FJWU (Economics) Working Papers
WP2021:1/3

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Recommended Citation:

Ejaz, A., & Manzoor, H. (2021). Institutions Augmented Wagner's Law: Empirical Evidence from Africa. FJWU Economics Working Paper Series (WP2021:1/3). Fatima Jinnah Women University. Rawalpindi.

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Institution Augmented Wagner's Law: Empirical Evidence from Africa

ABSTRACT

This paper appraises the existence and validity of Wagner's Law in its quintessential baseline model and in the presence of some consequential macroeconomic and significant governance indicators for 52 African countries over a period of 2002 to 2016 in a panel data framework. Results are indicative of the validity of Wagner's Law with a statistically significant model. The macro-economic indicators, financial development, trade openness and population growth show a diversified impact on the size and role of the government as control variables acting upon the economic development. Qualitatively, the governance indicators are found significant in the determination of increasing or decreasing government expenditure. Therefore, the improvement in governance and strengthening institutions is the last resort for compound problems and necessities the institutional reforms to upgrade the political instability, regularity quality, checks the corruption and violence.

Keywords: Government Expenditures, Per Capita GDP, Institutions

JEL Classification: H5, E01, E02

1. Introduction

After World War II, the size of the public sector expanded in most countries (Cooke, 2003; Mueller, 2003). The determinants of government size have been an important research domain in the public finance literature. Some factors that act as drivers of government size are economic development, (Tobin, 2005), FDI, (Kimakova 2009, Rodrik 1998), economies of scale, (Andrews et al, 2009), fiscal decentralization (Chen 2004, Ehdaie 1994, Grossman 1989) and increasing demand for public services with an ever-increasing population growth rate (Martin, 1982, Wu et al, 2012). Wagner suggested that growth in public expenditure is a natural consequence for a progressive economy. The importance of public finance is evident from the fact that as people achieved higher levels of civilizations, along with that the number of demands addressed to the state soared to equally high levels.

An extensive analytical and historical research has been carried out by public finance scholars since this notion became prevalent. Despite the overabundance of the research available for this, the results are either inconclusive or mixed. One of the reasons for this is

the complexity of the measurement of the variables and the limitations of data availability at a large scale.

Keeping all these issues in consideration, this study is carried out to flourish the Wagner's law in current scenarios with specific governance indicators and certain potentially intriguing findings have been provided by the study which were rarely recorded in the existing literature. The governance indicators provide a brighter outlook of economy and especially the government achievability. This paper attempts to fill the gap in literature by partly providing an empirical investigation of the some of the important determinants of government size including the macroeconomic variables in general and governance indicators in specific, under the framework of Wagner's law.

The next section presents a brief lucid review of literature, followed by model specification, data and econometric strategy. The next section is the empirical results and discussion, and finally conclusion of the study and the related policy implications.

2. Literature Review

The public economics literature widely pertains to a perennial debate regarding the size of government activity. Studies, in large, deal with the empirical inspection of the government's increasing role over the years and in different countries.

Some studies are suggestive that with higher levels of industrialization and development, the relationship between economic development and the growth in public expenditure may diminish but the groundwork implies that the hypothesis would still have a bearing in countries which are in their post industrialization phases (Tarschys, 1975). The justification behind this suggestion is that the demand for governmental services will not decline in spite of the rapid transition to elevated levels of GDP.

Ansari et al. (1997) found not support for Wagner's law for three African countries, while this phenomenon is proved true by Ziramba (2008) for South Africa as there exist long run relationship between per capita government expenditures and per capita income for long run.

Government spending as a share of GDP varies significantly across African countries (Biyase and Zwane, 2015). Findings of most studies are suggestive of bi-directional causality between economic development and government sector expenditure, which doesn't entirely support Wagner's law. (Keho, 2015). The existing studies done for African countries encompass only a few numbers of countries, which renders it arduous to make a general comprehensive statement for African continent.

Some of the determinants of the public expenditure anticipated by Wagner might get replaced or wear out in economies which moved past their industrial stage. For instance, government expenditure on infrastructure may manifest itself more vividly in newly industrialized countries. The capacity of government might not be intensifying at a rapid rate in post industrialized countries, but this does not contradict the relationship between the two variables. Government may have stroked a limit in relative terms but in absolute terms, it is always in a process of growth. All of the existing analyses have measured the government expenditure as a fiscal proceeding of the state. There has been no attempt harmonious with a qualitative measure of the activities of the state regarding rules and regulations.

In addition to that, there was a dearth of controlled variables in the empirical work to evaluate the Wagner's law qualitatively. This study, to some extent, fills this gap by taking a large sample and augmenting the base-line model with qualitative variables of institutions.

3. Model Specification, Data and Econometric Strategy

Owing to the unavailability of any mathematical formulation in order to inspect the law, during the last century, 6 distinct functional forms of the law have transpired. The different specified functional forms are presented in the Table 1.

Table 1: Functional Forms of Wagner's law

Studies	Functional form
Peacock- Wiseman (1961)	$GE = f(GNP)$
Gupta, S. P. (1967)	$GE/P = f(GNP/P)$
Pryor (1968)	$GC/GNP = f(GNP/P)$
Goffman (1968) and Goffman and Mahar (1971)	$GE = f(GDP/P)$
Musgrave (1969)	$GE/GNP = f(GNP/P)$
Mann (1980)	$GE/GDP = f(GDP)$

Note: GE is used for Government expenditure, GNP stands for Gross National Product, P denoted the population, GC is government consumption, GDP is for Gross Domestic Product.

There is noteworthy variability in all of these interpretations of the law ranging from the quantification of the economic indicators to the nature of the upper limits of government size.

The most recent exegesis of the Wagner's hypothesis has been explored by Florio and Colautti (2005) who considered that, the societal demand for public goods will have a higher rate of increase than that of income. This last inference of the law is suggestive of a social requirement for public expenditure which is previously not pondered upon.

The functional form used in this study is a modification of the Musgrave (1969) version on the basis of availability of data and is stated as:

$$GE = f\,(GDPPC) \qquad (1)$$

where, *GE* = general government final consumption expenditure (% of GDP) and *GDPPC* = is the GDP per capita growth (annual %).

The amount of government spending as a percentage of GDP reflects the underlying expectations about the role that the government plays in an economy. (Biyase and Zwane, 2015). Ram (1992), Murthy (1993), Lin (1995), Al-Faris (2002) have also used this measure to capture government size. Results of the studies which have employed aggregate quantification of government size are asymmetric. Furthermore, narrowing down of the measurement of government size to final government consumption expenditure as a share in GDP also procures skewness in the outcomes across countries used in the panel data study. The data is obtained from World Development Indicators (WDI-2019).

Annual growth rate of GDP per capita is used following the standard practices of testing the Wagner's law. Around 90% of the studies have operated with growth in GDP as the explanatory variable in Wagner's relationship. This is apparent in the works of Nagarajan and Spears (1990), Al-Faris (2002), Chang (2002), Wahab (2004). The empirical studies which have only used one independent variable i.e. GDP per capita growth have not been consistent in their results. The growth rate of GDP per capita is used to avoid the heterogeneity of countries in the panel data.

The deficiency of qualitative studies renders one unable to comprehend the degree of existence of the Wagnerian causality on the basis of governance and other socio-political indicators. All the extant studies have quantified government as a fiscal measure of a country. No study attempted to measure the regulatory undertakings of the government sector qualitatively. Therefore, governance indicators are also engaged in an augmented version of the basic model which runs as:

$$GE = f\,(GDPPC, GI) \quad (2)$$

Where GI is set of governance indicators including the voice and accountability, political stability and regulatory quality; being extracted from worldwide governance indicators (WGI-2109). The governance quality is measured in more than 200 countries by these indicators providing advocacy tools for the policy reformation and proper monitoring. This research supported the observation that in government, civil society and in the private sector, good governance is key for developmen. (Kaufmann et al. 2002). Empirical evidence also suggests that a strong association exists between good governance and effective development.

There are also many economic factors, being used in the literature by different studies. These controlled variables include population growth rate as population has considerable role in an economy (Hussain, 2010). Population growth causes urbanization enabling towns to grow into cities which increases government expenditure to provide basic facilities in the newly inhabited areas. The trade openness also affects the decision of government expenditures, as some of capital is being imported in order to provide public utilities (Dao, 2014).

Alongside, financial development is a very important determinant of economic growth as it plays chief role in its growth dynamics accounting to the public spending (Nazlioglu et al., 2014). Exchange rate of an economy has pivotal impact upon government spending as government expenditures are laid on borrowings, loans, debt (Rodrik, 2008). The final model, after incorporating these controlled variables to scrutinize the augmented Wagnerian law as follow:

$$GE = f\,(GDPPC, GI, X) \quad (3)$$

Where X is set of above – mentioned controlled variables. So, the model in panel framework would be like:

$$GE_{it} = f\,(GDPPC_{it}, GI_{it}, X_{it}) \quad (4)$$

Therefore, our main equation is as follow:

$$GE_{it} = \alpha + \beta_{it}\, GDPPC_{it} + \beta_{it}\, GI_{it} + + \beta_{it}\, X_{it} + \mu_{it} \quad (5)$$

X_{it} includes controlled variables and μ_{it} is error term. The subscripts, i represent cross sections as i = 1, 2, 3,…, N and t represents time periods as t = 1,2,3……., T. For a balanced panel data, in order to avoid the gap in the data, and to extract information to test the Wagner's law, this study covers the time span of 2002 to 2016, on the best availability.

The econometric strategy of fixed effect model (based on OLS methodology) and random effect model (based on GLS techniques) are applied and decision to select appropriate method will be taken with the help of Hausman test (Hausman, 1978).

Table 2: Description, Notation and Summary Statistics of Variables

The Static used in Hausman test is given as follow:

$$H=(\beta^{FE}-\beta^{RE})'[Var(\beta^{FE})-Var(\beta^{RE})]-1(\beta^{FE}-\beta^{RE}) \sim \chi^2(k) \quad (6)$$

Where $\chi^2(k)$ is chi-square distribution with k number of parameters. For large value of this H-static, the difference between estimates would be significant, results in rejection of null hypothesis and we will select fixed effect model against random effect model. Whereas, for small values of H-static, it implies that difference is not significant hence accepting the null and choosing random effect model as appropriate model.

The description of variables, their notation (used hereafter) and their summary statistics are provided in Table 2. The mean of government spending is 15.65041. The minimum value of government spending is 2.047122 and the maximum is 47.19156. The average value of growth in GDP per capita is 2.076427. To talk about the common governance indicators, the average value of political stability is -0.50394. The mean value of regularity quality is -0.70533, indicating worse condition of regulatory body. Population growth has a mean of 2.377927. Trade openness is greatly dispersed, having mean value of 83.566 and standard deviation 45.8381.

Variables	Description	Notation	Mean	St. Dev.	Min	Max
Dependent	Government Expenditures (as percentage of GNP)	GE	15.65041	6.484045	2.047122	47.19156
Focus Variable	Growth in per capita GDP	GGDPPC	2.076427	5.299316	-62.2251	32.24777
Governance Indicators	Voice and Accountability	VA	-0.62042	0.724707	-2.23	1.02
	Political Stability	PS	-0.50394	0.86052	-2.7	1.2
	Regulatory Quality	RQ	-0.70533	0.585234	-2.27	1.13
Controlled Variables	Financial Development (M2 as percentage of GDP)	FD	65.20018	707.316	2.917258	18347.09
	Exchange Rate	ER	817.1807	2323.51	0.055098	22090.64
	Population Growth	POPG	2.377927	0.870314	-2.62866	4.974578
	Trade Openness	TO	83.56613	45.8381	18.98163	321.6317

4. Results and Discussion

Initially, a simple model is taken and the dependent variable government final consumption expenditure (% of GDP) is regressed on the independent variable GDP per capita growth. Gradually, the variables on the right-hand side of the regression equation are increased. The findings of the present study show that GDP per capita growth has a negative and significant effect on the government expenditures in the base line model of Wagner's Law (i.e. model FE1). The empirical results are presents in Table 3. Specifically, the GDP per capita growth coefficient is 0.0592 with negative sign implying that 1 percent rise in GDP per capita growth will decrease 0.0592 percent of government expenditures in Africa. More importantly, the R2 coefficient implies that GDP per capita growth is able to explain only 0.8% of the model. This result is statistically significant at 5% level of significance. This is consistent with Szarowská (2011) who verified the positive long run relationship between government spending and GDP growth.

In the second model (FE2), the governance indicators are also included in the previous model, a well-established measure to gauge the government effectiveness, along with GDP per capita growth. The intention here is to fill in the gap of qualitative studies regarding the effectiveness and capacity of the government which can hardly be found when testing Wagner's law. Voice and accountability and regularity quality carry a positive sign whereas political stability is negative, and all of these are significant. Voice and accountability leads towards higher government spending by 3.115 percent and political stability decreased the government expenditures by 0.713. with increase in regularity quality, the government spending increase by 0.881 percent. The magnitude of growth rate of GDP per capita is increased from -0.0592 to -0.0715. The health of model is improved in FE2 as compared to FE1 (higher R-squared from the baseline model).

The third model (FE3) also contains the controlled variables, additional to baseline model, i.e. the exchange rate, population growth, trade openness and financial development as explanatory variables to check the uni-directional causality between government spending and economic development as these are important dynamics in growth models. The impact of growth rate of GDP per capita is -0.0795 percent on the government expenditures and its significant, in FE3. Except the exchange rate, all other controlled variables are significant. Results indicate that 1% increase in population growth tends to increase the government spending by 1.18% which is increasing at an increasing rate. Sobhee (2008) theorized and empirically tested that the validity of the Wagner's law is robustly supported if the economies tend to become more open. Our study finds that a 10% increase in trade openness will increase the government spending by 0.118%. Trade openness is included in the model as it greatly affects the growth in productivity which helps the economy to increase in the growth of per capita income. As the study is supported by Chow et al. (1987), Lin (1995), therefore trade is considered as an engine of growth, even for the developing countries in spite of their compound problems. For financial development, the result suggests that 1% increase in financial development (broad money), the government expenditure increases by 0.135%.

In the final model (FE4), all the governance indicators are accompanied by other controlled variables, to check the validity of Wagner's Law. Out of these independent variables, regularity quality, population growth and financial development are found to have significant impact on government spending. The impact of growth rate of GDP per capita is highest in magnitude as compared to all previous models i.e. -0.0858. the goodness of fit of the final model is highest than the set of all previous models. R2 of the final model suggests that it

explains only 24.7% of the variation of the model. It is obvious that the co-efficient of determination increases with every increase in the explanatory variables in the model.

Another common practice to estimate panel data in the applied economics literature is through random effects model. It also provides the robustness to check the estimates for the fixed effects model.

Following the same pattern, as of FEM, first GDP per capita growth is taken as a regressor (model RE1) followed by governance indicators in the second model (model RE2). Results of first model RE1 are statistically significant at 5% level of significance with the negative magnitude of 0.0599. In the second model (RE2), voice and accountability and regulatory quality are statistically significant along with the focus variable. The magnitude of focus variable is higher from the baseline model RE1.

In the third model (RE3), all the explanatory variables are statistically significant, leading a higher magnitude of focus variable i.e. -0.0813. In the final model RE4, all but political stability, have significant parameters, yielding towards higher value of coefficient of growth rate of GDP per capita i.e. -0.0886. Trade openness is also statistically significant at 5% level of significance and is in line with the theory which suggests that during the earlier decades of the twentieth century, trade openness served to expand social and public services. (Avelino et al., 2005). The coefficient of financial development suggests that 1% increase in the broad money, government spending increases by 0.130% at 1% level of significance. The final model

Table 3: Results of Fixed Effect Model, Random Effect Model and Hausman Test: Dependent Variable GE									
Regressors		**FE1**	**RE1[I]**	**FE2[I]**	**RE2**	**FE3**	**RE3[I]**	**FE4**	**RE4[I]**
Focus Variable	GGDPPC	-0.05924	-0.05993	-0.07151	-0.07293	-0.07949	-0.08128	-0.08578	-0.08859
		(0.0256)	(0.0256)	(0.0255)	(0.0255)	(0.0244)	(0.0242)	(0.0245)	(0.0242)
Governance Indicators	VA			3.114777	2.800788			1.788608	1.5808
				(0.641)	(0.581)			(0.644)	(0.580)
	PS			-0.71306	-0.46485			-0.55478	-0.43022
				(0.371)	(0.359)			(0.352)	(0.337)
	RQ			0.880772	0.754329			1.12342	1.003103
				(0.456)	(0.447)			(0.424)	(0.415)
Controlled Variables	ER					-0.00082	-0.00099	-0.00088	-0.00104
						(0.000606)	(0.000523)	(0.000603)	(0.000521)
	POPG					1.186812	1.053934	1.175222	1.06599
						(0.314)	(0.291)	(0.315)	(0.292)
	TO					0.011773	0.014749	0.009427	0.012874
						(0.00624)	(0.00585)	(0.00619)	(0.00581)
	FD					0.134654	0.133477	0.131383	0.129895
						(0.0137)	(0.0126)	(0.0137)	(0.0126)
Constant		15.77***	15.92***	17.96***	18.03***	7.311***	7.813***	9.222***	(1.376)
		(0.129)	(0.878)	(0.485)	(0.940)	(1.022)	(1.261)	(1.185)	559
Diagnostic Check									
R^2		0.008	0.0085	0.052	0.0387	0.222	0.2582	0.247	0.2528
F		5.347	5.50	8.716	35.06	28.93	160.30	20.68	179.92
chi-sq		0.18		8.51		3.38		5.01	
P(chi-sq)		0.6681		0.0747		0.6417		0.7569	

Note: Standard errors are presented in parentheses. *, ** and *** show 10%, 5% and 1% level of significance, respectively.
[I] shows the selected model between the fixed effect model and random effect model.

encompassing all the variables explains only 25.2% of the variations in the dependent variable i.e. government spending.

Standard test proposed by Hausman (1978) is used for selecting between the two models appropriately. The null hypothesis of Hausman test is that random effect model (REM) is consistent and is interpreted as random effect model is preferred over fixed effect model. The alternate hypothesis entails that FEM is consistent.

Looking at the table, in the base line model (from FE1 and RE1), random effect model is selected. Whereas, the model 2, augmented with governance indicators, the fixed effect model is selected over the random effect model as the probability value of chi-square is less than 0.1, while the augmented model 3 with only controlled variables in the Wagner's law, the again the random effect model is selected. Similarly, in the final model, the random effect model is preferred over the fixed effect model. So, in the case of Africa, the baseline and final model, the random effect model are found to have consistent parameters. Random effect model and its results will be preferred for the policy implications.

5. Conclusion

The long-term expansion of the government size prompted by the economic development is known as Wagner's law. The formulation of this law imparts that increasing technical, cultural and social development makes the state activities more influential on the whole economy. The objective of this study is to probe into the impact of governance and some macro-economic variables on the Wagner's law on regional grounds, specifically on a continental basis.

Empirics show that there exists a statistically significant but negative relationship between government spending and economic development for the African countries. The random effect model in the estimation of both panels suggested a statistically significant coefficient for GDP per capita growth when taken as the only explanatory model in the regression. Results are significant and faintly support the Wagnerian causality.

It is repeatedly documented in the literature that qualitative institutional changes can improve the pro-poor spending efficiently, leading to better development outcomes. (Armstrong, 2005). Governance quality is known to be an important determinant of the effectiveness in government expenditure. The theoretical literature shedding light on inefficiencies in government spending has continued to grow in recent years, the increasingly focused

attention of the researchers is on the international trends in public administration and governance. (Armstrong, 2005, Florini, 1999).

The augmented model of Wagner's law employed in this study uses GDP per capita growth as a focused independent variable, governance indicators as explanatory variables and some macro-economic factors as controlled variables to verify the causality from economic development to government sector expenditure in Africa. The final random effect models for both the samples generate statistical parameters, with the exception of one or two governance indicators which is supported by the theory.

6. Policy Implications

In the pursuit of a sustainable growth, economic development causes increased government spending. Even if the economy is thriving, non-development expenditures may lead to an insignificant increase in the size of the government. The study also stipulates that in absence of good governance, Wagner's law is not validated, as the public sector fails to deliver. Therefore, improvement in the governance environment and strengthening of the institutions is the last resort for the compound problems of the African countries. There is a massive need of institutional reforms to immobilize political instability, upgrade regularity quality, and to bring to a halt, the collective corruption and violence.

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Appendix

Table A1: List of African Countries			
Algeria	Cote D'ivore	Liberia	Sao Tome and Principe
Angola	Djibouti	Libya	Senegal
Benin	Egypt	Madagascar	Seychelles
Botswana	Equatorial Guinea	Malawi	Sierra Leone
Burkina Faso	Eritrea	Mali	South Africa
Burundi	Ethiopia	Mauritania	Sudan
Cabo Verde	Gabon	Mauritius	Swaziland
Cameroon	Gambia	Morocco	Tanzania
Central African Republic	Ghana	Mozambique	Togo
Chad	Guinea	Namibia	Tunisia
Comoros	Guinea Bissau	Niger	Uganda
Congo Dem Republic	Kenya	Nigeria	Zambia
Congo, Republic	Lesotho	Rwanda	Zimbabwe