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THE EFFECT OF DOMESTIC TAXES ON PRIVATE INVESTMENT IN CAMEROON

EBENE NDESSE Axelle Maryline
PhD student at the FSEG, University of Ngaoundéré, Cameroon
axelleebene@yahoo.fr

Abstract

This paper studies the effect of domestic taxes on private investment in Cameroon, using time series data from 1960 to 2017. The data for the study are drawn largely from international sources. The estimation technique adopted in the study is the robust estimation and cointegration technique. The estimation results showed that: (i) corporate income tax has a significant negative effect on domestic investment; (ii) value added tax has a significant positive relationship with domestic investment. In conclusion, the study comes to a mixed result. Based on the results of the study, the following recommendation was made: the government should use financial resources from taxation to provide adequate infrastructure.

Keywords: Taxation, Corporate tax, Value added tax, Domestic investment, Robust estimation, Cointegration

INTRODUCTION

A country's tax system has a significant impact on the business activities carried out in the country and can help encourage or discourage such business activities. Many countries use tax laws as a mechanism to encourage investment. In the past, Cameroon has adopted various policies to promote investment. The government has introduced various tax incentive schemes on a permanent basis since 1960. For example, upon accession to sovereignty, the country will have an investment code that grants broad tax and customs benefits to investors. Currently, investment incentives are governed in Cameroon by the ordinance establishing the free zone in

Cameroon, as well as the investment charter and the latest text to date, the 2013 law. Tax credit systems have also been put in place to encourage investment. Despite this, Cameroon's medium-sized business sector as a whole suffers from one of the highest tax burdens in Africa. Cameroon shares this high-tax status with three other countries in the Central African Economic and Monetary Community (CEMAC). It is in such a context of obstacles and impediments that the role of fiscal policy in boosting national economic performance through investment arises.

The economic effects of taxation can be good or bad. Due to the high tax burden, the taxpayer's ability to invest may be negatively affected or he may be reluctant to invest more since his additional profit is taxed. In fact, the orientation of Cameroon's tax measures must take into account at least four economic difficulties, most of which are listed as objectives in the Growth and Employment Strategy Paper (GESP, 2009): deficient production factors, the low attractiveness of the business environment, insufficient resources for major public investment projects, etc.

First of all, the main factors of production, physical and human capital, present structural deficiencies that the sectoral strategies have not yet been able to fully address. In addition, the low production capacity and the dilapidated state of the current energy installations slow down the development of national companies and industries, while at the same time not providing an incentive to invest. Secondly, observation of the investment climate reveals that fiscal pressure, lack of financing, poor governance and corruption are the constraints on investment. The investment charter itself, promulgated in 2001, has not yet been fully implemented, the corruption perception index remains high, the procurement process is considered rather long and the business environment remains insufficiently attractive. Finally, in addition to the limitation of the volume of resources allocated to major public investment projects, there is the generalised scattering of these investments, thus slowing down the State's willingness to launch large-scale projects; this does not really reassure economic operators in the framework of the partnership contracts envisaged.

The growing literature on the relationship between domestic taxes and private investment suggests that corporate taxes have either a negative or positive effect on investment. Treating tax as a factor that affects the costs of investment operations, Militzer and Ontscherenki (1990) argued that the business community should pay additional costs. Therefore, investors would tend to avoid investing in the country if tax rates are high.

However, a positive impact of domestic taxes on private investment could exist. Djankov et al (2010) present new data on effective corporate tax rates in 85 countries in 2004. They show that corporate tax rates are correlated with investment in the manufacturing sector

This suggests that previous specification models of the tax-investment relationship cannot be determined theoretically and that empirical analysis is needed to resolve this issue. Using Cameroonian data covering the period 1960 to 2017, this study evaluates this relationship using a robust estimation method. The remainder of this paper leads us to the literature, methodology, results and conclusion.

SUMMARY OF THE LITERATURE

The Johansson-Samuelson theorem (established by Johansson, 1961, 1969; and Samuelson, 1964) states that tax neutrality prevails if investment projects are taxed on their cash flows and tax depreciation is based on real economic depreciation. Real economic depreciation is measured in terms of revenue, as the change in the present value of cash flows generated by the projects. The theorem further requires that the discount rate be reduced in proportion to the tax rate, reflecting the assumption that all capital income is taxed at the same rate. Without adjustment costs, the present value of the cash flow generated by a marginal investment project is the acquisition cost of the project. Therefore, in order for the tax system not to affect the investment decision, the tax code cannot respect the accounting principle that depreciation is based on the purchase price of assets.

High taxes inhibit investment, while low tax rates favour investment, particularly in the context of domestic investment (Hall and Jorgenson, 1967; Summers, 1981; Skinner, 1989). However, in determining the channels through which this materialises, there is no consensus to date. If one focuses on other determinants of domestic investment, the relevance of the tax factor sometimes takes a back seat. Further research is therefore needed to arrive at sound conclusions and to empirically determine the effect of taxes on investment behaviour.

Militzer and Ontscherenki (1990) argue that although VAT is a consumption tax, in practice it is imposed directly on firms. It becomes a consumption tax when firms are able to pass on this tax to consumers in the final price of their products. Since businesses are not able to pass on the VAT fully to the consumer by including the full amount in the final price, it is harmful to private businesses. As a result, many businesses wish to either avoid the tax or leave it. As a result, private investment will decrease at any time.

Based on the premise that private investment is "household investment (housing purchases) and especially business investment", Hall and Jorgenson (1967) explored investment behaviour and tax policy in America on the basis of a neoclassical investment model. Using panel data from 1954 to 1963 from US industry, the authors calculated three major tax changes in tax policy in the post-war period and concluded that the capital tax has a negative impact on investment.

Chatelaine and Tiomo (2001) examined the impact of tax rates on investment in France and used panel data of different manufacturing firms in 1990-1999. Their study used the approach of King and Fullerton (1984) as a theoretical basis and used the so-called Autoregressive Distributed Lag (ARDL) model to test the relationship between tax rates and investment behaviour. The authors concluded that the tax rate has a negative impact on investment and the tax rate decreased investment by 2% if there is a 1% increase in the tax rate.

According to Vergara (2004), in parallel with several structural reforms, the developing country Chile embarked on a major income tax reform in the 1980s. Its main feature was a significant reduction in the corporate tax rate. The aim of this paper is to empirically investigate the link between tax reform and Chile's investment performance since the reform. Macroeconomic and microeconomic data are consistent with the hypothesis that the corporate tax cut was one of the determinants of the investment boom in the late 1980s and 1990s in Chile. Macroeconomic data for the period 1975-2003 are used and the evidence indicates that the tax reform explains an increase in private investment of three percentage points of GDP. On the other hand, information on 87 public enterprises is used to construct a panel for the period 1980-2002. The microeconomic data confirms that investment was favoured by the tax reform.

Vartia (2008) analyses how different tax policies can affect investment and productivity. To answer this question, the paper uses sectoral data from a set of Organisation for Economic Co-operation and Development (OECD) countries and examines whether different industries are affected differently by taxation. It is shown that investment reacts negatively to an increase in the corporate tax rate and a decrease in capital depreciation allowances by changing the cost of using capital.

In the same vein, Djankov et al (2010) present new data on effective corporate tax rates in 85 countries in 2004. The data come from a joint survey with PricewaterhouseCoopers of all taxes imposed on "the same" medium-sized domestic firms. In a representative sample of countries, our estimates of effective corporate tax rates have a significant negative impact on overall investment, Foreign Direct Investment (FDI) and entrepreneurial activity. Corporate tax rates are correlated with investment in the manufacturing sector but not with services, and with the size of the informal economy. Their results are robust to the inclusion of many controls.

Nie, Mingyue and Tao (2009) study the same VAT reform pilot as the paper presented by Cai and Harrison (2011). The former uses data up to 2005 and finds a positive impact of the VAT reform on investment by eligible firms; however, it lacks robustness analyses. The latter authors use a subsample of the data used in the former and find no effect of VAT reform on business investment.

Vergara (2010) has analysed the impact of taxation on private investment in Chile. He uses a neoclassical investment model as a theoretical basis. The study used macro and micro evidence to analyse whether the reduction in the tax rate was the main cause of investment promotion in Chile in the 1980s. The macro evidence is based on time series data (1975-2003) obtained from the Chilean Ministry of Finance and the IFS. Private investment as a percentage of capital stock and GDP was used as the dependent variable. The study exploits the Johansen cointegration technique and found that a lower corporate tax rate reduces capital expenditure. It also promotes private sector financing which increased investment in Chile. Microevidence selected eighty-seven public companies, to have panel data (over the period 1980-2002) and investments expressed as a percentage of fixed assets used as the dependent variable. The results were identical for the micro and macro evidence and it was shown that the corporate tax reduction had a positive impact on investment promotion in Chile.

Muhanmmed and Jumbo (2012) empirically studied the impact of Pakistani taxes on investment and economic growth. The study employs the OLS method to estimate the growth model, while the Johansen cointegration test was used to estimate the investment model. The results reveal that taxes do not have a direct impact on economic growth, but indirectly on investment.

According to Njuru et al (2013), private investment in Kenya has been low for four decades. This has caused a lot of concern among policy makers, knowing that investment is a key variable influencing economic growth. According to the authors, several economic policies were designed to rejuvenate private investment, which had been consistent in the first decade of independence before deteriorating in the subsequent decades. The main objective of this study was to investigate the impact of taxation on private investment in Kenya. The vector autoregression technique was used to achieve the objectives of the study. The time series research design was used for the period 1964-2010. The study found that VAT, income tax and the establishment of the Kenya Revenue Authority had a negative impact on private investment, while excise duties, import taxes and tax amnesty had a positive impact on private investment. The study concludes that an appropriate tax system and progressive tax reforms are needed to ensure a conducive environment for private investors to establish themselves.

Federici and Parisi (2015) use a panel dataset at the Italian firm level covering the period 1994-2006 to study the link between business taxation and investment. Studying the effects of business taxation on investment at the micro level has two advantages. First, investment does not exhibit aggregation bias and, second, the firm-level dimension makes it possible to question whether the effects of business taxation differ from one firm to another. In the empirical analysis, they use a generalized method of moments estimator, which allows them to handle not only the

dynamic structure of the model and predetermined or endogenous explanatory variables, but also firm-specific factors, heteroskedasticity and autocorrelation of individual observations. They find that corporate taxes distort investment decisions. The results are robust to the inclusion of many controls.

Nwokoye and Rolle (2015) draw on statistical information to examine the investment implications of the series of tax reforms in Nigeria, in particular the 2003 tax reforms and the 2012 national tax policy. Annual time series data covering the years (1981-2012) were used. A preliminary diagnostic test was conducted to determine whether the estimated model was consistent with the OLS assumptions. The basic assumptions of the OLS method were satisfied. The result of the estimated OLS model shows that tax reform, such as the VAT and CIT (Restructuring Corporate Income Tax) which are its proxies, positively and significantly stimulate investment in Nigeria.

Zaheer, Masood and Muhammad (2017) point out that investment plays a central role in promoting growth and introducing prosperous countries. However, the highest corporate tax rates are considered one of the main barriers to investment. Keeping this fact in mind, the present study was an effort to empirically explore this invention for Pakistan. The study used time series data for the period 1984-2014 by applying the so-called ARDL technique for econometric analysis. The results show that the increase in corporate tax rate has dampened private investment in Pakistan. The high tax rate for the corporate sector increases the cost and reduces the profit of companies; hence, it reduces private investment. Their present study recommends that the corporate tax rate should be reduced to improve private investment in Pakistan.

Adejare and Akande (2017) examined the impact of VAT on private investment in Nigeria. The data were extracted from the Central Bank of Nigeria's statistical bulletin from 1994 to 2015. Pearson correlation and multiple regressions were used to analyse the relationship between the dependent variable (private investment) and the independent variables (value added tax, interest rate, inflation rate and exchange rate,...). The results show that there is a significant positive relationship between private investment and value added tax, interest rate, inflation rate and exchange rate with the adjusted R2 at 75%. Therefore, value added tax, interest rate and exchange rate have a positive and positive statistical impact on private investment in Nigeria. They recommend that the government should increase the rate of value added tax in Nigeria so that the funds generated from value added tax should be spent on the provision of social infrastructure which will eventually stimulate the economy by increasing the level of investment (encouraging investors) which invariably create employment opportunities in the country.

METHODOLOGY

The Study and Data

The study adopted a descriptive research design. For estimation purposes, annual data for each variable are used primarily over the overall period 1960 to 2017; this may change from variable to variable. The choice of this period is due to the availability of data over the entire period mentioned above. The reason for using annual statistics is that data on fiscal policy are not available on a quarterly or monthly basis; and even when they do exist, they do not cover a large part of the sample. Data were collected from three main databases: World Bank, IMF and MINFI.

For the variables in Table 1, the corporate tax rate has an average of 37.9% and a standard deviation of 1.7% with a minimum value of 33% and a maximum value of 38.5%. The value added tax has an average of 18.9% and a standard deviation of 0.2% with a minimum value of 18.7% and a maximum value of 19.25%. Finally, the average of domestic credits is 811 billion and the standard deviation is 805 billion with a minimum and maximum value of 12.2 billion and 3560 billion respectively for the period studied.

Table 1. Descriptive statistics of the variables

Variable code	Number of observations	Mean	Standard deviation	Minimum	Maximum
Invpriv	43	1.60e+12	1.28e+12	1.00e+11	4.37e+12
impso	28	37.91071	1.732337	33.0	38.5
tva	28	18.95536	0.279331	18.7	19.25
tintre	29	10.94992	8.798941	-15.9813	23.38159
cropib	57	3.695559	5.535691	-10.91207	22.003
creint	58	8.11e+11	8.05e+11	1.22e+10	3.56e+12
invpub	58	7.74e+11	5.28e+11	1.55e+11	2.03e+12

Note: Invpriv = private investment; impso = corporate tax; vat = value added tax; tintre = real interest rate; cropib = gdp growth; creint = domestic credit; invpub = public investment.

The relationship between the dependent variable and the independent variables of the hypothesis is retained in Table 2.

-Tax revenue has a negative influence on private investment: Tax revenue is a variable that affects private investment in a negative way. The higher the tax rate on firms and other sectors of society, the lower the funds available for investment. According to our baseline author (see

Table 2), a 1% increase in tax revenues leads to a 0.343% decrease in long-term investment. Thus, government taxes dilute private investment by about 34%.

-Corporate taxes negatively affect private investment: Researchers generally find that corporate income taxes have negative effects on private investment, although studies differ in the strength and magnitude of this influence. Corporate taxes affect investment by reducing the cash flow available for financing in the current period. A decrease in the corporate income tax rate, in order to boost business spending, reduces the pre-tax rate of return used to assess the profitability of investment projects, thereby increasing business investment, the desired capital stock and potential output.

-Value added tax has a negative influence on private investment: Some countries persist in reducing their VAT rates in order to create an attractive environment for investment, while others are concerned about increasing tax revenues to finance public services and help reduce public sector difficulties. The higher the tax rate on businesses and other sectors of society, the lower the funds available for investment, while a tax cut can increase investment.

Table 2. Expected sign between explained and explanatory variables

	Private Investment	
	Sign	Sample article
Tax revenues	Negative (-)	Atif, Shahab et Mahmood (2012)
Corporate tax	Negative (-)	Federici et Parisi (2015)
Value added tax	Negative (-)	Njuru et *al*. (2013)
GDP growth	Positive (+)	Dash (2016)
Public investment	Negative (-)	Adegboye et Alimi (2017)
Domestic credit	Positive (+)	Dash (2016)
Real interest rate	Negative (-)	Bader et Malawi (2010)
External borrowing	Negative (-)	Tuffour (2012)

Source: Author's observation based on economic theory.

-GDP growth has a positive influence on private investment: Economic growth of GDP has a positive effect on the increase of private investment. Economic growth is reflected in the expansion of productive sectors. The more productive sectors expand, and in a favourable way, the more production in the form of goods and services is abundant. If the domestic market is

unable to absorb the products produced by the productive sectors, this is likely to encourage companies to make private investments.

-Public investment has a negative influence on private investment: Theoretically, public investment can have a positive or negative impact on private investment. An increase in public investment should increase private investment, as it allows firms to have greater access to markets through the construction of roads, ports, railways, etc. An increase in public investment should also increase private investment by raising the marginal productivity of capital. At the same time, public investment may crowd out private investment due to the reduced availability of savings to the private sector and/or the increased cost of financing.

-Domestic credit has a positive influence on private investment: bank lending to the private sector increases investment opportunities and an increase of about 1% in bank lending increases investment by about 0.1% in the long run according to our author. However, bank lending to the private sector generally has mixed effects on the economy. If the loan is approved for commercial purposes, it may have a positive effect on investment. But if the loans are passed on to the other sector where they can be misused, then they have a negative investment effect.

Investment also depends on the availability or supply of credit. Contrary to the neo-classical theory, according to which firms have access to unlimited credit, most developing countries are often characterised by a credit constraint. This is due to asymmetric information, directed credit programmes and controlled interest rates. These imperfections in credit markets prevent firms from borrowing as much as they want and discourage investment.

-The real interest rate has a negative influence on private investment: Theoretically, the real interest rate has a negative impact on private investment. The interest rate reduces investment due to the increased cost of borrowing and the demand for the investment fund decreases, which reduces investment. However, there are two divergent views on the effect of the real interest rate on the level of private investment. A high interest rate raises the real cost of capital and therefore reduces the level of private investment. On the other hand, poorly developed financial markets in less developed countries and insufficient access to external finance for most private projects mean that private investment is largely limited by domestic savings.

-External borrowing has a negative influence on private investment: External debt has a negative effect on GDP and private investment, as higher ratios of external debt to total debt are

associated with higher risks of currency and debt crises, although the strength of the association depends critically on the size of a country's reserve base and the credibility of its economic policy.

Modelling

Authors such as Berk (1990), Goodall (1983) and Rousseeuw and Leroy (1987) have given a fairly general description of the problems and methods of robust regressions. However, Hamilton (1991, 1992) will provide a more detailed description, and the developments below are largely inspired by his work.

Regular multiple regression is optimal when all its assumptions are valid. The classical least squares estimator is widely used in regression analysis because of its ease of calculation and tradition. When some of these assumptions are invalid, least squares regression can perform poorly. Linear least squares estimates can perform poorly when:

-outliers and other deviations from the standard linear regression model (for which the least squares method is best suited) appear.

-the distribution of errors is not normal, especially when the errors are large.

The danger of outlying observations, both in the direction of the dependent variables and the explanatory variables, on the least squares regression is that they can have a significant adverse effect on the estimation and can go unnoticed, particularly when analysing higher dimensional data. Therefore, statistical techniques to handle or detect outlying observations have been developed.

One remedy is to remove influential observations from the least squares fit. Another approach, called robust regression, is to use a fitting criterion that is not as vulnerable as least squares to unusual data.

Robust regression provides an alternative to least squares regression that works under less restrictive assumptions. Specifically, it provides much better estimates of the regression coefficient when outliers are present. Outliers violate the assumption of normally distributed residuals in least squares regression. They tend to distort the least squares coefficients by having more influence than they deserve. As a general rule, you would expect the weight attached to each observation to be about 1/N in a dataset containing N observations. However, outlying observations may receive a weight of 10, 20 or even 50%. This leads to serious distortions in the estimated coefficients.

Because of this distortion, these outlying values are difficult to identify because their residuals are much smaller than they should be. When only one or two independent variables are used, these outliers can be detected visually in various scatterplots. However, the added

complexity of additional independent variables often masks the outliers in the scatterplots. A robust regression reduces the influence of outliers. This makes the residuals of outlying observations larger and easier to spot. Robust regression is an iterative procedure that aims to identify outliers and minimise their impact on the coefficient estimates. The amount of weight assigned to each observation in the robust regression is controlled by a special curve called the influence function.

The most common general method of robust regression is M-estimation, introduced by Huber (1964). Consider the linear model

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_k x_{ik} + \varepsilon_i = x_i'\beta + \varepsilon_i, \qquad (1)$$

for the nth observation. The fitted model is

$$y_i = \hat{\beta}_0 + \hat{\beta}_1 x_{i1} + \hat{\beta}_2 x_{i2} + \cdots + \hat{\beta}_k x_{ik} + \hat{\varepsilon}_i = x_i'\hat{\beta} + \hat{\varepsilon}_i. \qquad (2)$$

The general estimator-M minimizes the objective function

$$\sum_{i=1}^{n} \rho(\hat{\varepsilon}_i) = \sum_{i=1}^{n} \rho\left(y_i - x_i'\hat{\beta}\right). \qquad (3)$$

Where the function ρ gives the contribution of each residual to the objective function. For example, for least squares estimation, $\rho(\hat{\varepsilon}_i) = \hat{\varepsilon}_i^2$.

The heteroskedasticity correction fits a multiplicative heteroskedastic linear regression model using the two-stage Generalized Least Squares (GLS), Maximum Likelihood (ML), or Harvey (1976) method. Multiplicative heteroscedasticity occurs when the variances of the error terms are assumed to be a multiplicative function of one or more variables. When the variables are not specified in the option, the heteroskedasticity correction corresponds to a homogeneous linear regression model.

Heteroskedasticity arises in a regression when the variances of the error terms are not constant across observations. For example, taxes can be heteroskedastic when they are predicted by group of agents. While taxes for workers in their 20s and early 20s vary little, taxes for workers in their 50s may vary considerably due to various factors. Heteroscedasticity is often found in time series data and cross-sectional measures and is a common problem in econometrics, social sciences and many other fields.

Heteroskedasticity correction can be used when the variance is assumed to have a form that is an exponential function of a linear combination of one or more variables. This is known as multiplicative heteroskedasticity and includes most useful formulations for variance as special cases. For example, in the special case of group heteroskedasticity, the sample can be divided into groups in which each group has a different variance.

A multiplicative heteroskedasticity model can be written as

$$y_i = x_i\beta + \varepsilon_i \; ; \; \sigma_i^2 = exp(z_i\alpha) \qquad (4)$$

where y_i, i = 1, 2, …, *n*, is the dependent variable; $x_i = (x_{1i}, x_{2i}, \dots, x_{ik})$ are the *k* independent variables that model the mean function; and $z_i = (z_{1i}, z_{2i}, \dots, z_{ik})$ are the *m* variables that model the variance function. The β are unknown parameters in the mean function and the α are unknown parameters in the variance function. The ε_i are independent and identically distributed errors with mean 0 and variance σ_i^2. Group heteroskedasticity is modelled using (3-6) but the z_i are all indicator (dummy) variables for groups.

Harvey (1976) introduced two methods for dealing with multiplicative heteroskedasticity: ML estimation and two-stage GLS estimation. By default, the heteroskedasticity correction corresponds to the multiplicative heteroskedastic regression model using ML. If the two-step option is specified, the heteroskedasticity correction fits the model using the two-step GLS method. ML estimates are more efficient than those obtained by the GLS estimator if the mean and variance functions are correctly specified and the errors are normally distributed. In contrast, the two-stage GLS estimates are more robust if the variance function is incorrect or the errors are non-normal.

If the form of the variance is completely unknown, it might be better to use the OLS estimator rather than the ML and GLS estimators, as it remains unbiased. However, we would then have to use robust standard errors to correct for heteroskedasticity. Using robust standard errors for the OLS estimator allows us to draw appropriate conclusions without specifying a formulation for the variance.

If the form of the variance is known and contains no unknown parameters, we can use the weighted least squares estimator, also known as the Generalized Least Squares estimator. For example, we can use weighted least squares to correct for heteroskedasticity if the variance is proportional to one of the regressors.

Greene (2018) and Hill, Griffiths and Lim (2018) compared the ML estimator and the GLS estimator with the robust OLS estimator. If the form of the heteroskedasticity is specified correctly, the ML and GLS estimators are more efficient than the robust OLS estimator. However, if the form of the heteroskedasticity is specified incorrectly, the robust OLS estimator may be more efficient than the ML and GLS estimators.

RESULTS

Table 3 presents the correlation matrix between the main variables of each hypothesis. The correlation matrix is used to determine the strength of the relationship between the dependent variable (domestic investment) and the explanatory variables (independent variables). The entries on the main diagonal give the correlation between a variable and itself, while the entries on the main diagonal give a pairwise correlation between the variables. In the

majority of cases, the cross-correlation is significant, positive but less than 0.50; this eliminates the risk of multicollinearity between explanatory variables.

Table 3 presents other pairs of correlations for private investment. We can already note with satisfaction the negative and significant association between this explained variable of the hypothesis and the corporate tax rate (-0.604). This supports our hypothesis that an increase in the tax rate has a negative effect on private investment. A similar relationship is observed for public investment - surprisingly - with almost identical orders of magnitude. Apart from the weak (insignificant) correlation between invpriv and cropib (0.037), the other cross-correlations involving invpriv are significant and positive. Therefore, the explanatory variables involved are also used to test the hypothesis, as the results should be comparable given the very strong association with private investment.

Table 3. Correlation matrix between variables

	invpriv	impso	tva	tintre	cropib	creint	invpub
invpriv	1.0000						
impso	-0.6046***	1.0000					
	(0.0007)						
tva	0.8434***	-0.3721*	1.0000				
	(0.0000)	(0.0512)					
tintre	0.5103***	-	0.0036	1.0000			
	(0.0047)		(0.9886)				
cropib	0.0376	-0.1563	0.3225*	-0.0160	1.0000		
	(0.8110)	(0.4272)	(0.0942)	(0.9345)			
creint	0.8524***	-0.7973***	0.5328***	0.5955***	-0.0345	1.0000	
	(0.0000)	(0.0000)	(0.0035)	(0.0007)	(0.7989)		
invpub	0.9756***	-0.6283***	0.8508***	0.5801***	-0.0218	0.9266***	1.0000
	(0.0000)	(0.0003)	(0.0000)	(0.0010)	(0.8721)	(0.0000)	

Notes: *** = significance at 1%; ** = significance at 5%; *= significance at 10%.

The analysis of the results relating to the test of the second hypothesis will start with a set of preliminary tests on the model linking the tax rate to private investment (paragraph 1), followed by robust estimates (paragraph 2) and the discussion of our results (paragraph 3).

The unit root tests for stationarity are similarly and logically performed for the variables of hypothesis 2. In Table 4, we find as non-stationary variables, domestic investments, but also domestic credits.

Table 4. Results of the unit root tests for the variables

	Test in levels				Test in first differences			
	ADF		PP		ADF		PP	
	Stat test (1)	Val cri (2)	Stat test	Val cri	Stat test	Val cri	Stat test	Val cri
Invpriv	1.800	-2.610	1.800	-2.610	1.534	-2.611	2.069	-2.610
impso	-0.278*	-2.628	-0.278	-2.628	-0.200*	-3.743	-0.270*	-2.628
tva	-0.891*	-2.628	-0.891	-2.628	-0.882*	-2.629	-0.884*	-2.628
Tintre	-3.397**	-2.992	-3.397	-2.626	-2.456*	-2.628	-3.354**	-2.992
cropib	-5.466***	-3.572	-5.466	-3.572	-4.253***	-3.573	-5.512***	-3.572
creint	1.897	-2.597	1.897	-2.597	2.022	-2.598	1.658	-2.597
invpub	2.461	-2.597	2.461	-2.597	1.439	-2.598	2.311	-2.597

Notes: (1) Test statistic; (2) Critical value. Compare (1) and (2) to get the stars: *** = significance at 1%; ** = significance at 5%; *= significance at 10%.

Table 5. Results of the trace test for the variables

Maximum rang	Eigenvalue	Trace statistic	Critical value at 5 %
0		196,5198	94,15
1	0,96712	107,7356	68,52
2	0,91206	44,5259*	47,21
3	0,60238	20,5470	29,68
4	0,44867	5,0659	15,41
5	0,17704	0,0000	3,76
6	0,00000		
Trend:	constant	Number of observ. =	26
Lags =	2	Sample =	1992 - 2017

Notes : *= significance at 5% provided by stata.

Using the six series (invpriv, impso, tva, cropib, creint, invpub) of our hypothesis model, we find that there are two cointegrating relationships in Table 5, we strongly reject the null hypothesis of no cointegration and do not reject the null hypothesis of at most two cointegrating equations. We therefore accept the null hypothesis that there are two cointegrating equations in the model that must now be estimated using the vector error correction model.

Having determined that there are two cointegrating equations between the series invpriv, impso, tva, cropib, creint, invpub, we now need to estimate the parameters of a cointegrating VECM for these series.

The header of the relevant table summarising this estimation contains information on the sample, the fit of each equation and the overall model fit statistics. The first estimation table contains the short-term parameter estimates, together with their standard errors, z-statistics and confidence intervals. The six coefficients for L. ce1 (respectively: 0.059; -1.95e-13; 1.61e-14; -7.68e-13; 0.4358; 0.1233) are the parameters of the fit matrix for this model. The other estimation tables contain the estimated parameters of the cointegrating vector for the said model, together with their standard errors, z-statistics and confidence intervals.

Overall, the result indicates that the model is not well fitted. The coefficient of our variable of interest impso in the first cointegrating equation is not statistically significant, nor are most of the fit parameters. These model fit parameters are easy to interpret and we can see that the estimates do not all have the right signs, even if they imply a "fast" adjustment towards equilibrium. When the predictions of the cointegrating equation are negative, invpriv is below its equilibrium value because the coefficient of invpriv in the cointegrating equation is negative. The estimated coefficient [D invpriv] L. ce1 is equal to -0.2189. Thus, when the average value of private investment in Cameroon is too high, it falls back "quickly". The estimated coefficient [D impso] L. Ce1 = 0.0462, which implies that when the corporate tax rate is too high, private investment adjusts less quickly (upwards).

The variables used in the White (1980) robust multiple regression model of the hypothesis are: invpriv, impso, tva, tintre, cropib, creint, invpub, d1. The last variable d1 is a dummy that takes into account the change in the trend of the endogenous variable private investment. Given the medium-term constant of tax rates implied here, investing agents have no reason to anticipate an immediate change in these rates. Consequently, their values are not differentiated.

OLS estimates for the multiple linear regression are optimal when all regression assumptions are valid. When some of these assumptions are invalid, the least squares regression may give poor results. Residual diagnostics can help identify where breaks occur, but they are likely to be time-consuming and sometimes difficult for the uninitiated. The robust regression methods we have chosen offer an alternative to least squares regression by requiring less restrictive assumptions. These methods attempt to attenuate the influence of individual cases so that they better fit the majority of the data.

The more remote data tend to pull the least squares further in their direction by receiving much more 'weight' than they deserve. As a general rule, it is expected that the weight attached to each observation will average 1/n in a data set with n observations. However, outliers can be given much more weight, resulting in biased estimates of the regression coefficients. This bias results in outliers that are difficult to identify because their residuals are much smaller than they

would otherwise be (if the bias were not present). Scatterplots can be used to assess outliers when a small number of predictors are present. However, the complexity added by other predictors can mask outliers in these scatterplots. A robust regression reduces the influence of outliers, making their residuals larger and easier to identify. For our robust estimates, we used White's heteroskedasticity corrected standard errors (see White, 1980).

Table 6 presents the estimates of the multiple regressions using corporate tax as the explanatory variable of interest. It is therefore appropriate to compare the four estimates in which all standard errors are robust. Considering the adjusted R^2 and the F-statistics, result 4 presents the most significant result. The R^2 value of 0.8854 shows that 88% of the variation in GFCF is due to the included regressors, while the remaining 12% that cannot be accounted for is due to white Gaussian noise. The statistical value F(2, 25) = 188 indicates that there is a strong (linear) relationship between the dependent variable and the regressors.

Interestingly, the corporate tax measure is negative and statistically significant in three of the four specifications, thus validating our hypothesis. This means, for example, that a one percentage point increase in the tax rate leads to a decrease in investment of at least 233 billion (estimate 4). Furthermore, the corporate tax rate is positively correlated with economic growth.

Table 6. Results of the multiple regression model with corporate taxes

	Estimation 1	Estimation 2	Estimation 3	Estimation 4
Constant	1.59e+13***	1.62e+13***	1.57e+13***	-4.22e+13***
	(0.000)	(0.000)	(0.000)	(0.000)
Impso	-3.99e+11***	-3.81e+11***	-3.80e+11***	-2.33e+11***
	(0.000)	(0.000)	(0.000)	(0.000)
Tva				2.79e+12***
				(0.000)
Cropib		1.59e+11***	1.22e+11***	1.00e+11***
		(0.000)	(0.002)	(0.000)
d1	1.57e+12***		6.00e+11***	
	(0.000)		(0.034)	
Number of observations=	28	28	28	28
F(2, 25) =	2820.04	111.63	169.97	188.10
Prob > F =	0.0000	0.0000	0.0000	0.0000
R- square =	0.5220	0.5735	0.5852	0.8854

Notes : *** = significance at 1%; ** = significance at 5%; *= significance at 10%.

Our result is consistent with Djankov et al (2010) who show from a representative sample of 85 countries that the effective corporate tax rate has a significant adverse effect on investment. In addition, Chang (1988) found that the existence of a corporate tax is an optimal tax policy according to the efficiency (or equity) criteria in the public economics literature.

Tables 7 and 8 present the results of alternative specifications. More specifically, the results of the model with the value added tax are presented in Table 7. The coefficient of this variable, while not having the negative sign expected here, is significant.

The positive sign, however, indicates that the impact of the VAT propagates in the same direction as private investment in Cameroon. These results can be accepted in the presence of the public sector, as higher government revenues may lead to higher public investment, but it is difficult to believe the same in the case of the private sector. It can be argued that, as the country is in a development phase, the application of VAT may not yet affect private investment.

Table 7. Results of the multiple regression model with is = vat

	Estimation 1		Estimation 2	
	Coefficient	Probability	Coefficient	Probability
Constant	-2.49e+13***	0.000	-4.09e+13***	0.000
Tva	1.34e+12***	0.000	2.19e+12***	0.000
Tintre	2.30e+10***	0.001		
Cropib			6.17e+10***	0.000
Creint			0.7479406***	0.000
d1	9.04e+11***	0.000	4.46e+11***	0.005
Number of observations=	18		28	
F(2, 25) =	98.94		233.30	
Prob > F =	0.0000		0.0000	
R- square =	0.7593		0.9536	

Notes : *** = significance at 1%; ** = significance at 5%; *= significance at 10%.

Another possible explanation is that since there are many direct or indirect business opportunities in Cameroon through various large-scale projects, private investment has shown a quasi-permanent upward trend over the long term. Such statements, however, require detailed econometric analysis for a better understanding.

This involves testing the equality of the coefficients of the IS and VAT on the model, given the sign mismatch. The tax variable in these regressions is corporate income tax = value added tax. Compared to Table 6, the estimates in Table 8 are similar in magnitude but less

significant. On balance, the results show the negative relationship reported above, thus confirming the conclusions obtained in our hypothesis.

Table 8. Results of the multiple regression model with value added tax

	Coefficient	Standard error	*t*-Student	Probability
Constant	2.04e+13***	6.55e+12	3.11	0.005
is = tva	-3.47e+11***	1.14e+11	-3.04	0.005
d1	1.70e+12***	5.97e+11	2.85	0.009
Number of bservations=	28			
F(2, 25) =	9.37			
Prob > F =	0.0009			
R-square =	0.4283			

Notes : *** = significance at 1%; ** = significance at 5%; *= significance at 10%.

Figure 1 shows the predictions of the baseline regression over the study period, based on observed changes in private investment. Based on the dynamic predictions, it can be said that the model performs relatively well, with the exception of a few intermediate years.

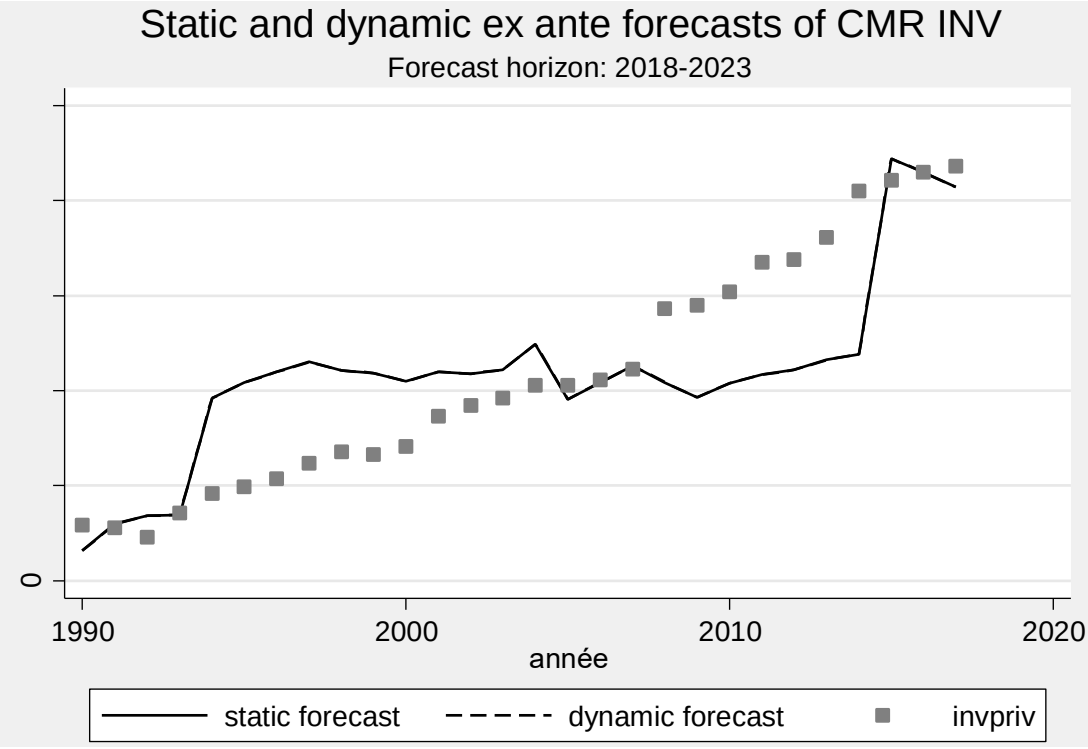

Figure 1: Representation of the response to shocks on Linvpriv

Two of the most important diagnostic tests on the residuals were conducted to ensure that the estimated model meets the minimum post-estimation conditions; these are the Breusch-Godfrey LM test for the presence of serial correlation and the Ramsey RESET test. We no longer need to test for heteroscedasticity, as the various models have already been corrected for this aspect. Table 9 summarises the results of these tests on model 4, as regards the model with corporate income tax, and on model 2, as regards the model with value added tax.

Table 9. Results of the diagnostic tests

Model with corporate tax				
LM Breusch-Godfrey test	chi^2=	19,388	Prob > chi^2=	0,0000
RESET Ramsey test	F(3, 19) =	2,71	Prob > F =	0,0743
Model with value added tax				
LM test Breusch-Godfrey	chi^2 =	4,203	Prob > chi^2=	0,0404
RESET Ramsey test	F(3, 8) =	5,10	Prob > F=	0,0291

As far as diagnostic controls are concerned, the model is significant and passes all diagnostic tests. The previously confirmed lack of serial correlation is further confirmed by the Breusch-Godfrey LM test. The model errors are uncorrelated; therefore, the OLS estimates are BLUE. The Ramsey RESET test checks whether there is an error in the way the overall model has been specified. It is concluded that the specification of the model on the determinants of private investment is complete and includes all important variables.

CONCLUSION

Tax policy also influences the sustainability of economic development: Income distribution effects (tax policy influences the distribution of income; e.g. progressive or flat PIT rate structure, basic allowances, non-consumable tax credits); Environmental effects (tax policy can be used as a market instrument to combat environmental degradation; e.g. so-called "green" taxes); fiscal effects (tax policy, which covers the tax treatment of investment, employment, as well as other activities, transactions and assets, also has fiscal consequences by influencing the amount of tax revenue available to finance public expenditure, including infrastructure and other programmes identified by investors as crucial to the changing investment environment).

The study aimed to show that an increase in the tax rate has a negative effect on private investment. Although there are many empirical studies in this area of the literature, the results differ considerably, especially with regard to the influence of the tax component of the user cost

of capital on capital formation. Following a fairly recent work by Cevik and Miryugin (2018), a linear relationship between endogenous and exogenous variables is assumed and a robust estimation technique is applied.

In total, the study found that the corporate tax discouraged private investment. A positive change in this tax would lead to a decrease in private investment by a factor of -2.33e+11 with a $p < 0.01$ to 0.000 in the country. Vergara (2010) also showed that reducing the corporate tax had a positive impact on investment promotion in Chile.

The sign of the coefficient of the value added tax is not negative as expected. This implies that the influence of tax policy has mixed results on private investment. However, the effect was made negative by means of a Wald test of coefficient equality, which led to the conclusion that these taxes did not promote private investment.

A poorly designed tax system (covering laws, regulations and administration) can discourage investment when the rules and their application are not transparent, or are too complex or unpredictable, increasing project costs and uncertainty about the net return.

Taxation is a major source of revenue for the Cameroonian government. However, if not properly managed, taxes can discourage investment rather than help generate the revenues needed to achieve economic emergence by 2035. Indeed, if taxes become so high that investors cannot pay, they will withdraw. The government therefore ends up losing what little revenue it can get from them. Paradoxically, higher tax revenues ensure sufficient revenues and avoid budget deficits, which in themselves either attract or deter investors (Norgah, 1998).

In general, high taxes, especially direct taxes such as corporate income tax, stifle private investment. Taxes have a negative impact on production costs and profitability. Indeed, although it is not clear from our results, most of the resources available for private investment are diverted to public purposes, thus avoiding private investment. Corporate taxes reduce disposable income and therefore help determine the amount of profit that should be reinvested in the company, if any. It is therefore imperative to determine an optimal level of income tax rate that maximises tax revenues and ensures maximum private investment. Indirect value-added and other (import) taxes can be used to protect local infant industries from the unhealthy competition created by cheap imports. This encourages private investment in industries that produce import substitutes. However, if indirect taxes such as value-added tax are imposed on inputs and capital used by local producers, this will increase production costs, which will discourage private investment (Bhatia, 1998).

Taxes can be used to promote investment in certain economic areas that are initially not popular with investors. This applies in a country where the government extends tax holidays (mostly used for the SI), tax exemptions, rebates and other tax benefits to investors in specified

sectors of the economy or regions. In Cameroon, special economic zones called industrial free zones (Zone franche industrielle d'exportation) illustrate how tax benefits can be used to encourage private investment (Ngo Balepa, 2012).

The results of our investigations and the inferences drawn from them are not infallible but indicative, mainly due to data limitations. In addition, there are several unanswered questions regarding the links between taxation and private investment in the literature. It remains interesting to examine whether the structure of tax structures has an effect on the way private investment is carried out in the country. Indeed, tax structure has an effect on how taxes can influence or stimulate private investment. Further research is needed into the links between tax policy measures and private investment, which is a universally recognized driver of economic growth.

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