Applied Econometrics

The Effect of Fiscal Policy on Investment

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Abstract

This paper evaluates the impact of fiscal policy components on private and public investment using data for a panel of fifteen emerging economies over the period 2009-2017. Some key components such as GDP per capita, tax revenues, social security contributions, interest payments, subsidies, etc. have been identified. The within estimator and the two step System - GMM estimators have been employed for this data analysis in order to make useful inferences. It was found that private investment has steadily increased over the years and public investment is shrinking for the emerging economies. Each component of the revenue side does not significantly affect private and public investment, and expenditure side variables are more significant than the revenue variables and affect negatively on both the investments. All the functional dependencies in the long run affect the private investment negatively.

Keywords: Fiscal Policy, public investment, private investment, two step system-GMM, within estimator.

Introduction

Investment is an important component of the aggregate demand in the economy, influencing the rate of growth and the productive capacity of the economy. The investment can be of two types; public and private, and it is important to study both of them individually because they play different roles in the contribution to economic growth.

Many studies have given empirical evidence for private investment being more productive than public investment as it directly contributes to the final output. However, public investment is no less important. A study by Aschauer (1989)[1] on the productivity slowdown in the USA in the 1980s found the reason to be a decrease in public infrastructure spending[2]. We can infer that public investment provides an infrastructure which is complementary to the private capital, thereby increasing its productivity.

The multiplier effect of investment can be observed in the growth of businesses, as they reinvest the profits made for further expansion and growth. An increase in income of the employees will lead to increased spending, which will further boost the GDP of the country. The investment in human capital, i.e. developing new skills, access to new and innovative technology etc. can increase the productive capacity of the economy. The result would be an increased aggregate supply, leading to sustainable economic growth[3].

As investment is the key for growth, it becomes very important for the policy makers to study the impact of different fiscal shocks on the public and private investment. This paper employs a panel data regression analysis on a panel of 15 emerging economies using the data of revenue and expenditure components of the government budget from the year 2009 to 2017. The effect of budgetary components on private and public investments is analyzed, reflecting on the importance of government debt and deficit as their determinants. A holistic approach is used to study the factors which in the long run affect investments in these emerging economies. Finally, the robustness of the results to different econometric specifications is examined.

Literature review

Studying the effect of fiscal policy on the economy is very important. Afonso A. et al. (2009) assessed the fiscal behavior in the EU countries for 1990-2005 via responsiveness of budget balances to several determinants. It was concluded that the existence of effective fiscal rules, the degree of public spending decentralization, and the electoral cycle can impinge on the country's fiscal position. Giavazzi et al. (2000) searched systematically for the circumstances in which national saving responds non-linearly to fiscal policy impulses. The data drawn from the OECD countries confirms that a non-linear response by the private sector is more likely when fiscal impulses are large and persistent. Afonso A. et al. (2014) try to find the potential linkage between fiscal policy developments and economic growth. They conclude that taxes on income are less welcome for growth; public wages, interest payments, subsidies and government consumption have a negative effect on output growth; expenditures on social security and welfare are less growth enhancing; both government spending on education and health boosts growth. However, there is weak evidence supporting causality running for expenditures or revenues to GDP per capita.

The reduction in investment during transformational recession and its slow growth during subsequent recovery of the economy was analyzed by Vladimir Popov (1997). It was found that though the transition economies are supposed to offer numerous opportunities to increase output with relatively small targeted investment, there still persisted low rates of output. However, upon further research, the reason behind low output rates was attributed to low capital productivity, rather than the investment rate. Hence, we can confidently say that investment is influenced by policy as well as non-policy factors. Evidence indicated that distortions in trade and industrial infrastructure resulted in supply-side recession, resulting in decline in output and investment. Changes in the share of public and private consumption in GDP was also influenced by the government budget deficit. The share of investment is affected by several other factors.

Several researchers studied the impact of fiscal policy measures on investment. Kenneth L. Judd (1985) analyzed the short run impact of current and future changes in fiscal policy on investment. Anticipated investment tax credits were found to depress current investment and immediate tax cuts meant future cuts in government expenditure, another negative effect. J. Gali et al. (2003) observed that the Maastricht Treaty and the Stability and Growth Pact significantly impaired the ability of EU governments to conduct a stabilizing fiscal policy. However, it was found that the decline in public investment experienced over the

last decade by EMU countries is part of a world-wide trend that started well before the Maastricht Treaty was signed.

Alberto Alesina et al. (2002) showed that the strongest effects on investments arise from changes in primary government spending. Fiscal policy also affected labor costs through labor market channels, thereby affecting profits, and investment. These conclusions were drawn by analyzing the data from 18 OECD countries for the years 1960-1996. Joanna Stawska (2012) analyzed the impact of monetary-fiscal policy mix on the economic growth, mainly for the investments of the euro area during the financial crisis. Despite significant budgetary increase and monetary authorities cutting interest rates to encourage businesses to borrow and invest, uncertainty of the financial markets discouraged borrowing, investing and spending. It was concluded that without the coordinated efforts of the fiscal and the monetary authorities, the financial crisis could have led to an even worse collapse of the economy.

Charging taxes is one of the most important ways in which the government controls the economy. Consumption and investment are directly targeted through this. Andrew Abel (1982) developed a Q model of investment useful to analyze the effects on permanent and temporary change in tax policy on investment. He concluded that temporary investment tax credit isn't necessarily more expansionary than permanent one. Jason G. Cummins et al. (1995) also studied the effect of tax reforms on business investment using an extension of the tax adjusted q model. It was found that changes in company tax policy have a significant economic and statistical impact on investment behavior in almost all the OECD countries in this study. J. Muzurura et al. (2018) studying taxation and investment in Zimbabwe, also concluded that taxation revenue that is channeled to productive public expenditure is likely to stimulate the productivity of private fixed domestic investment.

Hall et al. (1967) also studied the relationship between tax policy and investment expenditures, however they used the neoclassical theory of optimal capital accumulation. They concluded from studying three different post war tax revisions, that tax policy is highly effective in changing the level and timing of investment expenditures. It was also found that the tax policy has had important effects on the composition of investment. Jesse Edgerton (2010) suggested that tax incentives have the smallest impact on investment exactly when they are most likely to be put in place -- during downturns in economic activity when cash flows are low.

Antonio Afonso et al. (2016) studied the macroeconomic effects of public and private investment in 17 OECD economies through a VAR analysis with annual data from 1960 to 2014. The results showed that public investment had a positive growth effect in most countries.

Bond Set al. (2001) and Roodman (2009) highlighted the shortcomings of the first-differenced GMM Panel Estimator in estimating cross-sectional growth regressions. GMM estimates can be biased, inefficient and behave poorly, as lagged levels of the series are weak instruments to the subsequent first differences. They proposed panel regression to combat these problems.

Loungani Pet al. (1995) presented the reduced-form evidence that, even after controlling for the link between monetary aggregates and real activity, an increase in reserve requirements lowers aggregate investment, real GNP, and commercial and industrial lending by banks. Krishna K et al. (2003) looked at the causation between income, export, import and investment growth for 25 developing countries. In around 16-17 of the countries examined, growth could be satisfactorily explained through imports and exports. It was found that around 70% of the countries exhibit unidirectional causality.

Campos N, Nugent J (2003) studied the non-policy factor political stability and the negative association it had with aggregate investment. This long run negative relationship between political instability and investment was tested by investigating the existence and direction between Social and Political Instability (SPI) and investment. By using the Granger causality framework and Anderson-Hsiao-Arellano instrumental variable estimates, he concludes that there is indeed a causal relationship between SPI and the rate of investment, and it is positive.

Research Gaps

Till now, there has been no published theory that coherently explains all the determinants of investment. While rich literature is available for private investment despite the lack of a cohesive theory, little research has been done regarding the determinants of public investment. It is important to assess this though, since the effect of government investment on a country's growth is ambiguous. Especially in the context of an emerging economy, these determinants could play a big role in chartering the development pathway of these countries. No previous panel studies were conducted up until the one by Afonso-Jalles (2014)[4] to explain government capital spending. Finally, the study done by Afonso-Jalles (2014) estimates only short run determinants of investment. This report has also estimated the long run determinants of investment, to see where emerging economies should invest maximum on to propel growth. To the best of our knowledge, such a study has not been done before.

Objectives

The objectives of this report are:

- To analyze the budgetary components affecting public and private investments in emerging economies.
- To analyze the impact of functional dependencies on private investment
- To determine the long run determinants of investment in emerging economies.
- To determine the robustness of the results to different econometric specifications.

Panel Regression of 15 emerging economies has been done for this report.

Methodology

The term "emerging market economy" was first used in 1981 by Antoine W. Van Agtmael of the International Finance Corporation of the World Bank. Emerging market economies typically refer to the countries that are quickly making a move towards mixed or free markets, and are in the process of turning into an advanced economy. They usually have less per capita income than developed countries, and more liquidity in their equity markets. They are constantly increasing production in various sectors of the economy, and experience rapid growth[5].

This report analyzed the determinants of private and public investment in the context of emerging economies. For the analysis, 15 emerging economies were chosen. To ensure that the data analysis remained generic to the context of the emerging economies, the report attempted to choose a wide range of such economies, from the world's largest - such as India and Russia, to mid-range economies such as Malaysia and Thailand, and smal-scale economies such as Mauritius. An attempt was also made to geographically diversify the chosen countries as much as possible.

In choosing the time frame, it had to be kept in mind that emerging economies experience rapid growth and changes such as increased globalization and production size. To maintain the principle of *ceteris paribus* as best as possible, the most recent time frame was chosen. The time period starts from 2009, to eliminate any anomalies in prediction that could be caused due to the 2007-2008 financial crisis. Thus, the optimal time period was decided to be from 2009-2017.

In order to smooth out the effects of short-run fluctuations in the economy, three-year averages were taken. Thus, 3 time periods were constructed. They have been referred to in the dataset as follows:

Time Period 0: 2009 - 2011
Time Period 1: 2012 - 2014
Time Period 2: 2015 - 2017

Thus, the final panel data consists of 15 countries (N) * 3 time periods (T) = 45 (NT) observations.

Several regressors and control variables were used to carry out the regression. The regressions were first conducted for private investment, using both the within estimator and the two step System - GMM estimator. Robust standard error coefficients were obtained for the within estimator, and lagged regressors were used as instruments for the SYS-GMM. Two step SYS-GMM estimator was chosen over the one-step SYS-GMM estimator due to its robustness in situations of heteroskedasticity and autocorrelation. The Hansen statistic was used to test the validity of the instrument test. Almost all of the obtained values for the Hansen statistic were between 0.1 to 0.4, which indicates that the instrument test chosen was good. Arellano - Bond test for AR(2) is not reported due to lack of adequate time periods (The Arellano - Bond test for AR(2) requires at least 4 time observations to conduct). Though the Arellano - Bond test for AR(1) is calculated and reported, however, its results can be deemed unimportant as given the use of first degree transformations, some amount of first order serial correlation is expected. This does not invalidate the results obtained.

The obtained coefficients were tested for significance using the p values at 1%, 5% and 10% significance levels. Long run coefficients were generated for the parameters whose short run coefficients were significant. This further led us to determine the long run determinants of private investment.

The same steps were then applied for public investment.

The long run coefficients were calculated using the formula:

$$\frac{(\ b[parameter])}{(1 - b[parameter])}$$

A grand total of 52 regressions were conducted for our analysis on private and public investment:

- 13 regressions for private investment using the within estimator
- 13 regressions for private investment using the two step System GMM estimator
- 13 regressions for public investment using the within estimator
- 13 regressions for public investment using the two step System GMM estimator

Moreover, 8 long run coefficients were calculated for private investment and 10 long run coefficients were calculated for public investment.

List of regressions

1. Private investment regressed over control variables using the within estimator.
2. Private investment regressed over revenue variables, one at a time, all using the within estimator
    a. Private Investment regressed over tax revenue
    b. Private investment regressed over domestic taxes on goods and services
    c. Private investment regressed over income taxes
    d. Private investment regressed over property taxes
    e. Private investment regressed over payroll taxes
    f. Private investment regressed over social security contributions
3. Private investment regressed over expenditure variables, one at a time, all using the within estimator
    a. Private investment regressed over public wages
    b. Private investment regressed over interest payments
    c. Private investment regressed over subsidies
    d. Private investment regressed over public final consumption expenditure
4. Private investment regressed over control variables and decomposition of government revenues using the within estimator
5. Private investment regressed over control variables and decomposition of government expenditures using the within estimator
6. Private investment regressed over control variables using the SYS-GMM estimator.
7. Private investment regressed over revenue variables, one at a time, all using the SYS-GMM estimator
    a. Private Investment regressed over tax revenue
    b. Private investment regressed over domestic taxes on goods and services
    c. Private investment regressed over income taxes
    d. Private investment regressed over property taxes
    e. Private investment regressed over payroll taxes
    f. Private investment regressed over social security contributions
8. Private investment regressed over expenditure variables, one at a time, all using the SYS-GMM estimator
    a. Private investment regressed over public wages
    b. Private investment regressed over interest payments
    c. Private investment regressed over subsidies
    d. Private investment regressed over public final consumption expenditure

9. Private investment regressed over control variables and decomposition of government revenues using the SYS-GMM estimator
10. Private investment regressed over control variables and decomposition of government expenditures using the SYS-GMM estimator
11. Public investment regressed over control variables using the within estimator.
12. Public investment regressed over revenue variables, one at a time, all using the within estimator
    a. Public Investment regressed over tax revenue
    b. Public investment regressed over domestic taxes on goods and services
    c. Public investment regressed over income taxes
    d. Public investment regressed over property taxes
    e. Public investment regressed over payroll taxes
    f. Public investment regressed over social security contributions
13. Public investment regressed over expenditure variables, one at a time, all using the within estimator
    a. Public investment regressed over public wages
    b. Public investment regressed over interest payments
    c. Public investment regressed over subsidies
    d. Public investment regressed over public final consumption expenditure
14. Public investment regressed over control variables and decomposition of government revenues using the within estimator
15. Public investment regressed over control variables and decomposition of government expenditures using the within estimator
16. Public investment regressed over control variables using the SYS-GMM estimator.
17. Public investment regressed over revenue variables, one at a time, all using the SYS-GMM estimator
    a. Public Investment regressed over tax revenue
    b. Public investment regressed over domestic taxes on goods and services
    c. Public investment regressed over income taxes
    d. Public investment regressed over property taxes
    e. Public investment regressed over payroll taxes
    f. Public investment regressed over social security contributions
18. Public investment regressed over expenditure variables, one at a time, all using the SYS-GMM estimator
    a. Public investment regressed over public wages
    b. Public investment regressed over interest payments
    c. Public investment regressed over subsidies

    d. Public investment regressed over public final consumption expenditure
19. Public investment regressed over control variables and decomposition of government revenues using the SYS-GMM estimator
20. Public investment regressed over control variables and decomposition of government expenditures using the SYS-GMM estimator

Due to a lack of adequate data on the functional dependencies for the chosen panel, a fresh panel was taken to analyze the impact of functional dependencies on private investment. Data for 7 countries was taken from the time period 2000-2014, taking 3-year averages to smooth out short-run fluctuations. Data was chosen taking into consideration all the caveats mentioned previously for data collection of the first panel. Due to lack of adequate data, an unbalanced panel dataset was created as opposed to a balanced one. There were a total of 29 observations in the dataset (<NT). The Arellano-Bond for AR(2) has been calculated for these regressions.

A total of 8 regressions were run for functional dependencies (4 using the within estimator and 4 using the two step System GMM estimator) on private investment, and all possible long run coefficients were calculated.

List of regressions (continued)

21. Private investment regressed over functional dependencies, one at a time, all using the within estimator
    a. Private investment regressed over public expenditure in education
    b. Private investment regressed over public expenditure in health
    c. Private investment regressed over public expenditure in social security and welfare
22. Private investment regressed over functional dependencies of public expenditure using the within estimator
23. Private investment regressed over functional dependencies, one at a time, all using the SYS-GMM estimator
    a. Private investment regressed over public expenditure in education
    b. Private investment regressed over public expenditure in health
    c. Private investment regressed over public expenditure in social security and welfare

24. Private investment regressed over functional dependencies of public expenditure using the SYS-GMM estimator

Once all 60 regressions were completed, the results were extracted into word docs using STATA's outreg2 command and analyzed.

Finally, a panel was made which consisted of the 15 countries from the time period 2009-2017 and the values for private investment, public investment, and all the control variables (GDP, Labor force participation rate, Population growth and age dependency ratio) were stored in the dataset. Two SYS-GMM regressions were run on it.

List of regressions (continued)

25. Private investment regressed over the control variables using the SYS-GMM estimator
26. Public investment regressed over the control variables using the SYS-GMM estimator

Using the results from the above regressions, the coefficients for the year dummies were extracted into an excel sheet. This excel sheet was then imported back into STATA as a dataset, and the GMM year dummies for both private investment and public investment were plotted. These plots were then used for trend analysis.

Data Sources

The following is the list of data sources that were used in the preparation of this report.

Variable	**Data Source**
Real GDP Per Capita	WDI
Private Investment (% of GDP)	WDI, OECD.Stat
Public Investment (% of GDP)	WDI, OECD.Stat
Tax revenue (% of GDP)	IMF IFS, OECD.Stat
Domestic taxes on goods and services (% of GDP)	IMF IFS, OECD.Stat
Taxes on payroll or workforce (% of GDP)	IMF IFS, OECD.Stat
Taxes on income, profits and capital gains (% of GDP)	IMF IFS, OECD.Stat
Taxes on property (% of GDP)	IMF IFS, OECD.Stat
Tax and social security contributions government revenue (% of GDP)	IMF IFS, OECD.Stat
Interest Payments (% of GDP)	WDI
Compensation of employees (% of GDP)	WDI
Subsidies (% of GDP)	WDI
Public Final Consumption Expenditure (% of GDP)	WDI
Labour Force Participation Rate (% of total labour force)	WDI
Population Growth	WDI

Age Dependency Ratio (% of working age population)	WDI
Public spending on Education (% of GDP)	Asian Development Bank
Public spending on Health (% GDP)	OECD.Stat, WHO

Table No. 1: Table showing the data sources used for every variable

Theory and Background

Panel data, also known as longitudinal data, combines the essence of both cross sectional and time series data. Like time series data, panel data also contains observations collected at a regular frequency, chronologically. Like cross-sectional data, it contains observations across a collection of individuals. Some examples of categories that make up panel data are countries, firms, individuals or demographic groups[6].

Some advantages of using panel data over time series or cross-sectional data are as follows:

1. Panel data can model both the common and individual behaviors of groups.
2. Panel data contains more information, more variability, and more efficiency than pure time series data or cross-sectional data.
3. Panel data can detect and measure statistical effects that pure time series or cross-sectional data can't.
4. Panel data can minimize estimation biases that may arise from aggregating groups into a single time series.[4]

Panel data examples can be found in economics, social sciences, medicine and epidemiology, finance, and the physical sciences[4].

Panel data sets come in many different formats. Two of the most common ones are wide and long panel datasets. When panel data is stored with the observations for a single variable from separate groups stored in separate columns this is sometimes referred to as wide data format. Long format datasets stack the observations of each variable from all groups, across at all time periods into one column[4]. Since STATA can only work with long

panel data sets, for the purpose of this report, all panel datasets were created in the long format.

Panel datasets can further be classified into unbalanced panel datasets and balanced panel datasets. A balanced panel dataset is a dataset where each panel member is observed for every time period. Thus, if the number of panel members is N and the number of time periods is T, then the number of observations in a balanced panel will be NT. An unbalanced dataset is a dataset where not every panel member is observed for every time period. In an unbalanced panel, the number of observations is strictly less than NT. Ideally, it is preferred to use a balanced panel dataset. However, balanced panel datasets are extremely hard to come by in real life, especially in the field of finance. Thus, unbalanced panel datasets can be used to estimate the results. However, it is important to ensure that the missing observations are random, as opposed to non-random missing observations. This is due to the fact that if the missing observations follow some pattern, i.e. they are related to the idiosyncratic term, then such a sample selection will lead to biased estimates. Thus, it becomes important to correct the selectivity bias in such cases[7].

The Fixed Effects Model[8]

The report makes use of the fixed effects model to analyze the panel datasets. A fixed effects model works best for this analysis, as in a fixed-effects model the unobserved variables are allowed to be correlated in any manner with the observed variables. Thus, it controls for the Omitted Variable Bias (OVB). A fixed effects model works on the principle that the subjects serve as their own controls. This model controls OVB by implementing the simple idea that whatever effect the omitted variables have on the subject at a particular time, they will have the same effect at a later time. Thus, the effects of the omitted variables will be "fixed". For a fixed effects model to work, however, the following assumptions must hold true.

1. The omitted variable must have time invariant values. Thus, the values of the variable cannot change over time.
2. The omitted variable must have time invariant effects. Thus, the effect of the variable remains constant over time.

To control for variables that are not time invariant, year dummies can be introduced. This report makes use of the same to produce more robust results.

The equation for the fixed effects model becomes:

$$Y_{it} = \beta_1 \times X_{it} + \alpha_i + u_{it}$$

Where
α_i $(i = 1 \ldots . n)$ is the unknown intercept for each entity (n entity-specific intercepts).
Y_{it} is the dependent variable (DV) where i = entity and
t = time.
X_{it} represents one independent variable (IV),
β_1 is the coefficient for that IV,
u_{it} is the error term

There are 3 ways to estimate the fixed effects model:

1. Least Square Dummy Variable estimator (LSDV)
2. Within estimator, FE
3. First difference estimator, FD

The report has used the within estimator to estimate the fixed effects model.

The Within estimator [9]

Since α_i is not observable, it cannot be directly controlled for. The FE model eliminates α_i by demeaning the variables using the within transformation.

$$y_{it} - \bar{y}_i = \beta \times (X_{it} - \bar{X}_i) + (\alpha_i - \bar{\alpha}_i) + (u_{it} - \bar{u}_i) \Rightarrow \ddot{y}_{it} = \ddot{X}_{it}\beta + \ddot{u}_{it}$$

Where :

$$\bar{X}_i = \frac{1}{T}\sum_{t=1}^{T} X_{it}$$

$$\bar{u}_i = \frac{1}{T}\sum_{t=1}^{T} u_{it}$$

The FE estimator of β_1 can now be obtained using OLS regression.

Dynamic panel data models [10]

Dynamic panel data models (DPD) contain one or more lagged dependent variables, allowing for the modeling of a partial adjustment mechanism. It is based on the notion that the instrumental variables approach does not exploit all of the information available in the sample. By doing so in a Generalized Method of Moments (GMM) context, we may construct more efficient estimates of the dynamic panel data model.

Two step System GMM[11]

It is a general estimator designed for "small T, large N" panels. The SYS-GMM estimators control for endogeneity, that is, the independent variables do not need to be specifically exogeneous. They can be correlated with past as well as current realizations of the error. The two-step system estimator can control for heteroskedasticity and autocorrelation, which is why it was chosen over the one step system GMM estimator. The System GMM estimator is preferred over the difference estimator when the y values are persistent. The GMM estimates are short run estimates.

The xtabond2 was used to calculate the two step SYS-GMM estimates. It has several advantages (As per Arellano-Bond (1991)), such as:

- xtabond2 makes available a finite-sample correction to the Windmeijer (2000) two-step covariance matrix
- xtabond2 makes two-step robust more efficient than one-step robust
- xtabond2 addresses the instruments proliferation problem, using the "collapse" option
- xtabond2 gives the option to choose between the f and t statistics or the Wald and z statistic, using the option "small"

The Hansen and the Sargan test[12]

The validity of the moment conditions of the DPD models is tested using the GMM test of overidentifying restrictions, associated with Sargan and Hansen.

Null Hypothesis: The group of instruments is exogenous.

The p values are used to test the validity of the hypothesis. Insignificant p values allow us to reject the null hypothesis.

A test of overidentifying restrictions regresses the residuals from an IV or 2SLS regression on all instruments in Z. Under the null hypothesis that all instruments are uncorrelated with u, the test has a large-sample $\chi 2(r)$ distribution where r is the number of overidentifying restrictions. Under the assumption of i.i.d. errors, this is known as a Sargan test[13].

The Sargan test suffers from poor size properties for samples commonly encountered in econometric practice and therefore, a Hansen test is more common.

STATA's xtabond2 command calculated both the Hansen and the Sargan test, however, only the values of the Hansen test are reported due to the reason stated above.

Even if the Hansen statistic is insignificant, it is important to be wary of it. Caution must be exercised when interpreting the Hansen statistic. An important condition for the SYS-GMM estimator is that the number of instruments has to be less than the number of groups. If the number of instruments is high, the Hansen statistic would be higher. The following guidelines (as mentioned in Roodman (2009)) are followed when interpreting the Hansen statistic.

1. If the p-values are below 0.05, the instrument set is bad
2. If the p-values are below 0.1, there is reason to be cautious on the validity of the instrument set. While the instrument set can be considered "good", an attempt should be to raise its value.
3. If the p-values are between 0.1 to 0.4, the instrument set can be considered good and contains the appropriate number of instruments relative to the number of groups.
4. If the p-values are between 0.4 to 0.6, the instrument set contains slightly more instruments than would be ideal. It is required to be wary of this instrument set.
5. If the p-values are between 0.6 to 0.9, the instrument set contains almost as many values as the number of groups. This instrument set should be treated with great skepticism, and either the number of instruments should be reduced or the number of groups increased.
6. If the p-values are over 0.9, the instrument set can be ignored.

Literature is still not clear on how many are “too many” instruments. However, Monte Carlo simulation evidence suggests that cutting the number of over-identifying instruments in half can reduce the bias by 40%.

In the panel regression conducted as part of this report, almost all Hansen p-values were between 0.1 to 0.4. This indicates the validity and the “goodness” of the instrument test.

The Arellano Bond tests for serial correlation

The Arellano Bond tests are used to test for serial autocorrelation. The p-values are expected to be significant to rule out any serial correlation. The Arellano-Bond tests are conducted for AR(1) and AR(2). A minimum of 3 and 4 time periods are required to conduct these tests, respectively. While it is important that the null hypothesis for the Arellano-Bond test for AR(2) is not rejected, the presence of serial correlation in AR(1) is expected due to the presence of lagged dependent term. Thus, rejecting the null hypothesis in Arellano-Bond test for AR(1) should not be a problem, and does not invalidate the results obtained.

The xtabond2 automatically calculates the p-values of the Arellano Bond test. The specific command for it, estat abond, can also be used.

The p-values for the Arellano Bond test for AR(2) have not been reported in this report as there were only 3 time periods. The p-values for the Arellano Bond test for AR(1) have been reported, and were found to be insignificant almost all the time. The Arellano Bond of AR(2) values were calculated for the functional dependencies panel.

Empirical Analysis

In order to assess the impact of different budgetary sub-components on private and public investment, we estimate two specifications, using 3-year non-overlapping averages to smooth the effects of short-run fluctuations.

True Equations:

I1: $privinv = \beta_0 \times y_{i0} + \beta_1 \times Z_{it} + \gamma \times F_{it} + \eta_t + \nu_i + \varepsilon_{it}$

I2: $pubinv = \beta_0 \times y_{i0} + \beta_1 \times Z_{it} + \gamma \times F_{it} + \eta_t + \nu_i + \varepsilon_{it}$

$privinv$, $pubinv$ represent the levels of private and public investment (in % of GDP), respectively, and y_{i0} is the value of the real GDP per capita at the beginning of each 3-year period, Z_{it} is a vector of control variables, F_{it} is a vector of budgetary component(s) of interest, either from the expenditure or revenue side, ν_i, η_t correspond to the country and time effects, respectively, and ε_{it} is a column vector of some unobserved zero mean white noise-type satisfying the standard assumptions.

α, β_0, β_1, γ are unknown parameter vectors to be estimated. Z_{it} includes labour force participation rate, and population growth. Implicit and contingent liabilities represent other factors related to public expenditures (or the need to collect more revenue) but not taken into account so far. For the ageing-related burden, we account for it using the age dependency ratio, measured as a share of the working age population, as an explanatory variable.

Note: The models are estimated by either within fixed effects (FE-within) or two-step robust system generalized methods of moments (SYS-GMM). The dependent variable is either private investment or public investment. Robust heteroskedastic-consistent standard errors are reported in parenthesis below each coefficient estimate. Time fixed effects were included but are not reported for the economy of space. Also, a constant term has been estimated but it is not reported for reasons of parsimony.

*denotes significance at 10% level.

**denotes significance at 5% level.

***denotes significance at 1% level.

Dependent Variable	Private Investment	Public Investment	Private Investment	Public Investment
Estimation	FE (within)		SYS-GMM	
Regression no.	1	11	6	16
Initial GDP per capita	0.000352**	-0.000122*	-0.000322*	-7.37e-05*
	(0.000140)	(9.37e-05)	(0.000219)	(7.70e-05)
Labour Force Participation Rate	0.282*	0.0174	0.0208	-0.139
	(0.188)	(0.0828)	(0.458)	(0.109)
Population Growth	0.322	0.498*	-0.510	0.468
	(0.297)	(0.272)	(1.303)	(0.377)
Dependency Ratio	-0.398**	0.0423*	-0.187*	-0.134*
	(0.138)	(0.145)	(0.290)	(0.0746)
Observations	45	45	45	45
R-squared	0.412	0.092		
Hansen (p value)			0.37	0.359
AB AR(1) (p value)			0.745	0.906

Table No. 2(a) : Benchmark cross-country investment equations, 3 year averages - fixed effects and system generalised methods of moments

	Long Run Coefficients	
	Private	Public
Initial GDP per capita	-0.000322*	-7.37e-05*
	(0.000219)	(7.70e-05)
Dependency Ratio	-0.157705	-0.1184783 *
	(0.290)	(.0579556)

Table No. 2(b) : Long run coefficient estimates for the Table No. 2(a)

In general, it is seen that initial GDP per capita hampers investment. According to the SYS GMM estimate for private investment, a percentage change in initial GDP per capita is associated with a 0.0003% decrease in private investment in the short-run, at the 10% significance level, *ceteris paribus*. In the long run, a similar impact is seen. A percentage change in initial GDP per capita is associated with a 0.0003% decrease in private investment in the long run, at the 10% significance level, *ceteris paribus*. For public investment, a percentage change in initial GDP per capita is associated with a 0.0001%

decrease in public investment in the short-run, at the 10% significance level, *ceteris paribus*. In the long run, a similar impact is seen. A percentage change in initial GDP per capita is associated with a 0.0001% decrease in public investment in the long run, at the 10% significance level, *ceteris paribus*.

Labor force participation rate has a positive impact on private investment. According to the within estimate for private investment, a percentage change in the labor force participation rate is associated with a 0.282% increase in private investment, at the 10% significance level, *ceteris paribus.* Population growth has a positive impact on public investment. According to the within estimate for public investment, a percentage change in the population growth is associated with a 0.498% increase, at the 10% significance level, *ceteris paribus*.

Age dependency ratio hampers private investment and positively impacts public investment. According to the within estimates for private and public investment, a percentage change in the age dependency ratio is associated with a 0.398% decrease in investment, at the 1% significance level, *ceteris paribus*. Meanwhile, a percentage change in the age dependency ratio is associated with a 0.0423% increase in public investment, at the 10% significance level, *ceteris paribus*. In the long run, however, the age dependency ratio hampers public investment as well. A percentage change in the age dependency ratio is associated with a 0.12% decrease in public investment in the long run, at the 10% significance level, *ceteris paribus*.

The Hansen p-value is around 0.3 for both public and private investment, which validates the instrument test used. The AB test for AR(1) yields insignificant p-value, which is expected.

Dependent Variable	Private Investment	Public Investment	Private Investment	Public Investment
Estimation	FE (within)		SYS-GMM	
Regression no.	2	12	7	17
Revenue Variables				
Tax Revenue/GDP	0.144	-0.00847	-0.317	-0.156
	(0.457)	(0.184)	(0.358)	(0.144)
Domestic taxes on good and services/GDP	-0.234	-0.00106	-0.307	-0.174*
	(0.680)	(0.230)	(0.401)	(0.125)
Income taxes/GDP	-0.544	0.385*	-0.233	-0.0182
	(0.774)	(0.269)	(0.382)	(0.175)
Property taxes/GDP	-4.077**	0.186	-2.487*	-0.985
	(1.736)	(0.574)	(1.773)	(0.754)
Payroll taxes/GDP	-4.867	2.964	-2.403	-3.565**
	(8.512)	(4.904)	(3.507)	(1.638)
Social Contributions/GDP	1.111	-0.876	-0.253	-0.130
	(1.548)	(0.897)	(0.284)	(0.131)

Table No. 3(a) : Investment equations with budgetary economic decomposition when revenue variables are introduced one at a time in the benchmark equations. 3-year averages

Dependent Variable	Private Investment		Public Investment	
	Hansen (p values)	AB AR(1)	Hansen (p values)	AB AR(1)
Tax Revenue/GDP	0.32	0.072	0.405	0.61
Domestic taxes on good and services/GDP	0.43	0.06	0.416	0.683
Income taxes/GDP	0.41	0.05	0.334	0.724
Property taxes/GDP	0.36	0.107	0.41	0.678
Payroll taxes/GDP	0.42	0.066	0.523	0.7
Social Contributions/GDP	0.4	0.059	0.414	0.642

Table No. 3(b): Hansen and AB p-values for Table No. 3(a)

	Long Run Coefficients	
	Private	Public
Property taxes/GDP	-.713203** *	
	(1.483)	
Payroll taxes/GDP		-.780946***
		(.0786092)

Table No. 3(c) : Long run coefficient estimates for the Table No. 3(a)

It is known that taxes dampen investment. A percentage change in the domestic tax levied on goods and services (as a % of GDP) leads to a 0.174% decrease in public investment, at 10% significance level, *ceteris paribus*, according to SYS-GMM estimate for public investment. However, according to these estimates, a percentage change in income tax (as a % of GDP) results in 0.385% increase in public investment, at 10% significance level, *ceteris paribus*.

It is interesting to note that charging property tax (as a % of GDP) decreases the level of both private and public investment. A percentage increase in property tax charged (as a % of GDP) leads to a 2.487% decrease in private investment, at a 10% significance level,

ceteris paribus, according to the SYS-GMM estimates. This trend is also seen in the long run. However, the effect becomes weak. A percentage increase in property tax charged (as a % of GDP) is only able to bring about 0.713% decrease in private investment, at 1% significance level, *ceteris paribus*.

A similar effect of payroll tax charged (as a % of GDP) on the public investment can be seen. A percentage increase in payroll tax charged (as a % of GDP) leads to 3.565% decrease in public investment, at 5% significance level, *ceteris paribus*. Similarly, in the long run, a percentage change in this tax dampens the public investment by 0.781%, at 1% significance level, *ceteris paribus*.

The Hansen p-value is around 0.4 for both public investment and private investment, which validates the instrument test used. The AB test for AR(1) yields insignificant p-value, which is expected.

Dependent Variable	Private Investment	Public Investment	Private Investment	Public Investment
Estimation	FE (within)		SYS-GMM	
Regression no.	3	13	8	18
Expenditure Variables				
Public Wages/GDP	0.539*	-0.145	-0.181	0.0578
	(0.328)	(0.175)	(0.236)	(0.0981)
Interest Payments/GDP	0.0905	-0.259*	-0.357*	-0.118*
	(0.564)	(0.125)	(0.249)	(0.263)
Subsidies/GDP	-0.360**	0.0541	-0.0486*	-0.0300*
	(0.149)	(0.133)	(0.0670)	(0.0560)
Public consumption/GDP	0.624	-0.244	-0.324	-0.154*
	(0.811)	(0.276)	(0.243)	(0.103)

Table No. 3(d) : Investment equations with budgetary economic decomposition when expenditure variables are introduced one at a time in the benchmark equations. 3-year average

Dependent Variable	Private Investment		Public Investment	
	Hansen (p values)	AB AR(1)	Hansen (p values)	AB AR(1)
Public Wages/GDP	0.44	0.05	0.453	0.655
Interest Payments/GDP	0.056	0.054	0.388	0.824
Subsidies/GDP	0.48	0.078	0.371	0.689
Public consumption/GDP	0.44	0.052	0.272	0.653

Table No. 3(e)Hansen and AB p-values for Table No. 3(d)

	Long Run Coefficients	
	Private	Public
Interest Payments/GDP	-0.263**	
	(0.13524)	
Subsidies/GDP	-0.046**	
	(0.0670)	
Domestic taxes on good and services/GDP		.0579556*
		(.0908187)
Interest Payments/GDP		-.1057803*
		(.2100119)
Subsidies/GDP		-.0291153*
		(0.053)
Public consumption/GDP		-.1333614*
		(.077108)

Table No. 3(f) : Long run coefficient estimates for the Table No. (3d)

It is observed that an increase in public wages is leading to an increase in private investment in the short run. A percentage change in the public wages (as a % of GDP) leads to a 0.539% increase in private investment, at 10% significance level, ceteris paribus, according to within estimate for private investment.

Generally, increase in interest payments is seen to harm all types of investment. According to the SYS GMM estimates, a percentage change in Interest Payments (% of GDP) is associated with a 0.357% decrease in private investment and a 0.118% decrease in public investment in the short-run, at the 10% significance level, ceteris paribus. A similar trend is seen in the long run. A percentage change in Interest Payments (% of GDP) is associated with a 0.263% decrease in private investment and 0.106% decrease in public investment in the long run, at the 10% significance level, ceteris paribus.

Increase in subsidies is also found to adversely impact investment. According to the SYS GMM estimates, a percentage change in subsidies (% of GDP) is associated with a 0.0486% decrease in private investment and a 0.0300% decrease in public investment in the short-run, at the 10% significance level, ceteris paribus. In the long run, a similar impact is seen. A percentage change in subsidies (% of GDP) is associated with a 0.046% decrease in private investment and 0.029% decrease in public investment in the long run, at the 10% significance level, ceteris paribus.

An increase in public consumption is found to adversely affect public investment in the short run. According to the SYS GMM estimates, a percentage change in public consumption (% of GDP) is associated with a 0.154% decrease in public investment. The trend is similar in the long run. A percentage change in public consumption (% of GDP) is associated with a 0.133% decrease in public investment in the long run, at the 10% significance level, ceteris paribus.

Dependent variable	Private Investment	Public Investment	Private Investment	Public Investment
Estimation	FE (within)		SYS-GMM	
Regression number	4	14	9	19
Initial GDP per capita	0.000257*	2.11e-05	-0.000237*	-1.10e-05*
	(0.000166)	(0.000143)	(0.000387)	(0.000230)
Labour force participation	0.499**	-0.0407	-0.0425	-0.127
	(0.228)	(0.0861)	(0.720)	(0.129)
Population growth	0.123	0.642*	0.425	0.196
	(0.409)	(0.365)	(1.616)	(0.466)
Dependency ratio	-0.466***	0.0967*	-0.210*	-0.145
	(0.134)	(0.157)	(0.264)	(0.120)
Revenue Variables				
Domestic taxes on goods and services/GDP	1.224***	-0.0882	0.0603	-0.168
	(0.290)	(0.361)	(0.618)	(0.308)
Income taxes/GDP	0.152	0.515*	-0.303	0.0177
	(0.415)	(0.320)	(0.398)	(0.165)
Property taxes/GDP	-3.999*	0.974	-3.021*	-1.074
	(2.118)	(1.488)	(1.610)	(0.831)
Payroll taxes/GDP	-11.35	3.547	1.982	-3.839**
	(7.514)	(7.540)	(4.227)	(1.317)
Social security contributions/GDP	2.637	-1.388	0.146	0.286
	(1.818)	(1.257)	(0.530)	(0.213)
Observations	45	45	45	45
R-squared	0.555	0.226		
Hansen (p value)			0.47	0.26
AB AR(1) (p value)			0.156	0.69

Table No. 4(a) : Investment equations with decomposition of government revenues, 3-year averages – fixed effects and system generalized methods of moments

	Long Run Coefficients	
	Private	Public
Property taxes/GDP	-.751328***	
	(0.09956)	
Payroll taxes/GDP		-.7933567 ***
		(.056223)

Table No. 4(b) : Long run coefficient estimates for the Table No. 4(a)

A positive trend can be seen for the impact of domestic taxes on goods and services and income tax, both charged as a % of GDP. According to the within estimates, a percentage increase in the domestic tax on goods and services charged (as a % of GDP) leads to increase in private investment by 1.224%, at 1% significance level, *ceteris paribus*. According to the SYS-GMM estimates, a percentage increase in the income tax charged (as a % of GDP) leads to increase in private investment by 0.515%, at 10% significance level, *ceteris paribus*.

However, both property tax and payroll tax follow the same trend of dampening the investment. According to SYS-GMM estimates, a percentage increase in property tax charged (as a % of GDP) results in a 3.021% decrease in private investment, at a 10% significance level, *ceteris paribus*. After calculating the long term effect, we find that a percentage increase in property tax charged (as a % of GDP) results in a 0.751% decrease in private investment, at a 1% significance level, *ceteris paribus*.

Analyzing the impact of payroll tax on public investment, we find that according to SYS-GMM estimates, a percentage increase in payroll tax charged (as a % of GDP) results in a 3.839% decrease in public investment, at a 5% significance level, *ceteris paribus*. After calculating the long term effect, we find that a percentage increase in payroll tax charged (as a % of GDP) results in a 0.793% decrease in public investment, at a 1% significance level, *ceteris paribus*.

The Hansen p-value is around 0.3 for public investment and 0.4 for private investment, which validates the instrument test used. The AB test for AR(1) yields insignificant p-value, which is expected.

Dependent Variable	Private Investment	Public Investment	Private Investment	Public Investment
Estimation	FE (within)		SYS-GMM	
Regression no.	5	15	10	20
Initial GDP per capita	0.000362**	-0.000124*	-0.000141*	-8.64e-06*
	(0.000123)	(0.000135)	(0.000439)	(0.000125)
Labour Force Participation Rate	0.182	0.0951	-0.000151	-0.122
	(0.202)	(0.0937)	(0.596)	(0.119)
Population Growth	0.378	0.602*	0.435	0.458
	(0.325)	(0.323)	(1.758)	(0.472)
Dependency Ratio	-0.385*	-0.0537	-0.339*	-0.160
	(0.191)	(0.146)	(0.461)	(0.125)
Expenditure Variables				
Public wages/GDP	0.706	-0.0948	-0.253	0.157
	(0.540)	(0.258)	(0.439)	(0.119)
Interest payments/GDP	-0.562*	-0.229*	-0.213*	-0.0754*
	(0.433)	(0.196)	(0.487)	(0.154)
Subsidies/GDP	0.0957	0.0722	0.148	-0.0251*
	(0.250)	(0.185)	(0.209)	(0.0513)
Public Consumption/GDP	0.410	-0.248	-0.556	-0.196
	(1.065)	(0.366)	(0.715)	(0.168)
Observations	45	45	45	45
R-squared	0.465	0.194		
Hansen (p-value)			0.36	0.299
AB AR(1) (p-value)			0.128	0.934

Table No. 5(a) : Investment equations with decomposition of government expenditures, 3-year averages – fixed effects and system generalised methods of moments

	Long Run Coefficients	
	Private	Public
Interest payments/GDP	-0.17557*	-.0701545
	(0.3311)	(.1333043)
Subsidies/GDP	0.173284	-.0245218
	(.28727)	(.048772)

Table No. 5(b) : Long run coefficient estimates for the Table No. 5(a)

Interest payments are observed to negatively impact investment. According to the SYS GMM estimate for private and public investment, a percentage change in Interest Payments (% of GDP) is associated with a 0.213% decrease in private investment and 0.0754% decrease in public investment in the short-run, at 10% significance level, ceteris paribus. In the long run, a similar impact is seen. A percentage change in Interest Payments (% of GDP) is associated with a 0.176% decrease in private investment and 0.070% decrease in public investment in the long run, at the 10% significance level, ceteris paribus.

It is seen that subsidies adversely affect public investment in the short run. According to the SYS GMM estimate for private and public investment, a percentage change in subsidies (% of GDP) is associated with a 0.0251% decrease in public investment at 10% significance level, ceteris paribus. The result is similar for the long run. A percentage change in subsidies (% of GDP) is associated with a 0.0245% decrease in public investment in the long run, at the 10% significance level, ceteris paribus.

The Hansen p-value is around 0.3 for public investment and 0.4 for private investment, which validates the instrument test used. The AB test for AR(1) yields insignificant p-value, which is expected.

Dependent Variable	Private Investment	
Estimation	FE (within)	SYS-GMM
Regression no.	22	24
Panel A (simultaneous)		
Public expenditure in education/GDP	9.952**	26.16*
	(2.816)	(16.54)
Public expenditure in health/GDP	-15.95***	-3.670**
	(3.601)	(1.456)
Public expenditure in social security and welfare/GDP	-3.550***	-4.622
	(0.295)	(3.619)
Observations	29	29
R-squared	0.856	
NUMBER OF COUNTRIES	7	7
Regression no.	21	23
Panel B (one at a time)		
Public expenditure in education/GDP	-4.091	2.967*
	(4.794)	(1.690)
Public expenditure in health/GDP	-8.451*	-0.596
	(5.059)	(1.333)
Public expenditure in social security and welfare/GDP	-3.328*	0.429
	(1.459)	(0.490)

Table No. 6(a)Private investment equation with functional decomposition of public expenditure when fiscal variables are introduced simultaneously (Panel A) and one at a time (Panel B), 3-year averages

Dependent Variable	Private Investment		
	Hansen p-values	AB AR(1)	AB AR(2)
Panel A (simultaneous)	1	0.697	0.091
Panel B (one at a time)			
Public expenditure in education/GDP	0.853	0.484	0.053
Public expenditure in health/GDP	0.705	0.379	0.029
Public expenditure in social security and welfare/GDP	0.765	0.443	0.055

Table No. 6(b): Hansen and AB p-values for Table No. 6(a)

Long Run Coefficients	
Panel A	
Public expenditure in education/GDP	-1.039747***
	(.0261333)
Public expenditure in health/GDP	-.7858507***
	(.0667944)
Public expenditure in social security and welfare/GDP	-.8221161***
	(.1145063)
Panel B	
Public expenditure in education/GDP	-1.50834***
	(.436658)
Public expenditure in health/GDP	-.37335
	(.5232658)
Public expenditure in social security and welfare/GDP	.7526282
	(1.503761)

Table No. 6(c)Long run coefficient estimates for the Table No. 6(a)

From Panel A, we can observe the following.

Public expenditure in health and public expenditure in social security and welfare hamper private investment, whereas public expenditure in education has a positive impact on private investment. According to the SYS-GMM estimate, a percentage change in public expenditure on education is associated with a 26.16% increase in private investment in the short run, at the 10% significance level, *ceteris paribus*. However, a percentage change in public expenditure on education is associated with a 1.03% decrease in private investment in the long run, at the 1% significance level, *ceteris paribus*.

Public expenditure in health has a negative impact on private investment. According to the SYS-GMM estimate, a percentage change in public expenditure on health is associated with a 3.67% decrease in private investment in the short run, at the 5% significance level, *ceteris paribus*. Moreover, a percentage change in public expenditure on health is associated with a 0.78% decrease in private investment in the long run, at the 1% significance level, *ceteris paribus*.

Public expenditure in social security and welfare has a negative impact on private investment. According to the within estimate, a percentage change in public expenditure on social security and welfare is associated with a 3.55% decrease in private investment in the short run, at the 1% significance level, *ceteris paribus*. Moreover, a percentage change in public expenditure on social security and welfare is associated with a 0.82% decrease in private investment in the long run, at the 1% significance level, *ceteris paribus*.

From Panel B, we can observe the following.

Public expenditure in health and public expenditure in social security and welfare hamper private investment, whereas public expenditure in education has a positive impact on private investment. According to the SYS-GMM estimate, a percentage change in public expenditure on education is associated with a 2.98% increase in private investment in the short run, at the 10% significance level, *ceteris paribus*. However, a percentage change in public expenditure on education is associated with a 1.5% decrease in private investment in the long run, at the 1% significance level, *ceteris paribus*.

Public expenditure in health has a negative impact on private investment. According to the within estimate, a percentage change in public expenditure on health is associated with a

8.4% decrease in private investment in the short run, at the 10% significance level, *ceteris paribus*. Public expenditure in social security and welfare has a negative impact on private investment. According to the within estimate, a percentage change in public expenditure on social security and welfare is associated with a 3.32% decrease in private investment in the short run, at the 10% significance level, *ceteris paribus*.

The Hansen p-value is around 0.7 for both public investment and private investment, which validates the instrument test used. The instrument set can be improved, which can be done by adding more countries. The AB test for AR(1) yields insignificant p-value, which is expected. The AB test for AR(2) is significant at 5% and 10% levels.

Results and Policy Implications

Trend Analysis

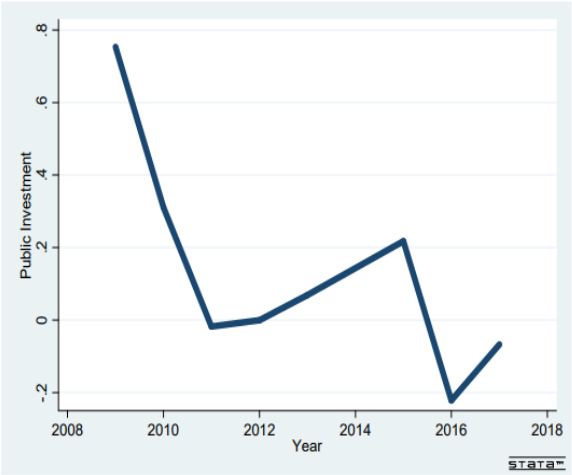

Fig. No. 1 Public Investment (over the years)

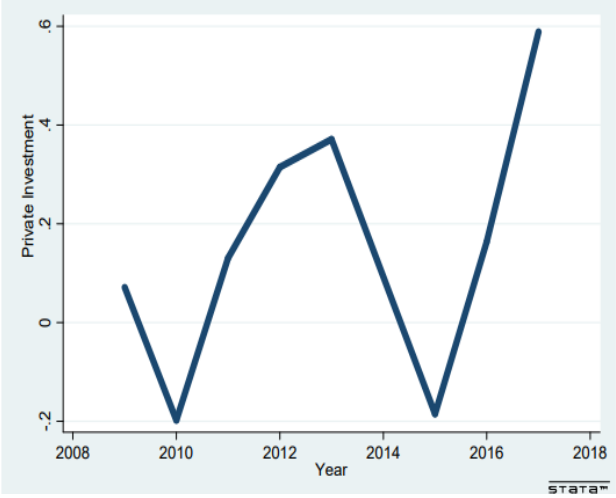

Fig. No. 2 Private investment (over the years)

The analysis performed in the paper is for emerging economies. Since the countries are gradually moving towards mixed or free economies, there is increased privatization and globalization and, therefore, the private investment is increasing. The decrease in private investment till 2010 can be attributed to the global financial crisis in 2008. In general, however, private investment has steadily increased over the years. Over the years, public investment is shrinking because as the country enters different stages of development the need for public expenditure varies. In the initial stages of development, there is a great need for public investment in various sectors like education and healthcare but in the course of development the income elasticity of demand for government expenditure decreases as these goods become a necessity in the developed stage. Thus, private investment in emerging economies steadily increases over the years and public investment gradually decreases over the year.

When the effect of the control variables used on the investment was analyzed, it was found that there is a negative relation between initial real GDP per capita and public investment as well as private investment. This is due to the fact that the effect on investment largely depends on the development stage that the country is in. In the initial stages of development, the output of public investment acts as a superior good for people and eventually with the improving development it becomes a necessity (Abizadeh,1988), hence

more the GDP per capita, less is the public investment. Also, since the output behaves as a superior good, if the income rises so will the expenditure so the major portion is consumed hence the private investment will be less.

Coefficient of age dependency ratio (ADR) is negative for private investment because if there is a large proportion of working age people then the private savings and investment will be large. But the coefficient of ADR is positive for the public investment because the larger proportion of the dependent population demands a large amount of investment in education, infrastructure as well as the healthcare facilities. However, in the long run ADR is affecting public investment negatively because in the long run if the proportion of dependent age groups is large then there will be less funds with the government to finance investment projects since the consumption pattern will shift from other goods to healthcare services and leisure[14] (Santacreu, 2016).
Labour force participation rate was found to be statistically significant for the private investment but not for the public. It has a positive impact on private investment because if the working force increases, the private savings would also increase and so will the investment. Population growth has a statistically significant positive impact on public investment because if the population will grow there will be a greater demand for public expenditure, hence, public investment will increase.

Results show that each component of the revenue side does not significantly affect private and public investment, and also expenditure side variables are more significant than the revenue variables. Overall, the components show a positive impact, however tax on income, goods and services and payroll has a statistically significant positive impact on public investment because the increase in the inflow of funds will lead to increased investment. On the expenditure side interest payments and subsidies have a negative effect on both the investments. Reason for the negative effect on private investment is because of the deadweight loss inefficiencies while moving the economy from its equilibrium state, also there would be spillover effects from higher yields for funding of private investment which would make the financing conditions stricter (Afonso and Jalles, 2015). Moreover, public investment will be difficult if the interest payments increase as it's a liability of the government.

In the long run, GDP per capita, age dependency ratio, interest payments and subsidies, public consumption show a significant negative impact on public investment whereas taxes on goods and services and payroll have positive effects due to above mentioned results. As

public consumption increases in the long run, there will be fewer funds to invest hence the negative effect.

On private investment, the real GDP per capita, ADR, interest payments and subsidies have negative impacts in the long run. Property tax in the long run has a negative impact on private investment as well because investment in property is the common form of capital investment and an increase in the property tax will discourage this investment.

In the long run, expenditure on health, education and social security and welfare have a negative effect on private investment because if the government expenditure in these sectors increases there will be a crowding out effect which will lead to a decrease in the private investment. Also, if the expenditure in these sectors is increased, it would improve the quality of the public infrastructure and other facilities which will give a strong competition to the private sector, thus, leading to a decrease in the private investment.

Conclusion

This report analyzed the determinants of private and public investment in the context of emerging economies. For the analysis, 15 diverse emerging economies were chosen, with the time period of study being 2009-2017.

In the long run as well as short run initial GDP per capita hampers investment, as in the initial stages of development, the output of public investment acts as a superior good for people. Labor force participation rate has a positive impact on private investment as expected, as when the working force increases, the private savings would also increase and so will the investment. Population growth has a positive impact on public investment with increased demand for public goods. Age dependency ratio hampers private investment but in the long run it has a negative impact on both the investments.

All the sources of government revenue (Domestic taxes on goods and services, Income taxes, Property taxes, Payroll taxes) have a positive effect on public investment. The trends are maintained in the long run as well but with a weaker effect because the increase in the inflow of funds will lead to increased investment.

Increase in government expenditure components- interest payments, subsidies and public consumption harm both the investments the results hold in the long run as well.

Public expenditure in health and public expenditure in social security and welfare hamper private investment in both short and long run. Interestingly, public expenditure in education has a positive impact on private investment in the short run and a negative impact in the long run.

In general, it was found that private investment has steadily increased over the years and public investment is shrinking. Results show that each component of the revenue side does not significantly affect private and public investment, and expenditure side variables are more significant than the revenue variables and affect negatively on both the investments. All the functional dependencies in the long run affect the private investment negatively.

All these components aim to deliver a complete picture on the impact of fiscal policies on public and private investment, and on applying this model in the context of India, the impact of popular public policies on the country could be explained.

References

1. Aschauer, D. A. (1990). Why is infrastructure? Industry Week, 21-50.
2. Erden L., Holcombe R. G. (2006). The Linkage between Public and Private Investment: A Cointegration Analysis of Developing Countries. Eastern Economic Journal, Vol. 32, No. 3, Summer 2006.
3. Pettinger T. (2019). Investment and economic growth. https://www.economicshelp.org/blog/495/economics/investment-and-economic-growth/
4. Afonso, A., & Jalles, J. T. (2014). Fiscal composition and long-term growth. *Applied Economics*, *46*(3), 349-358.
5. Sraders A. (2020). What Are Emerging Markets? Characteristics and List. https://www.thestreet.com/markets/emerging-markets/what-are-emerging-markets-14819803
6. Erica (2019). Introduction to the Fundamentals of Panel Data https://www.aptech.com/blog/introduction-to-the-fundamentals-of-panel-data/
7. Verbeek, M., & Nijman, T. (1992). Testing for selectivity bias in panel data models. *International Economic Review*, 681-703.
8. Williams R. (2016). Panel Data 4: Fixed Effects vs Random Effects Models
9. Schmidheiny, K., & Basel, U. (2011). Panel data: fixed and random effects. *Short Guides to Microeconometrics*, *7*(1), 2-7.
10. Baum, C. F. (2013). Dynamic panel data estimators. *Applied Econometrics*, 1-50.
11. Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *The stata journal*, *9*(1), 86-136.
12. Bowsher, C. G. (2002). On testing overidentifying restrictions in dynamic panel data models. *Economics letters*, *77*(2), 211-220.
13. Baum, C. F. (2009). Instrumental variables and panel data methods in economics and finance. *Boston College and DIW Berlin*.
14. Santacreu A. M. (2016) "Long-Run Economic Effects of Changes in the Age Dependency Ratio," Economic Synopses, No. 17 https://research.stlouisfed.org/publications/economic-synopses/2016/09/02/long-run-economic-effects-of-changes-in-the-age-dependency-ratio/

Miscellaneous

1. **António A. & João T. J.(2015). "How Does Fiscal Policy Affect Investment? Evidence from a Large Panel," International Journal of Finance & Economics, John Wiley & Sons, Ltd., vol. 20(4), pages 310-327**
2. Adeleye, N., Osabuohien, E., & Bowale, E. (2017). The role of institutions in the finance-inequality nexus in sub-Saharan Africa. Journal of Contextual Economics, 137(2017), 173-192.
3. Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. The review of economic studies, 58(2), 277-297.
4. Asteriou, D., Dimelis, S., & Moudatsou, A. (2014). Globalization and income inequality: A panel data econometric approach for the EU27 countries. Economic modelling, 36, 592-599.
5. Ejemeyovwi, J. O., & Osabuohien, E. S. (2020). Investigating the relevance of mobile technology adoption on inclusive growth in West Africa. Contemporary Social Science, 15(1), 48-61.
6. Roodman, D. (2018). xtabond2: Stata module to extend xtabond dynamic panel data estimator.
7. Mileva, E. (2007). Using Arellano-Bond dynamic panel GMM estimators in Stata. Economics Department, Fordham University, 64, 1-10.

Literature Reviews

1. Abel, A. B. (1982). Dynamic effects of permanent and temporary tax policies in a Q model of investment. Journal of Monetary Economics, 9(3), 353-373.
2. Afonso, A., & Hauptmeier, S. (2009). Fiscal behaviour in the European Union: rules, fiscal decentralization and government indebtedness.
3. Afonso, A., & Jalles, J. T. (2014). Fiscal composition and long-term growth. Applied Economics, 46(3), 349-358.
4. Afonso, A., & St Aubyn, M. (2016). Economic growth and public and private investment returns. ISEG-UL Working Paper, (14).
5. Alesina, A., Ardagna, S., Perotti, R., & Schiantarelli, F. (2002). Fiscal policy, profits, and investment. American economic review, 92(3), 571-589.

6. Bond, S., Hoeffler, A., & Temple, J. (2001). GMM estimation of empirical growth models. University of Oxford. The Institute for Fiscal Studies, Working Paper, (21), 77-89.
7. Campos, N. F., & Nugent, J. B. (2003). Aggregate investment and political instability: An econometric investigation. Economica, 70(279), 533-549.
8. Cummins, J. G., Hassett, K. A., & Hubbard, R. G. (1996). Tax reforms and investment: A cross-country comparison. Journal of public Economics, 62(1-2), 237-273.
9. Edgerton, J. (2010). Investment incentives and corporate tax asymmetries. Journal of Public Economics, 94(11-12), 936-952.
10. Galí, J., & Perotti, R. (2003). Fiscal policy and monetary integration in Europe. economic policy, 18(37), 533-572.
11. Giavazzi, F., Jappelli, T., & Pagano, M. (2000). Searching for non-linear effects of fiscal policy: evidence from industrial and developing countries. European economic review, 44(7), 1259-1289.
12. Hall, R. E., & Jorgenson, D. W. (1967). Tax policy and investment behavior. The American Economic Review, 57(3), 391-414.
13. Judd, K. L. (1985). Short-run analysis of fiscal policy in a simple perfect foresight model. Journal of Political Economy, 93(2), 298-319.
14. Krishna, K., Ozyildirim, A., & Swanson, N. R. (2003). Trade, investment and growth: nexus, analysis and prognosis. Journal of Development Economics, 70(2), 479-499.
15. Loungani, P., & Rush, M. (1995). The effect of changes in reserve requirements on investment and GNP. Journal of Money, Credit and Banking, 27(2), 511-526.
16. Muzurura, J., & Sikwila, M. (2018). Taxation, private fixed domestic investment behaviour and Zimbabwe economic growth. American Journal of Humanities and Social Sciences, 2(5), 26-39.
17. Popov, V. (1997). The Investment Decline in Transition Economies: Policy Versus Non-Policy Factors.
18. Roodman, D. (2009). A note on the theme of too many instruments. Oxford Bulletin of Economics and statistics, 71(1), 135-158.
19. Stawska, J. (2012). The impact of the monetary-fiscal policy mix on investments of euro area countries in the context of the financial crisis. Science and Studies of Accounting and Finance: Problems and Perspectives, 8(1), 228-236.