

REVIEW OF ECONOMIC AND BUSINESS STUDIES

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RESEARCH ARTICLE



MECHANICS OF INVESTMENT DRIVERS IN CHINESE ECONOMY

SHOBANDE, OLATUNJI ABDUL^{*}, SHODIPE, OLADIMEJI TOMIWA^{**}

Abstract: *We examine the predictors of investment in the Chinese economy for the period 1973- 2018. Our study adopts the Mark Nerlove (1962) partial adjustment hypothesis combined with instrumental econometric techniques based on the condition of the data used. Our results provide strong evidence that supports savings, export earnings, and final consumption expenditure as correlates of predictors of investment in China. Based on empirical results, we strongly recommend the integration of the unbaked population to a formal financial service to further stimulate more investment in the Chinese economy.*

Keywords: *Investment, Neoclassical Model, Savings, Econometrics, China*

JEL Classification: *E13, E22, D25, C26*

1. INTRODUCTION

1.1 Overview

This study is motivated by the need to unveil the predictors of domestic investment, due to the growing demand for financial inclusion as strategy for savings accumulation to drive investment and smoothen consumption. Lately, access and use of financial services have not only become paramount but also the hallmark of various campaigns among stakeholders and scholars. While the peculiarity of savings is critical, literature agreed that both savings and investment are share of income, but less agreement exist on whether savings and investment are really equal at equilibrium (Joseph & Shobande, 2018).

Numerous literature hold a consensus view on the trending China's economic growth and massive State-based employment creation for the past four decades (Garnaut, Fang, Song, & Johnston, 2016). Capital accumulation, driven by

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aggressive per capita savings rate has been listed as one of the reasons for this consistent growth in the Chinese Communist economy (X. Wang & Zhou, 2016). Beyond the persistent growth in China's economy determined by huge capital formation, major macroeconomic aggregates influencing the former are worth paying attention to. The current study thus examines the major drivers of domestic investments in China.

This study is critical to China at this urgent time when the country is undergoing rapid structural changes. We spelt out six major factors that call for urgent need to investigate the drivers of domestic investment in the country. First, the overhang of extreme investment in infrastructure and heavy industry from the upshot of expansion to offset the Global Financial Crisis (GFC), and the debt that funded it requires large structural change, independent of the longer-term pressure (Garnaut et al., 2016; Hasanbeigi, Harrell, Schreck, & Monga, 2016; Huimin, Fangdao, Qiang, Lianjun, & Xinyue, 2014; Yu, 2016).

Second, the diversification and transition experience, which has lead to more focus on market economy has enhanced spontaneous increase in more efficient production and resource allocation. This critical factor has contributed in no small measure in moving the economy towards a growth path (Wang & Zhou, 2016; Wang & Feng, 2015; Xie & Wang, 2015). Third, is the recent savings accumulation, which has triggered more investment than demand. This shows that China is moving more towards the supply side than demand and this obviously serves as an advantage for the economy. In no time, they have been predicted to likely become the world superpower (Bhaskaran, 2011; Kang, 2018; A. O. Shobande, 2018; R. Xie, Hu, Zhang, & Liu, 2017). Fourth, some studies argue that the transition from traditional sector to more industrialized economy combined with urbanization potential are key drivers of China's investment drive (Han, Li, & Zhao, 2018; Quan, 1991; Shin, 2016; M. Yang & Dixon, 2012; Zhang et al., 2018). Fifth, relatively few studies attempt to tie the drivers of investment to degree of trade openness and quest for globalization, which are expected to reduce economic of scale and enhance more efficient resource allocation (Connell, 2017; Trindade, 2018). In addition, some studies claimed that the demographic advantage of boom experienced in early 1980s and late 1990s, accounted for the rapid investment experienced as more labour is available to meet the demand for industrialization (A. O. Shobande, 2018).

In the early 1960s, China's capital formation witnessed rapid investment in the industries majoring in the production of capital goods. Steel and heavy industrial production was seen as economic advancement to the communist China

(Hollister, 1964; Wei, Xie, & Zhang, 2017). However, although the “leap-forward” economic and social campaign of Mao Zedong (the then Chairman of Communist Party of China) made China’s fixed investment spending surge at the latter end of the previous decade (1950s), it was characterized with imbalances. This unbalanced industrialization crusade also came at great cost to the country (Hollister, 1964). Acceleration of growth in the physical industrial goods in China at the time was severely backed with high volumes of public and private savings. Since heavy boost in capital does not always grow in isolation, the spiral effect of income, savings and investment perceivably engendered massive volume of the present capital stock in the China. Ma and Mccauley (2013), reported that Chinese’s economy in the 20th century showed a rise in investment to output but with much larger rise in savings. Wei, Xie, and Zhang (2017) quoted marginal propensity for household savings to be 30 percent in 2007 against 16 percent in 1990. China was also believed to have had the highest overall savings rate in the world since at least 2000s (Horioka & Wan, 2007). Despite the huge capital creation at the wake of the millennium, there was wide gap between savings and investment in the period leading to growing surplus. However, in the current study, the impact of savings, Gross Domestic Product (GDP), interest rate, export earnings and final consumption expenditure are examined on capital stock in China. The endogeneity of savings in the model made the study resolve to Instrumental Variable (IV) econometric technique for robust analysis.

1.2 Chinese Investment Profile

The rise in volume of investment in China was first noticed in the 1950s when the Communist showed interest in and invested massively in industries producing sophisticated capital products (Hollinger & Staats, 2015; Hollister, 1964). This strategy of was fueled by the agendum to achieve economic development, which could only be achieved through the industrialization of the economy from the policy makers’ point of view. According to an influential report on the economic activities during this period, the growth in investment-output ratio nearly doubled between 1956 and 1960 (Yang, 2012). However, the attention and focus given to the heavy industries over the traditional sectors resulted in some economic sets- back, even though the agricultural sub-sector attracted massive improvement during the period. Besides this, there were accounts of institutional and economic factors that also contributed to the imbalance experienced in the economy during this period.

With the evident economic challenges occasioned by the lopsided industrial investment in the economy, the Chinese Communist at the later years of 1960s initiated a reform programme designed to combat the identified structural economic problems. To this end, the traditional sector of the economy was given attention with the objective of allow it develop skills – with much consideration in the Communist economic planning. It was at this time, the socio-economic challenges that came with the “leap forward” programme gave policy makers some economic insights on the importance of investment in the neglected sectors. Through the 1980s, China was able to maintain investment balance across sectors with diminutive one-sidedness (He, Shi, Luo, & Zhang, 2015).

According to Huw and Ligang (2012), in a study conducted early in the millennium, investment-output ratio in China increased by 13 percent by the end of 2010. Within the decade, China’s continuous trade surplus was attributed to the massive enhancement in the transport and machinery equipment. The improvement in these sub-sectors stimulated increase in production of manufactured goods different from what was earlier observed in the 50s. Interesting, the institutional set-up that impacted the Chinese economy negatively in the 1960s resurfaced in a modern fashion when heavy capital production focus began to build up into increase in domestic absorptive and external imbalances (X. Wang & Zhou, 2016).

Capital formation over the past decades has been directly linked to the rising savings rate in the Communist economy of China. This has led to China being ranked as the highest saver in the globe early in the millennium. Research showed that the surge in the savings was occasioned by relatively smaller household in proportion to the national savings, government policies on subsidies, price distortions and market power of the state firms in telecommunication and energy (Ma, et al., 2012). Furthermore, the widening gap between wage-marginal labour productivity differential contributing to high business profit spurred high corporate savings that resulted in excess national savings over the years. The pension reforms and private ownership of home properties also bolster the incentive to save. These aggressive public and private savings initiatives and policies stimulated capital accumulation in the system.

1.3 Brief Investment Mechanic in China: *Some Reflections*

The economic growth experienced by communist China in the 1950s and beyond has attracted the interest of scholars, researchers and policy makers with keen interest in the factors that spur the growth. In recent times, researchers have

argued the organized institutional setup and aggressive economic policies as major contributors, which today continue to impact on China's economy. Chai and Kim (2018), He, Shi, Luo, and Zhang (2015) and Yang (2012) associated the Chinese economic growth with rapid increase in investment rate. Another study by Xu (2011) supported the view on the effect of gradual change from controlled institution to market - supporting institution. Examining these two standpoints, from economic perspective, gave credence to the important factors that can spur growth in any developing economies like China.

The next sections examined array of literature on investment, capital accumulation and capital formation in China.

The rest of the paper is organized as follows: Section 2 discusses the theoretical foundation and time series evidence of the study; section 3 presents the theoretical framework and methodology while section 4 concludes the paper with some policy implications of our findings.

2. STYLISTED FACTS

The Chinese economy has increasingly moved from the cycle of poverty to a more developed economy. Today, the Asian Tigers are refuting many orthodox economic assumptions, and their understanding of development and macroeconomic knowledge are reshaping the system with new macroeconomic textbook emerging. Paradoxically, the drivers (factors) of China's investment have generated research interest in both developing and developed nations. Below analysis are some of the predictors of investment in China and how they have been used to improve the economy of the country overtime.

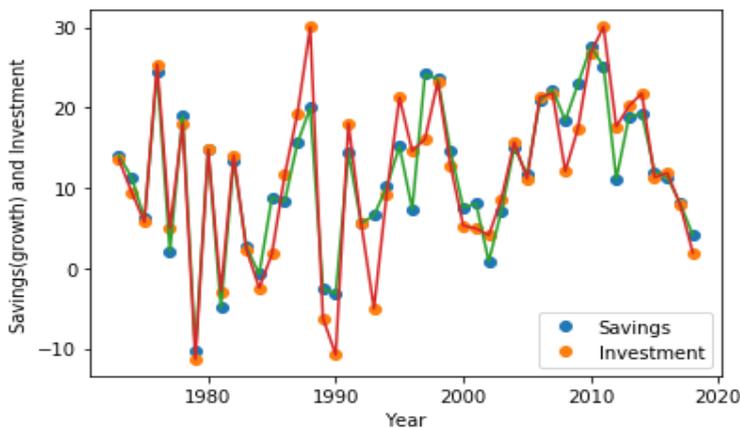


Fig 1. Connection level of Investment and Saving rate in China, CNBS, 2018

Fig 1 depicts the trend in level of investment and savings rate in China between 1973 and 2018. Between 70s and 80s, the figure shows that saving and investment exhibit a random walk with the gaps not obvious. Between 2000 and 2009, we observed upward and downward swing of the variables. In particular, investment and savings decreased sharply between 1980 and 1990. Between 2010 and 2018, there was persistent increase in both variables with partial reflection of fluctuation.

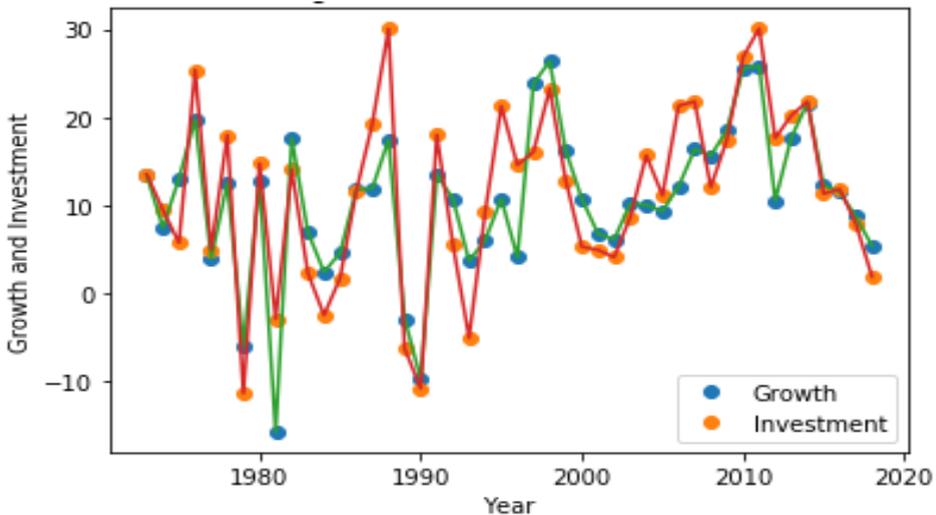


Fig 2. Connection level of Investment and Growth rate in China, CNBS, 2018.

Fig 2. depicts the trend in level of investment and growth in China between 1973 and 2018. We observed that their variables exhibit the same pattern of movement. In the 70s, 80s and 90s, we observed sharp decrease in investment, which reflected in the growth rate recorded. Precisely, the Chinese economy during this period witnessed negative investment in companies resulting in negative growth. Between the later part of the 90s and early 20s, the rapid growth began along with investment which compensated for the consistent increase in growth till date.

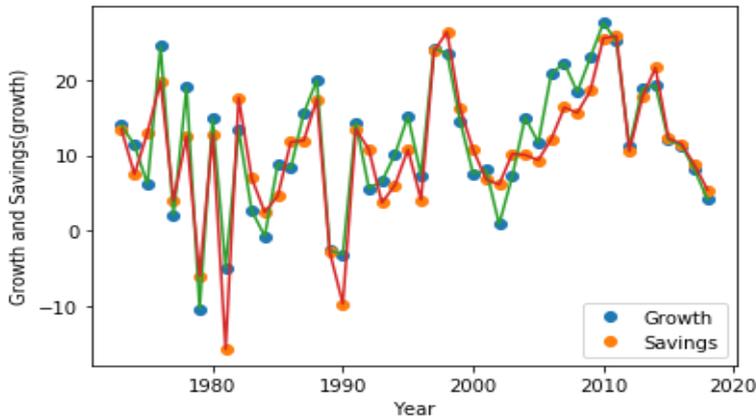


Fig 3. Connection level of Savings rates and Growth rate in China, CNBS, 2018.

Fig 3. depicts the trend in growth and saving in China between 1973 and 2018. The Chinese growth and savings have similar movement. As observed, savings have been the runner of Chinese economy. The perceived decrease in economic growth during the 80s and 90s were reflection of low saving rate during the period. The 20s witnessed consistent increase in saving rate which provided capital accumulation needed for investment to take place in the economy just as explained by the Harrod-Domar model of growth.

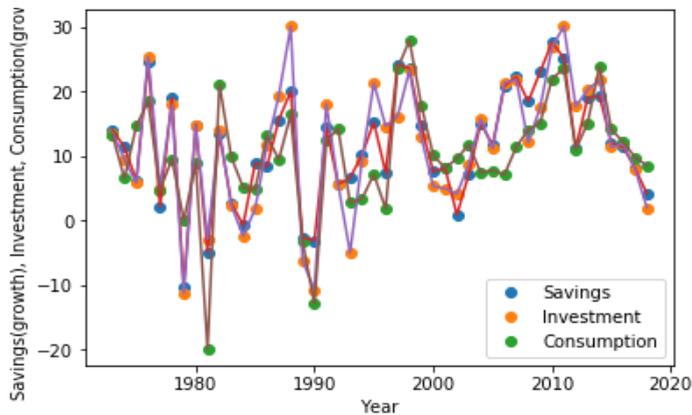


Fig 4. Connection level of Savings rates, Investment and Consumption in China, CNBS, 2018.

Fig 4. depicts the trend in level of investment, consumption, and saving in China between 1973 and 2018. We observed that consumption seems to exhibit upward movement between 2011 and 2018, as compared with the 80s and 90s

where there was high fluctuation and sharp decline in consumption. Precisely, movement in the later part of 70s and early part of 90s experienced this sharp decline. Similar movement was noticed for investment, however, saving seems to exhibit a random walk compared to others.

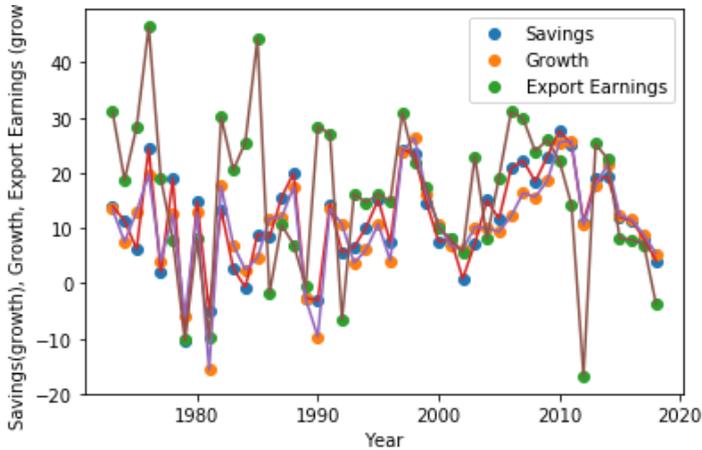


Fig 5. Connection level of Savings rates, Growth and Export earning in China, CNBS, 2018.

Fig 4. depicts the trend in savings rate, export earnings and growth in China between 1973 and 2018. We observed a fluctuation between 70s and 80s. There was a sharp decline in export earnings and growth during the period with exception of savings that seems gradually slow. Between 80s and 90s, there was turmoil in the economy as there was upward and downward swing among the variables with export earning recording its peak at the latter part of 80s. Between 90s and 20s, moderate and gradual movement was observed among the variables with exception of a sharp decline in export earning in 2010, which was rebalanced in 2013 and 2014 with a gradual decline in 2017 and 2018. Parts of the explanation for this were reflection of trade wars, investment uncertainty and slow growth among speculations, which led to trade tension.

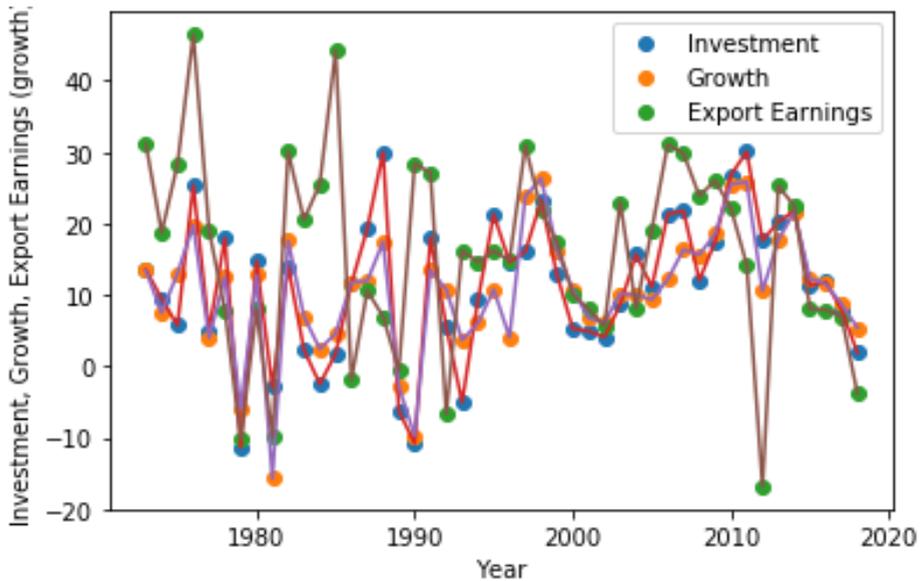


Fig 5. Connection level of Investment, Growth and Export earning in China, CNBS, 2018.

Fig 5. depicts the trend in level of investment, growth and export earning between 1973 and 2018. Between 70s and 80s, we observed fluctuation and random walk among the variables. Precisely, there was a gradual and slow decrease among the variables in the later half of the 70s toward the beginning of the 80s. Between 80s and 90s, the variables gradually moved up. We observed that export earning picked up in the later half of the 80s and sharp decrease was recorded toward the 20s. Apparently, the export earning support for growth was marginal while level of investment seems moderate but was not consistent. Between 2010 and 2018, slow earning was observed. There was a shock on the economy during 2010 which reflected the sharp decrease in earning. Although investment seems contrasting and accelerating but growth in the economy was a bit slower than the previous years. Thus, export earning outweighed investment as observed in the trends. We perceived that export was weakened by global trade lost, which affected the rate of investment as a result of speculation and perceived uncertainty among investors whom are concern about slower growth and the state of the present business environment.

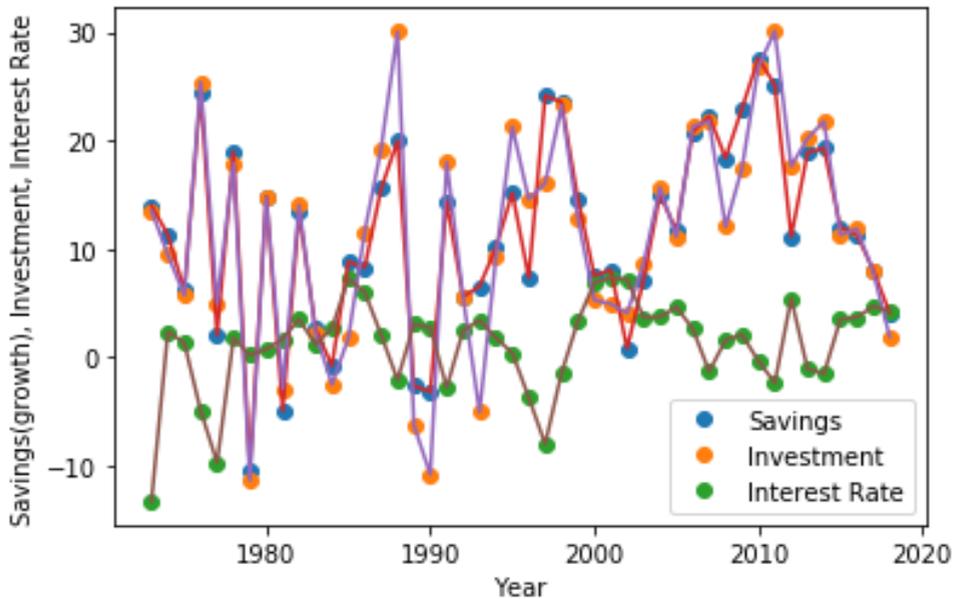


Fig 7. Connection level of Investment, Saving rate and Interest rates in China, CNBS, 2018.

Fig 5., depicts the trend in level of investment, savings rates and interest in China between 1973 and 2018. In early 70s, we observed a low level of interest rate, which gradually increased in the latter part of the period with a marginal drop close to the early 80s. Similarly, investment and savings have been volatile during the 70s. Between 80s and 20s, we observed a moderate movement in interest rate with exception of a sharp decline experienced in the latter part of 90s. Although investment and saving have continuously been on the upward trend with contrasting and accelerating movement during each quarters of the period. Moderate interest practice paved way for investment between 2010 and 2018. It was observed that savings rate was very rapid, providing extensive drive for accelerating investment. Although little disturbance was perceived, yet the interest rate and savings provided ground for investment to push gradually during the periods observed.

3. RELATED LITERATURE

This section presents evidence on the theoretical underpinning, time series evidence and varied debates on the predictors of investment in different economies of the world. The section summarizes the diverse opinions and evidence, which help to determine investment behaviour in Chinese economy.

1.1.1 Theoretical Framework

In literature, there are three major strong hypotheses that provide string of evidence for saving as the engine of investment. In the famous contribution of Harrod (1939) and Domar (1946), growth hypothesis provided evidence that savings is a driver of capital accumulation and investment, which influences growth. Also, this notion is consistent with the study by Rostow (1939), which provided evidence that savings is a *vita mechanic* for investment to transcend to development.

Taking Harrod (1939) dynamic hypothesis seriously for citing the dynamic properties of investment and spelling out the implication of how savings and other economic driver could stimulate investment, (Blume & Sargent, 2015) also provided explanation on savings rate as not being exogenously determined but instead the economic force with the system accounts for disparities in saving and investment (Blume & Sargent, 2015; Harrod, 1939). The Harrod (1939) dynamic model has been widely applied in the context of investment to include how a firm could adjust its cost of capital. For instance, Mark Nerlove (1962) built on Harrod's (1939) model and postulated a partial adjustment hypothesis. The model followed the accelerator model that presumed there was optimal capital stock desirable to produce a given level of output. In this model, the actual change in capital stock was a portion of a desired capital stock. To heighten the debate, Blume and Sargent (2015), cited Harrod (1939) for identifying the possible interaction between consumption and real decision to invest, and its consequential effect on economic growth which provided the theoretical underpinning for this present study.

This explanation by Harrod (1939) and Blume and Sargent (2015) is relevant to the study of the Asian Tigers. Specifically, it explained the reason why the rise of the Asian Tigers and China Communist economy was a big surprise to the observant economic analysts. This should, however, not be really surprising as the exponential growth of capital buildup and technological advancement that operationally pervaded the industrialized economies of these nations cannot be overlooked. Concentration of national savings on capital, and foreign direct investment, ever-increasing marginal factor productivity, factory relocation from developed countries etc. on building up the stock of capital lent credence to China's presence in the world economy. These factors, which determine growth in capital stock may seem limitless. Factors like rate of return, firms' expectation of change in future demand, technological progression and international influence on domestic economy are also conspicuously linked to the investment.

3.1 Evidence

A number of studies provide robust empirical support for savings as a great factor of investment that has the capacity to influence developmental progress. For instance, Moyo, Roux, and Roux (2018) estimated an ARDL bounds test for SADC countries for the period 1990-2015 and investigated whether investments have a positive impact on economic growth, and provide strong support for positive influence of savings on investments and growth.

Using eclectic model, Fielding (1993) conducted Engle Granger causality test for Kenya and Cote d'Ivoire on the determinants of investment between 1966 and 1989, and reported that concessional aids and access to foreign market play a predominant role in driving investment among the two countries during the period reviewed.

Jenkins (1998) estimated two step Engle Granger non-stationarity variables for Zimbabwe to determine the driver of investment between 1969 and 1989 and reported that access to market and effect of input and output pricing are determinants of investment during the period reviewed.

Ucan (2017) analyzed the relationship between private investment and its determiners using panel data for G7 countries over the period 1994-2010 within a multivariate framework. 1997 Asian crises, 1998 Russian crises and the early 2000s recession marked decline in economic activities, which mainly occurred in developed countries. The recession affected the European countries during 2000 and 2001 and the United States in 2002 and 2003, but the UK and Canada avoided the recession. Japan's 1990s recession continued and reported a positive relationship between the interest rate and investment among the countries studied.

Hassan and Salim (2011) examined the determinants of private investment in Bangladesh between 1981 and 2003 and provided evidence that real interest rate does not statistically determine private investment whereas government expenditure is found to be a significant determinant of private investment both in the long and short run. Similarly, Ang (2009) considered the determinants of private investment in Malaysia, using a dynamic model and cost minimization techniques. He provided evidence that access to financial resource was a key predictor of private investment in Malaysia.

Shobande and Olunkwa (2019) analysed the ease of doing business and private investment fundamentals in Nigeria between 1981 and 2017, using Autoregressive Distributed Lags Bound Testing Approach. Their study confirmed the existence of a long run relationship among the variables

considered. The results of our long run estimates confirmed that cost of capital, fiscal policy and regulatory framework are main binding constraint affecting the prospect of private investment in Nigeria. The short run estimates show that monetary policy rate, cost of capital and bank lending rates have the potential of crowding out private investment during the period reviewed.

Olunkwa and Shobande (2018) observed the effect of capital flow components on industrial growth in Nigeria over the period 1980 and 2016, using the Vector Error Correction Model and Engel Granger Causality test. Their result confirmed that short and long run relationship exist between the variables. However, no causality was found between foreign capital flow and industrial performance during the period reviewed.

Xu, Yang, and Ma (2017) decomposed and analysed China's savings and investment imbalances from 2002 and 2008, using the flow fund account to calculate household, corporate and government sectors. Their study further evaluated the relative contribution to the aggregate savings and investment and reported that increase in savings and investment surpluses is attributed to the steady household pull to increase in savings by household, and government sector and short-term downswing of investment by corporate and government sectors.

Shobande and Olunkwa, (2018) studied the effect of fiscal measures on private investment in Selected African countries between 1980-2016, using Panel Autoregressive Distributed Lag (PARDL) Bounds approach. Their study provided evidence that interest on debt payment, government expenditure, expected inflation, exchange rate and government tax revenue, all have positive relation with private investment among the five selected African countries studied, suggesting that fiscal measures have crowd in effects on private investment in the long run.

Also, a study by Athukorala (1998) analyzed the role of interest rates in the process of economic development in the Indian economy during the period 1955-95, providing evidence in support of the financial liberalization school of thought. The study further observed that higher real interest rates seem to promote both financial and total savings and stimulate private investment.

Acosta and Loza's (2005) analysis on the macroeconomic factors affecting investment decision in Argentina over the period 1970-2000 provided evidence for both short and long correlation of capital accumulation and investment decision in Argentina. In addition, the study confirmed that in the long run, Argentina will require a vibrant financial and credit market to sustain investment in the country.

Sharma and Vidisha (2018) examined the determinants of private investment in Mauritius between 1981 and 2014, using the ARDL approach and provided

evidence that corporate governance are key predictors of Mauritius investment drive during the period reviewed.

Wang, Liu and Su (2017) examined the effect of export driven factor on outward foreign direct investment in China between 2003 and 2010, using a panel data set of Chinese trading partners and provided evidence that China needed to focus more on export-oriented strategy to further drive investment in their economy.

Contrasting evidence of the determinants of capital formation simply confirm to us that diverse factors usually come to play in the process of capital build-up of any nation. It will be misleading to believe that certain uniform universal factor(s) contribute to development of capital build-up. The current study identifies this gap and moves forward to examine the major determinants that are peculiar to the communist economy of China.

4. METHODOLOGY

4.2 Empirical Model

We work with Harrod and Domal hypothesis as used by Mark Nerlove (1962) and replicated by Blume and Sargent (2015), thus influenced our model, which is based on partial adjustment hypothesis postulated by Mark Nerlove (1962). The model is considered because it followed the accelerator model that assumes there is optimum capital stock required to produce a given level of output. In this model, the actual variation in capital stock is a portion of an anticipated capital stock. Given, δ , as the coefficient of share between actual change in capital stock and desired stock, if $\delta=1$, it shows that both desired and actual stock are the same, if $\delta=0$, it means there is no change in capital stock. This coefficient is always expected to lie between these extremes.

$$gfcf_t^* = a_0 + a_1 X_{it} + \varepsilon_t \quad (1)$$

The General Model is given as:

Where $gfcf_t^*$ is actual capital stock at time t , X_{it} is a vector of independent variables – real interest rate int_t , Gross domestic product gdp_t , national savings sav , export earnings exp and final consumption expenditure fce and ε_t is the error term.

Since actual capital stock is related to the desired level of capital stock, then represent

$gfcf_t^*$ as desired level of capital stock which is not directly observable. Nerlove hypothesis allows us to derive $gfcf_t^*$ as:

$$gfcf_t - gfcf_{t-2} = \delta(gfcf_t^* - gfcf_{t-1}) \quad (2)$$

$gfcf_{t-1}$ = capital stock at the beginning of the period

$Ggfcf_t^* - gfcf_{t-1}$ = is the level of investment,

$gfcf_t^*$ = desired level of capital stock

δ = coefficient of adjustment.

In the equation 2, $gfcf_t^*$ is endogenous and is determined by real interest rate, output. That is,

$$gfcf_t^* = \beta_0 + \beta_1 int_t + \beta_2 gdp_t + \beta_3 exp_t + \beta_4 sav_t + \beta_5 fce_t + v_t \quad (3)$$

int_t = real interest rate at time t

gdp_t = gross domestic product at time t .

sav = national savings,

exp = export earnings (

fce_t = final consumption expenditure

β_0 = Constant parameter

β_{1-5} = intercept

Combining equations (2) and (3), we derive the actual capital stock as,

$$gfcf_t - gfcf_{t-1} = \delta (\beta_0 + \beta_1 int_t + \beta_2 gdp_t + \beta_3 exp_t + \beta_4 sav_t + \beta_5 fce_t + v_t + gfcf_{t-1}) \quad (4)$$

$$gfcf_t - gfcf_{t-1} = \delta \beta_0 + \delta \beta_1 int_t + \delta \beta_2 gdp_t + \delta \beta_3 exp_t + \delta \beta_4 sav_t + \beta_5 fce_t + (1 - \delta)gfcf_{t-1} + \delta v_t \quad (5)$$

The economic a priori for parameters in the model stated in equation (5) is as follow:

$$\delta > 0, \beta_1 < 0, \beta_2 > 0, \beta_3 > 0, \beta_4 > 0, \text{ and } \beta_5 > 0$$

The equation (5) is regarded as short-run demand for capital stock while the equation 1 is long-run equation.

Also, the model above may be deficient in a way. national saving is not completely exogenous. The resultant effect might lead to endogeneity problem in the results. To eliminate this effect, we capture national saving as:

$$sav_t = \theta_0 + \theta_1 int_t + \theta_2 gdp_t + \mu_t \quad (6)$$

$$\theta_0 > 0, \theta_1 > 0$$

National saving is positive function of both interest rate and output. This model is consistent with assumptions of savings behavior. That is, increase in interest rate and income motivates savers to increase amount of money allocated for future consumption through savings.

The equations (5) and (6) are behavioral which render Ordinary Least Square technique inconsistent. As a result, the models are estimated using Instrumental Variable technique, which gives estimator the assurance that they are consistent and efficient. Estimating the short-run equation (5), we can then divide through by the coefficient of adjustment to arrive at the long-run equation (1).

The China's time-series data used in this study are collected from the World databank. Data collected are on gross capital fixed formation, national savings, interest rate, gross domestic product, export earnings and final consumption expenditure. It is important to mention that the study was limited on the available data points (46) to be used for robust analysis.

4.2 Data

The data drawn from the National Bureau of Statistic, China published in Flow of Fund Account, FFA, and International Financial Statistics, its publication of International Monetary Fund. These sources provided annual observations for the period between 1973 and 2018 for the Chinese economy. The chosen variables are as follows:

Investment: China National Statistics reports reflect real and nominal investment and Gross Capital formation. The real capital formation is used in this study.

National Savings: China National Statistics reported gross national saving which reflects an appropriate deflator need to be expressed in the real saving contexts. Here, there is a conflict between deflator which would be appropriate when considering impact of savings on investment. Therefore, we measure the real value of savings in terms of capital goods they buy (Fielding, 1993).

Real GDP: China National Statistics reported real GDP and terms of trade adjusted price. The sum of these component are taken as real domestic income which is captured as GDP in this present study (Jenkins, 1998).

Interest rate: China National Statistics reported two major rates of interest. While one appears in savings behaviour model, the other is measured based on the returns on savings. As observed by Fielding (1993), using nominal interest rate to determine investment is problematic due to international exposure to volatility, as such, our study considered real interest rate as appropriate.

Export earnings: Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services WTO (2018).

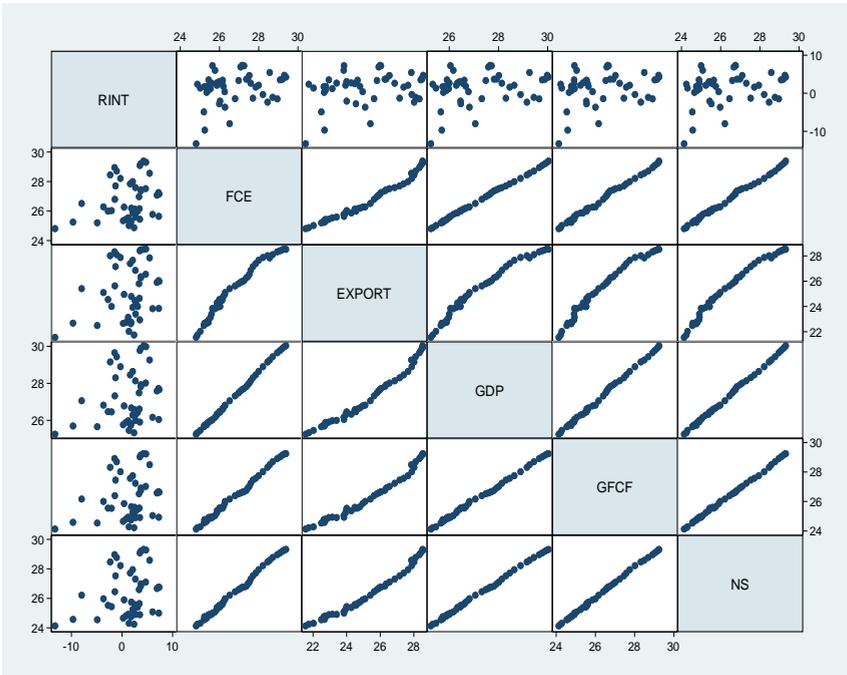


Fig 8 Combined Pictorial variable movements

Fig 6. depicts the trend analyses of research variables; gross fixed capital formation $gfcf_t$ national savings sav_t , gross domestic product gdp_t , export

Earnings exp_t final consumption expenditure fce_t and real interest rate int_t . As shown in the graphs, except the int , that alternates up and downs, it clearly indicates that the variables are upward trending. It suggests that the variables, except real interest rate, might need to be differenced to ascertain stationarity.

5. RESULTS

1.2 Descriptive statistics

In order to examine our model, we first checked the statistical properties of each series to know their average movement and standard deviations. The intuition behind this observation is to measure the difference of each series from their mean, which in turn revealed their degree of freedom and associated properties.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Obs
<i>gfcf</i>	1.25	4.25	46
<i>gdp</i>	26.7	1.35	46
<i>sav</i>	25.22	2.1	46
<i>int</i>	27.26	1.44	46
<i>exp</i>	26.35	1.58	46
<i>fce</i>	26.38	1.54	46

Source: *Researcher's (2019).*

Table 1. reports the descriptive statistics of each variable. The results indicate the average values of each variables and their associated standard deviations: Gross fixed capital formation $gfcf_t$ ($M = 1.25$, $SD = 4.25$) national savings sav_t ($M = 25.22$, $SD = 2.1$), gross domestic product gdp_t , ($M = 26.7$, $SD = 1.35$), Export earnings exp_t ($M = 26.35$, $SD = 1.58$) final consumption expenditure fce_t ($M = 26.38$, $SD = 1.54$) and real interest rate int_t ($M = 27.26$, $SD = 1.44$).

1.3 Preliminary Test: Unit Root

In this study, the Dickey-Fuller Generalized Least Squares unit root test was used and presented in results in Table 2. The test is important to know the stationary properties of the series. This is important since, the unit roots are useful as descriptors of future behaviour of the series.

Table 2: Dickey-Fuller Generalized Least Squares Unit Root Test

Variable	Level			First Difference		
	Constant	Constant & Trend	Order	Constant	Constant & Trend	Order
<i>gfcf</i>	1.37	-1.15	I(0)	-3.04**	-3.99**	I(1)
<i>gdp</i>	1.72	-0.94	I(0)	-5.37**	-5.91**	I(1)
<i>sav</i>	1.78	-1.09	I(0)	-5.44**	-6.03**	I(1)
<i>int</i>	-5.55**	-5.50**	I(0)	1.52*	2.41*	I(1)
<i>exp</i>	-0.91	-2.39	I(0)	-5.42**	-5.40**	I(1)
<i>fce</i>	1.56	-0.91	I(0)	-5.42**	-5.79**	I(1)

Note: Robust standard error in parentheses. * $P < 0.1$; ** $P < 0.05$; *** $P < 0.001$

Source: *Researcher's (2019).*

The tests rejected stationarity of all the variables at level except interest rate. After first difference $I(1)$, they became stationary.

5.3 Econometric Results

In this study, the Instrumental Variable (IV) technique is used. This technique, developed by Theil (1990), was meant solely to sanitize the stochastic explanatory variable such as National Savings in the model. What we did was to estimate first; this is regarded as first stage. The next step was to apply the estimated national savings to equation (5).

Instrument Validity Test: Table 3. shows the estimation of the regressed saving on log of Gross Domestic Product (GDP) and Real Interest Rate. The result is significant for GDP but not significant for real interest rate. This justifies similar test on investment by Hassan, Sanchez, and Yu (2011) and Stordel (1990). The

diagnostic test for autoregression shows the residuals are not serially correlated. Since interest rate fails relevance validity criterion, only output was used as instrument in the structural model.

Table 3: OLS Estimation for Endogenous National Saving (*sav*)

Variable	Coefficient
<i>gdp</i>	0.89* (0.07)
<i>int</i>	-0.001 (0.0016)
<i>c</i>	0.023 ** (0.012)
$R^2 = 0.81$ $f - stat = 89.61$ $DW = 2.136$	

Note: Robust standard error in parentheses. * $P < 0.1$; ** $P < 0.05$; *** $P < 0.001$

Source: Researcher's (2019)

In table 4. we present estimation of the structural model. The national savings series and its first lag alongside other explanatory variables - lag 1 of gross capital formation *gfcf*, real interest rate *int*, lag 1 of export earnings *exp* and final consumption expenditure *fce* are used in the Nerlove simulated structural model.

Table 4: Estimation of Nerlove Structural Model

Dependent Variable: Gross capital formation (<i>gfcf</i>)	
Variable	Coefficient
<i>sav</i> ~ [^]	2.13*** (0.18)
<i>sav</i> ~ [^] (-1)	-0.32***(0.11)
<i>gfcf</i> (-1)	0.23**(0.10)
<i>gdp</i>	0.0056**(0.002)
<i>exp</i> (-1)	0.083**(0.03)
<i>fce</i>	-0.97**(0.17)
<i>int</i>	-0.001(0.001)
<i>c</i>	-0.19**(0.073)
$R^2 = 0.94$ $f - stat = 102.88$ $Durbin's h = 0.600585$	
[$LM = 0.28$ ($p - value$ 0.59)] ,	
[$Normality - \chi^2 = 3.041$, ($p - value$ 0.21)]	

Note: Robust standard error in parentheses. * $P < 0.1$; ** $P < 0.05$; *** $P < 0.001$

Source: Researcher's (2019)

The coefficient of adjustments conjectured in the model considerably speaks volume about the level of capital stock adjustment in the China communist economy. This can directly be viewed from the reported adjusted coefficient of

determination ($R^2 = 0.94$). The diagnostic tests reflect high desirability as we fail to reject normality, homoskedasticity and non-serial autocorrelation (*durbin's h*) hypotheses of the developed model.

Thus, we would be wrong if we conclude ($\delta=1-0.231$) $\sim 0.769\%$ of the actual stock of capital adjusts to desired stock in particular year in China. This may be plausible for this country as it has ceaselessly boosted its capital stock in heavy industries to match up the western countries. However, in recent time, China believed to be changing its economic perspective towards economic development by paying more attention to human capital development for its huge labour force. The search for cheap labour by many multinational companies in developed countries that made them to outsource the domestic employment to emerging economies like China has become another straw of incentive for heavy investment in human capital in China.

The coefficient of saving is significant¹ and as expected at 1%, that is (2.13 $\delta=0.769$) % change in gross fixed capital formation as a result of 1% change in savings. This is similar to the study of Ma, et al. (2012). He had earlier noted that Chinese savings and investment exhibit one-to-one relationship before 2000 contrary to previous study of Feldstein and Horioka (1980). It could be inferred that Chinese saving habit mostly from state and corporate businesses was intentionally driven for investment purposes. Chai (1994) asserted also that China is among few nations that finance investment basically from domestic savings with disproportionate amount of capital inflow. The role of savings in Chinese economy cannot be overemphasized. It is the bedrock of capital accumulation in this emerging economy.

The result of first lag of first final consumption expenditure is significant at 1% level of significance. The test indicated over the years, increased export earnings and consumption expenditure showing negative relationship with gross fixed capital formation with ($-0.97/ \delta=0.769$) % change in gross fixed capital formation from 1% change in FCE (-1). This may be indisputable if we study how industrialization of China was patterned. This might, in some ways, resulted from the increase in capital formation of heavy industries that neglected other major sectors that provided income for the large labour force of China. Positive relationship was observed for export earnings and gross domestic product². This

¹ Ignoring the first lag, which has no economic meaning.

² Gross Fixed Capital Formation changes by (0.005/ $\delta=0.769$) % and (0.08 $\delta=0.769$) % by 1% change in GDP and Export(-1) separately.

should not be surprising for the economy that has bolstered its market presence in the world economy. China's excess earnings from international trade and increase in national income have helped to boost its capital accumulation over the years.

The past Chinese financial market restrictions closed the channel for the interest rate and investment nexus. This is most worrying for most developing economies and some emerging communist economies. Dao (2008) and Kumar (2004) had again reported the distressing situations of the financial market liberation for countries like China. Market efficiency and economic adjustment are almost compromised in nations where the market is not allowed to dictate the equilibrium. The result is not amazing for China as the states were regarded as major providers of investment funds.

6. CONCLUDING REMARKS

This paper examines the determinants of gross fixed capital formation in Communist Chinese economy adopting the Mark Nerlove (1962) postulate of partial adjustment hypothesis. Due to endogeneity of the major regressor (Savings) in the structural model, the study adopts Instrumental Variable (IV) econometric technique. Since only one instrument passed the instrument validity test, IV is used in place of 2SLS. The result provides evidence supporting, savings, export earnings, and final consumption expenditure as determinants of gross fixed capital formation in China.

In congruence with conventional theory of investment and saving, it is not hard to believe that Chinese economy bolstered their capital stock from domestic savings. Several empirical results have previously linked savings as major determinant of capital stock for the Chinese economy. In most developed countries, private firms and households are always seen to contribute to the large bulk of the money used in the loanable fund market. The case of the Communist State seems to be different from these conventional sources of investment funds. The state was believed to be the main architect for the increased capital stock through state massive savings. This paper suggests allowance for private participation in the financial system through private savings, which believably would strengthen private participation in the Chinese capital formation. The study hopes that this development will spur private investors to be more inward-looking and contribute to the existing stock of capital in growing the Chinese economy. Similarly, the general belief that interest rate is operationally not allowed to allocate investment funds in the developing and emerging economies can be discarded for the fast

growing Chinese Communist economy if the financial and economic constraints, that have plagued the economy, are relieved. This submission is in alignment with the proposition of the international financial community and Chinese financial institutions, suggesting to the Chinese leadership to pursue financial liberalization.

This research work is constrained in several practical ways; however, one important area future research may want to examine is the application of high-powered econometric technique that would make provision for the inclusion of several social-economic fundamentals motivating the Chinese savers towards capital formation.

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DOES FOREIGN DIRECT INVESTMENT CAUSE FINANCIAL SECTOR DEVELOPMENT – EVIDENCE FROM AN EMERGING ECONOMY

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Abstract: *The aim of this exploratory research is to examine the foreign direct investment (FDI) – financial development (FD) nexus and to analyse the strength of relationships among FDI measures. The study employed structural equation modelling (SEM) on selected data from the World Development Indicators (WDI) from 1979 to 2016 to achieve the modest goal of this paper. The study established that FDI inflows are precursors of a vibrant and well-developed financial institution in emerging economies. We also found positive and negative correlations amongst the FDI measures, which suggest they move pari passu in stimulating the FD of an economy. A notable feature of this study is in the employment of SEM empirical strategy to shed light on the FDI-FI nexus. The study concluded that emerging economies must focus on the creation of a congenial investment climate to attract FDI inflows, which pivots robust financial institutions because of their cascading effects on the overall economy.*

Keywords: *foreign; investment; financial; development; Ghana; economy; emerging;*

JEL Classification: *O16; O43; P45*

1. INTRODUCTION

1.1 Background

Recent socio-economic developments have re-echoed the importance of private investment for many developing countries (Ali-Nakyea and Amoh, 2018). These developments climaxed during the 2008 global economic crises, when there was a decline in FDI flows to many developing and emerging economies.

For example, inward FDI rates of return dropped from 12.3 per cent in 2012 to 7.1 per cent in 2015 and 6.3 per cent in 2017 (United Nations Conference

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on Trade and Development, UNCTAD (2018)). UNCTAD (2018) states further that global FDI flows declined by 23 per cent in 2017, from US\$1.87 trillion in 2016 to US\$1.43 trillion.

This underscores the appreciation of the massive role of FDI in the developmental process, economic growth and Sustainable Development Goals (SDGs) agenda of many emerging economies (Ali-Nakyea and Amoh, 2018). The United Nations Development Programme, UNDP (2014) reports that the annual SDGs investment gap for developing countries is US\$2.5 trillion.

However, whilst the efficacy of FDI flows to developing countries is questionable (Ali-Nakyea and Amoh, 2018), according to the Organisation for Economic Cooperation and Development, OECD (2008), these countries continue to embrace them to compensate for their poor business climates.

The primary role of FDI flows is to support recipient countries in their development initiatives and according to Shah (2013), it is driven by lower costs and higher efficiency of the host country. Researchers such as Vijayakumar, Rasheed and Tondkar (2009), Anyanwu (2012), Akpan, Isihaka and Asongub (2014), Etim, Onyebuchi and Udo (2014), Shah and Qayyum (2015), Shah and Khan (2016) and Ali-Nakyea and Amoh (2018) posit that key determinants of FDI inflow include the country risk ratings, trade openness of the recipient country, GDP per capita, remittances, political risk, size of government, economic growth rates of host country, size of market, availability of basic infrastructure, the dominance of the rule of law, and natural resource endowment.

Levine (1997) and Borensztein, Gregorio and Lee (1998) have also accentuated the importance of FDI via the transfer of technology, acquisition of new skills, transfer of knowledge and techniques in firms' production processes, increase competition among the production for local and foreign producers, export and import as well as economic growth. This they posit could lead to expansion of the financial development sector of the economy of the recipient country.

The role of financial development in national economy has been adequately espoused in empirical literature. In this regard, Hermes and Lensink (2003) posit that an essential trigger of FD is in driving the growth machinery of a developing economy. Dutta and Roy (2011) highlighted factors such as efficient resource channelling, risk diversification and pooling, reduction of information asymmetry issues, mobilisation of savings, simplification of trade, corporate control monitoring and the promotion of the interchange of goods and services.

Generally, extant literature has highlighted the determinants of FD to include institutional quality, real income, real interest rate, inflation rate, trade openness,

capital flows, good democratic governance, international trade and institutions (See Huang and Temple, 2005; Chin and Ito, 2005; Bilquess, Mukhtar and Sohail, 2011; Bittencourt, 2011; Ayadi, Emrah, Sami and Willem, 2013; Mahawiya, 2015; Mbulawa, 2015). The World Bank's Global Financial Development Database, GFDD (2014) recommended five measures as indicators of the depth of an economy's financial development with emphasis on financial institutions as opposed to financial markets. Hence, the study focused on the former for further discussion and analysis.

The FDI-FD nexus has been extensively researched and documented in literature (see Hermes and Lensink, 2003; Al Nasser and Soydemir, 2010; Shah, 2016; Adam and Tweneboah, 2009; Shah and Khan, 2017). The review of extant literature categorised the FDI-FD nexus into three strands. The first is the impact of FD on FDI flows and the second, the impact of FDI flows on FD. The last examines the complimentary roles of FDI and FD on economic growth (Adeniyi, Omisakin, Egwaikhide, and Oyinlola, 2012).

Although emerging economies have difficulty in selecting which one of the two policies (FD or FDI) to focus and pursue for accelerated economic growth (Choong and Chan, 2011), most literature focuses on the role of financial development in attracting FDI flows using traditional regression techniques (Desai, Foley and Hines, 2006; Dutta and Roy, 2011; Korgaonkar, 2012; Shah and Khan, 2017).

In contrast, our study focuses on the impact of FDI flows in stimulating FD of an emerging economy. We argue that FDI flows stimulate the financial development sector of emerging economies for rapid economic growth. This is based on the premise that most emerging economies have foreign investment flows gaps, which is hampering their growth and development (UNDP, 2014).

The purpose of this exploratory research is to examine the impact of FDI flows on financial development of an emerging economy. Consequently, we hypothesise that:

H₁: FDI does not cause financial development, and

H₂: There is no correlation amongst FDI determinants.

We employed structural equation modelling (SEM) empirical technique to test the hypotheses (Hoyle, 1995). SEM, ever since its introduction over three and half decades ago has become popular in several fields such as accounting (Lee, Petter, Fayard and Robinson, 2011), and marketing (Hair, Sarstedt, Pieper, and Ringle, 2012).

The justification for the use of the SEM over traditional multivariate regression analysis and discriminant analysis are mainly because of its ability to

accommodate small sample sizes, has no assumptions of the particular scale as well as the normality of the data distribution (Hair et al., 2012; Reinartz, Haenlein, and Henseler, 2009; Ringle et al., 2012).

Further, according to Hair, Black, Babin and Anderson (2010) and Hair, Hult, Ringle and Sarstedt (2016), SEM technique provides the elasticity for testing multiple models, permitting a researcher to employ several endogenous and exogenous variables.

The study produced the following results. We established that FDI inflows to an emerging economy such as Ghana are the reason for a vibrant and well-developed financial institution. The implication of this finding is that emerging economies desirous of rapid and accelerated economic growth should create the conducive investment environment to attract FDI flows. Secondly, we found that there is a positive or negative correlation amongst the FDI measures, implying that they move *pari passu* in influencing FD of an economy.

The paper extends literature by providing statistical evidence to establish that FDI flows to emerging economies pivots the FD sector for accelerated economic growth and will serve as the catalyst for SDGs achievement. Methodologically, the paper employs SEM empirical technique to test the hypotheses, which enables the researchers to graphically examine the impact of FDI on FD and analyse the correlations amongst FDI determinants.

The remainder of the paper is structured as follows: Section 2 briefly elucidates the literature on FDI and FD; Section 3 addresses the empirical strategy and estimation techniques; Section 4 analyses the empirical data and the research findings and Section 5 concludes with policy recommendations.

2. LITERATURE REVIEW

The literature on FDI and FD is quite extensive. This section seeks to briefly review the subject matter with respect to their meanings, determinants and measurements.

Theoretically, three strands of literature characterise the FDI-FD nexus debate. First, it has been established that a well-developed FD sector, which orchestrates massive FDI flows, triggers sustained economic growth and could aid the achievement of SDGs. Secondly, it has been argued that FDI flows pivots a well-developed financial market, which then triggers economic growth. Lastly, some researchers have examined the complimentary roles of FDI and FD in achieving sustainable levels of economic growth.

2.1 Meaning and determinants of financial development

2.1.1 Meaning of financial development (FD)

The World Economic Forum, WEF (2009) has defined financial development as the ‘factors, policies, and institutions that lead to effective financial intermediation and markets, and deep and broad access to capital and financial services. Generally, Choong and Chan (2011) define financial development as ‘the processes involved to advance and develop the financial intermediary services of a country about the quantity, quality and efficiency of those services’.

According to Akhtar, Sheikh and Altaf (2016) financial development includes policies, factors and institutions which trigger effective intermediation and financial markets.

Directly, FD makes available various affordable loans and financial assistance to consumers for the purchase of household items and other consumables (Mankiw and Scarth, 2008; Sadorsky, 2011).

Lamouchi and Zouari (2013) argue that the financial sector of a country develops when financial instruments such as financial markets and financial intermediaries collaborate to minimise the costs of information, enforcement and transactions. These instruments seek to ensure efficient distribution of resources for maximum returns on investment.

2.1.2 Determinants of financial development

In recent years, researchers such as Huang and Temple (2005), Chin and Ito (2005), Huang (2005), Bilquess et al., (2011), Bittencourt (2011), Ayadi et al., (2013), Mahawiya (2015), and Mbulawa (2015) have posited that financial development determinants include real income, real interest rate, inflation rate, trade openness, institutional quality, good democratic governance, capital flows, international trade and institutions.

Specifically, Huang (2005) concludes that institutional quality, government policies, geographic endowments, its income level and cultural characteristics positively and significantly affect financial development.

Selecting and studying Bangladesh, Egypt, Indonesia, Malaysia, Nigeria, Pakistan, and Turkey for the period of 1985 to 2008, Bilquess et al., (2011) assessed the impact of real income, real interest rate, capital flows, trade openness and institutions on financial development. They identified real income, capital

flows, trade openness and institutions as factors that positively and significantly impact financial development.

A research conducted by Ayadi et al., (2013) on some countries in the Mediterranean region from 1985 to 2009 emphasised robust legal institutions, good democratic governance and adequate implementation of financial reforms by countries as factors that significantly and positively impact financial development.

Mahawiya (2015) who studied Economic Community of West African States (ECOWAS) and Southern African Development Community (SADC) from 1980 to 2011 using a dynamic research approach revealed that nations that endorse trade openness of the financial sectors trigger enhanced financial development. Employing the generalised method of moments analysis on 11 SADC countries from 1996 to 2010, Mbulawa (2015) found a positive correlation between institutional quality and financial development.

Thus, extant literature has enumerated several variables as financial development sector triggering factors.

2.1.3 Measurement of financial development

Although, the significance of financial development in national economy has been adequately discussed in literature (Dutta and Roy, 2011; Shah, 2011), the concerns on the selection and measurement of financial development indicators remains unresolved (Choong and Chan, 2011). Demetriades and Hussein (1996) and Choong and Chan (2011) have suggested the use of financial development indicators such as the measure of different types of monetary aggregates to the level of nominal Gross Domestic Product (GDP) or Gross National Product (GNP).

The World Economic Forum, WEF (2009) highlighted two measures of financial development as the ratio of stock market capitalisation to GDP and the ratio of private credit provided by financial institutions to GDP. These measures are employed to external equity financing and debt financing.

Levine and Zervos (1998) and Levine et al., (2000) propose liquid liability, bank credit and private sector credit as the three variables for the measurement of FD.

Liquid liability refers to the ratio of liquid liability of a financial system to GDP. Thus, it is derived as money and quasi money (M2) divided by GDP. According to the World Bank (WDI, 2008), money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of residents other than the central government.

Bank credit is the ratio of domestic credit from the banking sector to GDP and is computed as the domestic credit from the banking sector divided by GDP. The banking sector include savings and mortgage loan institutions and building and loan associations (WDI, 2008).

Private sector credit is the ratio of domestic credit from financial intermediaries to GDP and ascertained by the formula: domestic credit to private sector divided by GDP. According to the World Bank (WDI, 2008), domestic credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, which establish a claim for repayment.

Additionally, GFDD (2014) has outlined five variables as indicators of the depth of an economy's financial development with emphasis on financial institutions as opposed to financial markets. These measures are private sector credit to GDP, financial institutions' asset to GDP, M2 to GDP, deposits to GDP and gross value-added of the financial sector to GDP.

However, due to the unavailability of data, the study employed private sector credit to GDP, M2 to GDP, and deposits to GDP variables in line with Levine and Zervos (1998) and Levine et al., (2000) who have used these three variables in empirical studies.

2.2 Meaning and determinants of foreign direct investment (FDI)

2.2.1 Meaning of FDI

UNCTAD (1999) defined FDI as 'investment involving a long term relationship and reflecting a lasting interest and control of a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor (FDI enterprise, affiliate enterprise, or foreign affiliate)'. Moosa (2002) explained that FDI is the process where citizens of one country (the home country) procure possession of assets to control the production, distribution, and other activities of a firm in another country (the host country).

Generally, FDI refers to the initial capital outlay a firm (desiring to expand its operations) injects into activities outside its country of origin in the form of the establishment (green FDI) or acquisition (merger and acquisition FDI).

The purpose of FDI is to help recipient countries in their development efforts and the investing entities in their expansion drive and this according to Shah (2013) is motivated by lower costs and higher efficiency of host country.

2.3.2 Determinants of FDI

The determinants of FDI have been extensively discussed in empirical literature. Nyamwange (2009) who examined the determinants of FD in Kenya posited that economic growth accounted for 23% of the variance in FDI and hence statistically influenced FDI. In Ghana, Tsikata, Asante and Gyasi (2000) indicated that important triggers of FDI over the 1970 to 1997 periods were trade regime, democratic governance, investment climate, economic uncertainty and raw material availability.

Employing data from over 100 countries and Euromoney's country risk ratings over a ten-year period, Vijayakumar et al., (2009) found that country risk ratings have a significant influence on FDI.

Mephokee, Cholpaisan and Roopsom (2012) find that GDP per capita, real interest rate, degree of openness, and exchange rate are leading indicators for attracting FDI flows to Thailand and Vietnam.

Asiedu (2006) relying on a panel data of 22 sub-Saharan African countries from 1984 to 2000 found that countries with larger markets, rich and abundant natural resources, highly educated human capital and open economies attracted more FDI inflows.

From a research in Malaysia, spanning 1974 to 2009, Fakhreddin, Nezakati and Vaighan (2011) found that inherent investment, trade openness, domestic credit to private sector and GDP are the factors that attract FDI.

Shah (2012) mentioned market size of a country, its development level, openness of the economy, infrastructure availability and its skilled human capital as the five main determinants of FDI in his study.

Anyanwu (2012) documented that market size, human capital, trade openness, foreign aid, agglomeration and natural resource exploitation have been the main determinants of inward FDI when he examined the factors triggering FDI flows into 53 African countries during the 1996-2008 period.

The market size, infrastructure availability and trade openness, as FDI inflows triggering have been cited by Akpan, et. al (2014). Etim, et. al (2014) also found out that market size (GDP), trade openness, and exchange rate affect FDI flows positively and significantly.

Shah and Qayyum (2015) have cited political stability, double taxation treaties, trade agreements, macroeconomic stability, bilateral investment treaties and the health of domestic governing institutions of a country as critical FDI inflow triggering determinants.

Shah and Khan (2016) identified the size of the market, human capital and degree of export positioning as factors critical to attracting FDI inflows.

Ali-Nakyea and Amoh (2018) found that FDI flows to economies that provide a sufficiently high rate of investment return. They cited the main FDI triggers as openness of the host country, political risk, financial depth, government size, economic growth as a measure of the attractiveness of the host country's market, market size, investors' trust in the country's economy, infrastructure availability, the prevalence of the rule of law, foreign aid, agglomeration, and natural resource endowment.

For our empirical analysis, we will employ inflation rate, FDI (net flows) and trade openness as the main FDI determinants, consistent with literature (Mephokee, Cholpaisan and Roopsom, 2012; Ali-Nakyea and Amoh, 2018).

2.3 The foreign direct investment–financial development nexus

For several years, great effort has been devoted to the study of the FDI-FD relationship. Some researchers including Henry (2000) and Desai et al., (2006) argue that a surge in FDI inflows shores up the funds available in a country and drives financial intermediation growth through financial institutions or the banking system.

In reverse, others (Shah and Khan, 2017) argue that a well-developed financial institution serves as a conduit to attract foreign investors into an economy. This is because foreign investors perceive such an economy as a symbol of strength, openness, market-friendliness and attractive environment.

Specifically, Hermes and Lensink (2003) and Alfaro et al., (2004) posit that the development of an economy's financial system is critical in attracting and controlling FDI inflows to more productive sectors of the economy. The empirical findings of Omran and Bolbol (2003) suggested that Arab countries should reform and improve their domestic financial systems as a catalyst to attract FDI inflows.

According to Nasser and Gomez (2009) in their study of 15 South American countries from 1978 to 2003, employing the banking sector and stock market variables as financial development indicators attract FDI flows.

Mahmoud (2010) examined the impact of financial development on FDI flows in 62 countries from 1996 to 2007 and agreed that jurisdictional financial services development attract FDI flows to low-income and lower middle-income countries.

Al Nasser and Soydemir (2010) examined the relationship between FDI and financial development in 14 Latin American countries from 1978 to 2007 and

found that a matured and developed financial market sector is a trigger for attracting FDI inflows to these economies.

Dutta and Roy (2011) relying on two measures of financial development in a panel study of 97 countries support the hypothesis that financial development serves as the leverage to attract FDI flows to a country.

Korgaonkar (2012) relied on data for 78 countries spanning from 1980 to 2009 to assess the impact of a vibrant financial system on FDI inflows. He concluded that infantile stock markets, inefficient banking and financial intermediary sectors adversely affected FDI flows.

Using data covering 1970 to 2005 to establish the causal relationship between FDI and economic growth with the mediating role of financial development in Cote' d'Ivoire, Gambia, Ghana, Nigeria and Sierra Leone, Adeniyi et al., (2012) concluded that a vibrant FD is FDI triggering which could improve economic growth in the long-run.

According to Shah and Khan (2017), strong financial development structures lower transaction costs and improve resource allocation. This ultimately improves trade and industry growth by attracting FDI flows.

Conversely, Zakaria (2007) examined the causal relationship between FDI and the level of financial development and found little support for the suggestion that the inflows of FDI can impact the development of the domestic banking sector in developing countries.

Following the inconclusive nature of the discussion on the direction of the causality of the FDI-FD nexus, the study sought to examine the impact of FDI on FD to ascertain where sub-Saharan Africa and other developing countries should focus to achieve appreciable levels of economic growth. The study also examined the correlation amongst exogenous variables, which is critical in explaining the FDI-FD relationship.

The study extended literature by providing fresh evidence that statistically FDI inflows affect FD positively and significantly for accelerated economic growth by employing a recent and more comprehensive research technique (SEM) to test two hypotheses.

3. METHODOLOGY

This section presents the data collection sources and discusses the justification for the application of the empirical strategy and estimation method.

3.1 Data and data sources

This study employed annual secondary data from 1979 to 2016, primarily gathered by the World Development Indicators of the World Bank (WDI). The World Bank is a reputable organisation for collating and disseminating credible and useful information. Anderson (2015) maintains that though the WDI data may not be perfect, they represent the most credible sources of FDI and FD data relied upon by researchers the world over.

For the endogenous variables, data for foreign direct investment, net inflows (% of GDP), inflation, consumer prices (annual %) and trade openness were extracted from the WDI. Similarly, data for the exogenous variables, bank deposit (% of GDP), domestic credit to private sector (% of GDP) and broad money (% of GDP) were from the WDI database.

Table 3.1: FDI and FD variables

Variable description	Type of variable	Abbreviation	Source
Foreign direct investment, net inflows (% of GDP)	Exogenous	FDIL	WDI
Inflation, consumer prices (annual %)	Exogenous	INFL	WDI
Trade openness	Exogenous	TROP	WDI
Bank deposit (% of GDP)	Endogenous	BKDP	WDI
Domestic credit to private sector (% of GDP)	Endogenous	CGDP	WDI
Broad money (% of GDP)	Endogenous	MGDP	WDI

Regarding the data type, most prior studies have relied on primary data to test hypotheses in SEM. However, researchers, according to Latan and Ghazali (2013) can equally rely on secondary data for analysis because it has been reported that SEM is suitable for all types of data and scales (Garson, 2012; Latan and Ghazali, 2013).

3.2 Model specification and estimation method

This study employed SEM to test the hypotheses because it allows the researcher to consider relationships among multiple exogenous and endogenous concepts concurrently. The use of SEM is justified in several methodological literature (Hair et al., 2016).

For example, it provides flexibility for testing models (Blanthorne, Jones-Farmer, and Almer, 2006; Hair et al., 2016), is not restricted by identification and other technical aspects, it is possible to test complex models with many different

constructs and indicators (Rigdon, 2014), and accommodates smaller sample sizes (Reinartz et al., 2009).

However, SEM requires in-depth knowledge about the technique because several assumptions have to be made which can lead to misleading conclusions, if not carefully considered.

For estimation of results, SEM adopts the maximum likelihood, ML (Hoyle, 2000) method. Bollen (1989) posits that ML is the favourite estimation method because it gives unbiased, consistent, and efficient parameter estimators when its assumptions are satisfied.

SEM is composed of two statistical techniques: confirmatory factor analysis and path analysis. SEM without dormant or unobserved variables is referred to as path analysis while the technique with both dormant and observed variables is called confirmatory factor analysis.

Path analysis enables a researcher to observe direct and indirect effects of variables simultaneously with several exogenous and endogenous variables. It also gives the researcher the flexibility to map and draw a set of hypothesized relationships that can be transformed directly into path analysis.

Our research is exploratory and employed observed secondary data for analysis. This suggests that we need to rely on path analysis within the SEM. Therefore, following Levine and Zervos (1998) and Levine et al., (2000), Mephokee, Cholpisan and Roopsom (2012) and Ali-Nakyea and Amoh (2018), the specified multivariate models are as follows:

$$BKDP_t = \beta_0 + \beta_1 FDIL_t + \beta_2 INFL_t + \beta_3 TROP_t + \varepsilon \quad (1)$$

$$CGDP_t = \beta_0 + \beta_1 FDIL_t + \beta_2 INFL_t + \beta_3 TROP_t + \varepsilon \quad (2)$$

$$MGDP_t = \beta_0 + \beta_1 FDIL_t + \beta_2 INFL_t + \beta_3 TROP_t + \varepsilon \quad (3)$$

where,

β_0 is the constant of the regression model,

ε denotes the stochastic term,

t denotes the year 1979 to 2016.

4. DISCUSSION OF RESULTS AND FINDINGS

4.1 Path analysis of statistical models

After the model specification, we present the path coefficients of the three models, as follows:

$$\text{Model 1: FDIL, INFL, TROP} \rightarrow \text{BKDP} \quad (4)$$

$$\text{Model 2: FDIL, INFL, TROP} \rightarrow \text{CGDP} \quad (5)$$

$$\text{Model 3: FDIL, INFL, TROP} \rightarrow \text{MGDP} \quad (6)$$

The above three equations (Eq. 1, 2 and 3) fashioned the path analysis in Figure 4.1.

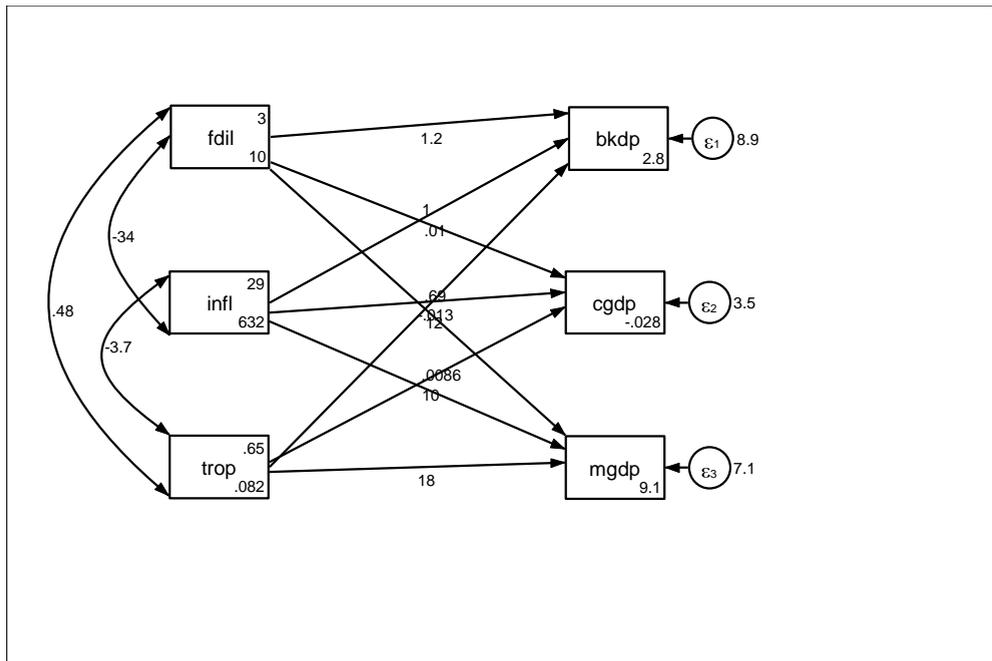


Figure 4.1: Path analysis showing multivariate relationships

From Figure 4.1, we can identify the coefficients, means, variances and co-variances among exogenous variables emanating from the three equations.

4.2 The fitness level of model and path analysis stability

In path analysis, Keith (2006) posits that the fit index statistic tests the stability between the predicted and observed data. Thus, a good fitting model is practically consistent with the dataset. There are several tests or strategies for evaluating the model fitness including Bentler-Raykov index, standard root mean

squared residual (SRMR), comparative fit index (CFI) and coefficient of determination (CD).

Jiang and Yuan (2017) noted that if multiple of the indices fall within the acceptable threshold levels, a researcher could statistically rely on the model for hypothesis testing, analysis and interpretation. Bentler (1999) recommended at least two indices for the acceptance of a model fit; this includes the SRMR, Tucker-Lewis index (TLI) or the Comparative fit index (CFI). Kline (2005) suggests the use of the RMSEA, the CFI and the SRMR.

Table 4.1: Equation-level, CFI, TFI and SRMR goodness of fit

Endogenous variables: BKDP, CGDP, MGDP

Endogenous variable	Fitted	Variance predicted	Residual	R ²	MC ²
BKDP	46.1564	37.2462	8.9101	0.8069	0.8069
CGDP	35.4322	31.9640	3.4682	0.9021	0.9021
MGDP	50.7734	43.6983	7.0751	0.8606	0.8606
Overall (coefficient of determination)				0.9625	
Standard root mean squared residual (SRMR)				0.0260	
Comparative fit index (CFI)				0.8800	

MC indicates the correlation between endogenous variable and its prediction

MC² indicates the Bentler-Raykov squared multiple correlation coefficient

Chen (2007) defines standardized root mean square residual (SRMR) as ‘the index of the average of standardized residuals between the observed and the hypothesized covariance matrices’. It indicates an acceptable model fit when it is lower than 0.10. However, Hu and Bentler (1999), Lacobucci (2010) and Kline (2011) suggest that the SRMR can be an indicator of good fit when it is smaller than 0.05. Therefore, our reported SRMR index of 0.0260 is a good indicator of our models’ fit.

Similarly, the comparative fit index (CFI) compares the fit of a target model to the fit of an independent model. Indices for CFI range between 0.0 and 1.0 with indices nearing 1.0 indicating good fit to ensure that mis-specified models are not accepted (Hu and Bentler, 1999). Thus, the CFI reported index denotes the extent to which the model of interest is better than the independent model. The CFI index of 0.88 therefore indicates an acceptable model fit.

Finally, the coefficient of determination (CD) or R-squared (R²) determines the ability of the model to predict accurately and becomes the pivotal criterion for

assessing the quality of SEM. Table 4.1 reports the overall R^2 as 96.25 per cent, indicating that all the three models jointly and significantly explain the FDI-FD nexus. Separately, the exogenous variables of equations 1 to 3 explain 80.69 per cent, 90.21 per cent, and 86.06 per cent respectively of the endogenous variables of those models.

Thus, we fail to accept the alternative hypothesis that FDI flows does not affect FD (H_1). This suggests that FDI affects FD.

4.3 SEM model stability condition

Relying on the eigenvalue for analysing the stability condition of the simultaneous equations, all the three models produced a stability index of zero. This shows that all the eigenvalues (zero) lie inside the unit circle, confirming the satisfaction of the stability condition for further analysis. Therefore, our models are stable and robust to test the hypotheses.

4.4 Wald Joint significance test

The Wald test determines if all the exogenous variables jointly and significantly affect the endogenous variables. Normally, a p-value of less than 5 per cent indicates the acceptance of the null hypothesis that the exogenous variables affect the endogenous variable jointly. From Table 4.2, all the exogenous variables (FDIL, INFL and TROP) jointly and significantly affect the endogenous variable in Equation 1(BKDP), Equation 2 (CGDP) and Equation 3 (MGDP).

Table 4.2: Wald tests for equations

Observed variable	Chi ²	df	p-value
BKDP	158.85	3	0.0000
CGDP	350.22	3	0.0000
MGDP	234.70	3	0.0000

4.5 Correlation analyses

The study sought to test whether there is correlation amongst the exogenous variables (ie. foreign direct investment, net inflows (FDIL), inflation, consumer prices (INFL), and trade openness (TROP)) and to determine the strength of those relationships. The empirical results are displayed in Table 4.3.

Table 4.3: Correlation matrix

	FDIL	INFL	TROP
FDIL	1.0000		
INFL	-0.4173**	1.0000	
TROP	0.5141**	0.5187**	1.0000

Note: **Correlation is significant at 0.001 levels

From the correlation matrix, there is correlation amongst all the FDI measures. There is a positive and significant correlation between trade openness (TROP) and foreign direct investment, net inflows (FDIL) and between inflation, consumer prices (INFL) and trade openness (TROP). However, there is a negative and significant correlation between foreign direct investment, net inflows (FDIL) and inflation (INFL).

The results indicate that there are varying degrees of positive and negative correlation amongst the exogenous variables. Therefore, we fail to accept the alternate hypothesis that there is no correlation amongst the exogenous variables (H_2).

4.6 Regression analyses

Consequent to the determination of the models' stability and predictive quality using the R^2 , estimating the unstandardized path coefficients and their respective p-values is critical. In the three equations of the path analysis in Equations 1 to 3, FDI variables (FDIL, INFL and TROP) were stated as the exogenous variables, whiles FD variables (BKDP, CGDO and MGDP) as endogenous variables. The results are displayed in Table 4.4.

In the first equation, we examined the impact of FDIL, INFL and TROP on BKDP. However, from the table, INFL is not significant as a variable in influencing BKDP.

Similarly, the second and third equations show that INFL is statistically an insignificant trigger or as a measure of foreign direct investment (FDI) in determining the level of financial development (FD) in Ghana.

Table 4.4: Final path analysis

Estimation method: ML

Endogenous variable	Exogenous variables	Unstandardized path coefficient	Standard error	P-value
BKDP	FDIL	1.1658	0.1785	0.0000
	INFL	0.0100	0.0230	0.6630
	TROP	11.8304	2.1374	0.0000
	CONS	2.8451	1.7816	0.1100
CGDP	FDIL	1.0341	0.1113	0.0000
	INFL	-0.0129	0.0144	0.3690
	TROP	10.2644	1.3335	0.0000
	CONS	-0.0281	1.1115	0.9800
MGDP	FDIL	0.6878	0.1590	0.0000
	INFL	0.0086	0.0251	0.6760
	TROP	18.4995	1.9047	0.0000
	CONS	9.0590	1.5876	0.0000

In conclusion, with an overall R^2 of 96.25% as captured in Table 4.1, all the three equations jointly and significantly explain the FDI-FD nexus. However, separately, apart from inflation (INFL), all the other exogenous variables (FDIL and TROP) impact the endogenous variables significantly.

5. CONCLUSIONS AND POLICY IMPLICATIONS

Over the last few years, following the global economic meltdown, the FDI-FD relationship has attracted great research attention. This research employed data from the WDI database to examine the FDI-FD nexus and to ascertain the kind of relationships that exist amongst FDI measures. One main addition to literature is the use of SEM empirical technique to test two hypotheses:

- (1) FDI does not cause financial development, and
- (2) There is no correlation amongst FDI determinants.

A test of the two hypotheses revealed the following results. Testing hypothesis one revealed that FDI flows to emerging economies motivates activities that orchestrate the development of financial institutions. Apart from inflation, statistically all the exogenous variables of the three models specified, significantly and positively affect financial development. The implication is that economies aiming at appreciable economic growth levels and achieving SDGs via FD, must concentrate efforts on attracting FDI flows.

In hypothesis two, the study failed to accept the alternative hypothesis that there is no correlation amongst the FDI measures. Thus, there is correlation amongst the exogenous variables. Specifically, there is a positive relationship between trade openness (TROP) and foreign direct investment (FDIL) and between inflation (INFL) and trade openness (TROP). On the other hand, there is a negative relationship between foreign direct investment (FDIL) and inflation (INFL).

We conclude by positing that FDI flows to emerging economies provide the stimulus and impetus to develop the financial institutions of those economies. Further, the results suggest that there is no single variable but a multiplicity of FDI variables/measures that drive an economy's financial development.

Based on these results, the following policy recommendations are suggested. First, governments of emerging and developing economies should focus on creating an enabling investment climate to attract commensurate FDI flows (Ali-Nakyeya and Amoh, 2018). This has the cascading and spill over effects of transforming and developing financial institutions to spur those economies towards accelerated economic growth and SDGs attainment.

Second, the exogenous variables (FDIL and TROP) move *pari passu*. Thus, they jointly and significantly affect financial development and therefore policy decisions on them must be drafted concurrently to have maximum impact on the economy.

The novelty of this research is in the use of SEM methodology to examine the FDI-FD nexus by providing fresh evidence to motivate a call to focus on the creation of an enabling investment atmosphere to attract FDI

flows, which has the cascading effects of creating effective and robust financial institutions.

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ALTERNATIVES FOR FINANCING OF MUNICIPAL INVESTMENTS - GREEN BONDS

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Abstract: *The perspective of global climate change emerges as a significant political, economic, financial and social issue. Scientific researches show that the accumulated carbon dioxide (CO₂), released by the industry and agriculture, together with the contribution of man-made greenhouse gases leads to a rise in the temperature of the earth's surface. Traditional sources of financing capital expenditure, such as own revenues and bank financing have proved to be extremely insufficient. At the same time, not only traditional municipal needs, such as costs for street, road, bridge, school construction etc., but also the need of investments related to climate change have been on the rise. The purpose of this article is to examine and analyze alternatives for financing climate change-related municipal investments. The subject of the research is green bonds and the so-called Subnational Pooled Financing Mechanisms, which have already gained popularity in Western Europe but are not yet well known in Eastern Europe. The positive aspects and opportunities that the green bond market reveals as well as the barriers to this type of financing are assessed and an analysis of the practice of bond financing in Europe is made.*

Keywords: *municipal investments, climate change, green bonds, green investments, Eastern Europe, debt, pooled financing mechanism.*

JEL Classification: *G150, G230*

1. INTRODUCTION

Local and regional authorities to oppose the climate change are looking for additional sources of funding beyond the traditional ones from the state budget and loans from the banking sector. The capital market, by mobilizing financial resources, is an appropriate source to finance investment projects to mitigate climate change, as well as for adaptation. Green bonds as a debt instrument are less popular in Bulgaria, but in countries with developed capital markets, municipalities use them as an option to finance public assets related to reducing the negative impacts of climate change. According to expert researches, over the next 15 years

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investments on a global scale, amounting to USD 6-7 trillion will be needed annually, in order to meet the demand for environmentally-friendly investments in sectors such as ecological recultivation, energy efficiency, clean energy, carbon-free transport, green infrastructure and to ensure a global transition to an environmentally sustainable and low carbon economy.

Economic development is directly dependent on the effects of climate change on a global scale, and the additional negative effects of climate change are compounded by a number of factors: industrialization, accelerated urbanization, increase in carbon emissions as a result of human intervention in environmental and natural pollution.

1.1 Green Bonds – A Financial Option Against the Impacts of Climate Change

The European Environment Agency's 2017 report assesses the economic losses caused by climate change in Europe at around EUR 400 billion over the period 1980-2013. On an average annual basis, economic losses are about EUR 13.7 billion since 2000, economic losses for EU could be about EUR 190 billion per year, net loss of welfare could reach 1.8% of current GDP by the end of the century. The annual cost of damage caused by river floods is expected to be EUR 20 billion by 2020 and EUR 46 billion by 2050³.

The increasing concern of climate change deepens the need to fund policies and measures to adapt and mitigate the impacts of climate change as quickly as possible. Adaptation and mitigation are components of social, economic and environmental sustainability. Mitigating the impacts of climate change means reducing greenhouse gas emissions from all sectors of the economy and from our daily lives. For this purpose, various energy efficiency measures for switching to low-carbon fuels etc. are being implemented. Adaptation is the process of taking action to adapt to climate change that has already occurred.

In order to keep the global temperature, rise below 2° C (or even 1.5° C) and to adapt to the effects of climate change, a change in global development models is needed with a view to moving towards a more sustainable economy.

In recent years, well-established international organizations have been working to mobilize financial resources by expanding the green bond market. Some of these organizations are G20 Green Finance Study Group, Climate Bond Initiative,

³ European Environment Agency “Climate change, impacts and vulnerability in Europe 2016”, Report No 1/2017

Green Finance Committee, UN⁴ UN-Habitat⁵. The use of green bond issues is also recommended by organizations such as OECD, The European Commission, The Global Commission on the Economy and Climate, The Brookings Institution etc. According to a report by The Global Commission on the Economy and Climate, “Financial innovations, including green bonds, risk-sharing instruments and products, which align the risk profile of low-carbon assets with the needs of investors, can reduce financing costs, potentially by up to 20% for low-carbon electricity” (The Global Commission on the Economy and Climate, 2014, p.9)

Due to growing interest in green investments and their funding sources, the European Commission has set up an expert group to develop standards for categorizing the green bond issues. By the end of 2019, the first unified standards will have to be presented, and this will lead to a further expansion of the market for this type of debt instruments. In this respect, the rise of the green bond market has been analyzed in the past few years, focusing on the key barriers that prevent some countries in Europe from using them as a source of climate financing.

1.2 Green Bonds – A Debt Instrument for Support of Investments in Climate and Environment

Green bonds are a type of climate bonds. They are a debt instrument for funding green projects oriented towards generating environmental benefits from mitigating the impacts of climate change. Green bonds are considered an innovative tool that allows new opportunities to accumulate private capital for financing green projects. Investors and politicians understand their importance for fulfilling their engagement to the 2015 Paris Agreement and for businesses to apply models that are environmentally and naturally friendly. Green bonds are seen by businesses and local authorities as an opportunity to achieve a good return on investment in environmental protection projects and countering climate change. There is no universal definition of green bonds, but considering the funding objectives, the green bond is defined as a fixed income financial instrument, a financial instrument for raising capital to finance green projects (OECD 2017; ICMA 2017)⁶, (Mercer 2015) green bonds’ refers to bonds whose proceeds are used to finance environmentally- friendly projects.⁷

⁴ <https://www.un.org/press/en/2015/dsgsm874.doc.htm>

⁵ UN-Habitat, Urbanization and development: emerging Futures, World Cities report 2016

⁶ OECD. 2017. Mobilising Bond Markets for a Low-Carbon Transition, Green Finance and Investment. Paris: EOCED Publishing. <http://doi.org/10.1787/9789264272323-en>. ICMA. 2017.

Typical of the green bond is that it induces co-operation between investors and issuers aiming to increase green investment (Kidney & Oliver, 2014)⁸. Fixed-income institutional investors are the main market players who, being aware of the sustainability of cash flows from investment, recognize green bonds as "an element of the risky diversification of their portfolios"⁹

The main difference between standard bond issues and green issues is the commitment that funds would be used to finance and refinance green projects, assets and business activities. Green bonds can be issued by both public and private entities. As with standard bonds, green bond issues represent borrowed funds over a period, and investors/ creditors receive a coupon with a fixed or variable rate of return. Green bonds can be structured as asset-backed securities, linked to certain green infrastructure projects, but currently they are most often issued for raising capital allocated to a portfolio of green projects.

Globally, the most widely accepted standards are the Green Bond Principles, a set of voluntary guidelines developed by key market players agreed by the International Capital Management Association (ICMA), and the Climate Bond Standard, which also includes sector-specific criteria, developed by scientific experts under the leadership of the Climate Bond Initiative (CBI). The standards for green bonds are designed to measure the effects of this type of specific investment through quantitative and qualitative indicators (ICMA, 2014)¹⁰. The Climate Bond Initiative and the International Capital Management Association (ICMA) recognize the following areas as green projects: a) mitigation of climate

The Green Bond Principles 2017: Voluntary Process Guidelines for Issuing Green Bonds. Annual Report. Switzerland. <https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/-GreenBondsBrochure-JUNE2017.pdf>.

⁷ Mercer. 2015. Investing in Times of Climate Change. Mercer Report. New York. <https://files.zotero.net/19506020670/mercer-climate-change-report-2015.pdf>.

⁸ Sean Kidney and Padraig Oliver Greening China's Financial Markets Growing a Green Bonds Market in China: Reducing costs and increasing capacity for green investment while promoting greater transparency and stability in financial markets, The International Institute for Sustainable Development, February 2014 /

https://www.climatebonds.net/files/files/growing_green_bonds_en.pdf

⁹ Josué Banga (2018): The green bond market: a potential source of climate finance for developing countries, Journal of Sustainable Finance & Investment link to this article: <https://doi.org/10.1080/20430795.2018.1498617>

¹⁰ ICMA. (2014). Green Bond Principles – Voluntary Process Guidelines for issuing Green Bonds. ICMA

change impact and adaptation b) protection of natural resources, c) conservation of biodiversity and d) prevention and control of environmental pollution¹¹.

At European Union level, negotiations are underway with respect to the criteria for bonds falling within the scope of green issues, such as standards and regulations on the green bond market regarding the issuer's legitimacy. "Green Bonds" include not only financial obligations (for example, payment of core capital at a given maturity, regular coupon/interest payments, etc.), but they also include environmental benefits that are claimed as targets by the green bond issuer. For these bonds, both the creditworthiness of the issuers and the green element in the issue are essential. Bonds provide returns for the investor, but they also demonstrate to the public how to preserve, restore and improve the environmental characteristics throughout the life cycle of funded investments.

Climate Bond Initiative's¹² Climate Bond Taxonomy identifies as green objects investment projects for achieving a low-carbon economy. Expanding the funding of these objects through bond issues definitely mitigates and limits climate change. In this respect, through green bonds, investments in the field of clean energy production, transport, energy efficiency, water management, waste management and pollution control, conservation of natural resources, incl. land use, agro-culture and forestry, information technology and communication, etc. can be financed.

Green investments aim to limit the impacts of climate change. The forecast for global investments in climate change and environmental protection for the next 15 years is about USD 6-7 trillion. Part of the investments are related in particular to transformation of the energy system, protection of ecosystems and guaranteeing sustainable use of water (G20 Green Finance Study Group).

There is, however, a big difference between current investment flows and capital needs. Green bonds are one of several financial instruments that could be used to finance these sustainable transitions. Green bonds are especially suitable for projects with long-term investment horizons, high capital costs and guaranteed revenue streams, such as renewable energy infrastructures.

However, green bonds could provide capital for other urgent environmental projects, related to, for example, sustainable water management, low-carbon transport, or ecosystems conservation. This type of bonds could provide the

¹¹ https://www.climatebonds.net/files/reports/policy_taxonomy_briefing_conference.pdf

¹² <https://www.climatebonds.net/files/files/CBI-Taxonomy-Sep18.pdf>

significant capital needed for these environmental transitions, provided that the market is more inclusive and growing. (G20 Green Finance Study Group).

Green bonds can be issued in the form of different types of bond issues. Table 1 shows the green bond issues and a brief characteristic for each type.

Table 1. Categorization of green bonds

Type	Purpose of funding	Collateral security	Example
General obligation bond	Designed for green projects	The full income base of the issuer is used for collateral; the default credit rating is used.	The city of Johannesburg issued 143 million general bonds in June 2014. The issue is for 10 years and uses the city's standard credit BBB rating.
Revenue obligation bonds	Designed for green projects	The issuer's revenue streams, such as income from taxes and fees, are used to pay for the issue costs	Arizona State University issued revenue green bonds for USD 182.6 million in April 2015. The issue is secured by the university's revenue, including revenue from education fees.
Project bonds	They are issued for specific green projects	The collateral security is only the assets created by the project and the revenue from the project	There is still no example of such an issue
Securitized Bonds	Either designed for green projects, or directly in subordinate green projects	The collateral security is a group of financial assets	The central government of Hawaii issues a bond issue of USD 150 million in November 2014. The collateral security on the issue is charges from the operation of green infrastructure, including charges from electric bills.

Source: Adapted from Climate Bonds Initiatives

Benefits and disadvantages

Green bonds are characterized by a number of benefits for both investors and issuers. First of all, green bonds provide an additional source of investment finance. Considering the growing need for green projects, bonds are an appropriate financial

instrument. Against the backdrop of huge investment needs, traditional sources of debt financing will not be enough. There is a need to introduce new sources of funding that can use a wider investment base, including institutional investors such as pension funds, insurance companies and state investment funds. Developing infrastructure as an asset class will require a pipeline of sustainable infrastructure projects and a better understanding of their risk/return profiles. Achieving this will allow for an expansion of debt financing vehicles such as green bonds tied to sustainable infrastructure projects. For instance, green bonds backed by a suite of sustainable infrastructure projects diversify risk and can be tailored to meet the needs of institutional investors. This underlies the need to develop appropriate financing vehicles for institutional investors, particularly debt instruments such as bonds. Such instruments should also be of the same duration as the underlying infrastructure to avoid reinvestment risk (Bhattacharya, A. 2016, p.94).

On the second place, we can put the long-term character of green issues and the possibility to “match” the maturities to the nature of the projects. Compared to the loans provided by banks, green bonds’ maturity can last much longer, reaching more than 20 years in some places.

Next, under certain conditions, green bonds may have a more attractive price than standard bonds. In case of an increased investor interest and due to the targeted spending of the funds, the average coupon achieved can be attractive to prospective lenders.

The green bond market attracts investors committed to the cause of environmental protection, who often overwrite issues. For investors, financing in green bonds, due to the targeted spending of the funds, builds a sustainable positive reputation, and investors often take leadership positions in capital markets. This type of investment is seen as evidence of a sustainable investor strategy. In some countries, investors in green bonds benefit from tax deductions.

Funding and green bond issuance allows the diversification of the portfolio of both the issuer and investors.

Last but not least, thanks to green bonds, local authorities create and maintain a sustainable and green infrastructure in line with climate change.

Of course, along with the benefits, there are certain risks and obstacles to the development and rapid growth of the green bond market. The barriers to the implementation of green bonds in Central and Eastern Europe (CEE) are presented.

One of the main disadvantages of green bonds is considered to be the problem with the so-called labeling (determining whether the issue is really green or not). Practice shows that bond issues include those that are green, but are not

announced as green, and self-identified green issues, for which it is difficult to assess whether they certainly contain a green element. The transaction costs of acquiring a green label certificate, of studying the issuer's creditworthiness, the impact of the investment turns out to be an obstacle for issuers (small and medium-sized municipalities, as well as small and medium-sized enterprises from intensive carbon emissions).

A major reason for the development of green bond segments in CEE is the lower liquidity of capital markets and the undeveloped environment for issuing green bond issues compared to that of Europe's leading industrial and market economies. In this regard, the visit of experts from the Climate Bond Initiative, Global Fund for Cities Development, Fonds Mondial pour le Développement des Villes and Kommuniinvest in the countries of Eastern Europe, including Bulgaria and Romania, in order to explore local capital markets and to familiarize local and central authorities with the benefits and good practices of funding investments in green and eco-infrastructure. Capital market financing is an alternative to providing additional resources on a market basis, as in these countries there is a strong dependence of local authorities on EU grants. Another obstacle to green bond financing in Eastern Europe is the low creditworthiness of local authorities. Therefore, as an alternative to development of the capital market, it is proposed to create a Pooled financing mechanism.¹³

Another disadvantage for market development is determined to be the lack of uniform standards. As we have already pointed out, due to the importance of green infrastructure and the lack of sufficient funding, the European Commission has set itself the target to have unified standards for green financial instruments by the end of 2019. This will lead to mitigation of risks such as loss of reputation if the essence of the green bond is disputed and limited opportunities for lawful implementation of green integrity etc.

¹³ PFMs can be constructed in many different ways. As a first step a group of cities can coordinate their borrowing activities and exchange best practises. This can include using similar procurement processes in relation to banks and other creditors. There are cases when neighbouring local authorities have agreed on a joint head of finance to further coordinate the financial questions. PFMs can be constructed in many different ways. As a first step, a group of cities can coordinate their lending activities and share best practices. This may include the use of similar procurement procedures for banks and other creditors. There are cases where neighbouring local authorities have agreed on a joint finance manager to further coordinate financial matters. For more information, see: Andresson L. [online] <https://www.maproductions.se/wpcontent/2015/03/What-the-World-Needs-Now%E2%80%A6-is-Local-Infrastructure-Investments-Challenges-and-Solutions-with-a-Focus-on-Finance.pdf> [accessed 26.03.2019]

Additional barriers to market development are the lack of bankable green projects. The public sector needs to develop a set of public investment projects that generate future revenue and ones for the benefit of society.

Last but not least, the problem of using green bond issues may be the low creditworthiness of the municipalities. The way to achieve good creditworthiness goes through good financial management, including the implementation of fully functional budgeting, accounting, reporting and auditing practices. There should also be prerequisites for a good planning of future revenue not only from own sources but also from transfers received from the central government (Andersson M. L., Kalcheva D., 2018).

Green bonds as a fixed-income debt instrument attract institutional investors and they become an asset for diversification of the portfolio.

2. DEVELOPMENT OF THE GREEN BOND MARKET

Countering climate change is essential to preserving the well-being of humanity on the planet, as well as achieving sustainable and inclusive economic growth globally. In this regard, different funding approaches are used – grant financing, bank financing and capital market financing. In 2017, the value of climate bond issues to invest in low-carbon economy projects is worth USD 674 billion, the total amount of the issued debt reaches USD 900 billion¹⁴. Areas of investment with climate bonds in Europe are in transport (59%) and energy (21%). The debt in green bonds is USD 221 billion. Most of the climate bonds are in euro, dollars and Chinese yuan respectively in the transport, energy and eco-innovation sector. i.e. green bonds are denominated in internationally recognized convertible currencies other than that of the issuer's country, i.e. green bonds have the potential to become global and raise capital from international financial centers and markets.

Over the next 20 years, EUR 180 billion a year will be needed to meet the EU's "Europe 2030" targets to cover the needs of energy efficiency investments and to reduce harmful emissions in transport, the needs of those being bigger in Central and Eastern Europe.

The green bond market as a segment of the climate bond market originated in 2007-2008, and is associated with the first issues of the so-called Multilateral Development Banks. Over the period 2007-2012, sovereign sub-national agencies,

¹⁴ Green bond growth data is from reports of the Climate Bond Initiative
https://www.climatebonds.net/files/files/CBI-SotM_2017-Bonds&ClimateChange.pdf

municipal development funds, and institutions such as the World Bank, the International Monetary Fund, the European Investment Bank are gradually being included in the green bonds market. With growing market appetite, diversification of issuers and investors is increasing. In 2013-2014 the involvement of the private sector in the issuance of bonds labeled as climate increases. Green bond issues reached USD 165.5 billion in 2017¹⁵ In Europe, 145 companies have issued green bonds, which is one third of the world's total. The issuers are 48 companies in the energy sector, 35 financial institutions, 23 real estate companies, 17 local authorities, capital markets on which green bonds are actively traded are the United Kingdom, Germany and France. About 70% of the green bonds issues in Europe have a term of ten years or less: 28% have a term up to 5 years and 41% between 5 and 10 years. – debt (5-10 years to limitless). By contrast, financial institutions have mostly issued bonds with a shorter term (up to 5 years). Worldwide, top markets for 2018 to issue green bonds are USA with USD 34 billion (20% market share), China with USD 31 billion (18% market share), France with USD 14 billion (8% market share), Germany with USD 7.6 billion (5% market share), the Netherlands with USD 7.6 billion (4% market share).¹⁶

A major factor in accelerating the dynamics of green bonds issuance is that businesses are treating investment as “social and environmental value rather than as a financial asset”. (Schoenmaker 2017)¹⁷. Investors in carbon intensive sectors are aware of the need to apply technologies to limit climate change and protect the environment and nature from harmful emissions.

In order to achieve the efficiency and liquidity of investments to reduce harmful carbon emissions and build assets to adapt to climate change, structured finance instruments are created, i.e. Securitised Green Bonds (ABS). The issuance of securitized bonds occupies 6% of the securities market. According to the The Organization for Economic Cooperation and Development (OECD) annual issuance of securitized green bonds could reach EUR 280-380 billion by 2035¹⁸.

¹⁵ Bloomberg

¹⁶ GREEN BONDS THE STATE OF THE MARKET 2018 CBI https://www.climatebonds.net/files/reports/cbi_gbm_final_032019_web_0.pdf

¹⁷ Schoenmaker, D. 2017. Investing for the Common Good: A Sustainable Finance Framework. BRUEGEL. <http://bruegel.org/2017/07/investing-for-the-common-good-a-sustainable-finance-framework/>

¹⁸ https://www.climatebonds.net/files/reports/cbi_gbm_final_032019_web_0.pdf

The securitization can be defined as the creation of a synthetic product¹⁹ secured by cash flows (loans, leasing of electric cars, renewable energy sources used in low-carbon industries, green infrastructure and green systems). An advantage of securitization is its multiplier effect due to the release of capital for creditors, which can be used for green projects and credits for existing assets. Securitization is suitable for debt financing, as it transforms a set of illiquid assets into marketable financial instruments.

Gradually, this type of debt instrument is becoming popular in North America and in the Pacific. From the newly emerging financial markets after 2016 the Chinese market has gained ground as the largest, the green bond issue is 70% of the issues of newly emerging financial markets for 2018.²⁰

In Europe, the market is steadily developing, with the most significant increase in issues being reported in 2015 and in 2018. The green bonds market in Europe is most successful in France, the Netherlands and Sweden. A key prerequisite for this is the substantial financial autonomy of local authorities and the high creditworthiness. In two of the countries, the Pool Financing Mechanism has been successfully implemented, which in turn implies the attraction of a larger number of issuers among municipalities.

Pool Financing Mechanism operates in different forms, but the most characteristic of Western Europe is the so-called Local Government Funding Agency²¹. Based on the so-called Club deal local authorities unite in the Agency and "go out" on the capital market, issuing municipal bond issues. The agency provides a guarantee to investors. The guarantee is used as collateral if the local authorities fail to repay their debt. The creation of such an institution could extend access to low interest loans for local authorities. The state and all the municipalities that want to can participate in the construction and ownership of the agency. By issuing bond issues, substantial funds can be provided to finance local authority's capital projects. Each municipality declares the financial means that are necessary and with which it would participate in the issuance of the bond issue.

From the studied practice, it was found that mainly the local authorities are involved as investors in the agency, and in rare cases with minimal state

¹⁹ CBI "Green Securitisation Unlocking finance for small-scale low carbon projects"
https://www.climatebonds.net/files/reports/green_securitisation_cbi_conference_final.pdf

²⁰ https://www.climatebonds.net/files/reports/cbi_gbm_final_032019_web_0.pdf

²¹ See more at <https://www.maproductions.se/wp-content/2015/03/Local-Government-Finance-in-Europe-Trends-to-Create-Local-Government-Funding-Agencies.pdf>

participation. Turnover capital for financing of municipalities is raised on the capital markets by issuing bond issues, including green bonds. In this case, the bondholder is the very company behind which all its shareholders are “standing” with all their income power. The unification of municipalities significantly increases the overall creditworthiness of local authorities and makes them a more reliable borrower.

With the funds received, municipalities can carry out various investment projects. In the case of the construction of investment sites, the reimbursement will not burden the municipal budget, but will be in line with the revenue generated by the newly built infrastructure. This instrument strengthens the creditworthiness of small and medium-sized municipalities that will have greater access to credit resources in a union. Sweden is one of the countries where the Agency for Local Government Financing is successfully used to develop the green bond market.

Poland issues green bonds worth EUR 2 billion for energy efficiency projects, and for the energy efficiency of residential buildings, the Lithuanian government issues sovereign green bonds. With regard to the issuance of green bonds, government structures and municipalities have a leading role with around 40% of the global green certificates issued and around 27% of corporate structures in the energy sector. Municipalities are among the major issuers of green bond issues related to carbon emissions reduction.

As we have already noted, green bonds finance a wide range of investments in the field of climate change and environmental protection. Figure 1 shows the distribution of green bonds in accordance with the objectives they serve worldwide.

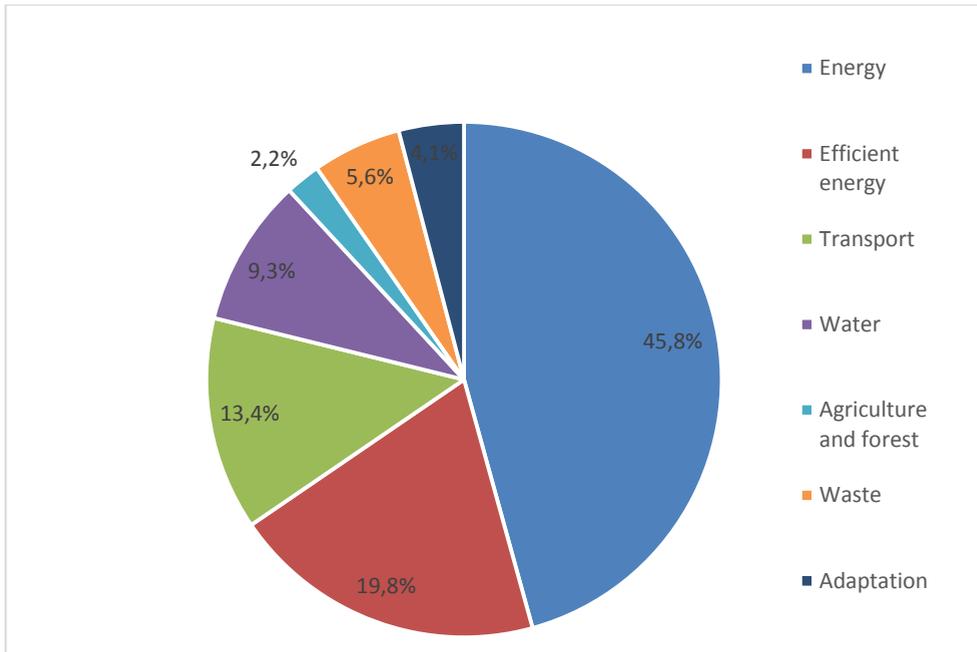


Figure 1. Target spending of green bond proceeds

Source: Presentation of Initiative Climate bonds, Green City Bonds, Web seminar: Pooled Green Bond Financing for Municipalities Webinar, 17th December 2018

The data presented in Figure 1 shows that funding for investment in the transport and water sectors, followed by energy efficiency and green buildings, is predominant. Municipalities finance environmentally-friendly and low-emission transport and energy efficiency of buildings.

A more substantial interest in this article is the development of the green bond market in Europe. Green bonds have begun to become popular in Europe since early 2010. Thanks to the Climate Bond Initiative, the benefits of this type of funding are spread among investors and issuers from Western European countries.

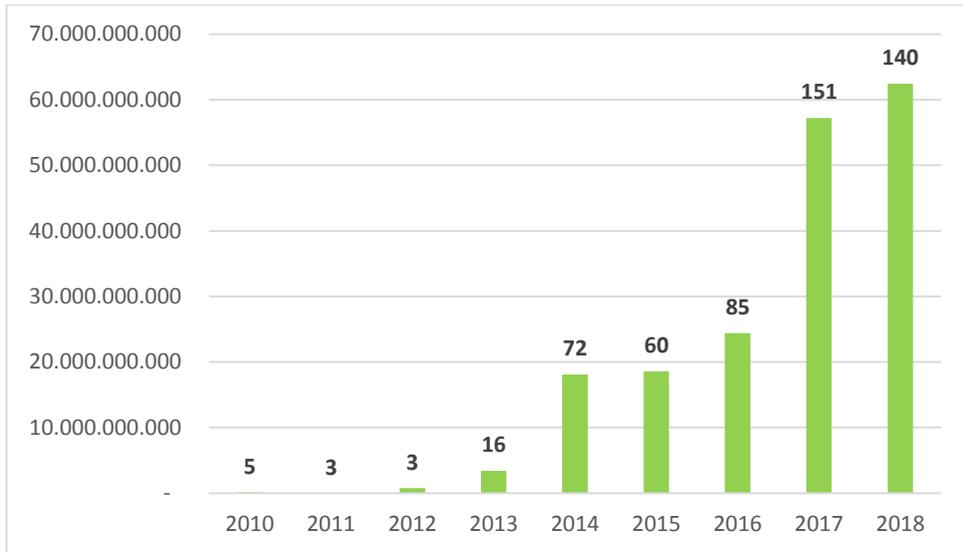


Figure 2. Green bond issues in Europe for 2010-2018
(total amount in US dollars and number)

Source: Climate Bond Initiative

In Europe, the first green bond issues were in 2010, they were issued in Norway, and the total amount was USD 150.7 million. Gradually over the years, both the total amount of emissions and the number and countries are rising. Towards the end of November 2018, over 20 countries (Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland and the United Kingdom) have issued green bond issues. The total value of the issues is USD 185 billion and covers a total of 535 issues. The green market reports the most significant development in the countries of France, the Netherlands and Sweden, 2016 and 2017 being considered two of the most successful years for the green bond market in these countries.

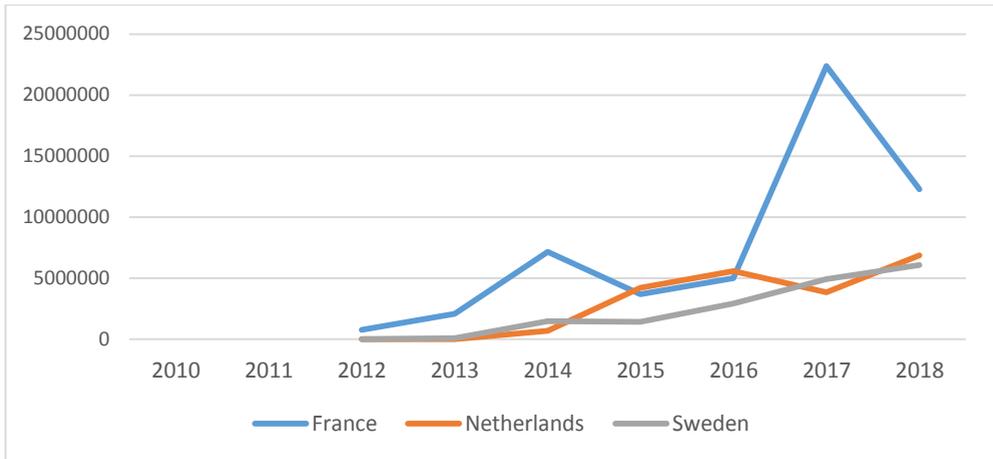


Figure 3. Countries with the most significant residual debt on green bond issues for the period 2010-2018 (in US dollars)

Source: Climate Bond Initiative

In Sweden, green bonds are used as a traditional source for financing municipal investment needs of environmentally-friendly investments. Typical examples of successful projects in Sweden are: financing of regional trains, construction of gas pipelines, construction of new neighborhoods with green buildings, rehabilitation and energy efficiency of schools, wind farms, renovation of water purification installations, etc.

In recent years, residual debt on green bond issues has been rising, which is evidence of successful market development and strong appetite from investors.

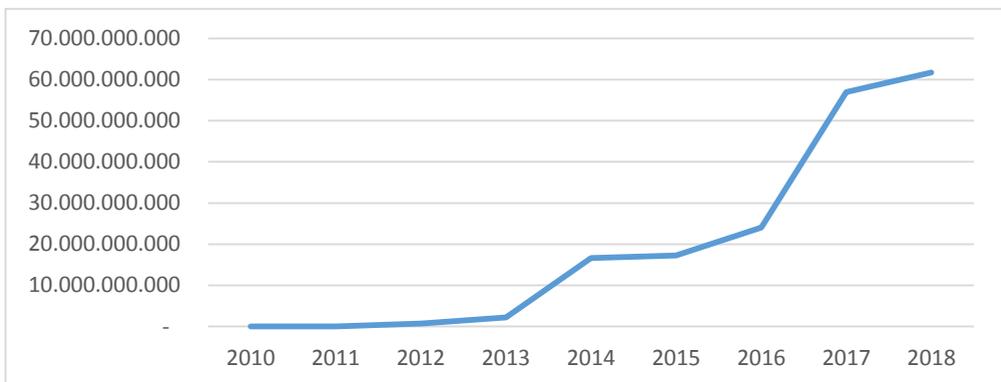


Figure 4. Residual debt of green bond issues for the period 2010 – November 2018 (in US Dollars)

Source: Climate Bond Initiative

Figure 4 shows the expansive development of the green bond market. In 2010, and 2011, the residual debt on green issues is zero, which means that the first issued green bonds are short-term, with a repayment term of only a few months. With the development of the market, the issue maturity also increases. In Sweden, for example, green bond issue maturity ranges between 3 and 25 years.

The Local Finance Agency Kommuninvest has a major role to play in the development of the green bond market in Sweden. The Agency combines the capital needs of almost all local governments in the country and therefore represents them on the capital market, including on the green bond market. The funding from green bonds in Sweden is mainly used for investments in green buildings (52%), renewable sources (33%) and investments in the water sector (13%) (Kommuninvest). Such a group financing practice (pool financing) has been successfully applied in Denmark, Norway, Finland, France and the Netherlands.

Structuring specialized agencies to finance local authorities is a good practice that aims to provide the necessary capital for targeted environmental and climate projects. A bond issue is large-scale investments. In general, local government funding agencies are financial institutions that provide access to the capital markets to municipalities, a group of municipalities and regional public entities. They also provide funding for small green projects and support investments in small municipalities that are not sufficiently creditworthy. It should be noted, however, that many green projects are carried out by small and medium-sized municipalities, especially in rural and less-developed areas with low creditworthiness. Green bonds are a good debt instrument but are better suited to large-scale projects, so setting up a financing agency can provide interest in investing and be a good management approach to investing in smaller projects.

3. CLIMATE CHANGE IN BULGARIA.

THE NEED FOR GREEN BONDS IN BULGARIA AND ROMANIA

Over the last decades the frequency of extreme meteorological and climatic phenomena in Bulgaria has increased. For example, the frequency of thunderstorms and hailstorms has increased in recent years, compared to the period 1961-1990. Bulgaria is located in one of the regions that are particularly vulnerable to climate change (temperature rise and intense rainfall).

The Climate Change Researches of the National Institute of Meteorology and Hydrology at the Bulgarian Academy of Sciences (NIMH-BAS) envisages an increase in the annual air temperature in Bulgaria from 0.7° C to 1.8° C by 2020.

Higher temperatures are expected in 2050 and 2080, with predicted increases between 1.6° C and 3.1° C and between 2.9° C and 4.1° C respectively²². According to estimates by the European Environment Agency for the period 1980-2013, economic losses from adverse climatic events for Bulgaria amount to EUR 1.2 billion (value of the euro in 2013), the average economic loss of EUR 150 per capita. According to the World Bank's assessment of the macroeconomic dynamics for Bulgaria, in case of unapplied actions to adapt to climate change, cumulative loss of growth of gross domestic product by 2050 is between 1% and 3.5%²³.

Coping with the climate impacts by the majority of Bulgarian municipalities is hampered by a shortage of financial resources. Therefore, private funding and capital market financing is important to cover the scarcity of investment for environmental protection and ecosystem balance.

Investments on a local level in Bulgaria and Romania are funded as a priority by European Union grants. Restricted own revenues and targeted grants leave a wide range of investment needs to local authorities without funding. Eurostat figures show that, after the end of the first programming period in Bulgaria and Romania, the share of public investment in GDP is down from 4.5% (2015) to 0.9% (2016) in Bulgaria, while in Romania there is a decline from 2.9 % (2015) to 1.3% (2017)²⁴. This data unambiguously shows the importance of European grants to both countries. European funding, however, has its own negatives – it does not cover all local authorities and does not cover the most necessary needs of municipalities. Substantial investment needs remain without the necessary funding. Bulgarian municipalities, regardless of the need to invest in green and eco projects, do not use debt financing due to low own revenues, substantial dependence on government subsidies, legislative constraints (the Public Finance Act limits annual debt payments to 15% of the average annual own revenue and the total equalization subsidy for the last three years). Adding the maximum maturity of loans traditionally approved by banks (10 years), small and medium-sized municipalities have access to relatively low investment credits. An increase in the credit ability can be sought through the discontinuation of the fiscal decentralization process and the expansion of the municipalities' revenue base.

²² National Report on the State and Protection of the Environment in Bulgaria, based on data from the National Institute of Meteorology and Hydrology, 2016.

²³ National Strategy and Action Plan for Adaptation to Climate Change, Annex 11: Macroeconomic Impacts of Climate Change – Analysis

²⁴ <https://ec.europa.eu/eurostat/data/database>

This, however, is related to structural reforms that require time. However, climate change issues are already on the agenda, and urgent alternatives need to be sought for dealing with them. One such alternative is to set up an agency for financing of local authorities and to combine such a structure with the development of the capital market and the green bonds market, not only in Bulgaria, but also in Central and Eastern Europe.

The creation of an Agency allows coverage of part of the identified investment gap in the climate and the environment sector. Another possibility is to use the potential of the Bulgarian Development Bank, which could provide adequate financing and private and public investment in low-carbon production and adaptable and climate-resilient technical infrastructure.

4. CONCLUSIONS

In conclusion, we can summarize that in recent years an innovative debt instrument – green bonds – has entered the capital market in Europe smoothly but steadily. The needs for environmental investments on a local and central level are indisputable, and so is the lack of sufficient funding. Debt financing with green bonds finds a broad application in mitigating the effects of climate change and less so in adaptation. As a specific instrument of capital markets, a higher satisfaction of investment needs is achieved and a sound basis for the transition to a more environmentally sustainable and low-carbon economy is laid. Green bonds are already a proven financial tool to implement climate change mitigation measures, mainly to finance low-carbon production and transport. Group funding through the creation of a specialized agency, based on the example of Sweden, the Netherlands, France and other countries, is an effective way of pooling financial resources and supporting local authorities to finance green infrastructure projects to protect ecosystems in combating climate change. This structural funding approach is suitable for municipalities that are not sufficiently creditworthy and facilitates their access to debt financing. When it comes to profitability, green bonds are close to conventional bonds, a driving factor for their development is the level of information and awareness of the need to limit and adapt to climate change on the part of investors and politicians and other stakeholders. The review of the application of green bonds in Europe has shown that countries with less liquid and developed capital markets do not apply this investment option yet. Experience shows that the state participates in the implementation of the funding as a guarantor of green bonds, and creates conditions (legislative and economic) for the issuance

of green bonds in order to achieve sustainable economic, social and environmental development. The importance of green bonds is also reinforced by the European Commission's initiative to issue uniform standards and regulations for green capital markets as well as Climate Bond Initiative and FMVD in Bulgaria and Romania.

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COMPETITIVE STRATEGIES IN HIGHER EDUCATION: SCALE DEVELOPMENT

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STEPHEN^{***}, KEHINDE, BUSOLA ELIZABETH^{****}

Abstract: *Leveraging on resource based-view theory, this paper shows strategies adopted in higher education to remain competitive. Using scale development method, 60 questionnaires as survey instrument was distributed and 58 respondents completed and returned. The result of socio-economic demographic variables, factor analysis and validity using the statistical packages for social science. Five dimensions were adopted: cost leadership strategy, service differentiation strategy, cost focus strategy, integration strategy and diversification strategy. The validity and reliability result as well as managerial implication, limitation and future research were discussed.*

Keywords: *Competitive strategies, Cost leadership, Focus strategy, Differentiation, Higher Education Institutions*

1. INTRODUCTION

Every organization strives to remain relevance in its industries or environment. Strategy is usually long term which is geared towards the efforts of the organization to remain competitive in line with Porter's generic strategies which involves cost leadership, differentiation, developing unique products or services for different customers and focus (Grant 2002). Competitive strategy ensures an increase profitability and sustainability in an organization over its competitors. Business organizations needs to identify its competitors and develop strategies to win its competitors. As stated by Harvard Business School Professor

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Porter on competitive advantage, “just because a company is the market leader now, does not mean it will be forever”. This is to say that a company must define its objective, goals and strategies to be relevant in business. It is the search for a favorable position in an industry; the fundamental arena in which competition occurs (Porter 1996). In recent times higher education has expected growth and competition among private universities have increased (Tam 2007). Covenant University being one of the leading private universities in Nigeria is the case study of this research. In this study the researcher focuses on various competitive strategies using Porter’s theory of competitive advantage.

As individuals find different or unique ways of achieving a personal goal so are organizations. Porter, (1996) states that competitive strategy is about being different. This involves choosing a different way of doing things to achieve a goal and add value to oneself or organization. The number of private universities in Nigeria is fast rising so is competition. Competition for relevance and survival serves as a guiding force for existence. Also, development and progress of civilization has made competition complex. However, the core competence of the organization is reflected in its commercial activities and the most competent is the winner having the large market share and leading in the industry. The organization is faced with uncertainty in its environment and needs to ensure that its resources and capabilities are enough to achieve its objectives (Podder and Gadhawe 2007).

Some researchers have carried out studies which focused on the conceptual model of research and the empirical was neglected. This constitutes to major in this research. Private universities are faced with the challenge of scarce resources, this has led to budgeting for additional fund to enhance scarce resources (Hardy 2004). As every business is faced with competition by competitors in the industry so is the environment of higher education and competition must be strategic to attract new students and maintain the existing ones (Maring et al, 2006). Having known that higher institution operates in a complex environment, it is important that the management of the institution to develop strategies that would enable its organization to compete and remain relevance in the industry.

A competitive strategy gives an organization a competitive advantage over its competitors and guarantees its sustainability in the market. In other words, a firm without an appropriate strategy risks its relevance and existence. Organizations need strategies to enable them to overcome the competitive nature of its environment (Mwenda 2007). Competitive strategy in higher institution gives the higher education to have edge over its counterparts. This present study focuses on the resource-based view theory to determinants of competitive strategy and advantage in Covenant

University. The resource-based view states that an organization can achieved competitiveness and remain relevance in its industry by delivering high quality goods or services innovatively. This theory focused on identifying strategically, resources and using those resources to achieve competitive advantage against an organization's rivalry (Barney 1991). Research carried out on competitive strategy has indicated the new entrant, the competition among rivalry and pressure from substitute products or service are factors that led to competitive strategies (Porter 1996, Carnillus 1997, Hutzchenreuter and Israel 2009).

The research-based view theory is centered on three major categories, namely; the human capital, financial capital, physical and organizational capital. These are very essential resources in the organization that drives organizations or institutions to achieve competitive advantage over its competitors in the industry (Barney, 1991). This study involves the significant of all these resources mentioned and how the institution has strategically remained competitive in terms of differentiating its cost and service delivery. In the study of competitive strategy, some research has shown that organizational structure and organizational resources and capabilities are important factors in organizational performance (Hutzschenreuter & Israel, 2009).

This study has contributed to the research-based theory in the sense that the institution has its unique capabilities and resources that shaped the foundation for its strategy. A firm's performance is based on its unique capabilities and resources than its structural characteristics in the industry (Barney 1991). However, management are interested in growth and sustainability which can be achieved through the competitive strategy adopted. In addition, research-based view theory was adopted to find out how Covenant University been one of the leading private university in Nigeria gained competitive advantage through innovative delivery of value for money services to its students and stakeholders.

The study is structured in into different parts. We would further propose that the resource-based view of an organization can also be best used in higher institution setting including summaries on the literature. In addition, we stated the measures of the concept, methodology which is based on qualitative and quantitative studies and our results. Lastly conclusion was drawn from our findings which will give directions for more detailed research in future.

2. CONCEPTUAL DEVELOPMENT

2.1 Resource base view theory of competitive strategy

The resource-based view focuses on how strategic organization identifies its resources and use their resources to develop a sustainable competitive advantage over its rivalry in the industry (Barney 1991). One cannot carry out a study in competitive strategy without mentioning Porter's competitive advantage as a strategy for an organization to remain relevance in its industry, which include cost leadership, market focus, differentiation, integration and diversification strategy. Firms including higher educational institutions must compete for the limited resources that are needed for its sustainability (Malburg 2000).

In this study, resource-based theory view on competitive strategy include the Porter's generic strategy also known as cost leadership (Malbury 2000). This strategy is said to focus on having competitive by giving the lowest cost in the industry (Porter, 1996; Cross 1999). An organization must have a large market share in other to have a large market share (Hyatt 2001). The various ways to achieve the cost leadership include economies of scale, technology, product or service design, access to raw materials, input cost, mass distribution and capacity utilization of resources (Malburg, 2000). Market focus is based on selection of market niche where clients have preference distinctively (Stone 1995)

Integration could be horizontal or vertical. Horizontal integration is for long term strategy which is focused on growth through the acquisition of firms in the same industry (Pearce & Robinson, 2000). However, vertical integration involves the expansion of the firm's services, products and other activities (Thompson, Strickland & Gamble, 2005). In service organization, product differentiation is a basic way of differentiating the organization's offer from its rivalry (Porter, 2001).

2.2 Competitive strategy

Strategic management deals with the analyses, decisions and cations taken by an organization to have and maintain competitive advantage over its rivalry (Dess, Lumpkin, & Eisner, 2008). However, it is important to note that competition is a complex phenomenon. Management of every organization make strategic decisions that provides an edge or advantage over competitor. Research has shown that the different literature on this subject matter. In higher institution, teachers' power influences the competitiveness in a meaningful way is influenced by teachers or the institution service providers (Mintberg & Rose, 2003). In addition,

the application of Porter's model requires the adaptations to enable usefulness in the construction of competitive strategies for higher institution (Michael, 2005).

Strategy is a firm's long-term plan to create a competitive advantage over its competitors (Pearce & Robinson, 2000). Strategy as stated by Ansoff & Mc Donnell (1990) is a set of decision creating rules for the guidance of organizational behavior. The uniqueness of a firm lies on its unique capabilities and resources (Barney 1991). The cost leadership includes having cost attached to products or services to penetrate the market. Differentiation strategies deals with giving services that differentiates an organization from its competitor. cost focus strategy involves creating a niche in the market (Porter 2001).

3. METHOD

This methodology section shows the process the researcher adopted in carrying out the research on competitive strategy in higher institution using Covenant University as the case study.

3.1 Item generation and content validity

3.1.1 Study 1

In this study, both qualitative and quantitative data were collected. Sixty (60) questionnaire was distributed and fifty-eight (58) was completed and returned. The population in which this research was carried out involved the students and staff of the university. In other words, primary data was used for this research is the distribution of questionnaire targeted population. A research population is referred to as the total collection of elements which a researcher uses to make gather information (Cooper & Schindler 2000). The respondents include the people with different personal data including education qualification and experiences. However, their responses were strictly confidential. The data gathered were properly examined making use of descriptive statistics known as mean and standard deviation. Part of the challenges the researcher encountered during the distribution of the survey instrument include some reluctant attitude on respondents.

The researcher distributed questionnaire to different respondents, thus, this method allows investigation and insight into complex problems. This method is usually required when undergoing study that requires major investigation. Questionnaire is highly valued in social sciences, especially studies in respect to education (Gulsecen & Kubat, 2006). There has been limitation in some research

methods which some scholars argued about lack of in-depth explanations of the subject matter. The use of quantitative and qualitative data has helped to explain the method and result of a phenomenon during investigation and analysis (Tellis, 1997). The questionnaires were administered to students and staff of the university, some were returned immediately while other were collected by the researcher from respondents later.

Qualitative collection of data is supported by interpretation. Collection of data requires detailed information as qualitative evidence are needed, however, there exist no difference and analysis (Cohen, Manion & Morrison, 2011). Qualitative data analysis usually results to more useful outcomes. It includes structing of raw data, organizing and writing them into graphs and tables. This enables the researcher the efforts for identification and comparison of data to base the study (Denscombe, 2010). Thematic analysis gives the chance of coding and categorizing data into themes, in addition, processed data can be classified in line with its relationship and variations (Miles & Huberman, 1994).

Respondents stated the cost leadership strategy they perceived the university adopted. Answers were also provided by respondents on the service differentiation strategy, cost focus strategy, integration strategy and diversification strategy. These respondents include both the senior and junior staff of the university and the post graduate student of the university. Respondents perceived that research and development capability are central to competitive advantage. Majority of the respondents agreed that the university offers wide range of differentiated supplementary services than its competitors such as sports centers, modern internet services as well as state of the art library. As shown below in table 1 which indicate the dimension to competitive strategy.

This stage focuses on item generation which involves scale as developed by Simon (2013) and Muiagi (2015). The questionnaire was divided into two sections which include the demography and different strategies the university may have adopted to remain relevance in its industry. Questionnaire is one of the methods used in research that allows respondents to answer questions provided. The Likert type of questionnaire ranging from SD – strongly agreed, A – agreed, U – undecided, SD – strongly disagree and D – disagree was the structure. The distribution of survey instrument was among the post graduate (PG) students which include MSc, MBA and PhD, and staff of covenant university.

Table 1 Dimension of competitive strategy

Competitive strategy dimension	Examples from the questionnaire
Cost leadership strategy	The university set its school fees slightly lower than that of other private universities.
Service differentiation strategy	The university committed to place students after graduation.
Cost focus strategy	The university unique services with more effective equipment maintenance and replacement policies.
Integration strategy	The university use horizontal integration (such as establishing other university to ease competition).
Diversification strategy	The university is into other businesses.

3.2 Item purification

3.2.1 Study 2

Data gotten from the population was obtained by the post graduate students and staff of the university. The study focused on the competitive strategies adopted by the university. Questionnaire was designed, printed and circulated to various respondents. The survey instrument size was 60 in number and 58 was returned while the remaining two was misplaced by some respondents. The 58-sample size returned were coded and validated. While the importance of using random sampling was to have enough size of extreme statistical strength (Suellen, Geoffery, Janet & Jilian, 2011).

The population includes both male and female between the age of 18 to 50 and above. The martial status of the respondents is single and married which include 63% and 36% respectively. The total of 27 males represented 46% and 31 females represented 53% participated in the study. 34% of respondents had BSc degree. 39% of respondents had MSc. 6% had MBA while 19% of the respondent had PhD. The respondents experience in the university, 53% had between 1 – 4yrs experience, 43% had between 5 – 10yrs experience while 3% had between 11 – 15yrs experience as shown in table 2.

Table 2 Socio- economic demographic variables.

INDICATOR	MALE (N=27)	FEMALE (N=31)	18-20 (N=21)	25-30 (N=19)	31-40 (N=10)	41-50 (N=7)	ABOVE 50 (N=1)
CLS	3.0556	3.1855	3.1905	3.1316	3.1750	3.0714	1.5000
SDC	3.9222	4.1778	4.0429	4.0760	3.9767	4.2286	3.7000
CFS	3.5309	3.7258	3.6667	3.6491	3.6667	3.4048	4.0000
IS	3.9630	3.9355	3.7619	4.1404	3.9333	4.0952	3.3333
DS	3.6420	3.9035	3.6667	3.8772	3.8000	3.9048	3.3333
TOTAL- $\sum f/\text{No. of indicators}$	3.62274	3.78562	3.66574	3.77486	3.71034	3.74096	3.17332

INDICATORS	SINGLE (N=37)	MARRIED (N=21)	DIVORCED (N=0)	BSC (N=20)	MSC (N=23)	MBA (N=4)	PHD (N=11)	1- 4 Y R S (N=31)	5- 10 Y RS (N=25)
CLS	3.0878	3.1905	-	3.0500	3.2500	2.6875	3.1591	2.8790	3.4800
SDC	4.0282	4.1127	-	3.8483	4.3193	3.7500	4.0091	3.9778	4.1680
CFS	3.5946	3.7063	-	3.3000	3.9058	3.9167	3.5758	3.5161	3.8733
IS	3.9550	3.9365	-	3.8333	4.0000	3.9167	4.0606	3.8172	4.0533
DS	3.7658	3.8095	-	3.7500	3.7971	4.0833	3.6970	3.6559	3.9867
TOTAL- $\sum f/\text{No. of indicators}$	3.68628	3.7511	0	3.55632	3.85444	3.67084	3.70032	3.5692	3.91226

INDICATOR	11-15YRS (N=2)	16-20YRS (N=0)	ABOVE 21YRS (N=0)	CBSS (N=31)	CST (N=16)	COE (N=10)	OTHERS (N=1)
CLS	2.5000	-	-	2.9194	3.3906	3.3000	3.5000
SDC	3.9500	-	-	4.0885	4.1042	3.9700	3.3000
CFS	2.5000	-	-	3.6613	3.6667	3.6000	2.6667
IS	4.6667	-	-	4.0430	3.8333	3.8667	3.6667
DS	3.1667	-	-	3.8925	3.6667	3.6667	3.3333
TOTAL- $\sum f/\text{No. of indicators}$	3.35668	0	0	3.72094	3.7323	3.68068	3.29334

4. DATA ANALYSIS

4.1 Item reduction and exploratory factor analysis

To confirm the validity of competitive strategy scale, a sequence of exploratory and confirmatory analysis was conducted (Bearden, Hardesty & Rose, 2001). All the survey instruments were properly checked to identify and test for violation of the hypothesis of multivariate analysis. The data was computed using

the Statistical Package for the Social Sciences (SPSS version 25) including the principle exploratory factor analysis (EFA). Scale analyses was computed and the Kaiser-Meyer-Olkin shown appropriately.

The exploratory factor was developed which the researcher used main component analysis and obli-min rotation as there was need to suggest the existence of interrelated dimension. However, the Kaiser-Meyer-Olki Measure of sampling Adequacy was 0.696 indicating that factor analysis was appropriate. Second process was deployed to disregard low loading and high cross items (Hair et al., 2006) which brought about the retention of 23 items as shown in table 3. The last factor analysis includes five components with eigenvalues more than one, that together showed 67% of the total variance.

The first-dimension deals with the cost leadership strategy (CLS) which focuses on how the university set its fees to remain competitive in its industry. The second factor includes service differentiation (SD) strategy which examines wide range of differentiated service the university offers. The third dimension states the cost focus strategy (CFS), the fourth deals with integration strategy (IS) while the fifth dimension examines the diversification strategy (DS) the university adopt. In addition, Cronbach's alpha for the five dimensions were 0.761, 0.710, 0.595, 0.426 and 0.099 respectively. Cost leadership and service differentiation strategies were above the 0.70 limit endorsed (Hair et al., 2006) indicating the five dimensions are unpredictable.

Table 3 Factor analysis

Scale items	Factor loadings
<i>Cost leadership strategy (CLS)</i>	
Item 7 The university set its school fees slightly lower than that of other private universities. (CLS)	0.473
Item8 The university cost minimization is more Important than high quality services. (CLS)	0.480
Item 10 The university's charges lower late registration fees than other private university. (CLS)	0.504
Item 11 The university concentrate on provision of unique program different from its competitors. (SD)	0.437
Item 12 The university differentiates its products/services on customer value proposition. (SD)	0.604
Item 13 The university offers a wide range of differentiated courses than its competitors. (SD)	0.541
Item 14 The university offers wide range of differentiated supplementary services than its competitors such as sports centers, modern internet services as well as state of the art library. (SD)	0.469
Item 15 The university committed to place students after graduation. (SD)	0.445

Scale items	Factor loadings
Item 17 The university has a peculiar way of monitoring her students. (SD)	0.524
Item 18 The university uses online registration for both new and existing students. (SD)	0.435
Item 19 The university is unique by publishing results before a new academic semester or session. (SD)	0.485
Item 20 The university offers e – learning. (SD)	0.490
Item 21 The university unique services with more effective equipment maintenance and replacement policies. (CFS)	0.604
Item 22 The university offers unique services and maintains competitive pricing. (CFS)	0.695
Item 23 The university concentrates on one key areas of expertise or service. (CFS)	0.451
Item 25 The university use horizontal integration (such as establishing other university to ease competition). (IS)	0.502
Item 27 The university use market development (such as opening new campuses in new cities within and outside the country. (DS)	0.277
Item 29 The university emphasis coordination amongst its different services/program. (DS)	0.461
<i>Service differentiation (SDC)</i>	
Item 16 The university is committed to ensure high discipline but freedom and responsibility. (SD)	0.474
Item 24 Use vertical integration (such as acquiring or establishing of high schools) (IS)	0.449
<i>Cost focus strategy (CFS)</i>	
Item 26 Research and development capability are central to competitive advantage (IS)	0.399
Item 28 The university is into other businesses. (DS)	0.516
<i>Integration strategy (IS)</i>	
Item 9 The university provides lower accommodation fees than other private university. (CLS)	0.482

Note: Initial classification of items: CLS = cost leadership strategy, SD= service differentiation, CFS = cost focus strategy, IS = integration strategy, DS = diversification strategy.

The factor analysis shows the cost leadership strategy (CLS) the university set its school fees slightly lower than other private universities. The (CLS) also indicated how the university provides lower accommodation fees than other private university. The university cost minimization is more Important than high quality services. Cronbach's alpha shows 0.761 which indicates that (CLS) exceeds the 0.70 limit endorsed.

The second factor which considers the service differentiation strategy (SD) from the survey instrument focuses on how the university differentiates its products/services on customer value proposition. The university offers wide range of differentiated supplementary services than its competitors such as sports centers,

modern internet services as well as state of the art library. However, the Cronbach's alpha shows 0.710 stating that service differentiation exceeds the 0.70 limit.

The third dimension considers the cost focus strategy (CFS) from the questionnaire, which allow the respondents to give opinion on how the university unique services with more effective equipment maintenance and replacement policies. The Cronbach's alpha shows 0.595 which is lower than the 0.70 limit endorsed. The fourth factor examines the integration strategy (IS) and the fifth dimension using Cronbach's alpha shows 0.426 and 0.099 respectively. These strategies were below the 0.70 limit endorsed.

4.2 Validity and Reliability

The validity and reliability result as shown in table 4 explains the relationship between the variables. The result of measuring a data or population is deemed reliable if one gets the outcome or result remains the same at all time (Ross, Hogaboam-Gray & Rolheiser, 2002).

The coefficient alpha was 0.60, 0.60 and 0.69 for variables under cost leadership dimension, 0.47 and 0.44 for variables under service differentiation dimension, 0.39 and 0.51 for variables under cost focus dimension while 0.48 for integration dimension. The outcome of the computation shows that inconsistency exist in each dimension as they are below the 0.7.

Table 4 Validity and reliability

Result of Validity and Reliability							
		Loading	Indicator	Error	Composite	Average	No. of
	Variables	> 0.7	Reliability	Variance	Reliability	< 0.5	Indicators
				< 0.5	> 0.8	< 0.5	
						0.4042	
Cost leadership strategy	Customer value	0.604	0.3648	0.6352	0.3648		1
	proposition	0.604	0.3648	0.6352	0.3648		1
	Unique services	0.695	0.4830	0.5170	0.4830		1
	Competitive pricing						
						0.2131	
Service Differentiation	High discipline	0.474	0.2247	0.7753	0.2247		1
	Vertical integration	0.449	0.2016	0.7984	0.2016		1

			Loading	Indicator	Error	Composite	Average	No. of
		Variables	> 0.7	Reliability	Variance	Reliability	< 0.5	Indicators
					< 0.5	> 0.8		
Cost Strategy	Focus	Research and development	0.399	0.1592	0.8408	0.1592	0.2127	1
		Other Businesses	0.516	0.2663	0.7337	0.2663		1
Integration Strategy		lower accommodation fees	0.482	0.2323	0.7677	0.2323	0.2323	1

All loadings are significant at $p < 0.0001$

5. DISCUSSION AND CONCLUSION

The research work creates numerous contributions to the theory and procedure using the multi-trait method and the scale development which is based on empirical validation. The research also lay its contributions to the resource-based view theory of competitive strategies, thus the study shown that the different literature on this subject matter. In higher institution, teachers' power influences the competitiveness in a meaningful way is influenced by teachers or the institution service providers (Mintberg & Rose, 2003).

Furthermore, the various ways to achieve the cost leadership include economies of scale, technology, product or service design, access to raw materials, input cost, mass distribution and capacity utilization of resources (Malburg, 2000). However, Covenant university being one the best universities in Nigeria has remained competitive and maintained relevance in its industry. The study shown that the university service differentiation strategy is peculiar and different from other private universities. The study carried out a detailed analysis of the survey instrument using the Statistical Package for the Social Sciences (SPSS version 25) including the principle exploratory factor analysis (EFA).

The questionnaire was structured and distributed to the population which includes the post graduate students and staff of the university. The *cost leadership strategy dimension* shows the how the university sets its school fees compare to other private universities. The *service differentiation dimension* shows how the university differentiates its products/services on customer value proposition, offer wide range of differentiated supplementary services than its competitors such as sports centers, modern internet services as well as the state-of-the-art library. The

cost focus strategy dimension reflects on the key areas of expertise or service. The *integration strategy dimension* reflects on the use of vertical integration (such as acquiring or establishing of high schools). The *diversification strategy dimension* reflects on whether the university is into other businesses.

The study shows that there are different strategies that an organization can adopt to remain relevant. These strategies would enable the university to achieve a competitive position in the higher institution industry. The findings were based on the respondent's answers to the questionnaires distributed, some people were reluctant to accept the questionnaire as they suggested their identity should not reflect. However, all information gotten was for research purposes and identity of respondents not required. A competitive strategy gives an organization a competitive advantage over its competitors and guarantees its sustainability in the market. In other words, a firm without an appropriate strategy risks its relevance and existence. Organizations need strategies to enable them to overcome the competitive nature of its environment (Mwenda 2007). Competitive strategy in higher institution gives the higher education to have edge over its counterparts.

6. MANAGERIAL IMPLICATION

Inclusive, the form of results shows the competitive strategies of a higher institution. The factor analysis scale includes twenty-three items that has five dimensions thus an appropriate method to evaluate an organization competitive strategy. This study shows that strategies are useful to an organization that desires to succeed and have competitive advantage over its competitors. The university and its management should maintain a competitive strategy that its competitors will find difficult to imitate. For instance, differentiation strategy goes a long way to show the university concentrate on provision of unique program different from its competitors. Further, the scale shows real significance as it will enable management to understand the best strategy to adopt.

7. LIMITATION AND FUTURE RESEARCH

From the findings of the study there exist few limitations. The survey instrument method used for the study was gotten from a source which may depend on respondent's point of view. The respondents were unwilling to answer the questions for fear revealing their identity by the researcher. However, the researcher assured respondents of treating all information strictly as confidential and for academic purposes. Secondly, the study was carried out putting into consideration

the post graduate and academic staff of the university not including the undergraduate and the non-academics staff. The questionnaire was not distributed to the office of the vice chancellor, registrar and dean of various colleges.

Finally, the research focused on covenant university, two or more private universities should be part of the future research to give room for more robust study. The limitations mentioned are recognized however, they have not affected the significance of the study, rather offer a foundation for future study. The researcher suggest that future study should investigate challenges that higher education face in adopting competitive strategies as these issues could hinder performance.

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MACROPRUDENTIAL POLICIES AND ECONOMIC GROWTH

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Abstract: *In this paper we assess the effectiveness of macroprudential policies in ensuring a sustainable contribution of the financial sector to economic growth. Our results sustain that macroprudential policies have beneficial effects on economic growth, expressed by the GDP per capita growth rate. Macroprudential policies, adopted to strengthen the resilience of the financial system and decrease the buildup of systemic risks, contribute to the economic growth by assuring a stable financial system, and, therefore, a healthier financial-macro relationship. Macroprudential policies that target financial institutions have greater impact on real economy compared with borrower-related macroprudential policies.*

Keywords: *macroprudential policies; economic growth.*

JEL Classification: *E58, G01, G21, G28, H81*

1. INTRODUCTION

The global financial crisis highlighted the thin line between financial sector and real economy, as financial sector distress transmitted rapidly to the real economy, generating large output losses²⁵. Originated in the U.S. subprime lending, the financial crisis became an economic crisis, with the greatest recession since the 1929-1933 crisis. The recent events highlighted the weaknesses of global economy (i.e. large current account deficits, lack of the regulation and supervision) and of the expansionary monetary policy conducted by central authorities for a long period. The low interest rates created vulnerabilities within the financial sector (i.e. excessive liquidity, excessive credit growth, increased risk-taking, increased asset

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²⁵ According to World Bank data, the global economy contracted by 2% in 2009, being the largest contraction in the last period – <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?page=4>

prices) that affected financial stability and increased systemic risks. Before crisis, central authorities were focused to achieve their primary objective of price stability, paying less attention to the effects of low interest rates on financial sector.

Financial developments affected real economy through several channels (Alpanda et al. 2014; BIS, 2011) and that countries with better regulations grow faster (Djankov et al., 2006). The increased prices of houses strengthened the borrowers' balance sheet by increasing their net worth, raising the collateral value and reducing their leverage (borrower balance-sheet channel). This allowed them to qualify for more and greater amounts of loans at lower costs. The housing market saturation in last quarter of 2006 and the increased interest rates by Fed to combat inflation rate, reduced the value of properties and increased the borrowers' loans costs. Due to the additional costs and the impossibility to refinance their credit or sell the property, borrowers began to default on their mortgages. This channel reduces borrowers' wealth and their consumption. The bank balance-sheet channel supposes that better-capitalized banks attract funds at cheaper rates, allowing them to lend to households and businesses at reduced rates. During the recent financial crisis, banks had large leverage ratios, funding themselves on wholesale market at reduced costs due to the existence of excessive liquidity. Any solvency or liquidity problems would lead to increases in wholesale funding costs and to the dry up of short-term funding sources. In the summer of 2007, the increasing uncertainty among banks on interbank market regarding their solvency, as a results of their investments in complex financial instruments, conducted to a lack of liquidity that determined banks to liquidate assets and reduce their lending. This reflected into economy through less investments and reduced consumption. Another transmission channel refers to the risk-taking channel or liquidity. Due to the existence of excessive liquidity, the search for higher yields and the belief that the institution is too-big-to-fail, the market participants could engage in riskier activities, whose failure will be supported by contributors, reducing their income.

As monetary policy interest rate reached the zero lower bound in several regions, its influence on the financial and macroeconomic variables was limited. In this case, macroprudential policy should complement monetary policy in achieving macroeconomic and financial stability. The benefits of using both policies to address financial imbalances and price stability concerns are recognized in several papers (Bailliu et al. 2015; Kannan et al. 2012; Angelini et al. 2011). Kannan, et al. (2012) and Angelini et al. (2011) sustain that by introducing a macroprudential measure in the monetary policy reaction can improve macroeconomic stability during financial shocks. The ultimate goal of macroprudential policy is to assure

the financial system stability, by taking the necessary actions to increase the financial institutions' resilience to shocks and the continuation of credit supply. Therefore, by affecting the availability of credit, macroprudential policy could curb output growth, influencing the households' wealth and company's investments.

Our study seeks to establish the relationship between macroprudential policies and real economy. The importance of a healthier financial sector in assuring a sustainable economic growth is highlighted in various studies (Alpanda et al. 2014; Bailliu et al. 2015; ESRB, 2011), as problems from one sector are transmitted to the other through several channels. Our results sustain that macroprudential policies have beneficial effects on economic growth, expressed by the GDP per capita growth rate. On long-term, macroprudential policies adopted to reduce the occurrence of financial crises succeed in influencing, also, the real economy, by assuring a healthier financial-macro economy relationship. Macroprudential policies that target financial institutions have greater impact on real economy compared with borrower-related macroprudential policies. We contribute to the literature by establishing the relationship between a large set of globally adopted macroprudential policies and real economy and the wellbeing of a county's citizens. Further, we contribute in terms of countries included in our analysis, period and variables used to control this relationship.

The remainder of the paper is organized as follows: Section 2 summarizes the review of related literature. Section 3 presents the methodology. Section 4 describes the sample and data. Section 5 reports the empirical results. Section 6 concludes.

2. LITERATURE REVIEW

Macroprudential policy could generate benefits for the economy by reducing systemic risk in the form of lower probabilities of banking crises and output losses in the event of a crisis or could generate costs from an increase in the cost of intermediation, reducing the provision of credit to the economy (Behn et al. 2016; Arregui et al. 2013). The empirical studies provide evidence for the both sides of the story and it only remains to establish the net benefits. The literature offers evidence for a positive impact, improving the economic performance (Boar et al. 2017; Fender and Lewrick, 2016) while there are studies that sustain that these policies could harm economic growth (Sanchez and Rohn, 2016; Kim and Mehrotra, 2017).

Boar et al. (2017) found that the more macroprudential policies a country uses, the higher is the growth rate of its per capita GDP and the less volatile its GDP growth. This result is partially confirmed by the study of Kawata et al. (2013), sustaining that macroprudential policies dampen economic volatility, but at the cost of reducing average economic growth. Sanchez and Rohn (2016) studied the impact of the macroprudential policy index constructed by Cerutti et al. (2017, JFS) on GDP growth, concluding that the use of an additional macroprudential policy is associated with a reduction in the quarterly GDP growth by 0.1 percentage points.

The effects are influenced by the macroprudential instruments used and on how financial institutions meet the additional requirements. Behn et al. (2016) studied the effects of additional capital requirements, concluding that if the additional capital required is achieved by raising and investing equity capital, the GDP responds positively. Further, a resilient banking system, due to higher capitalization levels, reduce the probabilities of banking crises and increase the net benefits. In contrast, if the capital requirements are met through rising lending spread, the GDP growth ranges between -0.05 to -0.15% per annum (Slovik and Courneade, 2011). These results are confirmed by Angelini et al. (2015) sustaining that each percentage point increase in the capital ratios reflects into a 0.09% loss in the long-term level of output, while liquidity requirements reduce output by 0.08%. There are also evidences of a negative impact of loan-to-value ratio caps on quarterly GDP growth, being associated with a reduction close to 0.5% (Sanchez and Rohn, 2016).

To sum up, the literature does not offer a conclusive response regarding the impact of macroprudential policy on real economy. The results depend on the macroprudential instruments adopted, bank's business model, country's level of financial development and openness, economy's cycle stage. For economies that are either very open or very financially developed, macroprudential policies tend to be less effective to sustain economic growth (Boar et al. 2017). Macroprudential policy is more effective during boom phase, tempering the economic cycle, while in normal times generate a cost in term of reduce average growth (Sanchez & Rohn, 2016).

3. METHODOLOGY

Using country-level data, we assess the effectiveness of macroprudential policies in assuring the long-term economic growth. We analyze the link between macroprudential policy and real economy using the following regression:

$$GDP\ cap\ growth_{j,t} = \beta_0 + \alpha \times GDP\ cap\ growth_{j,t-1} + \beta_1 \times Macroprudential\ Index_{j,t} + \Phi \times Banking\ system\ \&\ Macro\ controls_{j,t-1} + \varphi_i + \mu_j + v_t + \varepsilon_{ij,t} \quad (1)$$

The dependent variable is represented by *Annual growth rate of GDP per capita* from country *j* in year *t*. We used this variable, instead of GDP growth rate for example²⁶, to account for each country population’s level of prosperity and well-being. Boar et al. (2017) have used this variable in estimating the impact of monetary policy and macroprudential policy on economic development.

The macroprudential policy stance for our sample countries is reflected through a macroprudential policy index. We used the dataset collected by Cerutti et al. (2017) that covers twelve macroprudential instruments. These instruments were coded as a simple binary coding for the period they were in place - from the date that they were introduced until the day they were discontinued. Based on these resulting codes, they constructed an overall macroprudential index (MPI) which is the sum of the scores on all 12 measures. The aggregate macroprudential policy index takes values between 0 and 12. We consider that by using this index in our analysis we will highlight the impact of macroprudential policy on real economy on long-term. Cerutti, Claessens, and Laeven (2017) divided the macroprudential policies into two main categories, based on the transmission mechanism: (1) borrower-related measures that seek to limit the demand for credit and (2) financial-institutions-related measures that constrain bank’s supply of credit (see Table 1). Borrower-related macroprudential policies influence the amount of credit placed into the economy, as well as the household wealth inequality as it is related to the increases in rents and in the value of land. Lower cost of credit associated to tighten LTV policies can increase wealth inequality (Carpantier et al., 2018).

Table 1 Macroprudential policy index

Category of macroprudential instruments	Components
-----------------------------------------	------------

²⁶ In non-reported robustness checks, we use the GDP growth rate and achieve similar results.

Category of macroprudential instruments	Components
Borrower-targeted instruments	Loan-to-Value Ratio Caps + Debt-to-Income Ratio
Financial institution-targeted instruments	Dynamic Loan-Loss Provisioning + General Countercyclical Capital Requirements + Leverage Ratio + Capital Surcharges on SIFIs + Limits on Interbank Exposures + Concentration Limits + Limits on Foreign Currency Loans + Foreign Currency and/or Countercyclical Reserve Requirements + Limits on Domestic Currency Loans + Levy/Tax on Financial Institutions
Macroprudential policy index	Borrower-targeted instruments + Financial institution-targeted instruments

To estimate the impact of macroprudential measures on GDP per capita growth we control for banking sector-specific and macroeconomic characteristics. Therefore, we add an indicator that accounts for the level of financial intermediation, banking competition, financial stability and, finally, as macroeconomic variables we employ the inflation rate and GDP per capita level. Variables are extracted from World Bank database and their definitions are detailed in Table 2.

Table 2. Description of variables

Variables	Definition	Level	Source
Dependent variables			
GDP per capita	GDP per capita growth rate	country-year	World Bank
Macroprudential policy measures			
<i>Borrower-Targeted Instruments</i>			
Loan-to-Value Ratio Caps	Restricts to LTV used as a strictly enforced cap on new loans, as opposed to a supervisory guideline or merely a determinant of risk weights.	country-year	Cerutti et al. (2017)
Debt-to-Income Ratio	Constrains household indebtedness by enforcing or encouraging a limit.	country-year	Cerutti et al. (2017)
<i>Financial Institution-Targeted Instruments</i>			
Time-Varying/Dynamic Loan-Loss	Requires banks to hold more loan-loss provisions during upturns.	country-year	Cerutti et al. (2017)

Variables	Definition	Level	Source
Provisioning			
General Countercyclical Capital Buffer/Requirement	Requires banks to hold more capital during upturns.	country-year	Cerutti et al. (2017)
Leverage Ratio	Limits banks from exceeding a fixed minimum leverage ratio.	country-year	Cerutti et al. (2017)
Capital Surcharges on SIFIs	Requires Systemically Important Financial Institutions to hold a higher capital level than other financial institutions.	country-year	Cerutti et al. (2017)
Limits on Interbank Exposures	Limits the fraction of liabilities held by the banking sector or by individual banks.	country-year	Cerutti et al. (2017)
Concentration Limits	Limits the fraction of assets held by a limited number of borrowers.	country-year	Cerutti et al. (2017)
Limits on Foreign Currency Loans	Reduces vulnerability to foreign-currency risks.	country-year	Cerutti et al. (2017)
Reserve Requirement Ratios	Limits credit growth; can also be targeted to limit foreign-currency credit growth.	country-year	Cerutti et al. (2017)
Limits on Domestic Currency Loans	Limits credit growth directly.	country-year	Cerutti et al. (2017)
Levy/Tax on Financial Institutions	Taxes revenues of financial institutions.	country-year	Cerutti et al. (2017)
Banking system and Macro controls			
Financial intermediation	Domestic credit to private sector/GDP	country-year	World Bank
Lerner index	Lerner index, a measure of market power in the banking market, which compares the output pricing and the marginal costs.	country-year	World Bank
Z-score	It captures the probability of default of a country's commercial banking system.	country-year	World Bank
Inflation	Inflation, consumer prices (annual %)	country-year	World Bank
GDP per capita	Natural logarithm of GDP per capita	country-year	World Bank

To address potential endogeneity issues between macroprudential policy and GDP per capita growth, we use as main estimation method System Generalized Method of Moments. We estimate Equation (1) using System GMM estimator developed by Arellano and Bover (1995). This method allows controlling for endogeneity bias by including lagged values of the regressors (Roodman 2006). Governance variables are considered endogenous, being instrumented with lagged differences from 1 to 2 in the levels equation. The other regressors are considered exogenous and are instrumented with their level. The validity of the instrumental variables set is tested using the Hansen J statistic, while the serial correlation between residuals is assessed using the Arellano–Bond test.

While we are aware that no estimation method could mitigate all the potential endogeneity problems, we used other related estimation methods as robustness assessment. First, we used *Panel-Corrected Standard Errors Method (PCSE)* that aim to mitigate spatial autocorrelation, contemporaneous correlation of errors across units and heteroscedasticity. Second, our regression specification was estimated using *Ordinary Least Square estimation method with country fixed effects (OLS FE)*, as the above estimation methods are related to OLS method²⁷.

4. DATA

1.1. Sample

In order to assess the effects of macroprudential policy on real economy we considered 61 countries from 2000 to 2015. We included countries from different areas of development located in Africa, Asia, Australia, Europe and America. Emerging countries have more experience with macroprudential policy, relying on these measures well before crisis to manage the important capital inflows, while advanced economies amplified their adoption when financial crisis manifested. Therefore, our sample allows us to draw a general conclusion regarding the effectiveness of macroprudential policy bringing together different experiences, a variety of instruments and different periods of implementation. For a general picture regarding the number of countries from these areas, please see Table 3.

²⁷ Ordinary Least Square (OLS) and Two-Stage Least Squares (2SLS) are special cases of linear GMM (Roodman, 2006); PCSE uses the parameters estimated by OLS (Bailey and Katz, 2011)

Table 3. The distribution of the number of countries and banks across analyzed areas

Area	No of Countries
America	9
Europe	25
Asia	22
Africa	4
Australia	1
Total	61
<i>Advanced</i>	28
<i>Emerging</i>	33

We analyzed the macroprudential instruments that were implemented during 2000-2015 period. This period consists of the pre-crisis period (2000-2007) that reflects the financial and economic situation before the actual adoption of macroprudential policies in various advanced countries, crisis period (2008-2011) reflecting the period when the majority of analyzed countries started or intensified the adoption of macroprudential policies and post-crisis period (2012-2015) that highlights the effects of the implemented macroprudential policies.

1.2. Real economy activity

Financial crisis generated important costs in terms of lost output and high unemployment rates. According to Ollivaud and Turner (2014) the median loss in potential output for 19 OECD countries that experienced a banking crisis over the period 2007-2011 is estimated to be 5.5 percentage points. Countries from European Union suffered more than the USA, as euro zone countries had higher levels of leverage and the expansion of credit was larger than in the USA (Gros & Alcidi, 2010). Based on World Bank data, the European Union economy contracted in 2009 with 4.36 percentage points, while the United States' economy contracted with 2.78 percentage points.

We proxied the real economy activity with the *Annual growth rate of GDP per capita*. We used this variable, instead of GDP growth rate for example²⁸, to

²⁸ In non-reported robustness checks, we use the GDP growth rate and achieve similar results.

account for each country population's level of prosperity and well-being. Boar et al. (2017) have used this variable in estimating the impact of monetary policy and macroprudential policy on economic development.

At the global level, the average GDP per capita growth rate for the 2000 – 2015 period was 1.65 percentage points, with negative values during 2009 (-2.93%). Before crisis, the highest growth rate was registered in 2004 (3.16%), while after the crisis the highest value was of only 1.97% achieved in 2011. This shows that the global economy, even if it started to recover, did not reach the pre-crisis development level.

1.3. Macroprudential policy

We used the dataset collected by Cerutti et al. (2017) that covers twelve macroprudential instruments. These instruments were coded as a simple binary coding for the period they were in place - from the date that they were introduced until the day they were discontinued (if this happened during our sample period). Based on these resulting codes, they constructed an overall macroprudential index (MPI) which is the sum of the scores on all 12 measures. The aggregate macroprudential policy index takes values between 0 and 12. We consider that by using this index in our analysis we will highlight the impact of macroprudential policy on real economy on long-term.

Cerutti et al. (2017) divided the macroprudential policies into two main categories, based on the transmission mechanism: (1) borrower-related measures that seek to limit the demand for credit and (2) financial-institutions-related measures that constrain bank's supply of credit (please see Table 1). Borrower-related macroprudential policies influence the amount of credit placed into the economy, as well as the household wealth inequality as it is related to the increases in rents and in the value of land. Lower cost of credit associated to tighten LTV policies can increase wealth inequality (Carpantier et al. 2018).

Financial-institutions-related measures target bank's balance sheet influencing the supply of credit to economy. The build-up of additional capital may contain excessively fast credit growth by increasing the cost of granting new loans. In times of financial stress, these resources can be released to avoid a credit crunch and to absorb bank losses. Higher-capitalized banks and banks with higher credit provisions reduce the probabilities of banking crises and increase the net benefits to the real economy.

1.4. Macroeconomic and banking sector-specific variables

To estimate the impact of macroprudential measures on GDP per capita growth we control for banking sector-specific and macroeconomic characteristics. Therefore, we add an indicator that accounts for the level of financial intermediation (Domestic credit to private sector/GDP), banking competition (Lerner index), financial stability (Z-score) and, finally, as macroeconomic variables we employ the inflation rate and GDP per capita level. Variables are extracted from World Bank database and their definitions are detailed in Table 1.

Financial intermediation reflects the process where banks mobilize financial resources and allocate them optimally for investment purposes. A high degree of financial intermediation indicates the existence of a well-functioning financial sector, with credits allocated to profitable investments and increased output levels. The influence of the degree of financial intermediation is greater seen in countries with bank-centered financial systems. The literature offers different opinions regarding the impact of banking competition (Lerner index) on bank's credit supply. Caggiano and Calice (2016) sustain that more competition can reduce the cost of finance and increase the availability of credit, ultimately contributing to stronger economic growth. On the other hand, greater banking competition can make it less attractive for banks to invest in the lending relationship (Chen, 2007).

Further, we control for the banking system stability, measured using Z-score indicator at the banking system level. We consider that stable banking systems have greater incentives to lend and to loosen credit standards, giving access to credit for a larger range of clients and improving their wealth. In addition, stable banking systems are better capitalized and more resilient to shocks allowing them to continue lending in periods of distress. Igan and Pinheiro (2011) concluded that sounder banks tend to grow faster during moderate-growth periods, while during booms credit growth becomes less dependent on banks' soundness.

As macroeconomic controls that influence the GDP per capita growth rate, we used the inflation rate, the GDP growth and GDP per capita level. Higher levels of inflation determine higher levels of nominal interest rates that can reduce the demand for banking loans and investments (Iwanicz-Drozdowska and Witkowski, 2016) or can influence the level of capital flows in an economy (Cerutti et al. 2017). We included GDP per capita accounts for the country's level of development.

5. RESULTS

Table 4 presents the results for the long-term impact of macroprudential policy on GDP per capita growth rate. Model 1 estimates the impact of all macroprudential policies adopted during 2000-2015, captured by the macroprudential index, while model 2 and 3 present the results for the borrower and financial institutions macroprudential policies. All models include sector specific and macro characteristics as control variables. Positive coefficients correspond to an increased GDP growth rate following the adoption of macroprudential instruments, while negative coefficients are associated with a reduction in the country's value of goods and services.

Table 4: The impact of macroprudential policies on real economy

Dependent variable: GDP per capita	(1) All policies	(2) Borrower- Targeted	(3) Financial institutions - Targeted
Macroprudential Index	0.0021*** (0.0006)		
Borrower-Targeted Instruments		-0.0021 (0.0020)	
Financial Institution-Targeted Instruments			0.0036*** (0.0007)
GDP per cap growth (-1)	0.1988 (0.4443)	0.1095 (0.4870)	0.1827 (0.4630)
Financial intermediation	-0.0139*** (0.0030)	-0.0138*** (0.0031)	-0.0142*** (0.0031)
Lerner index	0.0099** (0.0040)	0.0086* (0.0046)	0.0122*** (0.0043)
Z-score - banking system level	-0.0002 (0.0001)	-0.0003* (0.0002)	-0.0002 (0.0001)
Inflation consumer prices	-0.0003 (0.0213)	-0.0069 (0.0234)	-0.0021 (0.0207)
GDP per capita	-0.0425*** (0.0070)	-0.0329*** (0.0070)	-0.0435*** (0.0071)
No. observations	976	976	976

No. of countries	61	61	61
Hansen j statistic	1.3552	0.9724	1.2916
Hansen j statistic p-value	0.7161	0.8079	0.7311
Arellano–Bond test	-3.0197	-3.1336	-3.0652
Arellano–Bond test p-value	0.0025	0.0017	0.0022

As the ultimate goals of macroprudential interventions are to assure the resilience of the financial sector and to reduce the occurrence of financial crises, macroprudential policies should contribute to the economic activity positively. Therefore, a positive coefficient corresponds to a beneficial effect, while the negative ones with a harmful effect on long-term economic growth.

The results obtained confirm the beneficial effects of the overall macroprudential policies adopted by our sample countries, the coefficient being positive and statistically significant at 1 percent (Model 1). Additional macroprudential policies adopted improve one country population's wealth, due to the financial and economic development on a safer and solid ground (i.e. stricter rules, capitalized banks, lower non-performing loans, reduced risk-taking). Through the macroprudential policies adopted, central authorities improve the financial sector conditions, limiting the buildup of financial vulnerabilities, and ultimately reduce the occurrence of financial crises and economic losses. Macroprudential policy is essential in any economy to complement monetary policy as the business and financial cycles are not synchronized. Our results confirm the results obtained by Boar et al. (2017).

The macroprudential policies that target financial institutions (Model 3) are more effective than those that target borrowers. The positive and statistically significant coefficient (at 1%) confirms the importance of holding additional capital, provisions and reserves on long-term financial and macroeconomic stability. Better-capitalized banks and those with low liquidity risks absorb losses, permitting them to continue lending during difficult times. In addition, macroprudential policies limit bank's incentives to invest in risky assets and the systemic risk manifestation, eliminating the need to sustain the financial sector with public money.

Borrower-related macroprudential policies (Model 2) manifest a negative, but statistically insignificant impact on economic growth. By tightening LTV and DSTI ratios, potential clients have limited access to credit, reducing their demand

and limiting the asset prices rise. These measures maintain the borrower-balance sheet unchanged and further limit their consumption and wealth.

Turning to control variables, we note the importance of financial intermediation, banking competition and of the country's level of development, as the resulting coefficients are statistically significant. Financial intermediation and the level of economic development generates a reduction in GDP per capital growth rate. We can affirm that the financial resources were not optimally allocated, limiting the access to finance for potential profitable investments. The country's level of development generates a reduction in GDP per capita, as the higher level of development is, the lower the economic growth rate. Banking competition generates an increase in the GDP per capita, as competition reduces costs, increasing the access to credit for borrowers.

Table 5: Robustness tests

		OLS FE			Panel-corrected standard errors		
Dependent variable:	GDP	(1)	(2)	(3)	(1)	(2)	(3)
per capita	All policies	Borrower-Targeted	Financial institutions - Targeted	All policies	Borrower-Targeted	Financial institutions - Targeted	
Macprudential Index	0.0021*** (0.0006)			0.0021*** (0.0006)			
Borrower-Targeted Instruments		-0.0007 (0.0018)			-0.0007 (0.0016)		
Financial Institution-Targeted Instruments			0.0031*** (0.0007)			0.0032*** (0.0006)	
GDP per cap growth (-1)	1.1972*** (0.1251)	1.1835*** (0.1200)	1.1951*** (0.1232)	1.1941*** (0.0755)	1.1816*** (0.0753)	1.1905*** (0.0759)	
Financial intermediation	-0.0117*** (0.0025)	-0.0111*** (0.0024)	-0.0119*** (0.0025)	-0.0118*** (0.0018)	-0.0112*** (0.0018)	- (0.0018)	
Lerner index	0.0063 (0.0039)	0.0039 (0.0042)	0.0078* (0.0040)	0.0066 (0.0053)	0.0041 (0.0053)	0.0081 (0.0054)	
Z-score banking system level	0.0000 (0.0001)	0.0000 (0.0001)	0.0000 (0.0001)	0.0000 (0.0001)	0.0000 (0.0001)	0.0000 (0.0001)	
Inflation	0.0081	0.0047	0.0059	0.0082	0.0048	0.0060	

	OLS FE			Panel-corrected standard errors		
consumer prices	(0.0183)	(0.0196)	(0.0181)	(0.0139)	(0.0140)	(0.0139)
GDP per capita level	-0.0420***	-0.0332***	-0.0415***	-0.0421***	-0.0332***	-
Constant	0.3605***	0.2944***	0.3525***	(0.0048)	(0.0050)	0.0416***
	(0.0458)	(0.0447)	(0.0432)			(0.0045)
R-squared adj.	0.6828	0.6811	0.6836	0.6788	0.6788	0.6779
No. observations	976	976	976	976	976	976
No. of countries	61	61	61	61	61	61

We run several robustness checks in order to test our results (Table 5). Models 1 to 3 present the empirical coefficients corresponding to the macroprudential policies' impact on economic growth using OLS estimation method with country fixed effects, while Models 4 to 6 present the results for PCSE estimation method. Our results remain robust in all the specifications run, strengthening the importance to implement macroprudential policies, mainly financial institutions-targeted macroprudential policies to assure economic growth on long-term.

6. CONCLUSION

In this paper, we assess the effectiveness of macroprudential policies in assuring a sustainable economic growth. Our results sustain that macroprudential policies have beneficial effects on economic growth, expressed by the GDP per capita growth rate. On long-term, macroprudential policies adopted to reduce the occurrence of financial crises succeed in influencing, also, the real economy, by assuring a healthier financial-macro economy relationship. Macroprudential policies that target financial institutions have greater impact on real economy compared with borrower-related macroprudential policies.

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THE CONSUMER EXPLAINED FROM THE PERSPECTIVE OF THE EXTENDED SELF

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Abstract: *Although the extended self is a relatively new concept, over the years it has developed rapidly, being the subject of study of several marketing researches. Our possessions contribute to reflecting our identity, so it is very important to look at how people expand their self in relation to others and how possessions become part of themselves. We can not hope to understand the behavior of consumers without first gaining a certain understanding of the attention they give to their possessions. The main findings until now show that certain objects accelerate the interest of the consumer for the actual consumption, because the consumption helps define people about what they are. Our aim is to deepen this idea through a survey.*

Keywords: *consumer's possessions, extended self, inner self, outer self*

JEL Classification: *D11, D83, D91*

1. LITERATURE REVIEW

1.1 The Extended Self

The extended self concept was first painted when James et al. (James, W . et al, 1890: 291-292) claimed that a human being is not only body and mind, but is a sum of everything surrounding him: his home, his clothing, his family, his workplace as well as his friends or social status. Later Russel Belk (1988: 167), in his first research, states that our possessions contribute to reflecting our identity: “knowingly or unknowingly, intentionally or unintentionally, we regard our possessions as part of ourselves.”

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Belk's (1988) "Extended Self and Possessions" has solidified and accelerated the consumer's interest in certain objects, and in how consumption and acquisition help define people's sentiment as to who they are. By bringing together many parts of literature, he supports the thesis that consumers use key goods to expand and build their identity, strengthening their sense of self. The vast majority of the extended self categories include our body, the internal process, the ideas, the experiences, the persons, the places and the things that one feels attached to.

Although the concept of self can include almost everything we ever wanted to have and live through, a systematic list would include six components: our bodies, our values and character, our success and competence, our social roles, our traits, and finally, our possessions. All the components listed above are basic elements that help build the self, but their composition varies from one to another. We can think of the components of the self as the ingredients that are part of a unique recipe in which consumers mix these elements in different proportions to have their own recipe for themselves. Thus, for some consumers, values will not be at the center of their own, but personal success and achievement; for others maybe, neither their body nor their success, but the values they guide are an important component in itself.

The possessions that we have become closer to our self due to specific reasons. For example, objects that are purchased of our own volition are closer to ourselves and are of greater importance to us than other possessions, this is due to the investments we made in that product: money, energy, feelings. For example, a camera does not become "my camera" before buying it, before learning how it works, not before capturing with it moments that are representative of us.

Sartre (1943: 56) suggests that there are three primary ways through which we learn to look at our objects as parts of ourselves. The first way, in which we acquire or control an object for personal use. For example, only by learning the use of a first bike, manipulating a new computer system or driving a first car, these objects really become parts of the self.

The second way, in which you can easily assimilate an object by creating it. Whether the created object is a material one or a thought, its creator retains a fingerprint of the integral form of the identity of the product, because it is he who brought it to life, and this makes it part of himself.

The third way, where objects become part of ourselves by learning about them. If the known object is a person, a place or a thing, there is a desire to possess that object for the moment. Only when the object is known and there is a compatibility between your self and that passionate object and it is loaded with emotion, it becomes more than a simple object.

If possessions are seen as part of the self, it would mean that an unintentional loss of possessions should be seen as a loss or diminution of self. Goffman (1961:101) provides an in-depth review of deliberate evidence such as self-diminution in institutions such as mental hospitals, elderly homes, prisons, concentration camps, military camps, or boarding schools. One of the first steps in receiving new members in these institutions is to systematically deprive them of all personal belongings, including clothes, money and even names. All of these things are made especially for building a new standardized identity. Another example where non-voluntary loss of possessions can diminish the self is when possessions are lost accidentally or stolen.

Exploratory Research of the Extended Self

We have found that certain objects accelerate the consumer's interest in his current consumption, because the consumption and possession help define people in regards to what they are or who they are.

Research problem: The products or brands that are associated by possession to the extended self, are not known.

The purpose of this research is to identify product and brand associations (both self-directed as well as others) that consumers incorporate into their own. We want to identify these products and brands through a comparative analysis. This analysis was done between people who have worked in the last 6 months and those who have not worked in the past 6 months, both female and male, from the perspective of the extended self explained by the possession of products, with the emphasis on the brands used today, respectively ideal ones.

RESEARCH OBJECTIVES

Taking into account the aspects listed above, we have proposed the following:

O1: Identifying product and brand associations for the expanded self, according to the scale of Sivadas and Machleit. In line with the assertions in this scale, we have proposed the following secondary objectives:

O1.1: Identifying products and brands that help build the identity towards which the consumer tends.

O1.2: Identifying products and brands that help the consumer to bring the real self closer to the ideal one.

O1.3: Identifying products and brands that are part of the consumer's ideal self.

O1.4: Identifying products and brands that are part of the consumer's real self.

O1.5: Identifying products and brands that are embedded in the consumer's broader self.

O1.6: Identifying products and brands that help consumers reach the identity they want.

O2: Identifying products whose choice corresponds to the self, respectively the extended self.

O3: Identifying the brands whose choice corresponds to the self, respectively the extended self.

O4: Identifying current brands and ideals for each product category.

The method used in this exploratory study is the survey with the questionnaire as a tool. It is structured into two sections. The first section is composed of six statements, represented by the scale created by Sivadas and Machleit (1994), which measures what are the objects that are embodied in the expanded self of each person. These are predefined statements that have a free space that respondents have to fill out (both for products and brands). The second section of the questionnaire is using an interval scale that aims to identify products and brands that are self-orientated as well as products and brands oriented towards others.

The survey was split in two stages:

(a) Product Generation - At this stage, we selected 20 people in each category to be interviewed (5 female workers, 5 unemployed females, 5 male workers and 5 unemployed males) about 5 products they own and have used in the last week. These will be added to section b.

(b) The main survey - Selected subjects were investigated at this stage. They were contacted by e-mail, and were invited to participate in the second part of the research (the first being the one in which we collected socio-demographic information through a selection questionnaires). At this stage we met people who were to be questioned.

Following the first step, we collected the products the respondents claimed to possess and used in the last week. Only products that have a frequency of occurrence of at least 2 times were selected: Phone, Laptop, Perfume, Cigarettes, Toothpaste, Skin Foundation, Lipstick, Car, Rimel, Deodorant, Phone Headsets,

Face Cream, Laundry Detergent, Water, Shower Gel, Bread, Trouser, Shampoo, Body Oil.

The Sample: The sample consists of 146 students from the Faculty of Economics and Business Administration, "Alexandru Ioan Cuza" University, Iasi. The persons to be interviewed are enrolled in the third year of study. We chose as a sampling technique, a non-probabilistic technique, namely quota sampling. To select the people to be interviewed from each specialization, we built a selection questionnaire, which was distributed to the Facebook groups of each specialization. This questionnaire was applied for 10 days to allow all people in our target to complete. Through the structure of the questionnaire we aimed at identifying both female and male, who have / haven't had a job in the last 6 months and are enrolled in the third year at the Faculty of Economics and Business Administration.

RESEARCH RESULTS

As Aaker (1996: 15) said, consumption is really a "vehicle of self-expression". Each consumer tries to create his or hers own identity through the products they buy and use, this gives them a coherent sense of self, and helps them to define themselves. According to the goals that we have originally proposed, following the data processing and analysis we have reached the following results:

O1.1: Among the responses received from females we can see a dominance of beauty products, clothing, accessories, which symbolizes particular attention to this female side that every woman tries to cherish, a female side trying to be accounted for by all the clothing and care products listed in the table below. We can also see that products with a high incidence rate for females, both those who have had a job and those who have not had a job in the past 6 months are: perfume, laptop, phone.

Among men, the products with the highest frequency of occurrence are: the phone, the perfume, the sneakers. We have noticed that two of these products, as we have seen above, were also listed by the female gender as well, proving to be essential in building the identity of the target group of research.

O1.2: Among the responses received by the respondents are several categories (cosmetics, body care products, electronic devices, clothing and accessories). The most commonly mentioned product of the female side, considered to be the product that helps reduce the gap between the real and the ideal self, is the skin foundation. Products such as: phone, mascara, hair dye,

lipstick, face cream and makeup, are the ones to help the feminine real self get closer to the feminine ideal self.

The presence of cosmetic products in such responses may be due to the construction of the feminine self. A construction that, unlike that of the male counterpart, (according to the results in the table below) as a component of the self, it is oriented towards the body image. The most commonly mentioned men's products are laptop, telephone, cigarettes. These may also be correlated with the desire to achieve and fulfill of the masculine side, although we also have products that refer to body image as a component of the self (tie, shoe cream, jacket), moreover, this image formed in the mind of the consumer, that a neatly dressed person is directly equal to the image of a person who is accomplished and successful is one that tries to narrow the gap between what you are at a time and what you might be.

O1.3: Among responses received from respondents, we can see that the most common product listed as part of the ideal identity of the consumer, both for female and male (with and without work in the last 6 months) is: phone. This product is one of the possessions that each of us uses and I frequently hold it upon us, because we keep it around us all the time, we can confirm (based on the results above) that it has become an extension of our self, a part of our identity.

O1.4: The most common products listed by women as part of the real self were: the phone, the perfume, the headphones and the sunglasses, these are the products that are part of the real self of most of the people questioned. Products such as: shirt, swimsuit, jacket, purse, shoes were mentioned at a lower frequency. Even if they were mentioned only once, this does not mean that they are not part of the consumer's real self, but there are simply different segments of consumers with different products incorporated in themselves. Unlike females, males have a more secluded category of products that have a higher frequency and are incorporated into their real self, these are: phone, car, shirt, perfume, wallet.

O1.5: Among the responses received from the respondents, we noticed that the products that were listed by the respondents as part of their self are: the phone, with a number of 21 mentions made by women, both with and without place for work. And male people mentioned this product 20 times. Another product that is part of the expanded self of male consumer is: the car, with 19 appearances made by men.

O1.6: Following the responses received, both women and men mentioned the car as an important product in achieving the identity they want, having the

greatest number of appearances. Cigarettes and the phone were the following 2 products that they listed as important to them and for their coveted identity.

O2: Analyzing the **female respondents** who had a job in the last 6 months and women who did not have a job in the last 6 months, making a comparison, we noticed that when it comes to choosing products that are integrated into the self, respectively in the extended self, is slightly different from one product category to another. We have seen that the choice of care and beauty products is more self-oriented than others, as opposed to electronic devices, cars, and clothing that are other-oriented.



Chart 1. Extended self explained by possessions
(Unemployed women during the past 6 months)

We can say that the products that are used for the advantages they have (face cream, deodorant, toothpaste, etc.) are more common with self-orientation than those we purchase for their symbolic value (machine, clock, lipstick). We can see these in the charts 1 and 2.



Chart 2. Extended self explained by possessions
(Employed women during the past 6 months)

Analyzing the **male respondents** who have had a job in the last 6 months and those who have not had one in the last 6 months, we have been able to notice the clear difference between them in their product orientation. We can see this in the charts 3 and 4, below:



Chart 3. Extended self explained by possessions
(Unemployed men during the past 6 months)

People who have not worked for the past 6 months have said that they are more involved than others in choosing the products they own and use. Instead,

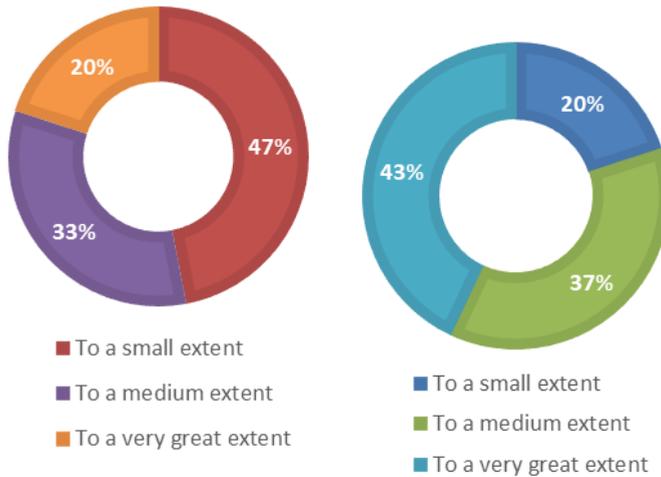
people who have had a job in the last 6 months have argued that in the decision making process of buying and using the products, the opinion of others is held in high regard.



Chart 4. Extended self explained by possessions
(Employed men during the past 6 months)

We also noticed that in both categories of people (with a job in the last 6 months and without a job in the last 6 months) there were products that were on the border between self-oriented and oriented towards others. The products most commonly found to be at the border of self-oriented are body care products, cleaning products and food, and the products on the border of the tendency to be oriented towards others, were clothing products, cars and electronic devices.

O3: Through this goal, we have come up with the intention to find out how much female consumers/ male consumers have contributed to the choice of the brand they are currently using for the product categories offered, and to what extent the people around them have contributed . We can see this in the graphs below:



Graph no 1. The extent to which others were involved in choosing the brand used for both women (left) and men (right)

O4: In order to analyze and centralize the results, we grouped all product categories into four broad categories, namely: beauty products and personal care (skin, mascara, lipstick, perfume, deodorant, face cream, shower gel, shampoo, toothpaste and body oil), electronic accessories (telephone, telephone headphones, laptop), clothing (trousers) and others (cigarette and car, detergent, water, bread). We can see that from each category mentioned above there are brands with which the consumer has a stronger relationship, these are:

- beauty and personal care products, the brands that earned the highest score are Sephora, Mac, Dove and Wash & Go.
- electronic accessories, the brands that have earned the highest score are: Apple, Samsung and Huawei.
- clothing products, brands with the highest score are Zara and H&M.

CONCLUSIONS

As a result of this research, we have noticed the products that consumers viewed as part of themselves. We have obtained a range of different products from one person to another, and in this way we have observed how different people are in building their own self, according to the products they have listed in the spaces they were supposed to complete. Both female and male consumers have mentioned in a high frequency that their mobile phone is a part of their self, which is essential for the identity of each person. Of great importance were also the clothing articles, which of course are used by respondents not only for their own attribution but have

been used as a means to make their own identity, to value what they are or what they try to become. There were also people who did not complete the statement that directly referred to the product and the brand that they consider part of their identity, this is due to the self-construction.

Choosing and using products allows consumers to define, maintain and improve both their own and social image, thus we saw that some products, such as personal care products (soap, toothpaste, shampoo, detergent) are products that women and men choose with a strong self-orientation. There have been products and brands where the identity of the respondents was clearly noticeable in their choice, such as clothing, car and electronic devices.

In the process of identifying the brands they are currently using, and the brands they aspire to, we have noticed that they have a strong relationship with some of the brands they are consuming in the moment of the research. We have concluded that most people have proved to be happy and fulfilled with the brands they are currently using, answering that the brands they are consuming now are their ideal brands, and if it were to be able to change it in the future with one another, would keep the one used at the moment.

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CASE STUDY



AN EXTENDED TECHNOLOGY ACCEPTANCE MODEL FOR MARKETING STRATEGIES IN SOCIAL MEDIA

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Abstract: *Social media is currently an evolving “wave” in online business marketing. Marketers are beginning to drive the use of social media as a component in their marketing strategy and campaigns to reach out to customers and fans. Within the subdisciplines of marketing that may use social media include promotions, marketing intelligence, sentiments research, public relations, marketing communications and product and customer management. This paper will try to find a conceptual model to examine people’s behavior, model based on the the Theory of Reason Action (TRA) and the Technology Acceptance Model (TAM).*

Keywords: *Social media, Social networks, Social influence, Technology acceptance model, perceived ease of use, perceived usefulness.*

JEL Classification: *M37, M31*

1. INTRODUCTION

The technology acceptance model [11, Davis, 1989] is one of the most widely used models of IT adoption. According to TAM model, IT adoption is influenced by two erceptions: usefulness and ease-of-use. acceptance. Since social network characteristics are group-level characteristics and the technology acceptance model (TAM) is grounded on an individual level, there is a need for a mediating variable that links group-level characteristics to individual-level characteristics. However, TAM focuses on the individual psychological level of technology acceptance, with less attention for the social context such as social networks that surround the user [38, Sykes et al., 2009]. As such, from an academic

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and practice perspective, little is known about the influence of these networks on the technology acceptance of individuals.

Prior research already indicated that social networks can influence technology acceptance [13, Eckhardt et al., 2009]. They do so, since social networks contain “a specific set of linkages among a defined set of persons, with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behavior of the persons involved” [20, Laumann et al., 1978]. In essence, TAM postulate that IT adoption is affected by prior use-related beliefs. TAM identified two such beliefs: perceived usefulness (PU) and perceived ease of use (PEOU) [41, Venkatesh, 2010]. Predicting the adoption and use of information technology has been a key interest since the early days of information systems research [7, Burton-Jones, 2005].

The main goal of technology acceptance theory is, to explore the factors that influence the adoption and diffusion of new technologies throughout a social system [5, Barnes, 2003]. Over the years, several independent theories for the acceptance as well as adoption of information technology have been developed. Most of these models apply to situations, in which individuals can voluntarily choose whether to adopt an innovation or not [15, Gallivan, 2001]. Perceived usefulness, perceived ease-of-use, and social influence appear to be promising variables for explaining behavior for the adoption of social media in different organization; however, more research is necessary to explicate the possible effect of social influence on perceived usefulness and perceived ease-of-use and how these variables may co-influence the usage of social media technologies [12, Demei et al., 2006]. Another issue to be taken into account is that companies behaviors and attitudes may be influenced differently when interacting in social media with customers, competitors, suppliers which one of them holding different roles.

LITERATURE REVIEW

1. Technology acceptance model

In recent years, a number of influential models investigating intentions to adopt technology have emerged. These models have their origins in the disciplines of psychology, information systems and sociology [46, Venkatesh, Morris, Davis, & Davis, 2003]. Among the best known of these is the Technology Acceptance Model (TAM) [11, Davis, Bagozzi, & Warshaw, 1989]. Based on the Theory of Reasoned Action (TRA) [14, Fishbein & Ajzen, 1975], the TAM has become well

established as a robust, powerful and parsimonious model for predicting employee acceptance in the information technology domain [43, Venkatesh & Davis, 2000].

TAM suggests that when users are presented with a new technology, different variables influence the decision whether and how they will use it. Two causal linkages influence this decision: perceived usefulness (PU) and perceived ease of use (PEOU) of the relevant technology [36, Stephan et al., 2010].

Perceived usefulness explains the user's perception to the extent that the technology will improve his/her work performance and perceived ease of use relates to the user's perception of the amount of effort required to utilize the system or the extent to which a user believes that using a particular technology will be effortless [11, Davis et al., 1989]. The model provides explanations of determinants of computer technology acceptance by tracing the impact of external factors on internal beliefs, intentions and attitudes [34, Rose et al., 2006].

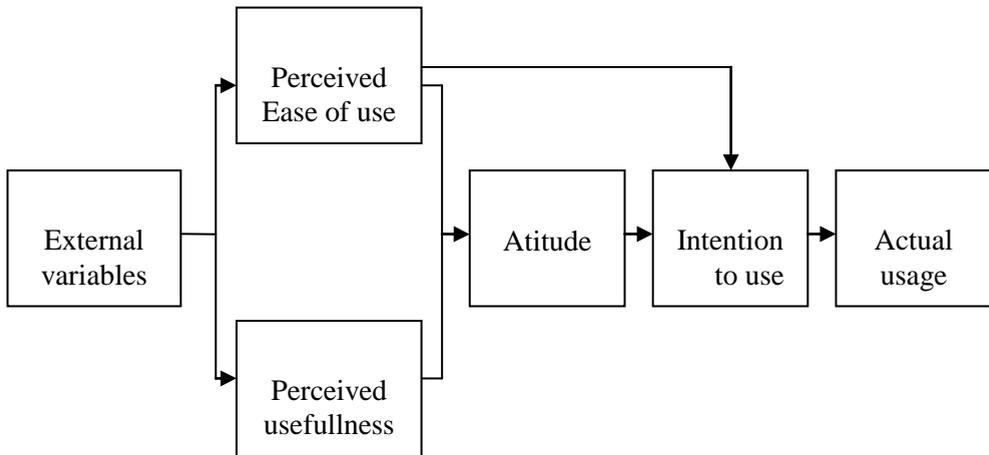


Figure 1 Original Technology Acceptance Model

The parsimony of TAM combined with its predictive power make it easy to apply to different situations [41, Venkatesh, 2010]. However, while parsimony is TAM's strength, it is also the model's key limitation. TAM is predictive but its generality does not provide sufficient understanding from the standpoint of providing system designers with the information necessary to create user acceptance for new systems [28, Mathieson, 1991]. Specifically, it is important to emphasize that although perceived ease of use has been employed extensively in user acceptance research in general and TAM research in particular, very little has been done to understand the determinants of perceived ease of use [41, Venkatesh, 2010].

Davis' more recent work acknowledges this potential limitation: "While being very powerful in helping us predict acceptance, one of the limitations of TAM is that it does not help understand and explain acceptance in ways that guide development beyond suggesting that system characteristics impact ease of use. This places a damper on our ability to meaningfully design interventions to foster acceptance. In order to be able to explain user acceptance and use, it is important to understand the antecedents of the key TAM constructs, perceived ease of use and usefulness" [44, Venkatesh and Davis, 1996]

The Technology Acceptance Model has been tested by numerous authors, including [1, Adams et al.,1992], [18, Hendrickson et al.,1993], [19, Igbaria et al.1997], [32, Riemenschneider et al.,2003], [37, Subramanian, 1994] [39, Szajna, 1994], [40, Taylor and Todd, 1995] or [9, Chin and Todd 1995]. In most of these studies, the TAM model was able to explain a reasonable amount of variance in the actual use of the technology [3, Alshare, 2004]. An up-to-date review of existing TAM studies and meta analyses can be found in [24, Ma and Liu, 2004] or [22, Legris et al., 2003]. Based on these studies, the original TAM model was extended by various authors to incorporate additional variables [33, Röcker, 2010], that may account for more variance in technology usage [3, Alshare et al., 2004].

The additional variables included perceived system performance [24, Ma and Liu, 2004], perceived user resources [27, Mathieson et al., 2001], prior experiences with similar technologies [2, Agarwal and Prasad, 1999] [40, Taylor and Todd, 1995], age and education [2, Agarwal and Prasad, 1999] as well as personal innovativeness [2, Agarwal, and Prasad, 1998]. Further extensions of the Technology Acceptance Model were done by [9, Chin and Todd, 1995], [35, Segars and Grover 1993], [42, Venkatesh, 2000], [43, Venkatesh and Davis, 2000], [45, Venkatesh and Morris, 2000] as well as [16, Gefen and Straub, 1997].

Perceived ease of use

According to the definitions of [11, Davis et al., 1989], PEOU refers to "the degree, to which the [...] user expects the target system to be free of effort", Understanding the determinants of perceived ease of use is further underscored by the two mechanisms by which it influences intention: (1) perceived ease of use has a direct effect on intention, and an indirect effect on intention via perceived usefulness, and (2) it is an initial hurdle that users have to overcome for acceptance, adoption, and usage of a system.

Perceived usefulness

PU describes the individual's "subjective probability, that using a specific application system, will increase his or her job performance within an organizational context" [11, Davis, 1989]. Researchers have used the constructs of perceived usefulness, perceived ease-of-use, to explain technology usage/acceptance for a variety of information systems. [29, Miller et al., 2003] conducted a study in an online class delivered by interactive modules, which was developed using Authorware [...]. They reported that perceived ease-of-use and perceived usefulness both have a significant and positive relationship with the amount of time students spent in the course [12, Demei et al., 2006].

Social influence

Social influence is defined as the perceived external pressure that individuals feel in the process of being informed about an innovation and decide to use it, and the degree in which an individual perceives that important others believe he or she should use the new system [14, Fishbein and Ajzen, 1975]. People tend to adjust their beliefs according to the group they are in. Individuals are also influenced by the majority: when a large portion of an individual's referent social group holds a particular attitude, it is likely that the individual will adopt it as well [4, Asch, 1951].

Previous studies have looked at the relationship between social ties and technology in areas such as exploitation of inter-organizational computer-mediated communication infrastructure [31, Pickering and King, 1995]; usefulness of electronic ties through broadcast messages [10, Constant et al., 1996]; and electronic media usage for information exchange [17, Haythornthwaite and Wellman, 1998]. However, so far a limited number of studies have been conducted on social influence and technology acceptance [21, Lee et al., 2003].

In the end I propose a conceptual model with the variables discussed above as a result of the revised theory and findings:

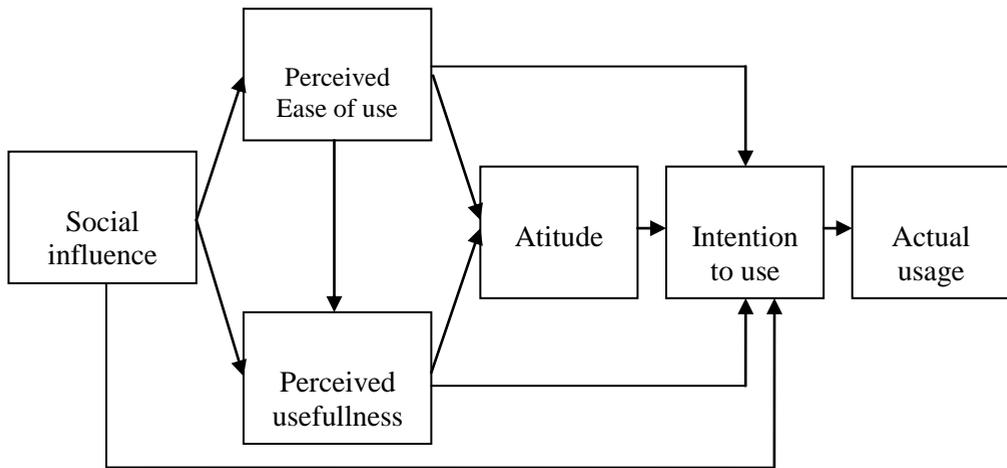


Figure 2 Proposed research model

FUTURE RESEARCH DESIGN

The general idea for this research is to deepen the knowledge concerning the relations between social media and companies. Alternatives had to be chosen, in order to answer the main purpose of the research being to “describe and explore how companies are interacting with customers using social media tools. The research study will have two phases. In the first phase, the results of a qualitative open-ended question survey will be conducted on over 100 community managers and it will be combined with literature and theory related to online social networking to create a comprehensive research model. In the study’s second phase, a survey instrument will be developed and tested, and data will be collected from over 200 community managers-respondents and it will be analyzed to test the proposed conceptual research model.

CONCLUSIONS

In this research-in-progress study, I propose a conceptual model to examine the factors affecting attitude, intention to use and continuance intention of social media services from companies perspectives. Organizations should consider putting in place general computer training programs that target increasing computer awareness, enhancing computer self-efficacy, and reducing computer anxiety among employees that interact with customers in online. One of the areas that has not been exploited in practice is the potential for intrinsic motivation to enhance

companies acceptance and usage. Much prior research [11, Davis et al., 1992], [25, Malone, 1981], [48, Webster and Martocchio, 1992], [47, Venkatesh and Speier, 1999] has found intrinsic motivation to be an important factor influencing acceptance and learning from individuals user perspective.

POSSIBLE LIMITATIONS

Since the proposed model includes the fundamentals of the TAM, it is worthwhile to address some opinions about the model as well. There has been a streamlet that focused on its limitations and their arguments can be valid for this model as well [6, Benbasat and Barki, 2007]. [23, Lucas and Spitler, 2000] argue that the model is not applicable on the whole range of technology possibilities. They concluded that TAM might not work in the case of a complex technology.

Another important aspect is the cultural dimension. Cultural background of individuals influence the decision-making process and therefore, also the process of adoption and use of information systems [30, Myers and Tan, 2002]. [16, Gefen and Straub, 1997] investigated the gender differences and concluded that it affects the IT adoption process as well. Beside this, the conceptual model needs to be empirical tested both on individuals and organizations especially here on community managers or community coordinators engaged in social media technologies.

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EARLY WARNING INDICATORS FOR MACROFINANCIAL ACTIVITY IN ROMANIA

NICU SPRINCEAN*

Abstract: *Overheating of economic and financial activities leads to macrofinancial imbalances that may disrupt financial stability, and can be detected by studying relevant indicators. In this study we developed an aggregate early warning index of macrofinancial activity for Romania over the 1998q1-2020q4 period, employing data from six categories: (i) macroeconomic risks, (ii) bank risks, (iii) activity of corporations and households, (iv) monetary and financial conditions, (v) risk appetite and (vi) external shocks. We determine the utility of these variables from two perspectives: (i) whether these indicators are able to detect overheating of macrofinancial activity in Romania in two periods characterized by systemic crises and (ii) whether these variables successfully minimize various statistical errors involved in forecasting future events. Comparing the evolution of our index with a series of indicators that measure investors' perception of macrofinancial stability or the probability of default of Romanian economy, we note the positive correlation between these two, but our index exhibits a more pronounced early warning component, making it extremely useful in anticipating future systemic crises.*

Keywords: *Early Warning Indicator; Systemic crisis; Macrofinancial vulnerabilities.*

JEL Classification: *G01; G21; G28*

Every disaster, financial or otherwise, is compounded out of initial displacements or shocks, structural characteristics of the system, and human error. The theory developed here argues that the structural characteristics of the financial system change during periods of prolonged expansion and economic boom and that these changes cumulate to decrease the stability of the system. Thus, after an expansion has been in progress for some time, an event that is not of unusual size or duration can trigger a sharp financial reaction.

(Minsky, 1972, pp. 1-2)

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1. INTRODUCTION

After the global financial crisis from 2007-2009, there has been a renewed interest, both from national and supranational supervisory authorities and researchers, to develop measures in order to monitor in real time and to keep under control macrofinancial imbalances that could disrupt financial stability. An essential step in this respect was realized by developing systemic risk

¹ indicators to quantify cross-sectional and temporal dimensions of systemic risk, and to implement macroprudential measures that are able to limit the systemic character of financial institutions and to reduce the vulnerability of financial system that amplify the shocks.² To this end, one should take into account the interaction between real economy and the financial sector since there could accumulate mismatches in balance sheet of entities (usually assets are long-term and liabilities short-term) – corporations, financial institutions, households, and the public sector (Ghosh, 2016). Indeed, during the crisis many countries experienced risk spillover from one segment of the economy to another, in many cases the vulnerabilities amplified to the point when they became systemic (Cervantes et al., 2014).

The aim of this study is to elaborate early warning indicators for Romania using relevant macroeconomic and financial variables. More precisely we develop an aggregate index of macrofinancial instability for the period 1998q1-2020q4³ employing data from Oxford Economics. Hence, based on data projected by Oxford Economics, our intention is to forecast the evolution of the index until 2020.⁴ The analysis starts in the first quarter of 1998 because the

¹ In general, a risk is defined as the possibility of loss. Freixas et al. (2014) define systemic risk as “the risk of threats to financial stability that impair the functioning of the financial system as a whole with significant adverse effects on the broader economy”. For other definitions and surveys, see De Bandt and Hartmann (2000) and Silva et al. (2017).

² Ghosh (2016) defines vulnerability as the susceptibility to loss coming from the exposure of the financial system to negative shock, internal conditions and risk management – the latter being the process that implies confronting the risk either ex-ante (preparing for shocks) or ex-post (mitigate negative effects). Adrian et al. (2015) point out that vulnerabilities include leverage, maturity transformation without support from the government, compressed pricing of risk (i.e., values of the assets that are higher with respect to fundamental values in accordance with historical standards), interconnectedness, and complexity. They group vulnerabilities in four categories: (i) banking sector, (ii) nonbanking sector including shadow banking, (iii) assets markets and (iv) nonfinancial sector.

³ “q” stands for quarter.

⁴ In a recent survey realized by Duke University / CFO Global Business on June 7th, 2019 on approximately 600 CFOs from all over the world, including 250 from North America, 62 from Asia, 99 from Europe and 32 from Africa, most of them expect a new recession in the country they activate by the end of 2020. The highest uncertainty persists among the CFOs from Asia,

benchmark index of the Bucharest Stock Exchange, Bucharest Exchange Trading (BET) index was released in September 1997, being an indicator from our assessment. The present work is based on recent studies with the same purpose (see, among others, Behn et al., 2013; Ito et al., 2014; Cervantes et al., 2014; Mencia and Saurina, 2016; Aikman et al., 2017; Aikman et al., 2018). It is worth mentioning that Minsky (1982) was among the first to analyze early warning indicators for financial crises, arguing that the overheating of financial sector can be detected by monitoring relevant financial indicators.

Credit-to-GDP gap is seen in the literature as one of the most relevant indicators for detecting overheating of financial activity (e.g. BCBS, 2010; Drehmann et al., 2011; 2012; Drehman and Yetman, 2018).⁵ In Behn et al.'s (2013) study for 23 countries from the European Union over the 1982q1-2012q3 period, the authors conclude that, besides credit-to-GDP gap, other domestic and global factors, such as equity prices, house prices and the variables describing banking sector activity could be employed for monitoring the accumulation of financial imbalances for member states. Against this backdrop, we include in our analysis several variables that are capable to catch the overheating of macrofinancial activity, grouped into specific categories. Based on these categories, we determine the utility of these variables from two perspectives: (i) whether these indicators are able to detect overheating of macrofinancial activity in Romania in two periods characterized by systemic crises⁶, i.e. the banking crisis from 1996-2000 and the global financial crises which started in Romania in November 2007 and ended in August 2010 and (ii) whether these variables successfully minimize various statistical errors involved in forecasting future events.

over 90% of them see a recession coming by the end of 2020, followed by those from Europe with 70%. Against this backdrop, it is very relevant to analyze the evolution of financial stability in Romania in 2020.

⁵ Other similar studies (e.g., Kaminsky and Reinhart, 1999; Reinhart and Rogoff, 2008; 2009a; 2009b; 2011; Schularick and Taylor, 2012; Jordà et al., 2013) point out the leverage (credit) is a first-order factor in explaining banking crises and the fact that the effect on the real economy is worse when the crisis is preceded by a credit boom. Therefore, there seems to be a consensus that "leverage is the Achilles heel of capitalism" as James Tobin put it in his book review on "Stabilizing an unstable economy" by Hyman P. Minsky (Tobin, 1989).

⁶ According to European Systemic Risk Board (ESRB), Romania has experienced three systemic crises: from November 1981 to December 1989, with the main cause being the external shock of oil crisis from 1977 combined with the increase in the interest rate by the Federal Reserve; from January 1996 to December 2000, with the root cause being the excessive credit growth and leverage, liberalization of the exchange rate and the start of the liberalization process for the goods with administered prices; and from November 2007 to August 2010, with excessive credit growth and leverage, mismatches and market illiquidity being the key drivers.

The rest of the paper is structured as follows: in Section 2 we discuss the methodology to select the indicators, in Section 3 we present the empirical results, and in Section 4 we conclude.

2. METHODOLOGY

1.1. Selecting relevant indicators

To capture the interaction between real economy and financial sector, this study will include the selection of the relevant indicators in three steps that are exhibited in Figure 1. Step 1 involves selection of the candidate indicators based on previous studies realized for other countries or group of countries. Because we want to make a quarterly prediction for 2020, we are constrained by the availability of the data provided by Oxford Economics. Hence, some data will be derived from other specific variables. For instance, the best proxy for global volatility is VIX, but because Oxford Economic does not realize forecast for this indicator, we use the conditional volatility of MSCI World index from a GARCH (1, 1) model with t disturbances. Similar to Ito et al. (2014), in some cases different processing methods will be used for the same data. For example, for credit, besides the credit-to-GDP ratio, we also employ q-o-q credit growth. In Step 2, selected variables will be grouped in six different categories, as follows: (i) macroeconomic risks, (ii) bank risks, (iii) activity of corporations and households, (iv) monetary and financial conditions, (v) risk appetite and (vi) external shocks.

The overall economic risks are closely linked with financial stability (Cervantes et al., 2014). Economic growth influences the income of households and corporations and consequently ability of debtors to pay their debts. Inflation / deflation affects financial stability through real prices of assets, fixed-income markets and fiscal burden, while fiscal policy and public debt have important implications on country risk (Corsetti et al., 2012), and the latter has the ability to create systemic risk (Adrian et al., 2015). As macroeconomic activity can influence developments in the financial sector, outlook and expectation for macroeconomic activity can influence the outlook for financial stability (Ghosh, 2016).

Financial intermediation in Romania is realized primarily through banking sector. In this context, monitoring the evolution of banks' balance sheet indicators is of great importance, being able to detect in advance the overheating periods caused, for instance, by the excessive credit growth. Moreover, banks' balance sheet risk can become credit risk for the government (an enhanced public debt) if it has to step in and save the systemic institutions that are too big to fail through bail-

out (Cervantes et al., 2014). Alternatively, a higher public debt that is reflected in higher financing costs, could affect the profitability and solvency of banks.

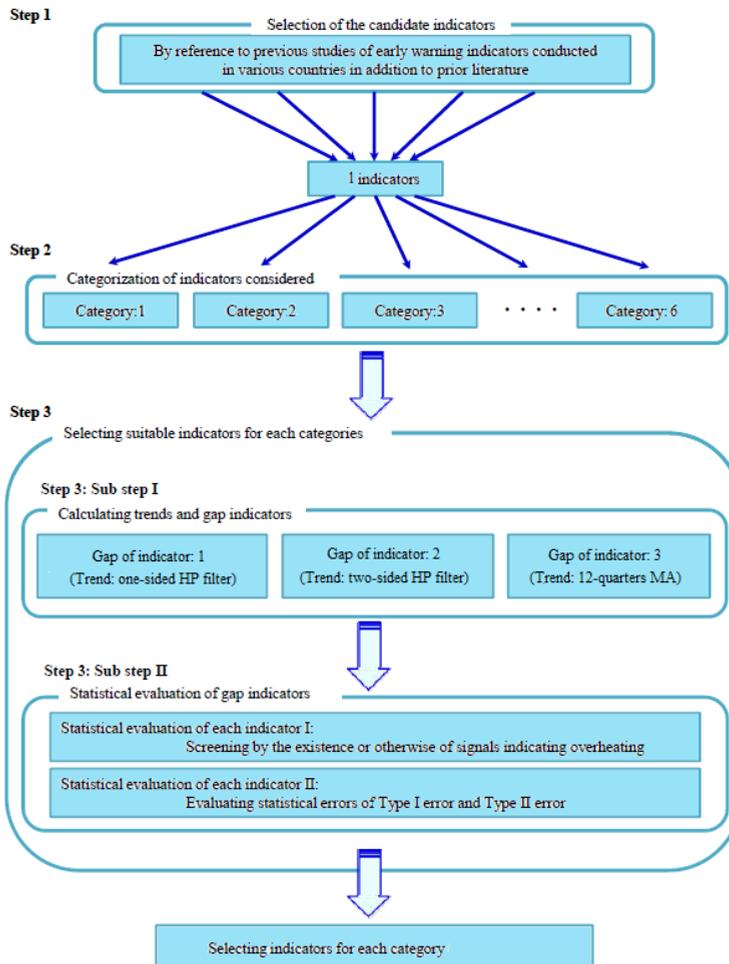


Figure 1. Selection process of variables included in analysis.

Source: Adapted from Ito et al. (2014).

Because the sector of households and the sector of corporations include mutual indicators and the data for latter is limited, we compute a single index to capture the risks of households and corporations. Variables from this category reflect essentially the debt as a share of GDP, equity prices and house prices. A key channel for transmission of financial crises to the real economy is the wealth effect of households and nonfinancial entities (Adrian et al., 2015), and an increased lending to these sectors leads to systemic risk accumulation (Borio et al., 2001;

2011). A high leverage ratio for households and corporations induces a limited capacity to absorb the adverse shocks on income or asset prices, and the reduction in spending following these shocks will amplify the negative effects.

Monetary conditions refer to monetary policy, while financial conditions are especially reflected into the capacity and willingness of the banks to grant loans (Cervantes et al., 2014). From the macrofinancial standpoint, financial stability is linked with monetary policy (Clouse, 2013), while financial conditions affect economic growth (Hatzius et al., 2010). On the one hand, the consequences of monetary policy decisions can be found in short-term interest rates and money supply growth. On the other hand, financial conditions are most faithfully reflected in the overall credit growth in the economy.

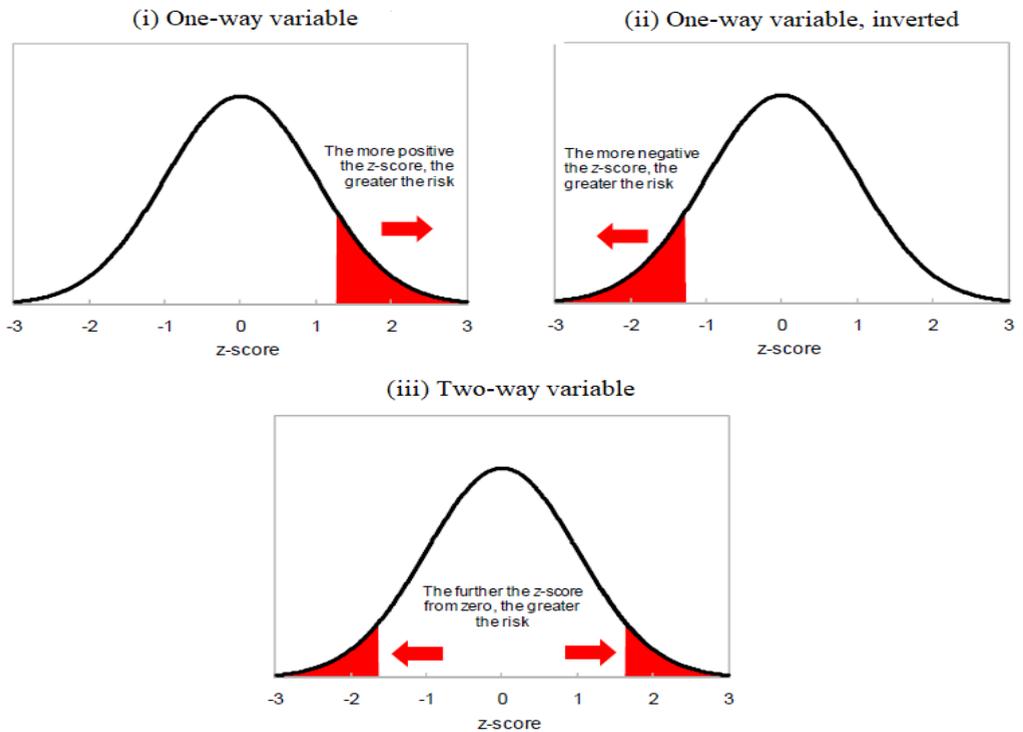


Figure 2. Probability Density Function of normal distribution and the interpretation of the z-score in relation with vulnerabilities.

Note: In this figure, for simplicity, we assume a normal distribution for the z-score. However, we employ in our analysis a non-parametric kernel estimator which does not assume a specific distribution.

Source: Adapted from Cervantes et al. (2014).

As Cervantes et al. (2014) point out, the risk appetite of investors for a particular country is characterized by the assessment of the risk and by the investment decisions they take. Thus, to evaluate the risk the most prominent indicators take the form of spreads (Carceres et al., 2010; Bakaert and Hoerova, 2016), volatility of asset prices (González-Hermosillo, 2008) and risk premia (Gai and Vause, 2006). *De facto* allocation of investors' assets are reflected in capital flows to particular countries or markets, investment portfolios and foreign direct investments (Forbes and Warnock, 2012; Ahmed and Zlate, 2014).

Last but not least, external shocks will be quantified through the real prices of commodities (gold and oil), volatility of the MSCI World index (investors' expectations), long-term government bond yield for the U.S., real effective exchange rate (REER)⁷ of leu and exchange pressure market index (EMPI).⁸

In Step 3, we select the most suitable indicators on the basis of statistical evaluation. First, for variables chosen in Step 1, we compute the trend and the cycle (gap) employing three methods: one-sided Hodrick–Prescott (HP), two-sided Hodrick–Prescott filter and averages based on 12-quarters moving average. For macroeconomic variables (national accounts) we use in the HP filter⁹ a smoothing parameter (λ) of 1,600 as suggested by Hodrick and Prescott (1997) for quarterly data. For financial variables, the λ will be set at 100,000 similar to Alessi and Detken (2011). It is worth mentioning that the variables from the six categories listed above can be simultaneously in several categories. Hence, for

⁷ Measure of the inflation-adjusted strength of a currency (RON, in our case) against a basket of currencies that includes the main trading partners of that country (Romania, in our case). Increase (decrease) in REER indicates that the exports are more expensive (cheaper), while imports are cheaper (more expensive). Therefore, a higher REER denotes a drop in competitiveness in trade with other countries.

⁸ This concept has been used for the first time by Girton and Roper (1977) and extended afterwards by Weymark (1995; 1998), measuring the total pressure of an exchange rate (USD / RON in our case) that has been tempered by the interventions of authorities in the foreign exchange market or by changing the exchange rate regime. For details, including the methodology adopted in this paper, see Patnaik et al. (2017).

⁹ The HP filter decomposes a time-series y_t into a grow component (g_t) and an additive cyclical component (c_t), and reduces to minimization of the variance of the cyclical component subject to a penalty for the variation in the second difference of the growth. For details, see Hodrick and Prescott (1997).

The one-sided HP filter is used for real-time estimations, employing only past observations. In contrast to one-sided HP filter, the two-sided HP filter is applied to the entire sample of the original series to extract the trend of all periods at once, i.e., using both past and future values. Rünstler and Vlekke (2018) argue that policymakers have to rely on past observations only because future values would not be available for real-time estimations (Stock and Watson, 1999).

every category in part we build an index of macrofinancial vulnerabilities that will ultimately be aggregated in a single aggregate indicator. The gap indicators (actual value minus the long-term trend) will be evaluated based on two criteria: (i) whether these indicators are able to detect overheating of macrofinancial activity in Romania in two periods characterized by systemic crises, i.e. the banking crisis from 1996-2000 and the global financial crises which started in Romania in November 2007 and ended in August 2010 and (ii) whether these variables successfully minimize various statistical errors involved in forecasting future events. Furthermore, every variable is standardized by deducting its mean (long-term trend) and dividing the results by its standard deviation (i.e., the z-score) and categorized according to its relationship with vulnerabilities (risk), as shown in Figure 2: (i) one-way variables, for which an increase in their values (increase in z-score) leads to a rise of the risk (e.g., public debt / GDP, BET index volatility etc.), (ii) one-way variables, inverted for which a decrease in their values (decrease in z-score) determines a rise in the risk (e.g., fiscal balance / GDP, industrial production growth etc.) and (iii) two-way variables, for which the further their z-scores from zero, the greater the risk (e.g., output gap, inflation etc.).

To detect the overheating of the financial activity, we need to evaluate the values of each indicator in comparison with a specific threshold. Since we cannot know *a priori* these thresholds, we will examine several threshold levels. For this purpose, we compute the root mean square (RMS) of gaps, noted with σ in Eq. (1), and examine four cases: $1 \times \text{RMS}$, $1.25 \times \text{RMS}$, $1.5 \times \text{RMS}$ and $1.75 \times \text{RMS}$:

$$\sigma = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (x_i - x_{i,t})^2} \quad (1)$$

where x_i is the actual value of the variable, $x_{i,t}$ is the long-term trend of the same variable at time t , and N is the number of observations. The first statistical evaluation refers to the capacity of variable to signal the overheating of financial activity by moving above the upper threshold in a particular period of time. In our case, the overheating periods correspond to the banking crisis from 1996-2000 (1998q1-2000q4, according to the availability of the data) and the global financial crisis from November 2007 to August 2010 (in this case, we set the overheating period three quarters earlier, i.e. 2007q1-2010q3, in order to select the variables that have an early warning component). Indicators that will not issue any signal will be discarded from the analysis at this stage, and the remaining indicators will be assessed in the next stage.

When one studies the values of a certain indicator to analyze financial vulnerabilities within a country or a market it is ideal that overheating signals to be issued ahead of a financial crisis, and not to be issued if there is no crisis at all. The ideal scenarios are A and D, exhibited in the table below:

Table 2.

Scenarios for selected indicators.

	Event	No event
Signal issued	Correct signal: A	Type II error: B
No signal issued	Type I error: C	Correct signal: D

Source: Ito et al. (2014).

Table 1. Categories, indicators used in the analysis, and their relation with vulnerabilities.

Category	Indicator	Relation with risk
Macroeconomic risks	Real GDP	Two-way
Macroeconomic risks	Trade growth	Inverted
Macroeconomic risks	Inflation	Two-way
Macroeconomic risks	Unemployment rate	Two-way
Macroeconomic risks	Fiscal balance / GDP	Inverted
Macroeconomic risks	Public debt / GDP	One-way
Macroeconomic risks	Current account / GDP	Inverted
Macroeconomic risks	Industrial production growth	Inverted
Macroeconomic risks	Investment growth	Inverted
Macroeconomic risks	Credit granted by banks / GDP growth	Two-way
Macroeconomic risks	Credit granted by banks growth	Two-way
Macroeconomic risks	Real house price	Two-way
Macroeconomic risks	Long-term interest rate	One-way
Bank risks	Credit granted by banks growth	One-way
Bank risks	Credit granted by banks / GDP growth	One-way
Bank risks	Banks foreign liabilities / GDP	One-way
Corporations and Households	Corporate debt / GDP	One-way
Corporations and Households	BET index (real terms) growth	Inverted
Corporations and Households	BET index (real terms)	Inverted
Corporations and Households	Saving rate	Inverted
Corporations and Households	Unemployment rate	One-way
Corporations and Households	Household liabilities / GDP	One-way
Corporations and Households	Real house price growth	Inverted
Monetary and financial conditions	Real short-term interest rate	One-way
Monetary and financial conditions	M2 growth	Inverted
Monetary and financial conditions	M2 / GDP	Inverted
Monetary and financial conditions	Credit granted by banks growth	Inverted
Monetary and financial conditions	Credit granted by banks / GDP growth	Inverted
Risk appetite	BET index volatility*	One-way
Risk appetite	10-years government bond yield volatility**	One-way
Risk appetite	NEER volatility*	One-way
Risk appetite	Foreign direct investments / GDP	Inverted
Risk appetite	Portfolio investments / GDP	Inverted
External shocks	U.S. 10-years government bond yield	One-way

External shocks	MSCI World index volatility*	One-way
External shocks	REER	One-way
External shocks	EMPI	One-way
External shocks	Real oil price	One-way
External shocks	Real gold price	One-way

Note: * BET index volatility, MSCI World index volatility and the change in NEER volatility have been calculated using the GARCH (1, 1) process with t disturbances. *** 10-years government bond yield volatility has been calculated as the spread with U.S. 10-years government bond yield.

One can note that that some indicators from specific categories may have different relation with the risk (e.g. Credit granted by banks / GDP growth has a two-way relation with Macroeconomic risk and a one-way relation with Banks risk).

Sources: Oxford Economics; own calculations.

Ito et al. (2014) argue that indicators do not issue every time accurate signals, and the occurrence of the events and the signals they transmit may involve two types of errors. Type I errors reveal the inability of indicators to emit signals when an event occurs (C in Table 2), and represent the risk to miss a crisis. Type II errors occur when variables issue overheating signals when no specific event occurs (B in Table 2), and describe the risk to issue false signals.

The threshold level should be set to a relatively low value if one wants to minimize Type I errors (the risk of omitting crises), signals being thus emitted at an early stage. This will allow to send warning signals whenever the risk of a crisis occurs. At the same time, it is necessary to keep the reference level to a relatively high value in order to reduce Type II errors (the risk of signaling false crises). Therefore, there is a trade-off between these two objectives that is exhibited in Figure 3, the threshold level being selected to minimize the loss function.

Three out of four statistical models to assess the selected indicators are based on a loss function that is a weighted average of probability of Type I and Type II errors. The method of choosing the threshold level τ to minimize the loss function is called *policymaker's approach* (Ito et al., 2014):

$$L(\mu, \tau) = \mu P T_1(\tau) + (1 - \mu)(1 - P) T_2(\tau) \quad (2)$$

$$P = \frac{a+c}{a+b+c+d}, T_1(\tau) = \frac{c}{a+c}, T_2(\tau) = \frac{b}{b+d} \quad (3)$$

where a, b, c and d are the periods corresponding to events A, B, C and D, μ is the weighting parameter, $L(\mu, \tau)$ is the loss of policymakers with the weight μ and threshold level τ , P is the ratio of periods when a signal should be issued over the total number of periods, and $T_1(\tau)$ and $T_2(\tau)$ are the probabilities of Type I and Type II errors, respectively. μ is a parameter of preference of policymakers that indicates the preference for Type I and Type II errors. Similar to Ito et al. (2014), we use three values for μ : 0.5, 0.7 and 0.9.

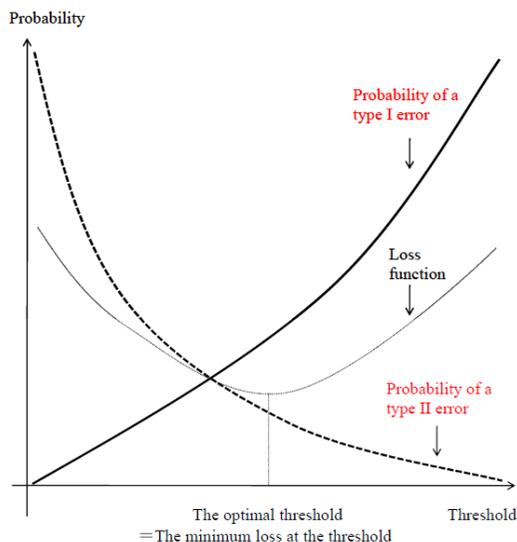


Figure 3. Type I and Type II errors.
Source: Ito et al. (2014).

Furthermore, to minimize the noise-to-signal ratio (NS), i.e., the ratio of false signals to correct signals, we compute a fourth model based only in indicators that issue signals in more than two-thirds of the overheat indication period, similar to Drehman et al. (2010) and Ito et al. (2014):

$$NS(\tau) = \frac{b}{b+d} / \frac{a}{a+c} \quad (4)$$

For every single indicator selected in Step 1, along with the relevant method to extract the trend and the threshold level, we calculate the loss functions for the four models described above, and select the model that minimizes the loss function. For example, in the case of GDP, initially we will select the first statistical model with $\mu = 0.5$ and the three methods to extract the trend (i.e., one-sided and two-sided HP filters, and 12-quarters moving average), in combination with the four threshold levels, i.e., $1 \times \text{RMS}$, $1.25 \times \text{RMS}$, $1.5 \times \text{RMS}$ and $1.75 \times \text{RMS}$, having 12 combinations in total. From these results, we will select those with the minimum loss function and the relevant trend extraction method. Then, the following indicator is assessed through the lens of the same methodology (e.g., inflation). The process is repeated for all statistical models, i.e., with $\mu = 0.75$, $\mu = 0.9$, and the one that minimizes the NS ratio (based solely on indicators that issue signals in more than $2/3$ of the overheat indication period).

2.2 Building the heatmap

Before describing the methodology to build the heatmap, it's necessary to present the construction of indicators:

- Each category from the six abovementioned is represented by an aggregate indicator X_i .
- Each aggregate indicator X_i is determined based on j elements (e_j^i).
- Each element e_j^i is derived from k individual economic or market sub-indicators.
- Each sub-indicator α_k^l uses l variables (ϑ_t^k) derived from m series (s_m).

The index of macrofinancial vulnerabilities is determined based on the six aggregate indicators X_i , being the simple average mean. For each variable k at time t we apply the three methods to extract the gaps, the trend in this case being the mean of the variable. Each cyclical component (effective variable minus the trend) is then standardized, as follows:

$$Z_{\vartheta_{t,t}^k} = \frac{\vartheta_{t,t}^k - \mu_{\vartheta_{t,t}^k}}{\sigma_{\vartheta_{t,t}^k}} \quad (5)$$

where $\mu_{\vartheta_{t,t}^k}$ is the mean (trend) and $\sigma_{\vartheta_{t,t}^k}$ is the standard deviation. Then, for each category we build aggregated indicators based on standardized indicators, giving equal weights:

$$X_i = \frac{1}{j} \sum_{n=1}^j e_i^j \quad (6)$$

After this, we estimate the distribution of each aggregate indicator using a non-parametric gaussian kernel estimator.³⁸ Their periodic observations are transformed into the [0, 1] interval based on their quantile in the historical distribution, where 0 denotes the absence of macrofinancial vulnerabilities, while 1 denotes maximum risk. This process takes into account the relation of indicators with vulnerabilities. If the indicator is one-way, nothing is changed. If the indicator is one-way and inverted, the order of the percentiles is reversed in such a way that values close to 1 represent observations close to the minimum historical values (maximum risk). In the case the variable is two-way, then the rescaled indicator is replaced with (1 minus rescaled value) for observations that are below the median of historical observations. Since the steps from the process of building the indexes imply first standardization, then computing the averages and in the end rescale in the [0, 1] interval, computing the averages of X_i categories will not produce the value of the aggregate index.

In the end, we will build the heatmap according to Figure 4, assigning each indicator four colors (green, yellow, orange and red), the intensity of which will depend on the value of the z-score and on the linkages of variables with macrofinancial vulnerabilities.

³⁸ Non-parametric method (i.e., does not assume any distribution, such as the normal distribution or the Poisson distribution) to estimate the Probability Density Function (PDF) of a random variable. The most known kernel estimators are Gauss and Epanechnikov. For theoretical details and examples implemented in Stata, see Van Kerm (2003).

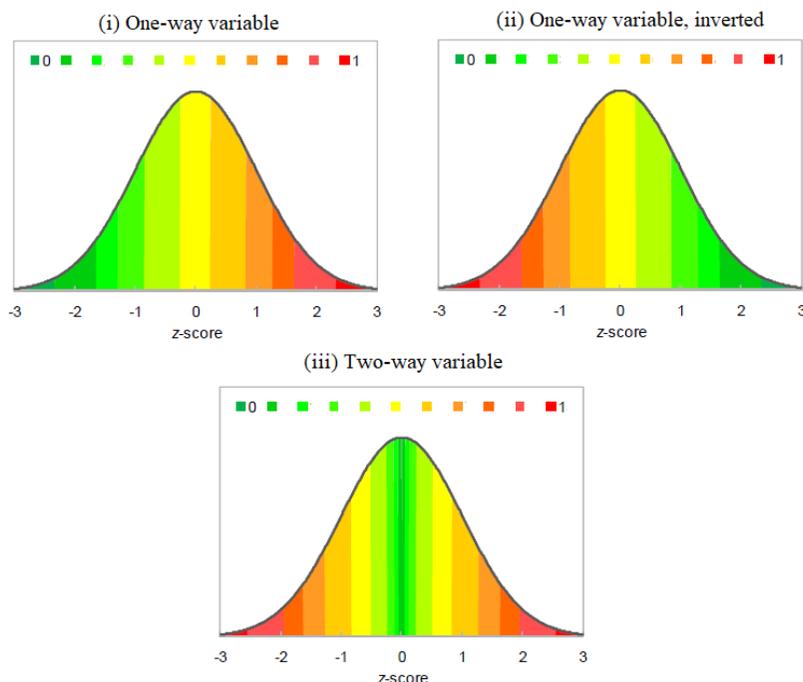


Figure 4. Assigning numerical values and colors with different intensities of standardized variables.

Note: In this figure, for simplification, we have assumed a normal distribution of the z-score.

Source: Adapted from Cervantes et al. (2014).

2. THE HEATMAP OF MACROFINANCIAL ACTIVITY IN ROMANIA

Figure 5 presents the heatmap of macrofinancial activity in Romania over the 1998q1-2020q4 period. Besides the aggregate index, the other six indexes are also shown, in accordance with the categories mentioned above: (i) macroeconomic risks, (ii) bank risks, (iii) activity of corporations and households, (iv) monetary and financial conditions, (v) risk appetite and (vi) external shocks. Initially, we started with 39 indicators as shown in Table 1.

After the Step 1, we have eliminated the variables with the gaps correlated more than 80% and the ones that did not present an early warning component for systemic crises experienced by Romania. In the end resulted 31 indicators that can be found in Table 3 together with the method used to extract the cycle, the threshold level and the references parameter of policymakers. Also, the variables are exhibited in ascending order based on the average loss given by the loss function.

Red areas on the heatmap are associated with difficult periods experienced by Romania, i.e., with increased macrofinancial vulnerabilities. Thus, one can observe that all indexes corresponding to six categories and the aggregated index *per se* have increased significantly during the banking crisis and global financial crisis.

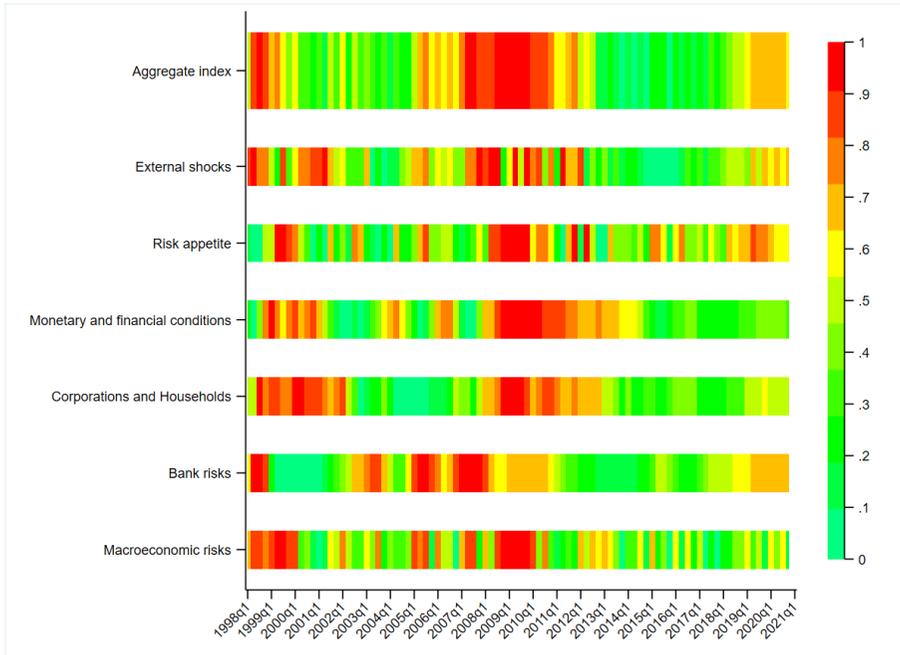


Figure 5. Heatmap of macrofinancial activity for Romania.

Figure 6 shows the evolution of the aggregated index and the crisis periods (shaded areas) in the ESRB chronology. We can note a sharp increase in second quarter of 1998, from 0.48 in 1998q1 to 0.85 in 1998q2. It should be mentioned that the analysis begins in 1998q1 because of the unavailability of the data, and thus we could not investigate the early warning component of the index during the whole period of the banking crisis. The index goes up then in 1998q3 to 0.94, and starts to fall afterwards. In 2000q4, when the systemic crisis ended, the index had a value of 0.25. Regarding the global financial crisis, the index has been on an upward trend since 2005q2 when it rose to 0.72, from 0.48 in the first quarter of 2005. It has oscillated slightly up to 2006q4 in the range of 0.55-0.78 to climb to 0.81 in the first quarter of 2007, three quarters before the ESRB official crisis period. The maximum values recorded were in 2009: 0.98 in 2009q1, 0.99 in 2009q2, 0.97 in 2009q3 and 0.96 in 2009q4. According to IMF (2010), in 2009 Romania's real GDP contracted by 7.1% compared to 2008 and by 1.9% in 2010 compared to 2009, being one of the most severe corrections (the average economic growth during 2008 and 2009 was -4,5%), being only overtaken by the Baltic countries. In the second quarter of 2018, the index advanced by more than 50% as compared with previous quarter, driven by the rise of three components: bank risks, risk appetite and external shocks. Therefore, we can imply the usefulness of the index that measures macrofinancial activity in Romania, having an early warning component and indicating overheating of the macrofinancial activity ten quarters ahead of global financial crisis that started in Romania in the last quarter of 2007.

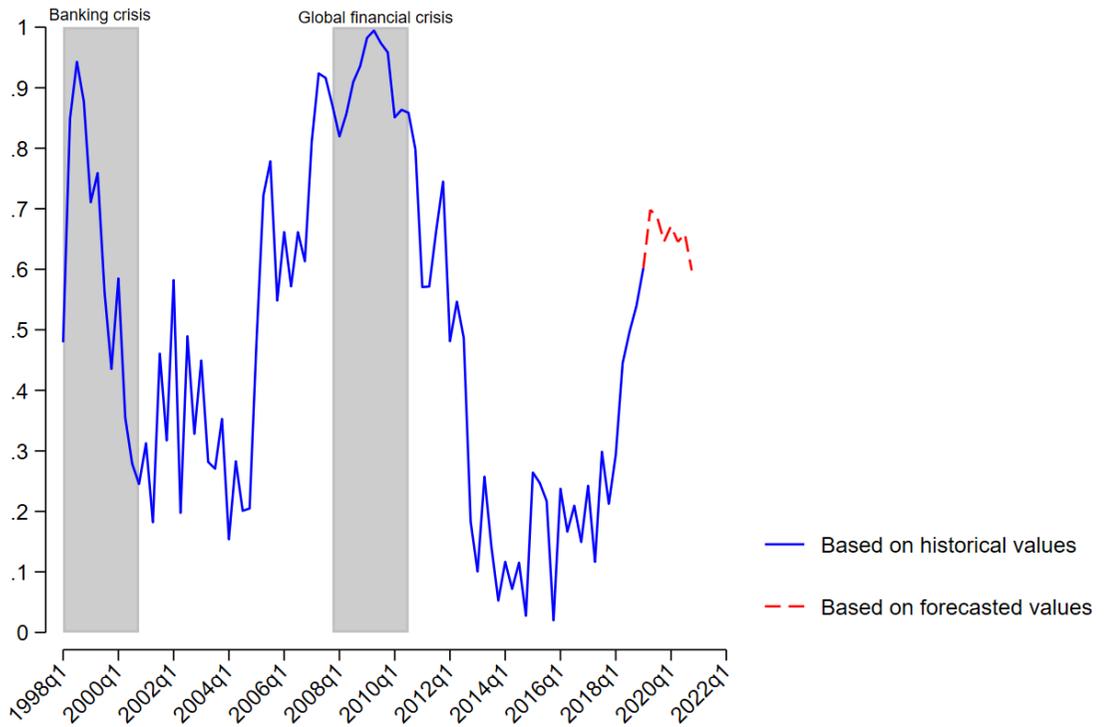


Figure 6. Index of macrofinancial activity for Romania over the 1998q1-2020q4 period.
Note: Data for 2019q1-2020q4 is forecasted, and the shaded areas represent the crisis periods in the ESRB chronology.

Table 3. The results of the statistical selection of the indicators.

Category	Indicator	Cycle extraction technique	Reference level	Statistical model	Average loss	Rank
Macroeconomic risks	Credit granted by banks growth	Moving average	1	4	0.0674	1
Corporations and Households	BET index (real terms)	Moving average	1	3	0.0902	2
Macroeconomic risks	Unemployment rate	Two-sided HP filter	1	3	0.0957	3
Macroeconomic risks	Credit granted by banks / GDP growth	Two-sided HP filter	3	2	0.1065	4
Macroeconomic risks	Inflation	One-sided HP filter	1	2	0.1100	5
Corporations and Households	BET index (real terms) growth	Two-sided HP filter	1	2	0.1114	6
Macroeconomic risks	Current account / GDP	One-sided HP filter	1	2	0.1322	7
Bank risks	Banks foreign liabilities / GDP	Two-sided HP filter	1	2	0.1326	8
Monetary and financial conditions	M2 growth	Moving average	3	1	0.1337	9
Corporations and Households	Corporate debt / GDP	Moving average	3	2	0.1337	10
Macroeconomic risks	Investment growth	One-sided HP filter	1	3	0.1356	11
Monetary and financial conditions	Credit granted by banks / GDP growth	Moving average	1	2	0.1359	12
Macroeconomic risks	Real GDP	Two-sided HP filter	2	2	0.1370	13
Macroeconomic risks	Real house prices	Moving average	2	2	0.1380	14
Corporations and Households	Unemployment rate	Two-sided HP filter	1	2	0.1391	15
External shocks	REER	Two-sided HP filter	1	3	0.1457	16
Monetary and financial conditions	Real short-term interest rate	One-sided HP filter	1	2	0.1467	17
Risk appetite	NEER volatility	Two-sided HP filter	1	2	0.1467	18
Macroeconomic risks	Public debt / GDP	One-sided HP filter	1	3	0.1500	19
Risk appetite	10-years government bond yield volatility	One-sided HP filter	1	2	0.1500	20
Macroeconomic risks	Trade growth	Two-sided HP filter	2	3	0.1554	21
External shocks	MSCI World index volatility	One-sided HP filter	1	3	0.1589	22
Bank risks	Credit granted by banks / GDP growth	Two-sided HP filter	3	3	0.1598	23
Risk appetite	BET index volatility	Two-sided HP filter	1	2	0.1609	24
Macroeconomic risks	Industrial production growth	Two-sided HP filter	2	3	0.1630	25
External shocks	EMPI	One-sided HP filter	1	3	0.1700	26
External shocks	Real gold price	Moving average	1	2	0.1783	27
External shocks	Real oil price	One-sided HP filter	1	3	0.1789	28
Corporations and Households	Saving rate	Moving average	4	3	0.1804	29
Risk appetite	Portfolio investments / GDP	Two-sided HP filter	1	3	0.1989	30
Macroeconomic risks	Fiscal balance / GDP	Two-sided HP filter	2	3	0.2130	31

Note: This table presents the results of the statistical selection of the indicators described above ranked in ascending order in accordance with the average loss given by the loss function. The references levels are as follows: 1 - $1 \times \text{RMS}$, 2 - $1.25 \times \text{RMS}$, 3 - $1.5 \times \text{RMS}$ and 4 - $1.75 \times \text{RMS}$. Statistical models are shown according to preference parameter of policymakers (μ): 1 - 0.5, 2 - 0.7, 3 - 0.9 and 4 - the NS ratio modified according to Drehman et al. (2010) and Ito et al. (2014).

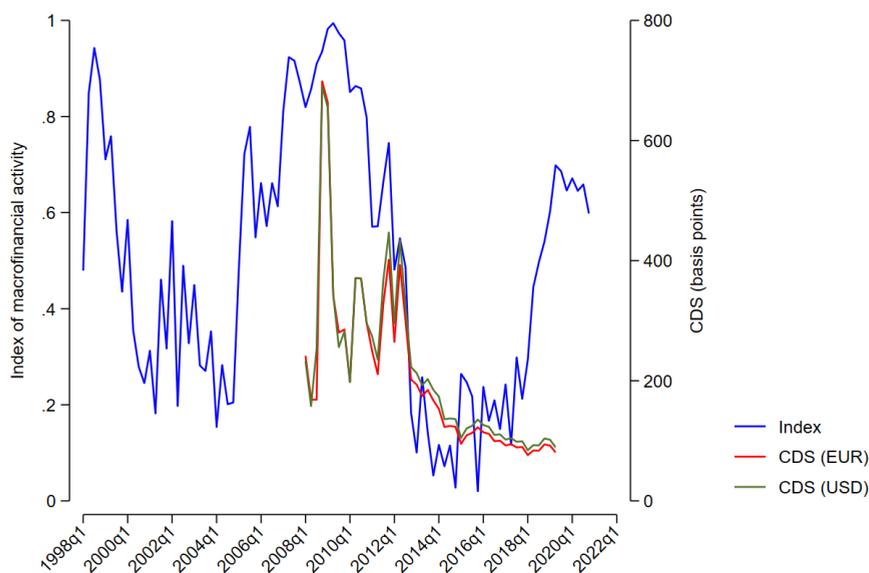


Figure 7. Index of macrofinancial activity and CDS spreads for Romania.

Source: Datastream; own calculations.

As for the year 2020 based on forecasted data by Oxford Economics, the index indicates a relatively high vulnerability, with an average of 0.64 across all four quarters. It should be noted that the forecasts were made at the end of fourth quarter of 2018 and, given the unpredictability of the macroeconomic and financial environment in Romania, amplified by frequent legislative changes and political instability, one should expect significant changes.³⁹ In Figure 7 is exhibited the

³⁹ In a recent analysis of the International Monetary fund (IMF) from June 7th, 2019, the experts point the deepening of macroeconomic imbalances caused in particular by the growth of the twin deficits (i.e., current account deficit and fiscal deficit) and by the increasing inflationary pressures as the main problem that our country faces. Thus, among the countries from the region (Romania, Poland, Hungary, Bulgaria, Czech Republic and Greece) Romania ranks the first for springs estimates realized by the European Commission for fiscal deficit / GDP (-3.5% in 2019 and -4.7% in 2020) and current deficit / GDP (-5.2% in 2019 and -5.3% in 2020). The real economic growth from the previous years (4.8% in 2016, 7% in 2017 and 4.1% in 2019 with projections of 4% in 2019 and 3.7% in 2020 according to the European Commission's summer estimates) has been fueled by rising consumption, at the expense of investment, through procyclical policies (e.g., wage growth, including the minimum wage, without a similar increase in labor productivity, and pension growth without any budgetary revenue coverage). Also, the rate of inflation is situated at high levels given the constant evolution in the European Union (EU) (e.g., the rate of inflation in May was 4.1% and the EU average was 1.6%). The National Bank of Romania (NBR) sees a rate of inflation of 4.2% at the end of 2019, well above the self-imposed target of 2.5%, ± 1 percentage point. These aspects contribute to the image of risky country for Romania in international financial markets, thus increasing the costs of external financing.

index of macrofinancial activity together with the 5-year CDS spreads for Romania in EUR and USD. Quarterly CDS spreads are available starting with the first quarter of 2008. The sovereign CDS reflects the investors' perception regarding credit risk of a country (proxy for country risk). CDS spreads for Romania increased exponentially following the default of Lehman Brothers, from 168.5 basis points in 2008q3 to 698.5 basis points in 2008q4, to decrease afterwards to 341.2 basis points in 2009q2 (for spreads in EUR). The correlation index between the aggregated index and the CDS spreads denominated in EUR is 64.11%. Thus, the index developed in this paper fairly reflects investors' perception in Romanian government bonds.

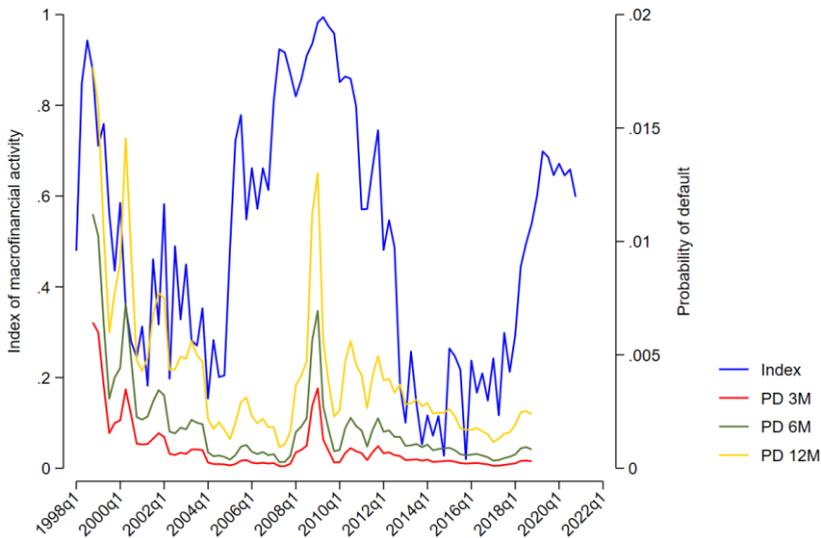


Figure 8. Index of macrofinancial activity and probability of default for different maturities for Romania.

Source: Credit Research Initiative; own calculations.

External shocks should also be considered in the context of a US-China trade war, the uncertainty of the UK exit from the EU, and the negative yields of the 10-years government bonds (long-term interest rates) (e.g., the cases of Germany, France and Japan) where their notional value, according to Bloomberg, exceeded \$13.4 trillion in June, where investors do not request anymore a risk premium for their investments in long-term fixed-income securities of developed countries. This means that many capital flows (including speculative flows) will enter emerging countries, including Romania, where interest rates are still positive and attractive. The global volatility of the government bonds, measured by Macaulay duration of the Bloomberg Barclays Global Aggregate Treasuries Total Return Index was 8.32 years in June, meaning that an increase in the yield of one percentage point leads to a loss greater than \$2.4 trillion.

Besides the CDS spreads, we compare the performance of the index of macrofinancial activity with the median probability of default (PD) for Romanian economy for three different maturities: 3, 6 and 12 months, i.e. 1, 2 and 4 quarters. The data is taken from Credit Research Initiative (CRI) and follows Duan et al.'s (2012) methodology. They propose forward-looking PD-term structures of public firms using both macrofinancial and balance sheet data. One of the covarites from the prediction model is distance to default based on Merton's (1974) model which views firm's equity as a call option on the value of firm's assets, and debt is taken as a strike price. Forward-looking PD is a much comprehensive measure of a company's default probability, and a major advantage of this approach is that one can compute PDs for different maturities. According to CRI, the number of public companies included in the model is 88, and the measures PD 3M, PD 6M and PD 12M are computed as the median of all 88 companies for the three maturities, being available starting with the fourth quarter of 1998. One can observe the positive correlation of our index (left-hand axis) with PD of Romanian economy (right-hand axis) (Figure 8). If our index had the maximum value in 2009q2 (0.99), according to the model of Duan et al. (2012), the Romanian economy faced the greatest difficulties during the banking crisis (1998q4), when the probability of default was 0.64% (PD 3M), 1.12% (PD 6M) and 1.77% (PD 12M). In the last quarter of 2018, PD 12M is 0.24, indicating a very low probability of default for Romanian economy in 2019. In the same context, PD 24M (unreported) is 0.6%, i.e., there is only 0.6% probability for Romanian companies to default in the next two years, conditional upon their survival upon 2020q3. In comparison, the index of microfinancial activity averages 0.66 in 2019 and 0.64 in 2020, which indicates a relatively high vulnerability.

3. CONCLUDING REMARKS

Overheating of economic and financial activities leads to macrofinancial imbalances that may disrupt financial stability, and can be detected by studying relevant indicators. In this study we developed an aggregate early warning index of macrofinancial activity for Romania over the 1998q1-2020q4 period, employing data from six categories: (i) macroeconomic risks, (ii) bank risks, (iii) activity of corporations and households, (iv) monetary and financial conditions, (v) risk appetite and (vi) external shocks. Based on these categories, we determined the utility of these variables from two perspectives: (i) whether these indicators are able to detect overheating of macrofinancial activity in Romania in two periods characterized by systemic crises, i.e. the banking crisis from 1996-2000 and the global financial crises which started in Romania in November 2007 and ended in August 2010 and (ii) whether these variables successfully minimize various statistical errors involved in forecasting future events. Initially we started with 39 indicators, to finally select only 31 of them based on which the aggregate indicator was built. This index recorded the highest values during the banking crisis and global financial crisis, and managed to send signals of increased vulnerability as early as the second quarter of 2005. Based on the data forecasted by Oxford Economics, the index will average 0.64 in 2020, indicating a relatively high risk, and confirming the concerns of approximately 600 CFOs from all over the world, most expecting a new recession in their country of activity by the end of 2020. Comparing the evolution of our index with a series of indicators that measure investors' perception of macrofinancial stability or the probability of default of Romanian economy (i.e., CDS spreads and the probability of default for different maturities), one can note the positive correlation between these two, but our index exhibits a more pronounced early warning component, making it extremely useful in anticipating future systemic crises.

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SYSTEMICALLY IMPORTANT BANKS IN EUROPE: RISK, COMPLEXITY AND CROSS-JURISDICTIONAL ACTIVITIES

ANA-ȘTEFANIA BĂLUȚĂ*, SIMONA NISTOR**

Abstract: *This paper aims to investigate the effects of the assets and liabilities structure of financial institutions considered for regulatory purposes on their probability of default, across a sample of European banks that are designated as Global Systemically Important Banks (G-SIBs). Our analysis spans from 1995 to 2018. The empirical findings of a Fixed Effects panel model indicate that characteristics like size, complexity and cross-jurisdictional activities have a considerable impact on banks' distance to default. This study also finds that financial institutions with greater Capital Tier1 ratios are more likely to have a lower probability of default, a result that highlights the importance of implementing the BASEL III Capital Accord specifications.*

Keywords: *Z score, financial stability, complexity, cross-jurisdictional activity.*

JEL Classification: *G21, G01*

1. INTRODUCTION

Playing an important role in the financial integration process, cross-border banking brings many benefits, especially regarding risk allocation and risk diversification. Financial institutions are less liable to be influenced by shocks affecting domestic markets due to the geographically diversified loan books and deposit bases, which reduce the volatility of their cash-flows. Other benefits may arise from a tight competition and a greater stability within the banking system. For example, foreign banks that invest in less developed markets may accelerate the privatization process of banks owned by the state and may introduce advanced risk management practices which can initiate a faster resolution procedure of the non-performing loans (NPLs).

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On the other side, cross-border banking activities may also involve costs that affect the financial stability. As foreign banks are in general connected with a more mobile capital compared to domestic financial institutions, they might destabilize the financial soundness in the host country, mainly due to contagion effects arising from external shocks. Emter, Schmitz and Tirpák (2018), for example, highlight the contagion effects from national banking markets across the European Union and provide evidence that large NPLs ratios were a crucial obstacle to cross-border lending after the crisis. In spite of this, the consensus in the literature, is that the integration of financial markets via cross-border banking produces a net benefit overall, with exceptions in the situations where cross-border exposures are too large.

Due to the wave of M&A in Europe, the systemic risk imposed by individual G-SIBs is considerably higher now, compared with the preview's decade, therefore it is important to know the individual risk of default of each G-SIB. Knowing the main determinants of the Z-score might help improving the financial soundness of the banking sector by reducing the individual systemic risk of banks in EU therefore reducing the entire systemic risk of the region.

The main question from which this study originated is the following: What are the determinants of the bank solvency risk and what effects it generates on the probability of bankruptcy

Using a panel dataset, we examined the determinant of the Z-Score for G-SIBs in the European Union and EEA. As proxy for the dependent variable we used distance to default expressed through Z-score. The main regressors are Tier 1 Capital Ratio, Net Interest Income, and Size of the bank, Loans to Deposits Ratio, Leverage Ratio, Non-Performing Loans Ratio and Funding Structure. In addition, we considered system-specific regressors that represent banks' interconnectedness, complexity, infrastructure and cross-jurisdictional activities. Alternatively, we used a subset of the dataset in order to control if the period 2008-2009 is relevant for the individual Z-score. Furthermore, I test if profitability, capitalization, or country are relevant for the individual Z-score of the banks. The methodology used is Panel Ordinary Least Squares (OLS) regression with fixed effects.

The contribution of this study to the scientific literature goes in two directions. First, we identified the main determinants of the probability of bankruptcy of European G-SIBs banks. Secondly, we used various subsets of the dataset to examine the possible asymmetric effects of these determinants on banks' distance to default, by exploring the following channels of shock transmission: profitability, capitalization, euro area membership, and sovereign debt crisis.

The rest of this paper has the following structure: Section 2 discusses the related literature, Section 3 describes the dataset and the methodology employed, Section 4 presents the empirical methodology and results and Section 5 offers conclusions.

2. RELATED LITERATURE

Although the number of papers that assess the impact of cross-border banking activities on macro financial stability have increased rapidly in the last period, the empirical literature with reference to the impact of cross-border banking activities on macro financial stability is inconclusive. Furthermore, cross-border banking has increased rapidly in the last years. Shin and Shin (2011) highlight that cross-border banking has been a crucial factor of the 2007-2009 financial crisis build-up phase, as European banks provided significant intermediary services for USA banks.

On the subject of consolidation in the banking market and cross-border banking, the viewpoints are contrasting. On one hand, the supporters of stability perspective consider that large banks, with monopolistic tendencies, may increase profits in concentrated banking markets through higher capital buffers (Boyd, De Nicoló and Smith, 2004). In another study, Boot and Thakor (2000), demonstrate that a usual practice of larger banks is credit rationing because focusing on greater quality of credit investments in a lower volume will enhance the return of investment and further strengthen financial soundness. These types of banks are considered to acquire comparative advantages regarding the monitoring of lending process due to the high volume of data that they possess.

On the other hand, the promoters of the fragility perspective theorize that larger banks have a higher probability to receive subsidies because of the too big to fail status. Due to this behaviour, the lack of incentives to guard against risk is even more severe for the managers of large banks who may undertake risky strategies considering that government has a high propensity to provide interventions to the banking market. Beck et al. (2006 a, b) suggested a positive association among the size of the banks and their organizational complexity and that large banks may have lower standards of transparency taking in consideration that they tend to internationalize their activities and expand across numerous geographic markets.

Schaeck, Cihák and Wolfe (2006), as well as Schaeck and Cihák (2012) investigate the impact of competition and concentration in the banking sector on systemic stability for a large sample of more than 260 financial institutions within the EU-10 area and Switzerland, covering the period 1999-2004. They found no

link among competition and risk-taking motivation in the banking sector. However, they show that financial institutions operating in an environment with greater competition are more likely to hold higher capital buffers.

Cross-border banking is an eminent feature of the Eurozone monetary union. As stated in Poutineau and Vermandel (2015), between 1999 and 2012, a surge in cross-border loans has been observed. This surge is more pronounced between Eurozone countries than between the Eurozone and EU members, and tremendously more than across countries not included in the European Union. The increase in cross-border lending had its peak in 2008, when transfrontier loans were about 300% of the level from 1999.

Uhde and Heimeshoff (2009) provide empirical proof that a greater concentration of the banking market is negatively associated with financial stability, using aggregate data of financial institutions from countries within the EU-25 covering the period 1997-2005. To reflect the financial soundness of banks they employed the Z-score measure. Also, they showed how capital regulations can promote financial stability.

3. DATA

In this study, we analyze an international sample of banks for the period 1995-2018. Data from banks' financial reports are retrieved from the Thomson Reuters Eikon database. Our sample is limited to banks that publish their balance sheets and income statements to ensure a relatively high quality and transparency of data.

Appendix 1. Banks present in the dataset

Country	Bank
AUSTRIA	ERSTE GROUP
BELGIUM	KBC
DENMARK	DANSKE BANK NYKREDIT
FRANCE	BNP PARIBAS* CREDIT AGRICOLE* BPCE SOCIETE GENERALE*
GERMANY	BAYERN LB COMMERZBANK DEUTSCHE BANK*

Country	Bank
	DZ BANK LBBW
ITALY	INTESA SANPAOLO UNICREDIT*
NETHERLANDS	ABN AMRO ING* RABOBANK
NORWAY	DNB
SPAIN	SANTANDER* BBVA LA CAIXA SABADELL
SWEDEN	NORDEA SEB HANDELSBANKEN SWEDBANK
UK	BARCLAYS* HSBC* LLOYDS NATIONWIDE RBS STANDARD CHARTERED*

Note: The list was published by European banking Authority. *Banks identified as G-SIBs by the Financial Stability Board and by the Basel Committee on Banking Supervision. The data set consists of a group of 33 large banks with headquarters in 11 countries members of the European Union. The list of banks included in the study complies with the European Banking Authority (EBA) guide on the requirements for the publication of systemic global indicators. Under the provisions of EBA, all EU financial institutions that have exceeded EUR 200 billion leverage in 2017, were selected for study. In addition to the data collected from the Thomson Reuters Eikon database, we have used the ECB 2018 report for the period 2013-2017. From this report, we have extracted data for banks' interconnectedness, infrastructure, complexity, and cross-jurisdictional activities. A complete explanation of the variables employed in the empirical specifications is given in Appendix 2.

Appendix 2. Description of the variables

Variable	Definition	Measure	Source
Dependent Variable Z-score	The solvability of the bank	Log(Units)	Own calculations
Balance Sheet Data (Bank Level)			
Leverage Ratio	Total Debt/Equity	%	Eikon
Capital Tier 1 Adequacy Ratio	Capital Tier 1/ Risk-Weighted Assets	%	Eikon
Log Net Interest Income	log(Interest Income – Interest Expenses)	%	Eikon
Size of the Bank	log(Total Assets)	Log(thousand EUR)	Eikon
Lending Activity	Net Loans/Total Assets	%	Own calculations
Funding Structure	Gross Deposits/Total Liabilities	%	Own calculations
Payments activity	Payments activity/Total Assets	%	ECB
Assets under custody	Assets under custody/Total Assets	%	ECB
Underwriting activity	Underwriting activity/Total Assets	%	ECB
Cross-Jurisdictional Claims	Cross-jurisdictional claims/Total Assets	%	ECB
Cross-Jurisdictional Liabilities	Cross-jurisdictional liabilities/Total Assets	%	ECB
Intra-financial system assets	Intra-financial system assets/Total Assets	%	ECB
Intra-financial system liabilities	Intra-financial system liabilities/Total Assets	%	ECB
Securities outstanding	Securities outstanding/Total Assets	%	ECB
OTC derivatives	OTC derivatives/Total Assets	%	ECB
Trading and AFS securities	Trading and AFS securities/Total Assets	%	ECB

Level 3 assets	Level 3 assets/Total Assets	%	ECB
Other variables			
Dummy Crises	Dummy variable that takes the value 1 for period 2008-2009 and 0 otherwise.	0/1	
Dummy Capitalization	Dummy variable that take the value 1 if a bank had the Capital Tier 1 Adequacy Ratio higher than the median Capital Tier 1 Adequacy Ratio and 0 otherwise.	0/1	
Dummy Profitability	Dummy variable that take the value 1 if a bank had the ROE is higher than the median ROE and 0 otherwise.	0/1	
Dummy Sovereign Debt	Dummy variable that take the value 1 if the banks belong to countries that encounter the European Sovereign Debt Crisis and 0 otherwise	0/1	
Eurozone	Dummy variable that takes the value 1 for the Eurozone region and 0 otherwise.	0/1	

In order to determine banks' distance to default (Z-score), the period considered for the study is from 1995 to 2018. The dependent variable is Z-score and is calculated with the following formula:

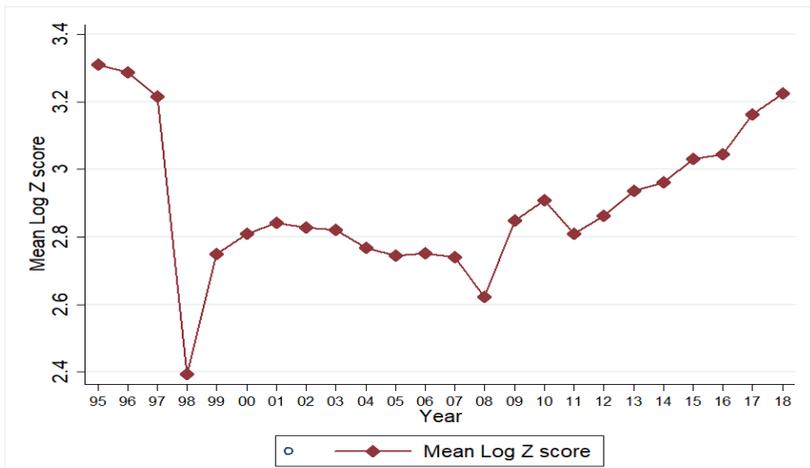
$$Z\ Score = \frac{Mean(ROA)+CAR}{SD(ROA)} \quad (1)$$

ROA represents the return on assets ratio (Net profit over Total assets) and CAR represents the capital ratio (Equity over Total Assets). Mean(ROA) and SD(ROA) are empirical estimates of the average and standard deviation of return on assets. Higher Z-scores are related with greater soundness of banks and a reduced probability of bankruptcy. In the empirical specifications, we employ the natural logarithm of the Z-score because its distribution tends to be highly skewed, as shown in Demirgüç-Kunt, Detragiache and Tressel (2008).

Z-score was developed by Roy (1952) as a measure of financial soundness for banks. It is widely used in the scientific literature (see for example Hannan and Hanweck (1988), as well as Boyd, Graham and Hewitt (1993)).

The evolution of bankruptcy risk during the analysis period is shown in Figure 1. The figure illustrates an increase in the probability of bankruptcy in 1998, which corresponds to the Asian financial crisis, and 2008, which corresponds to the global financial crisis.

Figure 1. Evolution of the default risk for the period 1995-2018.



Note: This figure represents the average distance to default measured by Z-score for a sample of 33 European systemically important banks over 1995-2008.

In order to identify key determinants of the Z-score we considered the following regressors: the size of the banks (logarithmic value of the Total Assets), the funding Structure (Total Deposits over Total Liabilities), Tier 1 Capital adequacy ratio (Risk-Weighted Capital Tier 1 over by Risk-Adjusted Assets), and, the lending activity (Net Loans over Total Assets). Balance Sheet data has been extracted from the Thomson Reuters - Eikon database. Other regressors considered in the study are the proxies for banks' interconnectedness (Intra-Financial System Assets, Intra-Financial System Liabilities, and Securities Outstanding), banks' infrastructure (Assets under Custody, Underwriting Activity, and Payments Activity), banks' complexity (Trading and Available for Sale Securities, OTC Derivatives, and Level 3 Assets), and banks' cross-jurisdictional activities (Cross-Jurisdictional Claims and Cross-Jurisdictional Liabilities). The data used for these variables was obtained from the ECB's 2018 report. The report contains data collected over the period 2013-2017. In Appendix 3 we provide descriptive statistics for all the variables employed in the study.

Appendix 3. Descriptive Statistics

Variables	(1) N	(2) Mean	(3) Standard deviation	(4) Min	(5) p25	(6) p50	(7) p75	(8) Max
Log Z-Score	572	2.874	0.605	0.581	2.497	2.959	3.322	4.116
Capital Tier 1 Adequacy Ratio	509	0.111	0.044	0.060	0.080	0.100	0.130	0.340
Total Capital Adequacy Ratio	506	0.144	0.045	0.900	0.110	0.130	0.170	0.430
Leverage Ratio	572	5.236	5.367	0.000	1.586	3.647	6.499	32.43
Size of the Bank	572	19.86	0.971	16.55	19.22	19.83	20.63	21.64
Dummy Crisis	572	0.098	0.297	0.000	0.000	0.000	0.000	1.000
Dummy Capitalization	506	0.514	0.500	0.000	0.000	1.000	1.000	1.000
Dummy Profitability	506	0.528	0.500	0.000	0.000	1.000	1.000	1.000
Log Net Interest Income	565	15.44	0.973	13.01	14.72	15.44	16.26	17.35
Lending Activity	557	0.520	0.175	0.011	0.409	0.536	0.629	0.902
Funding Structure	560	0.518	0.179	0.004	0.415	0.517	0.665	0.867
Dummy Sovereign Debt Crisis	572	0.187	0.390	0.000	0.000	0.000	0.000	1.000
Dummy Eurozone	572	0.526	0.500	0.000	0.000	1.000	1.000	1.000
Intra-financial system assets	154	0.145	0.090	0.012	0.089	0.128	0.176	0.483
Intra-financial system liabilities	154	0.159	0.123	0.008	0.088	0.120	0.180	0.966
Securities outstanding	154	0.249	0.200	0.078	0.160	0.197	0.251	2.090
Payments activity	154	25.10	18.99	0.030	10.64	20.40	36.34	102.3
Assets under custody	154	0.952	0.972	0.000	0.279	0.694	1.290	7.427
Underwriting activity	154	0.055	0.516	0.000	0.021	0.044	0.076	0.230
OTC derivatives	154	7.594	7.276	0.004	2.729	4.994	9.576	36.98
Trading and AFS securities	154	0.035	0.029	0.001	0.131	0.024	0.053	0.120
Level 3 assets	154	0.007	0.007	0.000	0.002	0.004	0.009	0.055
Cross-jurisdictional claims	154	0.374	0.230	0.000	0.207	0.379	0.504	1.857
Cross-jurisdictional liabilities	154	0.328	0.205	0.000	0.144	0.304	0.478	0.777

4. EMPIRICAL METHODOLOGY AND RESULTS

Li, Tripe and Malone (2017) prove that Z-score is effective in determining the individual risk and systemic risk of a bank.

We started by analyzing the relationship between the Z-score and Capital Tier 1. To eliminate the risk of underestimation of the distance to default (because the Z-score does not follow the normal distribution pattern) we used the natural logarithm of the variable Z-score, similar to Demirgüç-Kunt, Detragiache and Tressel (2008) approach. In the regression analysis, we used the Least Squares method, with bank level Fixed Effects. The formula for the main regression model is:

$$\begin{aligned} \text{Log Z - Score}_{i,t} = & \beta_0 + \beta_1 * \text{Size of the Bank}_{i,t} + \beta_2 * \\ & \text{Capital Tier 1}_{i,t} + \beta_k * \sum Z_{i,t} + \varphi_i + \varepsilon_{i,t} \end{aligned} \quad (2)$$

The regression analysis began with the examination of the impact of the core capital adequacy ratio; we further added the size of the bank expressed by the logarithmic value of the total assets and the logged value of the net interest income (Column (1), Table 1). Next, we added other variables for risk and efficiency that have been identified as determinants of financial instability in the scientific literature ($Z_{i,t}$) in columns (2) to (9), Table 1. We used **Net Interest Income** $_{i,t}$ as proxy for total net revenue because it has a better explanatory power over the dependent variable than the logged value of total net revenue. This variable is obtained using the natural logarithm of net interest income. **Funding Structure** $_{i,t}$ is calculated by dividing total deposits to total liabilities. This variable conveys the influence of the funding structure on the financial stability. **Lending Activity** $_{i,t}$ is introduced into the model in order to assess the impact of net loans to total assets ratio. We also investigated the impact of the 2008 global financial crisis and membership of euro area using two dummy variables. **Crisis** $_t$ is a dummy variable that takes the value 1 for the years 2008 and 2009 and the value 0 for any other year. **Eurozone** $_t$ is also a dummy variable, which takes the value 1 for euro area banks and the value 0 for non-euro area banks. In addition to these variables, we added the variables that represent banks' interconnectedness, complexity, infrastructure and cross-jurisdictional activities. The estimated models with the latter stated variables have fewer observations since data for these variables is available only for 2013-2017 period. For greater accuracy of empirical

models and easier interpretation of coefficients, we have divided the latter mentioned variables to the total asset.

In Table 1, we present the main results for the regression estimations made. The most interesting results are from the columns (6) to (9).

The empirical specifications are estimated using an OLS model with fixed effects. φ_i represents fixed effects at the bank level and $\varepsilon_{i,t}$ is the error. The main results are to be found in Table 1.

Table 1. Z-score Determinants. Main result using OLS with fixed effects

VARIABLES	(1) Log Z- score <i>Baseline model</i>	(2) Log Z- score <i>Business models</i>	(3) Log Z- score <i>Funding structure</i>	(4) Log Z- score <i>Crisis dummy</i>	(5) Log Z- score <i>Eurozone dummy</i>	(6) Log Z-score <i>Interconnectedness</i>	(7) Log Z-score <i>Substitutability</i>	(8) Log Z- score <i>Complexity</i>	(9) Log Z- score <i>Cross- jurisdictional activity</i>
Size of the bank	-0.226*** (0.055)	-0.206*** (0.059)	-0.162*** (0.059)	-0.213*** (0.054)	-0.221*** (0.055)	-0.231** (0.112)	-0.226** (0.105)	-0.244** (0.103)	-0.155* (0.080)
Capital Tier1 %	2.919*** (0.565)	2.920*** (0.590)	2.793*** (0.555)	2.699*** (0.562)	2.936*** (0.563)	1.898*** (0.449)	2.003*** (0.410)	1.758*** (0.425)	2.036*** (0.379)
Log Net Interest Income	0.186*** (0.046)	0.169*** (0.049)	0.169*** (0.044)	0.196*** (0.046)	0.180*** (0.045)	0.055 (0.084)	0.036 (0.081)	0.045 (0.085)	0.002 (0.080)
Net Loans to Assets		0.283 (0.220)							
Funding Structure			0.457** (0.216)						
Crisis				-0.107*** (0.032)					
EUROZONE					-0.267* (0.156)				
Intra-financial system assets						-0.444 (0.314)			
Intra-financial system Liabilities						-0.108 (0.218)			
Securities Outstanding						0.377 (0.353)			
Payments Activity							0.000 (0.001)		
Assets under Custody							0.026 (0.037)		
Underwriting Activity							0.054 (0.313)		

OTC derivatives								-0.001 (0.004)	
Trading and AFS securities								-1.372*** (0.421)	
Level 3 assets								-2.917 (2.567)	
Cross-jurisdictional Assets									0.424*** (0.103)
Cross-jurisdictional Liabilities									-0.008 (0.109)
Constant	4.153*** (0.769)	3.893*** (0.872)	2.928*** (1.017)	3.780*** (0.768)	4.388*** (0.712)	6.560*** (2.191)	6.709*** (2.306)	7.062*** (2.131)	5.684*** (1.854)
Observations	503	495	498	503	503	131	131	131	131
R2	0.326	0.329	0.355	0.349	0.326	0.453	0.425	0.481	0.485
Number of banks	31	31	31	31	31	31	31	31	31
Bank FE	YES	YES	YES	YES	NO	YES	YES	YES	YES
Region FE	NO	NO	NO	NO	YES	NO	NO	NO	NO

Note: *** denotes $p < 0.01$, ** denotes $p < 0.05$, * denotes $p < 0.1$. Robust standard errors in parentheses.

Table 2 lists the regression results using sub-samples datasets. We have reevaluated the base model, replacing the *Net Interest Income*_{*i,t*} with the variable *Leverage Ratio*_{*i,t*}. *Leverage Ratio*_{*i,t*} represents the indebtedness level of a bank. The description of this indicator is to be found in the BASEL III Capital Adequacy Accord. Using dummy variables, we have divided the dataset into three categories: profitability, capitalization, geographical location (with further two more subcategories: membership of Eurozone and banks that have headquarters in countries that undergone the European Sovereign Debt Crisis)

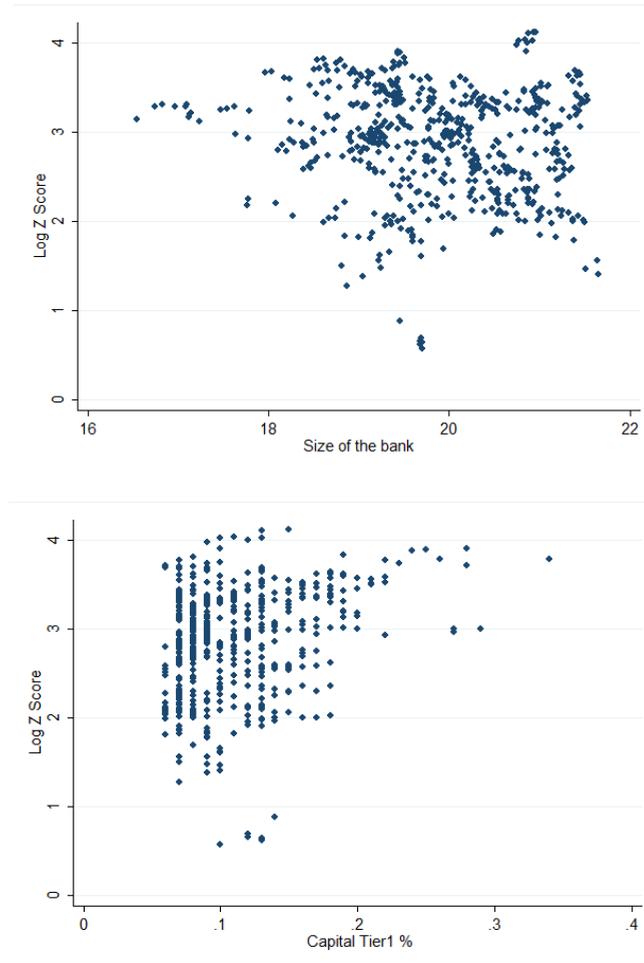
Table 2. Z-score determinants. Subset: Main results using OLS with fixed effects

	Banks under the profitability mean of the dataset	Banks over the profitability mean of the dataset	Banks with capitalization under the mean of the dataset	Banks with capitalization over the mean of the dataset	Banks from the Eurozone	Banks from the non-Eurozone regions	Banks not from countries that encounter the sovereign debt crisis	Banks from countries that encounter the sovereign debt crisis
Variables	(1) Log Z-score	(2) Log Z-score	(3) Log Z-score	(4) Log Z-score	(5) Log Z-score	(6) Log Z-	(7) Log Z-score	(8) Log Z-score
Size of the Bank	-0.132** (0.0545)	-0.0567 (0.0392)	-0.0296 (0.0624)	-0.0930 (0.0707)	-0.0612 (0.0660)	-0.0401 (0.0622)	-0.0562 (0.0400)	-0.0154 (0.129)
Leverage Ratio	-0.0327*** (0.00489)	-0.0194*** (0.00474)	-0.0313*** (0.00758)	-0.0420*** (0.00869)	-0.0156*** (0.00391)	-0.0215** (0.00860)	-0.0222*** (0.00465)	-0.0213 (0.0168)
Capital TIER 1 %	1.939** (0.784)	2.557*** (0.500)			4.539*** (0.775)	2.122*** (0.553)	2.590*** (0.515)	3.115* (1.511)
Dummy Crises	-0.113** (0.0483)	-0.0660* (0.0364)	-0.0285 (0.0382)	-0.178*** (0.0473)	-0.0194 (0.0610)	-0.144*** (0.0358)	-0.124*** (0.0371)	0.0892* (0.0437)
Constant	5.457*** (1.079)	3.799*** (0.746)	3.499*** (1.204)	5.019*** (1.437)	3.527** (1.309)	3.678*** (1.188)	3.840*** (0.768)	2.756 (2.398)
Observations	239	267	246	260	270	217	410	99
R ²	0.481	0.387	0.279	0.401	0.381	0.487	0.446	0.236
Number of banks	31	29	26	32	18	13	26	6
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES

Note: *** denotes $p < 0.01$, ** denotes $p < 0.05$, * denotes $p < 0.1$. Robust standard errors in parentheses.

The empirical results from Table 1 highlight the fact that the size of the bank has a negative impact on the bank's distance to default. This is not surprising given that there are several studies indicating that the size of the bank adversely affects its profitability (Beck *et al.*, 2006a). The dataset is made up of systemically important banks; this might be another reason for this result. Figure 2 illustrates the relationship between the distance to default, bank size and capitalization.

Figure 2. The relationship between the default risk, size and capitalization



Note: This figure presents the relationship between the Z-score and the size of the banks (the logarithmic value of total assets), respectively the relationship between Z-score and the Capital Tier 1 Adequacy Ratio (Capital Tier 1/ Risk-Weighted Assets). For the period 1995-2018.

Total Equity and Capital Tier 1 have a strong positive impact on Z-score. Basel III calls for Capital Tier 1 to be more than 6% at any given time, for a bank to be considered well capitalized. The source of bank income also is an important channel in influencing financial stability. **Net Interest Income**_{*i,t*} illustrates the positive impact of net interest income on Z-score at bank level in columns (1) to (5). In column (4) the negative impact of the financial crisis of 2008-2009 is highlighted. In columns (6) to (9) we analyzed the system-specific characteristics of banks and the impact of this characteristics on the Z-score. In the BIS methodological report, in 2014, in partnership with BCBS, five categories of indicators for measuring the systemic importance score were established. In Table 1, columns (6) - (9) we measured the importance of four of these categories, namely: interconnectivity, substitutability, complexity and cross-border activity. Among the characteristics of systemically important banks, AFS transactions and titles, as well as Cross-border Claims, have a significant influence on the distance to default.

The results presented in Table 2 are consistent with previous results. These models using subsamples datasets, illustrate the importance of propagation channels, through which the impact of the previously analyzed variables on Z-score can be enhanced. It can be noticed that for banks with profitability below the sample average (column 1), bank size is an important determinant of Z-score, and that for profitable banks (column 2) it becomes insignificant. For well-capitalized banks, above the sample average (column 4), the impact of the crisis has a strong negative effect, while less-capitalized banks are not influenced by the crisis. The degree of indebtedness is relevant in all estimated models, except for banks that belong to countries that have undergone the sovereign debt crisis (column 8). Instead, membership of euro area does not influence the relationship between the banks' risk profile and their solvency in a significant way compared to the non-euro area (columns 5 and 6). This result hints the harmonization of banking regulations between the two European regions.

As future research proposition, we intend to examine the impact of the regulatory and supervisory framework at national and international level on the relationship between banks' characteristics and individual distance to default. For example, in Căpraru *et al.* (2016) the association between banking market concentration and an increase probability of default among banks is highlighted. This study also points out that this negative effect can be reduced by employing a stricter supervisory framework.

5. CONCLUSIONS

Exploring the different ways in which the individual characteristics of banking institutions could influence Z-score and using a panel dataset, we examined the determinants of the distance to default for systemically important banks from the European-banking sector. In the regression analysis, we have used the least squares method, with fixed effects at bank level. The main regressors are: Capital Tier 1, Net Interest Income, Size of the Bank, Lending Activity, Leverage Ratio, NPL ratio and Funding Structure. Alternatively, we used sub-sample datasets to identify whether other events are relevant to the individual Z-score of the banks.

The size of cross-border banks has a negative effect on financial stability. When it comes to banking institutions of this size, it is very important to take into account the systemic risk they impose on the entire financial system. Empirical results have shown that the degree of indebtedness is a good indication of the financial stability of a banking institution and that compliance with BASEL III requirements is necessary. A higher rate of Capital Tier 1 was found to generate a beneficial impact on financial stability. Empirical results highlight the impact of banks' specific factors on the bankruptcy probability. This model could allow regulators to assign more precisely bank's individual risk potential and therefore could reduce systemic risk in the regional banking system.

In addition, in this paper we have found no evidence of a negative link among the factors determining systemic importance and financial stability in the absence of financial shocks (e.g. post-crisis period).

Regarding future research directions, we propose to introduce banking sector characteristics such as the degree of concentration, competition and regulatory and supervisory frameworks implemented by central banks to identify possible channels through which banks' characteristics influence financial stability.

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