget-making process. It implies that future health status (outcome) depends on current year health expenditure and a current year health expenditure depends on past year budget allocation.

In Table 2, we empirically examined the short-run impact of state's own revenue capacity (tax revenue, non-tax revenue, direct tax, and indirect tax) on the growth of PHE (column 3–5). It shows that tax revenue and indirect tax positively affects the growth of PHE, while non-tax revenue and direct tax show insignificant relationships with PHE. It implies that at 1% increase in tax revenue leads to 0.04% increment in the growth of PHE. We find that the positive contribution of tax revenue toward public health expenditure is mostly derived from the sources of indirect taxes and there is no contribution of direct tax or non-tax revenue sources toward health financing in the short run. Our result is similar to those studies such as Reeves et al. (2015); Bajo-Rubio and Gómez-Plana (2015); Ángeles Castro and Ramírez Camarillo (2014), Lora and Olivera (2007), which found that tax revenue is strongly positively associated with greater investment in public health, resulting in higher levels of social security and more access to medical services. Further, it improves health outcome.

In Table 2, we estimated the short-run impact of central government fiscal transfer (tax devolution and central grants) on the growth of PHE in the regression model (column 3–5). It finds that both central tax devolution and central grants positively affect the growth of PHE in the short run. It implies that at 1% increase of tax devolution from central government to states leads to 0.11–0.13% increment in PHE. Similarly, at 1% increment of central grants to states leads to 0.05–0.07% increment in PHE.

In Table 2, we estimated the short-run impact of major macroeconomic factors (fiscal balance, domestic debt, and per capita GSDP) on the growth of PHE in the regression model. It finds that fiscal balance positively contributes to the growth of PHE, while domestic debt show an insignificant impact on PHE (column 1–5). Similarly, the per capita GSDP (economic growth) adversely affects to the growth of PHE (column 1–2) and it implies that at 1% increase of per capita income leads to 0.16% reduction in the growth of PHE.

The overall result shows that the growth of alternative source of revenue through domestic revenue mobilization and central grants has the potential to improve fiscal space in the states of India. Moreover, it would mobilize resources toward health care. Additionally, the generation of fiscal space would reduce the fiscal deficit and debt burden in the Indian economy. A similar argument regarding the impact of public revenue in order to stimulate fiscal deficit and public debt is done by Baldacci, Gupta, and Mulas-Granados (2012), Reinhart and Rogoff (2009). They found that decrease in public revenue is the main reason behind the higher government deficits associated with the financial crisis. Further, they suggested that importance needs to be given to the fiscal consolidation measures such as an increase in public revenue and unproductive spending cuts when the deficit is large and even more if the economy follows a financial crisis.

4.4. Long-run impact of macroeconomic factors on the growth of public health expenditure

In Table 3, we empirically examined the long-run impact of macroeconomic factors (i.e. Per capita GSDP, domestic debt, fiscal balance, tax devolution, central grants, revenue, tax revenue, non-tax revenue, direct tax, and indirect tax) on the growth of PHE.

Table 3. Panel Dynamic ordinary least square (DOLS) regression model for long-run elasticity (Dependent: PHE)

Variables	(1)	(2)	(3)	(4)	(5)
ln (Per capita GSDP)	0.0241** (0.0112)	0.0307 (0.0269)			
Domestic Debt	0.0118** (0.00480)	0.00982** (0.00438)	0.00862** (0.00357)	0.00832** (0.00359)	0.00904** (0.00380)
Fiscal Balance	0.0649 (0.0422)	0.0591 (0.0368)	0.0523* (0.0301)	0.0550* (0.0296)	0.0493 (0.0311)
ln (Tax Devolution)		0.211** (0.100)	0.234*** (0.0800)	0.242*** (0.0785)	0.226*** (0.0833)
ln (Central Grants)		-0.218** (0.107)	-0.233*** (0.0816)	-0.242*** (0.0801)	-0.220** (0.0856)
Revenue			0.0296*** (0.00808)		
Tax Revenue				0.0319** (0.0141)	
Non-Tax Revenue				0.0279** (0.0141)	0.0177 (0.0162)
Direct Tax					-0.142 (0.117)
Indirect Tax					0.0477*** (0.0181)
Number of states	15	15	15	15	15
Number of years	25	25	25	25	25

Note: (1) Standard errors in parentheses. (2) Long-run covariance estimates through Bartlett kernel, Newey–West fixed bandwidth criteria. (3) We Used fixed leads and lags specification (lead = 1, lag = 1) for the DOLS estimation. (4) ln: Natural logarithms.

Source: Authors estimation.

*Statistical significant at 10% level.

**Statistical significant at 5% level.

***Statistical significant at 1% level.

In Table 3, we empirically examined the long-run impact of state’s own revenue capacity (tax revenue, non-tax revenue, direct tax, and indirect tax) on the growth of PHE (column 3–5). It shows that tax revenue, non-tax revenue, and indirect tax positively affect the growth of PHE. It further implies that domestic revenue mobilization by the state government in the short run enhance health care financing in the long run, while the direct tax shows insignificant relationships with PHE in both the short run as well as the long run. There is a necessity to increase revenue through direct tax in the states of India. The earlier study by Behera and Dash (2017b), finds that per capita tax revenue positively affects to the growth of PHE of Indian states in the long run.

In Table 3, we examine the long-run impact of central government fiscal transfer (tax devolution and central grants) on the growth of PHE in the regression model (column 3–5). It finds that central government revenue positively affect the growth of PHE in the long run. It implies that at 1% increase of tax devolution from central government to states leads to 0.21–0.24% increment in PHE in long run. The coefficient value of long-run estimation of PHE with respect to tax devolution is higher than the short-run estimation. It implies that central government tax contribution to state’s revenue shows a higher impact toward PHE in the long-run, while the central government contribution to state’s budget in form discretionary grants shows negative impact to the growth of PHE. The

literature includes Arena and Revilla (2009), Tornell and Lane (1999) who argue that central government improves the fiscal position of the sub-national government through the allocation of discretionary transfers during the crisis period. Thereby, sub-national government mobilizes the fiscal resources toward developmental activities such as health care. In the case of India, the central government stimulates the fiscal resource (tax devolution and central grants) to the states for the improvement of fiscal space and it finds that most of the central grants are underutilized by the majority of Indian states (Chakraborty, 2015).

In Table 3, we examined the long-run impact of major macroeconomic factors (fiscal balance, domestic debt, and per capita GSDP) on the growth of PHE in the regression model. It shows that domestic debt positively affects for the growth of PHE in the long-run (column 1–5). The literature finds the mixed result regarding the relationship between domestic debt and PHE. Liang and Mirelman (2014) find that domestic debt is positive and significantly correlated with PHE. The positive coefficient on domestic debt implies that debt financing provides financial leverage to expand public expenditure on health care. While Lora and Olivera (2007), Landon et al. (2006), finds that high debt services reduced current health expenditure as well as social sector expenditure.

We find that the per capita GSDP positively affects the growth of PHE in the long run, while it reduces the growth of PHE in the short run (column 1–2). A similar argument is made by Lu et al. (2010) that per capita income would not affect PHE directly. It can affect indirectly by paying income taxes. But we find the positive impact of per capita GSDP on PHE and the coefficient value is around 0.03%. It implies that there is an emergency of increment of per capita GSDP in Indian states. This would increase more tax revenue and eventually lead to the rise of PHE in the long run.

5. Conclusion and policy implication

This study examines the impact of macroeconomic factors (i.e. economic growth, domestic revenue, domestic debt, fiscal balance, tax devolution, and central grants) on the growth of public health expenditure in assessing fiscal space for health in the 15 major states of India for the period 1990–2014. The empirical estimation is divided into two parts. First, we examine the short-run impact of macroeconomic factors on the growth of public health expenditure, using dynamic biased LSDVC regression method. Second, we examine the long-run impact of macroeconomic factors on the growth of public health expenditure, employing panel DOLS regression method.

The cointegration results show that there is a long-run association between the changes of public health expenditure and changes of macroeconomic factors in the Indian economy. The regression coefficient result shows that state's revenue capacity (tax revenue and indirect tax) and central government fiscal transfer (tax devolution) are major public providers for financing health care of Indian states. While, other sources of revenue of the state government, namely non-tax revenue and direct tax shows no impact on public health expenditure in the short run, it shows positive impact on the growth of public health expenditure in the long run. We find the positive and significant impact of major macroeconomic factors (i.e. domestic debt, per capita GSDP, and fiscal balance) on the growth of public health expenditure in the long run, while it shows negligible impact on public health expenditure in the short run.

From the analysis of public health expenditure and macroeconomic policies, we observed that the various fiscal policy initiatives such as tax reform, fiscal management reform, national health policy, and improvement of central transfer during the fiscal deterioration period (1991–2003) have positively influenced the state-level fiscal capacity by raising tax revenue and improved fiscal balance during 2005–2014. Despite the conducive macroeconomic environment since 2005, there is a huge disparity among the states of India in the share of public health expenditure with respect to macroeconomic factors and only marginal improvement has been seen in the growth of public health expenditure. The study has suggested the following fiscal policy measures for the generation of fiscal space for health in order to achieve UHC. First, increase the fiscal capacity of states by raising domestic tax revenue collection and widening the tax base. Second, generate more direct tax revenue

by the formalization of the unorganized sector and indirect tax revenue through the effective implementation GST reform. Third, utilize the central government transfer (tax devolution and central grants) by the respective state governments of India effectively. Fourth, offer higher prioritization of health budget in the respective state government and periodical increment of health budget with respect to state domestic income. With these measures, India would achieve the 5% of GDP on public health expenditure by 2030.

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Notes

1. Health system includes all the activities whose primary purpose is to promote, restore, or maintain health. More precisely, health systems are not just concerned with improving people's health but with protecting them against the financial costs of illness. The challenge facing governments in low-income countries is to reduce the regressive burden of OOP payment for health by expanding prepayment schemes, which spread financial risk and reduce the spectra of catastrophic health care expenditures (WHO, 2010).
2. UHC provides assurance of health services to all needy people under three objectives such as equity in access, quality of health services, and ensuring financial risk protection (WHO, 2010).
3. The Abuja Declaration doi: http://www.who.int/health-systems/publications/abuja_10.pdf.
4. IMF-World Bank Spring Meeting. doi: <http://www.imf.org/external/spring/2016/>.
5. Addis Ababa Development Finance Summit. doi: <http://www.un.org/esa/ffd/ffd3/conference.html>.
6. The government can mobilize additional revenue collection by raising the tax rate on personal income and profits of the corporate sector; second, levy taxes on goods and services; third, levy taxes from mineral and natural resources; and fourth, reduce tax avoidance and evasion (Meheus & McIntyre, 2017).
7. There are 29 states in India, which are divided into 18 major and 11 special category states. In our study, we have not included 11 special category states of India because these states have common socioeconomic and geographic problems. Additionally, these states have a low resource base and cannot mobilize resources for their developmental needs in spite of their high per capita income. Therefore, a separate analysis is required

for these states. Further, we have not included three major states, namely Chhatisgarh, Jharkhand, and Telangana in this study, due to the unavailability of data for the whole time period.

8. Westerlund (2007) error-correction-based measures four-panel cointegration tests, namely Pt, Pa and Gt, Ga to test the null hypothesis of no cointegration. The first pair of the statistics Pt and Pa referred as panel statistics are based the information regarding the error correction along the cross-sectional dimension of the panel. The second pair Gt and Ga referred to a group mean statistics. The first two tests are meant to test the alternative hypothesis that the panel is cointegrated as a whole, while the other two test the alternative that at least one unit is cointegrated. The advantages of these tests are that they are normally distributed and also accommodate unit-specific short-run dynamics, unit-specific trend and slope parameters, and cross-sectional dependence. Before applying Westerlund error-correction-based cointegration test, we have checked the stationary property of the variables and cross-section dependency. The results of unit-root and cross-section dependence test of the variables are reported in Tables A2 and A3 (Appendix) respectively.
9. The DOLS estimators are obtained by adding the lead and lag of the differenced regressors to soak up the long-run correlation (Kao & Chiang, 2001). The panel DOLS estimator is mentioned as below:

$$\hat{\beta}_{GD}^* = N^{-1} \sum_{i=1}^N \left(\sum_{t=1}^T z_{it} z_{it}' \right)^{-1} \times \left(\sum_{t=1}^T z_{it} \tilde{y}_{it} \right)$$

where, $\hat{\beta}_{GD}^*$ is group mean distributor of panel dynamic OLS. $Z_{it} = (X_{it} - \bar{X}_i, \Delta X_{it-K}, \dots, \Delta X_{it+K})$, $\tilde{y}_{it} = Y_{it} - \bar{Y}_i$ and Z_{it} is the $2(K+1) \times 1$ vector of regressors.

Cover image

Source: Authors.

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Appendix

Table A1. Variable definitions.

Variable	Definition
Public Health Expenditure (PHE)	Medical and public health expenditure, family welfare in both revenue and capital expenditure of the state government
Tax Revenue (TR)	State’s own tax revenue which includes Taxes on income, property, and capital transactions and commodities and services
Direct tax (DT)	Agricultural income tax and profession tax, taxes on land revenue, stamps and registration fees, surcharge on some cash crops, and urban immovable property taxes
Indirect tax (IT)	Sales tax, central sales tax, surcharge on sales tax etc
Non-Tax Revenue (NTR)	State’s own non-tax revenue includes interest receipts, dividends and profits, and income from lotteries
Tax devolution (TD)	A certain percentage of central taxes revenue is assigned to states under law enactment by Parliament under Article 270 of the Constitution of India. The share of states in the gross tax revenue as decided by the finance commission of India which is changed time to time
Central grants (Grants)	Central assistance in order to mobilize funds for the social programs for the uplift of the poor as well as developmental activities by the union government. Union government also extends grants to states at the time of natural calamities
Domestic Debt (DD)	Total outstanding liabilities of state government. It includes total internal loans debt, loans from banks and foreign institutes, loans and advances from the centre, provident funds, reserve funds, deposit and advances, and contingency funds
Gross Fiscal Balance (FB)	Gross fiscal deficit/surplus is the excess/below of total expenditure including loans net of recovery over revenue receipts (including external grants) and non-debt capital receipts

Source: State finance budget report (State Finances study of Budgets, 2015), RBI.

Table A2. Results of panel unit root tests.

Variables	LLC	IPS	Fisher-ADF	Fisher-PP
<i>Level</i>				
PHE	2.527 (0.994)	1.880 (0.970)	26.898 (0.628)	21.234 (0.880)
Per capita GSDP	-2.099** (0.017)	-1.008 (0.156)	36.637 (0.188)	40.252 (0.100)
Domestic Debt	-0.798 (0.212)	0.946 (0.828)	19.864 (0.920)	7.650 (1.000)
Fiscal Balance	0.197 (0.578)	-1.010 (0.156)	30.457 (0.442)	27.072 (0.619)
Tax Devolution	-2.053*** (0.020)	-0.719 (0.235)	30.195 (0.455)	32.818 (0.330)
Central Grants	-1.674 (0.047)	-0.199 (0.421)	33.706 (0.292)	30.195 (0.455)
Revenue	0.272 (0.607)	-0.765 (0.221)	36.843 (0.181)	53.714*** (0.004)
Tax Revenue	-0.007 (0.497)	-1.178 (0.119)	38.608 (0.134)	42.663* (0.062)
Non-Tax Revenue	0.121 (0.548)	-0.689 (0.245)	44.312** (0.044)	72.392*** (0.000)
Direct Tax	3.802 (0.999)	0.456 (0.675)	20.985 (0.888)	41.621* (0.077)
Indirect Tax	0.522 (0.699)	-0.695 (0.243)	34.460 (0.262)	40.461 (0.096)
<i>1st difference</i>				
PHE	-5.692*** (0.000)	-8.562*** (0.000)	130.365*** (0.000)	171.172*** (0.000)
Per capita GSDP	-8.744*** (0.000)	-11.283*** (0.000)	166.486*** (0.000)	299.820*** (0.000)
Domestic Debt	-6.458*** (0.000)	-5.921*** (0.000)	91.764*** (0.000)	97.497*** (0.000)
Fiscal Balance	-11.677*** (0.000)	-11.406*** (0.000)	157.990*** (0.000)	178.840*** (0.000)
Tax Devolution	-14.527*** (0.000)	-13.663*** (0.000)	190.777*** (0.000)	369.132*** (0.000)
Central Grants	-12.789*** (0.000)	-14.641*** (0.000)	205.251*** (0.000)	384.113*** (0.000)
Revenue	-0.749 (0.226)	-7.315*** (0.000)	110.328*** (0.000)	310.021*** (0.000)
Tax Revenue	-3.383*** (0.000)	-5.796*** (0.000)	89.112*** (0.000)	443.157*** (0.000)
Non-Tax Revenue	-2.923*** (0.001)	-8.674*** (0.000)	129.022*** (0.000)	477.747*** (0.000)
Direct Tax	-0.975 (0.164)	-5.974*** (0.000)	84.133*** (0.000)	269.430*** (0.000)
Indirect Tax	-3.924*** (0.000)	-5.822*** (0.000)	89.061*** (0.000)	232.880*** (0.000)

Notes: (1) LLC and IPS represent the panel unit root tests of Levin, Lin, and James Chu (2002) and Im, Pesaran, and Shin (2003), respectively. (2) Fisher-ADF and Fisher-PP represent the Maddala and Wu (1999) Fisher-ADF and Fisher-PP panel unit root tests, respectively. (3) In null hypothesis, LLC assumes common unit root process, while IPS and Fisher test assume the individual unit root process. (4) The Schwarz information criterion (SIC) is used to select the lag length for all variables (automatic lag length: 2), except revenue variables (user-specified lag length: 1). (5) Bandwidth is selected using the Newey-West method and Bartlett kernel is used as the spectral estimation method. (6) The exogenous variables represented in individual effects, and individual linear trends. (7) Probability is in parentheses; probabilities for Fisher tests are computed using an asymptotic chi-square distribution and all other tests assume asymptotic normality. (8) Per capita GSDP, tax devolution, and central grants are transformed to natural logarithm and all other variables are percentage of Gross State Domestic Product (GSDP). (9) Null: Unit root (Non-stationary).

Source: Authors estimation.

*Statistical significant at 10% level.

**Statistical significant at 5% level.

***Statistical significant at 1% level.

Table A3. Results of Pesaran (2004) cross-section dependence test.

Variables	CD-test	p-value	Corr	Abs (Corr)
PHE	25.71	0.000	0.502	0.556
Per capita GSDP	50.12	0.000	0.978	0.978
Domestic Debt	30.25	0.000	0.590	0.637
Fiscal Balance	26.84	0.000	0.524	0.524
Tax Devolution	48.33	0.000	0.943	0.943
Central Grants	42.45	0.000	0.829	0.829
Revenue	2.63	0.009	0.051	0.318
Tax Revenue	16.09	0.000	0.314	0.427
Non-Tax Revenue	4.28	0.000	0.084	0.273
Direct Tax	21.84	0.000	0.426	0.474
Indirect Tax	10.54	0.000	0.206	0.365

Notec: (1) Per capita GSDP, Tax Devolution, and Central Grants are transformed to natural logarithm and all other variables are percentage of GSDP. (2) Null: Cross-section independence.

Source: Authors estimation.

Table A4. Result of Westerlund (2007) error correction panel cointegration tests (Dependent: PHE).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Statistics	Per capita GSDP	Domestic Debt	Fiscal Balance	Tax Devolution	Central Grants	Revenue	Tax Revenue	Non-Tax Revenue	Direct Tax	Indirect Tax
Gt	-3.522*** (0.000)	-3.425*** (0.000)	-2.931*** (0.003)	-3.431*** (0.000)	-4.343*** (0.000)	-3.830*** (0.000)	-4.228*** (0.000)	-4.085*** (0.000)	-5.261*** (0.000)	-5.226*** (0.000)
Ga	-6.282 (1.000)	-12.236 (0.422)	-8.580 (0.973)	-10.342 (0.818)	-13.623 (0.158)	-14.821** (0.044)	-15.613** (0.015)	-11.900 (0.500)	-14.165* (0.093)	-16.795*** (0.002)
Pt	-12.891*** (0.000)	-10.100 (0.013)	-12.517*** (0.000)	-11.140*** (0.000)	-13.654*** (0.000)	-11.815*** (0.000)	-11.201*** (0.000)	-10.269*** (0.008)	-14.193*** (0.000)	-11.578*** (0.000)
Pa	-14.490*** (0.000)	-13.993*** (0.001)	-14.206*** (0.000)	-11.953** (0.026)	-15.310*** (0.000)	-16.846*** (0.000)	-14.312*** (0.000)	-12.602*** (0.009)	-23.081*** (0.000)	-14.178*** (0.000)

Notes: (1) The exogenous variables represented in deterministic intercept and linear trend. (2) Probability are in parentheses. (3) Per capita GSDP, Tax Devolution, and Central Grants are transformed to natural logarithm and all other variables are percentage of Gross State Domestic Product (GSDP). (4) Null: No cointegration.

Source: Authors estimation.

*Statistical significant at 10% level.

**Statistical significant at 5% level.

***Statistical significant at 1% level.



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