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The Impact of Transportation and Water Infrastructure Spending on Economic Growth: Evidence from the U.S. State and Local Governments and Federal Government

Prince FOSU[1]
Martinson Ankrah TWUMASI[2]

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Abstract

We sought to analyze the impact of U.S. state and local governments and federal government transportation and water infrastructure spending on economic growth using historic data from 1980 to 2016. Our results show that state and local governments spending had a positive and statistically significant impact on economic growth. The federal government spending also had a positive impact on economic growth however, this effect is statistically insignificant. Our results suggest that state and local governments spending matters significantly for economic growth more than federal government spending and so, the state and local authorities can intensify their spending on transportation and water infrastructure to boost U.S. economic growth.

Keywords: economic growth, transportation and water infrastructure spending, state and local governments, the federal government, United States.

JEL Classification: EOO, H54, O47, O18

1. Introduction

Investment in infrastructure plays a critical role in economic growth and development of every country. Previous research has suggested that the availability and quality of infrastructure increase economic growth in both developed and developing countries (Fosu, 2019; Fosu 2021; Canning & Pedroni, 2004; Holtz-Eakin & Schwartz, 1995). Countries with available and quality infrastructure such as roads, railways, and electricity, among others, tend to have increased productivity and economic growth. On the contrary, countries with poor infrastructure tend to have low productivity, high

[1] School of Analytics, Finance and Economics Southern Illinois University Carbondale Carbondale, IL, USA, prince.fosu@siu.edu, https://orcid.org/ 0000-0001-8536-8311
2 College of Economics Sichuan Agricultural University, Chengdu 611130, China, twuma2012@gmail.com, https://orcid.org/0000-0001-8703-7102

unemployment, decreased personal income, low foreign direct investments inflows, and reduced international competitiveness (Armah & Fosu, 2016).

Although infrastructure investment plays a crucial role in economic growth, developing and developed countries still have a huge infrastructure gap. Available data revealed that globally, spending on basic infrastructures (i.e., transport, power, water, and communications) currently stands at $2.7 trillion a year when it ought to be $3.7 trillion (The World Economic Forum report, 2016). Furthermore, according to a new study by Mckinsey Global Institute (2016), the World's investments in transport, power, water, and telecommunication system amounts to $2.5 trillion.

The United States' total infrastructure gap is largely seen in almost all sectors of the economy (ASCE, 2017). The country's infrastructure needs between 2016 and 2040 are anticipated to be 0.7% of GDP (McBride and Moss, 2020). Public spending on transportation and water, measured as a share of GDP in the U.S., has declined from 3.0% in 1959 to 2.4% in 2014 (Sherraden 2011). Also, in recent years, there has been a declining trend in public spending on transportation and water infrastructure by both the state and local governments and the federal government (see Figure 1). Among the factors contributing to the huge infrastructure deficit in the U.S. are inadequate infrastructure investment, especially by the federal government, the high cost of building additional infrastructure, and current state and local governments budget cuts (Sherraden 2011).

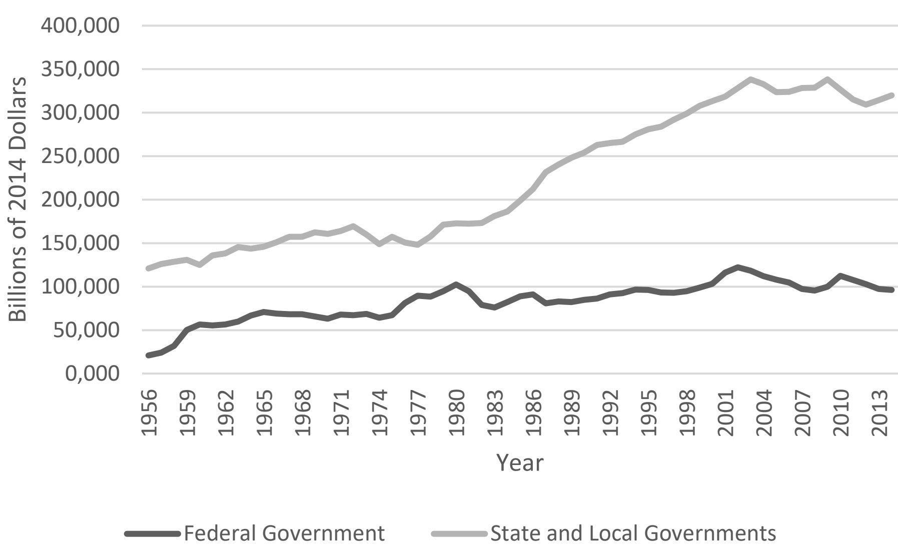

Figure 1: Trends in Public Spending on Transportation and Water Infrastructure, by the level of government (1956 to 2014). Source: Congressional Office Budget (2019). Note. Spending expressed in constant dollars has been adjusted

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to reflect the effects of inflation between the year the expenditure occurred and a base year (2014).

Bloomberg report (2016) indicated that China spends more on infrastructure than the U.S. and other Western European countries combined. Actual infrastructure spending between 2010 and 2015 for China was 8.3% of GDP compared with average spending of 2.3% of GDP in the U.S. and 2.1% in Germany and the U.K. (see Figure 2). The detrimental effect of the huge infrastructure gap includes jobs lost, declining economic growth, households' disposable income, and welfare. The ASCE report (2017) has indicated that if the investment gap in the U.S. is not addressed, the country is expected to lose almost $4 trillion in GDP (in inflation-adjusted 2015 dollars), 2.5 million lost American jobs, and 7 trillion in lost business sales by 2025. These losses are due to increased cost of production, declining exports due to high cost of transportation, and a reduction in private consumption.

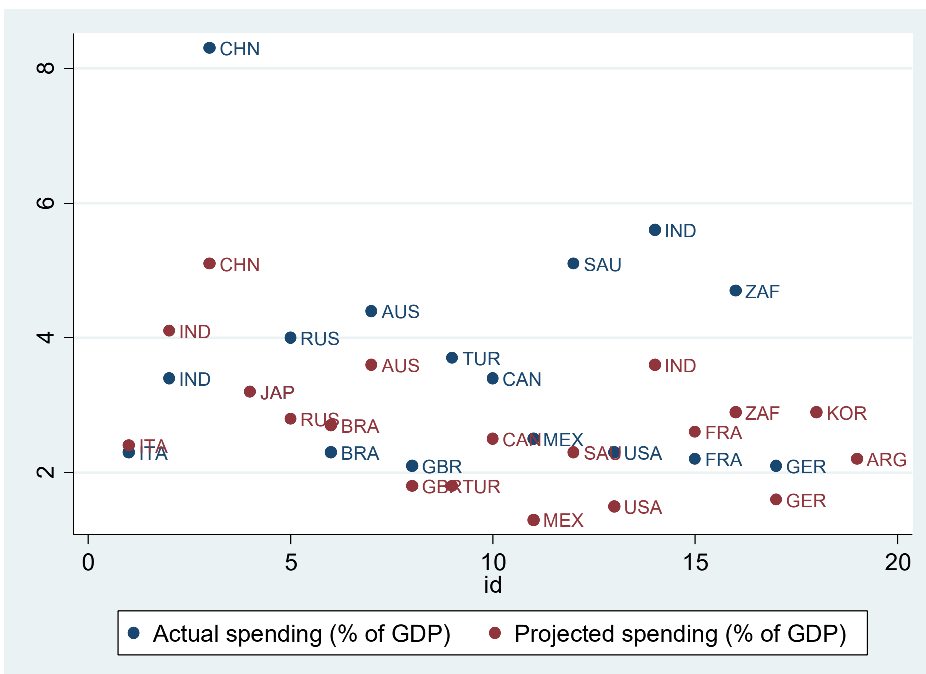

Figure 2: Actual and projected infrastructure spending as a percent of GDP for G-20 countries. Sources: Bloomberg BusinessWeek report (2016), World Economic Forum (2019), and McBride and Moss (2020). Notes. Actual infrastructure spending covers (2010-2015) while projected infrastructure spending covers (2016-2040).

Previous studies have examined the impact of various infrastructure types and infrastructure investments on economic growth (Czernich et al. 2011; Canning and Pedroni 2004; Escaleras and Calcagno 2017; Fosu 2019; 2021; Graham and Brage-

Ardao 2013). However, none of these studies have empirically analyzed how the U.S. state and local governments and federal government spending on transportation and water infrastructure influence economic growth. Thus, the current study will answer these research questions: (1) To what extent do U.S. state and local governments and federal government spending on transportation and water infrastructure influence economic growth in the short run and long run? (2) What is the causal link between transportation and water infrastructure spending and economic growth? This paper contributes to empirical literature because its decomposed transportation and water infrastructure spending sources into state and local government spending and federal government spending and examined their impact on economic growth. Decomposing infrastructure spending into state and local governments and federal governments enables policymakers to know the effect of these spending categories on economic growth and thus, helps in planning and resource allocation. Also, policymakers in both the U.S. and developing countries could rely on the outcome of this study to design policies that will improve the overall transportation system and water supply. The rest of the paper is organized as follows. The section presents a review of relevant literature; section three presents the methodology; section four presents the results and discussions while the last section presents the conclusion and recommendations.

2. Literature Review

This section of the paper presents a literature review by focusing on the link between infrastructure spending on economic growth. Employing the panel analysis, Czernich et al. (2011) estimated the effect of broadband infrastructure on economic growth in OECD countries from the period of 1996-to 2007. They found that a ten-percentage point increase in broadband penetration increases annual per capita growth by 0.9-1.5 percent points in economic growth.

Canning and Pedroni (2004) investigated the long-run consequences of infrastructure provision (i.e., telephones, electricity generating capacity, and paved roads) on per capita income in a panel of countries from 1950-to 1992. Their study found that infrastructure induces long-run growth effects; however, a great deal of variation was found across individual countries.

In addition, Aschauer (1989) work considered the relationship between aggregate productivity and stock and flowed government-spending variables. The study found that nonmilitary public capital stock played a significant role in determining productivity than the flow of nonmilitary or military spending. Also, military capital bears little relation to productivity, and lastly, a 'core' infrastructure of streets, highways, airports, mass transit, sewers, water systems, etc., has the most explanatory power for productivity.

Using the generalized lineal model estimation and state data covering the period of 1992 to 2012, Escaleras and Calcagno (2017) examined the role of political institutions and decision-making on the quality of highway infrastructure in the U.S. Their study found that fiscal decentralization improves infrastructure quality.

Also, employing cointegration analysis, Fosu (2019; 2021) used U.S. data and found a positive and statistically significant effect of infrastructure investment and railway lines, total-route km on economic growth, respectively, in both long-run and short-run.

In a similar study, Melo, Graham, and Brage-Ardao (2013) employed meta-analysis and examined the productivity effect of transport infrastructure investment in the U.S. and the European Union. The study found that the productivity effect of transport infrastructure tends be higher in the U.S. than in the European Union.

In Ghana, Nketiah-Amponsah (2009) also examined the impact of infrastructure on economic growth and found expenditures on health and infrastructure positively impacted growth; however, educational expenses had no significant effect on growth.

Using GMM, Kodongo and Ojah (2016) analyzed the link between infrastructure and economic growth for a panel of 45 Sub-Saharan African (SSA) countries. They found that spending on infrastructure positively impacted economic growth and development in SSA.

3. Methodology

3.1 Analytical model

The main objectives of this study are to examine the effect of transportation and water infrastructure spending on economic growth in the United States. To analyze the impact of infrastructure spending on growth, we followed the Solow-Swan growth model, which relates economic growth to capital accumulation, labor or population growth, and technological change. This is shown below:

$$Y_t = K_t^{\alpha} L_t^{1-\alpha} A_t \tag{1}$$

Y denotes economic growth, K denotes capital, L denotes labor or population growth, t is time, and A denotes total factor productivity or technology. We extend this growth model by assuming that infrastructure development can influence technological progress (INFRA). Thus, we specify A as follows:

$$A_t = \quad INFRA_t^{\delta} Z_t^{\mu} \tag{2}$$

Where INFRA denotes infrastructure development, and Z is other factors that may influence the state of technology. Substituting Equation (2) into Equation (1) and decomposing infrastructure (INFRA) into state and local governments' spending on transport and water infrastructure (STW) and federal government spending on transport and water infrastructure (FTW), Equation (3) is obtained.

$$Y_t = STW_t^{\emptyset} FTW_t^{\delta} K_t^{\alpha} L_t^{1-\alpha} Z_t^{\mu} \tag{3}$$

By taking logs of Equation (3), the econometric model for transportation and water infrastructure spending and growth was obtained. This model is specified by equation (4) below:

$$lnY_t = \vartheta_0 + \vartheta_1 lnK_t + \vartheta_2 lnL_t + \vartheta_3 lnSLTW_t + \vartheta_4 lnFTW_t + \mu_t \tag{4}$$

Where Y is economic growth measured by real GDP per capita (constant 2010 US$), K is capital stock measured by gross fixed capital formation (current US$), L is labor supply measured by secondary school enrollment (% gross), SLTW indicates the state and local governments spending on transportation and water infrastructure (Billions of 2017 dollars), FTW indicates federal government spending on transportation and water infrastructure (Billions of 2017 dollars), μ_t is the error terms which are assumed to be independent and identically distributed (iid) with zero mean and constant variance variance (i.e., $\mu_t\ iid\ N(0, \sigma^2)$), ϑ_0 is the intercept parameter, $\vartheta_1, .., \vartheta_4$ measure the elasticities, and ln is the natural logarithm. The study employs annual time series data covering 1980 to 2016. The choice of these sample periods is influenced by data availability.

The improved capital stock is expected to increase productivity and efficiency. The study, therefore, expects the capital stock to be positively related to economic growth ($\vartheta_1 > 0$). Human capital increases labor productivity and thus increases economic growth. The coefficient of labor or human capital is expected to positively impact economic growth ($\vartheta_2 > 0$). State and local governments and federal governments on transportation and water infrastructure can increase economic growth from either the demand or supply. From the demand side, investments in transportation and water infrastructure create jobs, increase household income and consumption, increase the quality of life, and hence increase economic growth. From the supply side, increased spending on transportation and water is expected to improve labor and overall productivity, enhance the movement of goods and services, and increase economic growth. The study, therefore, expects the coefficient of state and local governments' spending on transportation and water infrastructure and federal government on transportation and water infrastructure to increase economic growth ($\vartheta_3 > 0$ and $\vartheta_4 > 0$).

Table 1: Summary of variables description, measurements, and source

Variable	Name and Measurement	Source	Sign
Y	Economic growth measured by real GDP per capita (constant 2010 US$)	WDI [1]	+
K	Capital stock measured by gross fixed capital formation (current US$)	WDI [1]	+
L	Labor or human capital measured as secondary school enrollment (% gross)	WDI [1]	+
SLTW	State and local governments spending on transportation and water infrastructure (Billions of 2017 dollars)	Congressional Budget Office [2]	+
FTW	Federal government spending on transportation and water infrastructure (Billions of 2017 dollars)	Congressional Budget Office [2]	+

Note: ln indicates natural log. The links to the data sources are provided below:

[1] WDI, World Development Indicators | DataBank (worldbank.org)

[2] Congressional Budget Office, Public Spending on Transportation and Water Infrastructure, 1956 to 2017 | Congressional Budget Office (cbo.gov)

3.2. Estimation Technique

To analyze the long-run and short-run dynamics among the variables, the autoregressive distributed lag (ARDL) cointegration technique developed by Pesaran and Shin (1999) and Pesaran et al. (2001) was employed. The mathematical representation of the ARDL model is shown below:

$$D(\ln(Y_t)) = \alpha_{01} + \beta_{11}\ln(Y_{t-1}) + \beta_{21}\ln(K_{t-1}) + \beta_{31}\ln(L_{t-1}) + \beta_{41}\ln(FWS_{t-1}) + \beta_{51}\ln(STW_{t-1}) + \sum_{i=1}^{P}\alpha_{1i}Dln(Y_{t-i}) + \sum_{i=1}^{P}\alpha_{2i}Dln(K_{t-i}) + \sum_{i=1}^{P}\alpha_{3i}Dln(L_{t-i}) + \sum_{i=1}^{P}\alpha_{4i}Dln(FWS_{t-i}) + \sum_{i=1}^{P}\alpha_{5i}Dln(STW_{t-i}) + \epsilon_{1t} \quad (5)$$

Where ln is the logarithm operator, α and β are unknown parameters to be estimated, D is the first difference, and ϵ_( )is the error term. The optimal lag length is determined using either the AIC or SIC minimum. The first step in the ARDL estimation is to estimate equations 6 and 7 by OLS. The OLS estimation of these equations essentially tests for a long relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of variables (Belloumi 2014). The null hypothesis of no cointegration given by $H_0: \beta_{1i} = \cdots = \beta_{5i} = 0$ against the alternative one given by H $.A.: \beta_{1i} \neq \cdots \neq \beta_{5i} \neq 0$ ∀ i=1,..,5.

We compared the calculated F-statistic value to the critical values that Pesaran et al. (2001) determined. According to Pesaran et al. (2001), the lower bound critical values assumed that all variables included in the ARDL are integrated of order zero, while the upper bound critical values assumed that variables are integrated of order. Suppose the F-statistic exceeds the upper critical bounds value. The null hypothesis of no cointegration is rejected, while it is accepted if F-statistic is lower than the lower bounds value. The test is inconclusive if the F-statistic lies between them.

Following the empirical work of Belloumi 2014, Odhiambo (2009) and Narayan and Smyth (2008), the short run dynamic coefficients were specified by estimating the error correction model associated with the long run estimates. This is specified as follows:

$$D(\ln(Y_t)) = \alpha_0 + \sum_{i=1}^{P}\alpha_{1i}Dln(Y_{t-i}) + \sum_{i=1}^{P}\alpha_{2i}Dln(K_{t-i}) + \sum_{i=1}^{P}\alpha_{3i}Dln(L_{t-i}) + \sum_{i=1}^{P}\alpha_{4i}Dln(FWS_{t-i}) + \sum_{i=1}^{P}\alpha_{5i}Dln(STW_{t-i}) + \gamma ECT_{t-1} + \epsilon_{1t} \quad (6)$$

Where $\alpha_{1i}, \dots, \alpha_{5i}$ are the short-run dynamic coefficients, γ indicates the speed of adjustments, and ECT_{t-1} is the error correction term. Also, based on equations (5), the test of causality was performed to determine if the past values of transportation and water infrastructure spending affect economic growth and examine if past economic growth values help predict transportation and water infrastructure spending.

4. Results and Discussions

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This section of the paper presents the results of the study. Table 2 shows the summary statistics of the data. From Table 2, the average GDP per capita within the study period is $41,440.12, with the minimum and maximum GDP per capita $28,362.49 and $52,364.24, respectively. The federal government's average spending on transport and water infrastructure is $100.6069 billion, with a minimum expenditure of $ 79.731 billion and a maximum expenditure of $ 126.64 billion. In comparison, the state and local governments' average spending on transport and water infrastructure is $295.71 billion, with a minimum expenditure of $ 183.12 billion and a maximum expenditure of about $ 360.78 billion. In addition, the skewness and kurtosis test showed that all the variables are normally distributed.

Table 2: Summary Statistics

	Y	K	L	FTW	SLTW
Mean	41440.12	2.06E+12	94.962	100.607	295.71
Median	42292.89	2.02E+12	95.055	99.527	316.285
Maximum	52364.24	3.77E+12	98.77	126.64	360.777
Minimum	28362.49	6.72E+11	89.999	79.731	183.121
Std.Dev.	7625.379	9.64E+11	1.871	11.222	57.737
Skewness	-0.234	1.82E-01	-0.589	0.35	-0.781
Kurtosis	1.683	1.67E+00	3.483	2.746	2.284
Jarque-Bera	3.009	2.93E+00	2.502	0.855	4.552
Probability	0.222	2.32E-01	0.286	0.652	0.103
Sum	1533285	7.64E+13	3513.6	3722.45	10941.25
Sum Sq. Dev.	2.09E+09	3.35E+25	3513.6	3722.45	10941.25

Source: Author's construct

Before conducting the cointegration analysis, we carried out the unit root test (i.e., ADF and P.P.) on all the variables to examine their stationarity properties. We conducted the test for intercept only and intercept and trend. The results from both ADF and P.P. with intercept only and intercept and trend are shown in Table 3 and Table 4. From Tables 3 and 4, it can be observed that all variables are nonstationary at their levels except labor and state and local governments transport and water infrastructure spending. That is, stationary variables at levels have their order of integration to be I(0), while the nonstationary variables have their order of integration to be I(1). The choice of the ARDL estimation for this study is appropriate because it allows for a mix of both I(0) and I(1) variables to be used for the estimation.

Table 3: Unit Root Test-ADF and P.P. (Intercept Only)

	ADF		PP		
	Intercept Only		Intercept Only		
Variable	t-Statistic	P-Value	t-Statistic	P-Value	O.I.
lnY	-1.575	0.484	-1.731	0.408	I(1)
lnK	-2.089	0.250	-1.854	0.350	I(1)
lnL	-3.221**	0.027	-1.949	0.307	I(0)
lnFTW	-2.579	0.107	-2.050	0.265	I(1)
lnSLTW	-3.226**	0.027	-2.837*	0.063	I(0)

Note: *p<0.1; **p<0.05; ***p<0.01, OI indicates order of integration.
Source: Author's construct

Table 4: Unit Root Test- ADF and P.P. ((Intercept and Trend)

	ADF		PP		
	(Intercept & Trend)		Intercept & Trend)		
Variable	t-Statistic	P-Value	t-Statistic	P-Value	O.I.
lnY	-1.575	0.484	-1.731	0.407	I(1)
lnK	-2.089	0.250	-1.854	0.350	I(1)
ln	-3.221**	0.027	-1.949	0.307	I(0)
LnFTW	-2.579	0.107	-2.050	0.265	I(1)
lnSLTW	-0.632	0.971	-0.532	0.971	I(1)

Note: *p<0.1; **p<0.05; ***p<0.01, OI indicates order of integration.
Source: Author's construct

The F-Statistic test of cointegration indicates the presence of a long-run relationship among the variables (see Table 5). Since the test statistic lies above the upper bound (i.e., I(1)), the null hypothesis of no level effect is rejected at a 10% significance level for the growth model.

Table 5: Test of Long-Run Relationship (F-Bounds Test)

Model	F-Statistic	Significance	I(0)	I(1)
lnY	3.488	10%	2.2	3.09
		5%	2.56	3.49
		1%	3.29	4.37

Note: Null Hypothesis: No levels relationship.
Source: Authors' construct.

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Table 6 present the test of causality among the variables. The granger causality test results indicate a unidirectional causality running from state and local government spending to economic growth and unidirectional causality from economic growth to federal government spending. This result suggests that state and local governments spending can predict federal government spending via economic growth.

Table 6: Test of Granger Causality

Granger Causality	Chi-sq	Prob
lnSLTW does not granger Cause lnY	5.760	0.056*
lnY does not granger Cause lnSLTW	4.125	0.127
lnFTW does not granger Cause lnY	1.339	0.512
lnY does not granger Cause lnFTW	4.904	0.086*

Note: *p<0.1; **p<0.05; ***p<0.01

Table 7 presents the long-run results of the study. The results revealed a positive and significant relationship between current economic growth and its lag. A one percent increase in last year's growth increases current economic growth by about 0.609%. Also, the results revealed a positive and significant relationship between physical capital (K) and economic growth in the current year. The results show that a one percent increase in the current year's physical capital leads to about a 0.379% increase in economic growth in the long run. This result is expected because the increase in capital stock improves the marginal product of labor and hence increases the overall output.

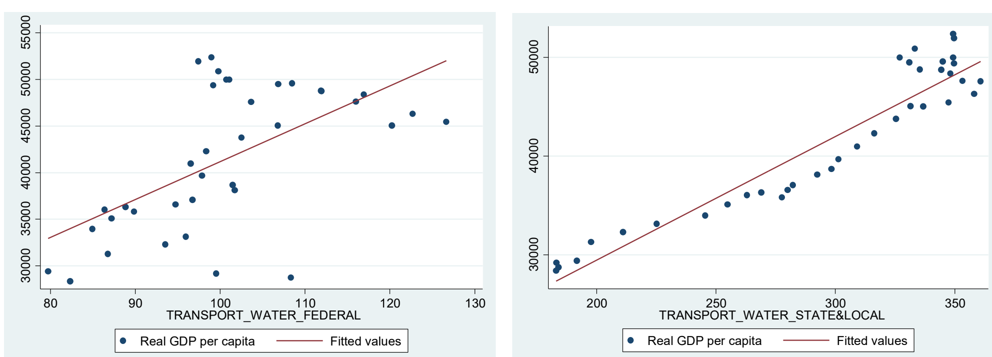

Figure 3: Correlation between federal government spending, state and local governments' spending on transportation and water infrastructure, and economic growth.

Source: Author’s construct

The study found a positive and insignificant relationship between federal government spending on transportation and water infrastructure and economic growth in the long run. A one percent increase in federal government spending on transportation and water leads to a 0.025% increase in economic growth; however, this relationship was insignificant. This result is not surprising because the federal government spends only a small percentage on infrastructure investment as state and local governments fund the bulk of the infrastructure needs. For example, in the European Union, the majority of their infrastructure spending comes from the national government; however, in the U.S., available statistics show that only 25 percent of her public infrastructure funding comes from the federal government (Council on Foreign Relations, 2021, see Figure 1). These reasons might explain why federal spending on transport and water does not significantly influence growth in our analysis. The positive relationship between federal government spending is supported by Figure 3.

Similarly, state and local governments spending on transport and water infrastructure had a positive and statistically significant relationship between economic growth in the long run. Empirically, a one percent increase in state and local government spending on transport and water infrastructure increases economic growth by 0.179% in the long run. This result is expected because most transportation and infrastructure spending in the U.S. comes from state and local governments. For example, in Figure 1, we can observe that the state and local governments spend more on transportation and water infrastructure than the federal government. So we expect the coefficient of this variable to be statistically significant. The results suggest that state and local governments spending on transport and water infrastructure matters significantly for economic growth in the U.S. This result is consistent with several studies (Du, Zhang, and Han 2022, Fosu 2019, 2021; Nketiah-Amponsah 2009 and Kodongo & Ojah 2016) who found a positive and statistically significant impact of infrastructure investments on economic growth. This empirical result is consistent with the data (see Figure 3).

Table 7: ARDL results (Long-Run and Short-run Estimates)

	Long-run Estimates		**Short- run Estimates**
Variables	lnY	Variable	DlnY
lnY		link	0.379***
			(24.042)
lnY(-1)	0.609***	DlnK(-1)	-0.077***
	(4.608)		(-4.542)
lnK	0.379***	DlnSTW	0.179***
	(17.680)		(5.197)
lnK(-1)	-0.327***	DlnSTW(-1)	0.078***
	(-5.388)		(2.408)
lnK(-2)	0.077***	DlnFTW	0.025

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	(3.804)		(1.895)
lnL	-0.095	CointEq(-1)	-0.391***
	(-1.569)		(-5.028)
		DW Stat	2.010
lnFTW	0.025		
	(1.542)		
lnFTW(-1)	-0.035**		
	(-2.334)	**Diagnostic Test**	lnY
lnSTW	0.179***	Heteroskedasticity	0.568
	(3.792)		(0.824)
lnSTW(-1)	-0.039	Serial Correlation	0.123
	(-0.507)		(0.885)
lnSTW(-2)	-0.078*	Kurtosis	2.749
	(-2.003)	Jacque-Bera	0.279
CONSTANT	0.638*		
	(1.974)		
D.W. Stat	2.009		

Note: *p<0.1; **p<0.05; ***p<0.01. Values in parentheses are t-statistic. For the diagnostic test, Values in parentheses indicate probabilities.

Source: Author's construct

The short-run results are presented in Table 7. These results are shown in columns 4-6. The error correction term (CointEq(-1)) indicates the speed of adjustment. It is negative and statistically significant, as expected. The speed of adjustment value for the growth model was -0.391, meaning that approximately 39.1% of the short-run disequilibrium in the growth model is corrected in the long run. Also, the study found evidence of a positive and 1% significant effect of the current year's physical capital on economic growth in the short run. One increase in physical capital, all things being equal, leads to about a 0.379% growth in the short run. More so, in the short run, a 1% increase in local and state governments and federal government spending on transport and water infrastructure leads to a 0.179% and 0.025% increase in economic growth.

The diagnostic tests of the model are also presented in Table 7. The diagnostic test results indicate the presence of no heteroskedasticity and serial correlation in the model. In other words, we fail to reject the null hypothesis of homoskedasticity and no autocorrelation. The Kurtosis and Jacque-Bera tests indicate that the error terms are normally distributed. Also, to test for structural stability of the growth model, the CUSUM and CUSUMSQ were presented (See Figures 5 and 6). Since both the CUSUM and CUSUM of Squares plots lie within the 5% critical bounds, there is enough evidence to conclude that the model is structurally stable over time.

We carried out the impulse response analysis to examine how shocks to infrastructure spending affect economic growth. These analyses are presented in Figure 4. The impulse response analysis also shows that shocks from both state and local governments spending and federal government spending on transportation and water raise economic growth.

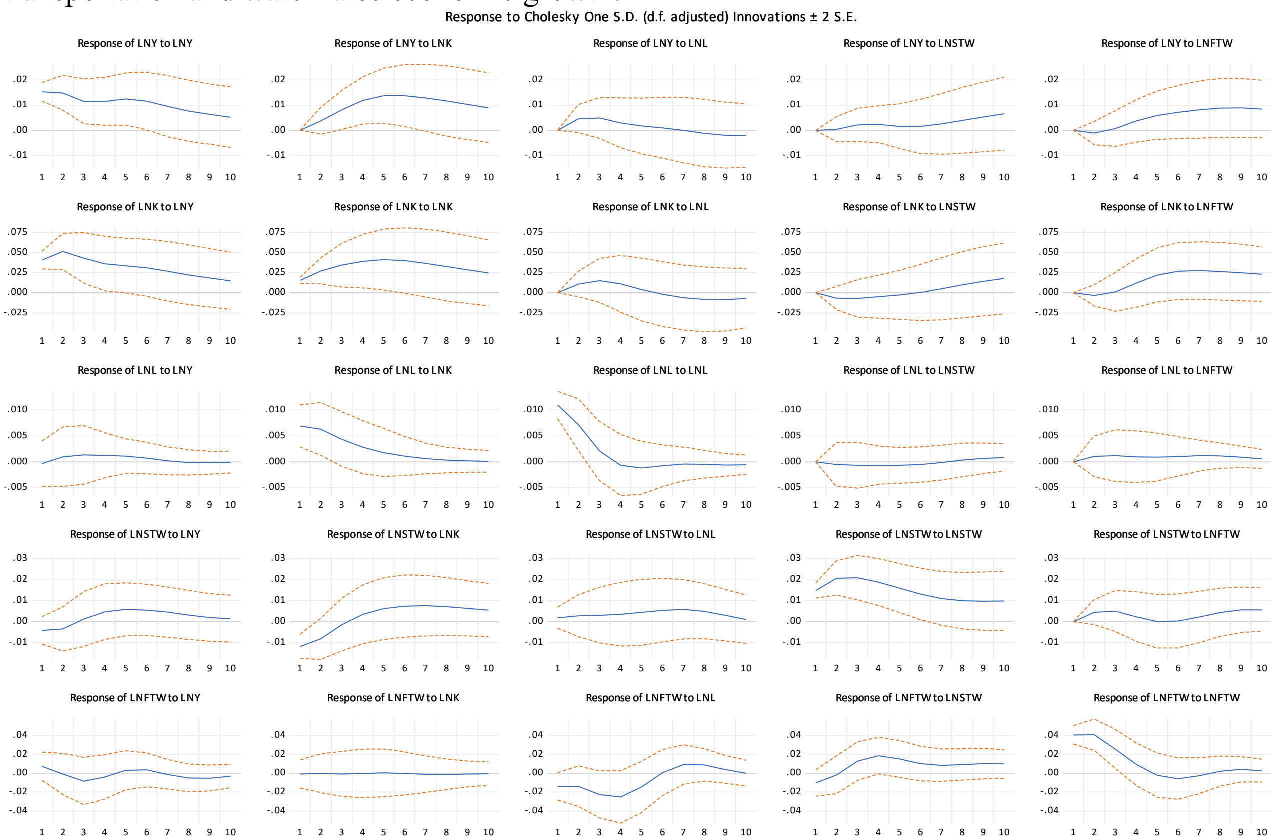

Figure 4: Impulse Response Analysis of the variables (Growth Model)
Source: Author's construct

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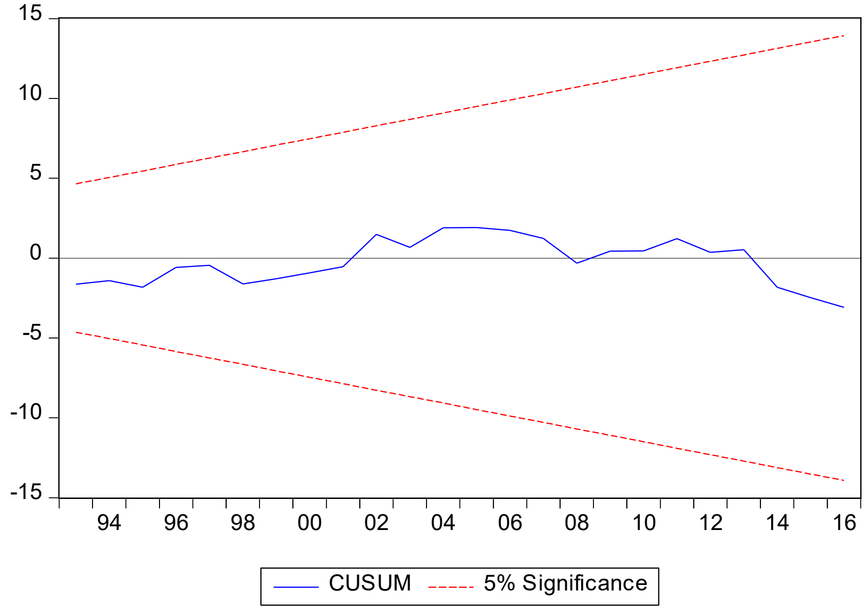

Figure 5: Stability Test (CUSUM)

Source: Author's construct

Appendix B

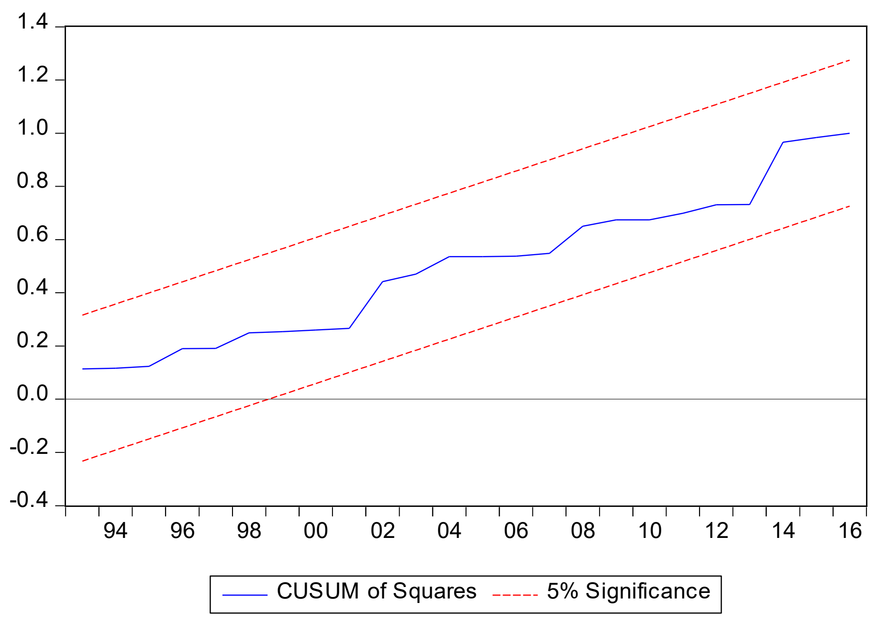

Figure 6: Stability Test (CUSUM of Squares) (Growth Model)

Source: Author's construct

5. Conclusion and Recommendation

This study sought to address two key objectives. The first objective was to analyze the effect of state and local governments and federal government transportation and water infrastructure spending on economic growth using historical data covering the period of 1980 to 2016 and the ARDL estimation technique. The second objective explores the causal relationship between state and local governments and federal government spending and economic growth. We found that state and local governments and federal spending on transportation and water infrastructure had a strong positive effect on economic growth; however, the federal government had an insignificant impact on economic growth only in the long run. The results suggest that state and local governments' spending on transportation and water plays a crucial role in increasing economic growth.

The findings from the study have several policy implications not only for the U.S. economy but also for developing countries. For instance, policymakers in the U.S. and developing countries could rely on the outcome of this study to design policies that will improve the overall transportation system and water supply and hence increase economic growth. The study suggests that increasing public spending on transportation and water infrastructure at the state and local levels could significantly increase economic growth. The current research contributes considerably to empirical literature because it is the first study to examine the impact of state and local governments and federal government spending on transportation and water infrastructure on economic growth. Decomposing infrastructure spending into state and local governments and federal governments enables policymakers to know the impact of these spending categories on economic growth and thus, helps in planning and resource allocation. The study suggests raising state and local governments' spending on water and transportation could significantly impact economic growth.

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