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Macroeconomic Impact Analysis of Kusile and Medupi Electricity Generation Investment: An Eye Bird View at Construction and Operational Phase

By Joel Marumo Mosenogi & Olebogeng David Daw

North West University

Abstract- Economic growth, unemployment, and inequality have been challenges facing South Africa in the past decade. Amongst others, energy security is one of the underlying factors of declining foreign direct investment and economic growth. This study investigates the impact of electricity investment in Kusile and Medupi power plant on the macroeconomic environment of South Africa with the application of the Social Accounting Matrix Model (SAM). The study results show that the infrastructure investment in the two-power station has a positive impact in the South African Economy at the macroeconomic level. Furthermore, infrastructure investment shows to have a positive impact on GDP and does add significant value to Gross Fixed Capital Formation in the country at both construction and operational phase of Kusile and Medupi. Furthermore, household income is positively impacted by the economy as a result of electricity infrastructure investment. The SAM-based Model shows that total employment will be positively impacted and labor force with different skills level will unequally benefit.

Keywords: economic growth, macroeconomic, employment, electricity, infrastructure.

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Joel Marumo Mosenogi^α & Olebogeng David Daw^σ

Abstract- Economic growth, unemployment, and inequality have been challenges facing South Africa in the past decade. Amongst others, energy security is one of the underlying factors of declining foreign direct investment and economic growth. This study investigates the impact of electricity investment in Kusile and Medupi power plant on the macroeconomic environment of South Africa with the application of the Social Accounting Matrix Model (SAM). The study results show that the infrastructure investment in the two-power station has a positive impact in the South African Economy at the macroeconomic level. Furthermore, infrastructure investment shows to have a positive impact on GDP and does add significant value to Gross Fixed Capital Formation in the country at both construction and operational phase of Kusile and Medupi. Furthermore, household income is positively impacted by the economy as a result of electricity infrastructure investment. The SAM-based Model shows that total employment will be positively impacted and labor force with different skills level will unequally benefit.

Keywords: economic growth, macroeconomic, employment, electricity, infrastructure.

I. INTRODUCTION

For more than ten years, the South African economy has been under-performing, growing below 3% per annum while on the other hand unemployment, poverty, and inequality being unacceptably high. Such challenges saw the development and adoption of the National development plan and increased investment in electricity infrastructure. The National Development Plan (NDP), aims to half poverty, reduce inequality and unemployment by the year 2030. To achieve the NDP goals, sufficient energy is required to ensure reliable and continuous production, which could create more jobs, and it is against this backdrop that the country resolved to invest in electricity infrastructure.

Infrastructure development remains the backbone of every developing economy across the globe more, especially in Africa. As a developing country, South Africa, to a certain extent, is facing infrastructure challenges in various sectors and electricity is one of them. Energy infrastructure is key to

both foreign and domestic investment. In 2008, South Africa experienced electricity blackouts costing the economy billions of rand and ultimately scaring off investors. Within infrastructure investment projects, South Africa has amongst others identified two energy projects that are expected to increase the country's generation capacity and improve on stable electricity supply. These projects are Kusile Power Plant and, Medupi Power Plant and According to Engineering News, Projects in Progress, (March 2015), the investment for these projects is estimated to the tune of R118.5 billion and R105 billion, respectively. At both the construction and operational phase, these projects are expected to stimulate economic growth and create jobs. Of critical importance in a developing economy like South Africa is the extent at which women are afforded equal opportunity as men to participate as developers and suppliers of labor in these projects.

The critical question today is, what is the impact of such an investment in the South African economy about the desired outcomes of the NDP in the context of returns on investment? To scientifically respond to this question, this study applies the Social Accounting Matrix to reliably assess the Kusile and Medupi investment on the macroeconomic conditions of South Africa, quantitatively analyzing the impact at both construction and operational phase.

II. BACKGROUND AND LITERATURE

South Africa is facing enormous challenges of low economic growth, high unemployment, high levels of poverty, and inequality. To achieve high economic growth and increased household income, South Africa needs to create a conducive environment for investment (both local private and Foreign Direct investment). One other way to achieve the development proper infrastructure, is through participation of the construction sector as the producer of infrastructure stock, which is enabled by public infrastructure investment. As argued by Mbanda and Chitiga (2013), increasing public infrastructure investment is expected to raise the marginal productivity of private factors of production, lower production costs, increase levels of employment

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and increase economic growth (Fedderke and Bogetic, 2006; Kularatne, Undated; Fedderke and Garlick, 2008 and Guild, 2000). Investment in infrastructure affects many variables in the economy which include productivity, labor demand, economic growth, prices, consumption, employment, income distribution, poverty, and welfare, (Mbanda and Chitiga, 2013). Noting the low growth and high unemployment in South Africa, investment in Kusile and Medupi are generally expected to stimulate growth and increase employment across the country in the short to long term.

As indicated in table 1 below, South Africa's GDP growth slowed from 1.3% in 2017 to an estimated

0.7% in 2018. The medium-term outlook is weaker than projected in the 2018 MTBPS. Economic growth is expected to reach 1.5% in 2019, rising to 2.1% by 2021. The revisions take into account weaker investment outcomes in 2018, a more fragile recovery in household income and slower export demand than expected due to moderating global growth. Consumer inflation has also been revised down due to lower oil prices and food inflation than previously assumed (South African National Treasury, 2019).

Table 1: Macroeconomic Performance and Projections

Percentage Change	Actual			Estimates	Forecast		
	2015	2016	2017	2018	2019	2020	2021
Final Household Consumption	1.8	0.7	2.2	1.5	1.5	2.0	2.3
Final Government Consumption	-0.3	1.9	0.6	0.9	0.2	0.9	0.7
Gross Fixed-Capital Formation	3.4	-4.1	0.4	-0.2	1.5	2.1	3.0
Gross Domestic Expenditure	2.1	-0.9	1.8	1.2	1.3	1.9	2.2
Exports	2.8	1.0	-0.1	2.0	2.3	2.7	2.8
Imports	5.4	-3.8	1.6	3.8	1.7	3.2	3.3
Real GDP Growth	1.3	0.6	1.3	0.7	1.5	1.7	2.1
GDP Inflation	5.1	6.8	5.5	5.8	5.8	5.4	5.3
GDP at Current Prices (R billion)	4 051.4	4 350.3	4 651.9	4 957.9	5 323.1	5 708.1	6 135.9
CPI Inflation	4.6	6.3	5.3	4.7	5.2	5.4	5.4
Current Account Balance (% of GDP)	-4.6	-2.8	-2.4	-3.5	-3.4	-3.8	-4.0

Source: National Treasury

As a percentage of GDP, investment has persistently declined, reaching a 13-year low of 17.7% in the third quarter of 2018. The combination of low growth in employment, investment, and productivity continue to restrain economic growth. According to South African National Treasury (2019), investment growth is projected to rise from 1.5% in 2019 to 3% in 2021 as confidence gradually increases, worn-out capital is replaced, and the state improves its ability to execute capital projects. However, concerns about electricity supply and slower global growth pose risks to the near-term outlook. The Investment Summit affirmed that South Africa remains an attractive investment destination, with R300 billion in investments pledged across a variety of sectors. Efforts by the President's investment envoys yielded another \$28 billion in investment pledges, (South African National Treasury, 2019).

According to Statistics South Africa (2019), the first quarter of 2019 shows that unemployment increased by 0.5% point to 27.6% compared to the last quarter of 2018. This increase is caused by a decline of 237 000 of people in employment and an increase of 62 000 in the number of people who were unemployed between the fourth quarter of 2018 and the first quarter

of 2019. According to Statistics South Africa (2019), the results indicate that South African labor force increased by 149 000 in the first quarter of 2019 compared to the last quarter of 2018. The decline of 237 000 in employment during the first quarter of 2019 was experienced in six sectors. However, the construction had the largest share of decline which amounted to 142 000, followed by Finance with 94 000, Community and social services decreased by 50 000, Private households with 31 000, Mining with 20 000 and Agriculture with 12 000. Employment gains were observed in Transport which increased by 59 000; Trade increased by 25 000, Utilities increased with 16 000 and Manufacturing increased with 14 000, (Statistics South Africa, 2019).

Many economists have presented evidence to prove the positive link or relationship between infrastructure development and economic growth in many countries. Aschauer (1989) and Munnell (1990) found a strong positive relationship between infrastructure and growth. In their study, Fedderke & Garlick (2008), when observing infrastructure development and economic growth in South Africa, they concluded that based on both theoretical and empirical

evidence there is an existence of a robust positive relationship between infrastructure and economic growth. They particularly pointed out the following findings:

- Aggregate infrastructure stock and investment drive economic output;
- The driving relationship between economic output and infrastructure varies significantly across different types of physical infrastructure; and
- Infrastructure impacts on output both directly and indirectly, via increased private sector investment, improved productivity, and rising exports.

In general, infrastructure reduces the cost of production and consumption and makes it easier for participants in the economy to enter into transactions. Thus, if the efficiency of infrastructure is increased, there should be a concomitant improvement in growth performance, service provision and development outcomes. Overall, this should also result in improved economic competitiveness, (DBSA, 2006). This indicates that infrastructure stock is also an input towards productivity and ultimately, improved economic output. This is further supported by Serven (2010), who argues that, Conceptually, infrastructure may affect aggregate output in two main ways: first, directly because infrastructure services enter production as an additional input, and second, because they raise total factor productivity by reducing transaction and other costs thus allowing a more efficient use of conventional productive inputs.

III. METHODOLOGY

The study applies South African Social Accounting Matrix to perform a macroeconomic impact analysis of Kusile and Medupi investment in the South African economy. As argued by Fathurrahman (2014), the SAM analysis is mainly an impact analysis usually used to describe the impact of a given policy on the economy. A SAM coupled with a conceptual framework that contains the behavioural and technical relationships among variables within and among sets of accounts can be used for the evaluation of the economy-wide effects of policy changes or other economic impacts rather than only for purely diagnostic purposes (van Wyk, Saayman, Roussouw and Saayman, 2014; Pyatt, 1988:349).

The model will therefore provide reliable quantitative assessment of the subject under study to effectively inform economic and infrastructure investment policy and strategy direction for South Africa. For such impact analysis to be effectively performed, the model specification therefore outlines all agents in the economy to reflect macroeconomic impacts.

The starting point in computing the multiplier effects is the input-output (IO) table or the social accounting matrix (SAM).

The first step is to choose the exogenous accounts. The rest of the world, the government, and the investment accounts will be included in the exogenous bloc of the multiplier model. If we want to compute only direct and indirect effects, the household account will also be included in the exogenous bloc. The next step in producing SAM multipliers is to calculate the direct requirements matrix (A). The values of the cells in the direct requirements matrix are derived by dividing each cell in a column by its column total. Each cell in a column of the direct requirements matrix A shows how many cents of each producing industry's goods or services are required to produce one dollar of the consuming industry's production.

Next in the process of producing the multipliers, the Leontief Inverse is calculated. A SAM model can be written as:

$$X - AX = Y, \quad (1)$$

where X is the column vector of gross industrial output, Y is the column vector of exogenous final demand accounts, and A is the direct requirement matrix.

We can express this equation as:

$$(I - A)X = Y \quad (2)$$

or

$$X = (I - A)^{-1} Y \quad (3)$$

$$X = BY, \quad (4)$$

where

I is the identity matrix (with "1" in the diagonal, "0" in all other fields), $(I-A)^{-1}$ is the "Leontief Inverse (Matrix)" = B (or B' if induced effects are included), B (or B') is the matrix of direct and indirect (and induced) coefficients b_{ij} (or b'_{ij}), and b_{ij} (or b'_{ij}) = "Leontief Coefficient" representing the direct and indirect (and "induced") requirements per unit of final demand for the output of sector j.

Using the B (or B') matrix, we can compute the effects of an exogenous shock on the output, valued-added, and employment in the different industries and on the household income. The output multiplier for an industry is the ratio of the direct and indirect (and induced when included) output changes to the direct output change due to a unit increase in final demand. Multiplying a change in final demand (direct impact) for an individual industry's output by that industry's output multiplier will generate an estimate of direct and indirect impacts (and induced when included) upon output throughout the economy, (International Finance Corporation, 2015).

We can also compute the value-added, income, and employment effects. The gross value-added (or GDP) effect is the direct and indirect (and induced when included) gross value-added changes to the direct

output change, due to a unit increase in final demand. The income effects show the direct plus indirect (and induced when included) income change to the direct output change due to a unit increase in final demand. The employment effects show the direct plus indirect (and induced when included) employment change to the direct output change due to a unit increase in final demand. The employment effect in each industry is computed by multiplying the employment coefficient (number of employees per Rand of output) in that industry by the change in the output of the industry as a consequence of a shock to the final demand in industry, (International Finance Corporation, 2015).

a) *Employment Effects (Coefficient)*

SAM framework is using monetary values in its transactions matrix. However, as already discussed in the previous sub-section, employment changes will be analyzed for the study. To do that, the monetary value should be converted into employment value by using an employment coefficient. As argued by International Finance Corporation (2015), the employment effects will be estimated in the following steps.

- 1) Compute the employment coefficient for each industry. For example, for industry i : Employment coefficient i = number of employees in industry i / output of the industry i (measured in monetary units).
- 2) Compute the change (using the output multiplier) in the output of the industry i due to a shock to the final demand of an industry j .

$$\Delta \varepsilon_j = \Delta Y_j e_j \quad (6)$$

Where:

$$\Delta \varepsilon_j = \text{Employment impact (changes) for sector in row-} j \quad (7)$$

$$\Delta Y_j = \text{Output changes for the sector in row-} j \quad (8)$$

The turnover of the business economy associated with the electricity infrastructure investment is an “outside agents” impacting on the model through an increase in its final demand components. The implication of this is that for every project a (column) vector for every relevant final demand component of the model, at macro level, had to be compiled.

IV. STUDY RESULTS

a) *Macroeconomic Impacts Results*

This section presents total macroeconomic results for both investment (construction) phase, operational phase, and combined results of both Kusile and Medupi power plants at an aggregate level.

i. *Macroeconomic Impacts of the Construction (Investment) Phase*

The impact of the construction Phase of the Medupi and Kusile power stations in 2018 prices is in the table below. As argued by Perkins (2011) economic

- 3) Multiply the change in the output of an industry i by the employment coefficient of industry i . This will give the change in the number of jobs in industry i as a result of a shock in the final demand of an industry j .
- 4) Total number of new jobs in the economy as a result of a shock to the final demand of an industry $j = \sum_i \text{change in employment in industry } i$

Thus, computing employment will be done as follows:

As Argued by Fathurrahman (2014), to do this, let's assume “e” as an employment coefficient which will be described as total human capital needed per billion IDR of sectoral output. Expressing in mathematical form, it can be written as follows:

$$e_j = \text{Employment}_j / Y_j \quad (5)$$

Where:

Y_j = Total output of sector in row j

Employment_j = Total employment for the sector in row- j

e_j = employment coefficient for the sector in row- j

Here, we assume those employment coefficients will remain constant regardless of changes in sectoral output. The employment impact (changes) then can be assessed by multiplying employment coefficient by each sector's output changes:

infrastructure may be compared to the foundation of a building. It plays a supporting role, facilitating the multitude of productive economic activities that constitute the bulk of the economy, or gross domestic product. From the results in table 2 below, economic growth, the GDP figures, i.e. direct, indirect and, induced arise from the implementation of these projects. The total GDP of R190.4 billion shows the additional economic growth value that will on average be generated on an annual basis for the next 5 – 8 years during the construction phase in the South African Economy with direct economic impact being the highest at R79.959 billion.

The total value of capital accumulation on annual basis during the construction phase of Kusile and Medupi Power Station is estimated to R423.890 billion per annum with direct impact taking the largest share of R182.914 billion followed by induced impact at R167.802 billion and direct impact being the lowest at R73.173 billion. The construction of the two- power

station, will as a result, add value to the South African gross fixed capital formation.

Table 2: Investment Phase - Macroeconomic Impact of Medupi and Kusile, 2018 prices, R Millions

	Investment Impact: <i>National</i>			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product	R 79,959	R 36,854	R 73,556	R 190,369
Impact on capital formation	R 182,914	R 73,173	R 167,802	R 423,890
Total impact on employment [job opportunities]	450,271	216,356	400,642	1,067,269
Skilled impact on employment [job opportunities]	56,958	48,340	110,101	215,399
Semi-skilled impact on employment [job opportunities]	304,524	119,364	205,611	629,500
Unskilled impact on employment [job opportunities]	88,788	48,652	84,930	222,370
Impact on Households				R 125,672
Low Income Households				R 20,315
Medium Income Households				R 23,939
High Income Households				R 81,417
Fiscal Impact				R 55,389
National Government				R 51,363
Provincial Government				R 581.4
Local Government				R 3,444.1
Impact on the Balance of Payments				R-125,294

Source: Author's Computation Results based on SAM Model

From table 2 above, it is evident that during the construction phase, a total number of 1 067 269 job opportunities are created through-out South Africa as a result of the electricity infrastructure construction. The direct (450 271), indirect (216 356) and induced (400 642) impacts of employment form the total impact of employment. Of the total employment opportunities created during the construction phase, a significant impact is due to the direct impact followed by induced impact and the indirect impact.

The induced employment of 400 642 job opportunities refers to the number of jobs created where the salaries and wages from direct employment will be spent. The indirect employment of 216 356 job opportunities shows the number of jobs that will be created in other sectors because of their increased business activity resulting from supplying goods and services to the electricity infrastructure development projects. Because the power stations also require the expansion of coal activities, water supply as well as supply from other economic sectors, the multiplier effect (indirect and induced) effect are significant.

Amongst job opportunities emanating from the Medupi and Kusile Investment phase, semi-skilled (629 500) laborers are expected to be the most benefitting followed by un-skilled (222 370) and skilled at (215 399). However, noting that households are suppliers of labor to the market and in return received salaries and wages, results from the table above shows that various

households in terms of low, medium and high income do received income. Worth noting is that, high income households receives the highest amount of income R81 417 billion, followed by medium income households at R23 939 billion and low-income households receiving the lowest income at R20 315 billion per annum.

ii. *Macroeconomic Impacts of the Operational Phase*

The Operational Phase impact of the Medupi and Kusile power stations in 2018 prices is shown in the Table below. Similarly, in terms of economic growth, the GDP figures, i.e., direct, indirect, and induced arise from the implementation of the approved ECIC projects. The total GDP of R106.8 billion shows the additional economic growth that will on average, be generated on an annual basis for the next 20 years during the operational phase in the South African Economy.

Investment in energy supply is largely expected to attract and stimulate foreign direct investment and local investment. According to Glennen (2017), foreign investment is commonplace within the energy sector. As indicated in table 3 below, capital formation is expected to continue growing post investment at an operational phase of Kusile and Medupi power station with a total impact of R376 467 billion per annum. Addition energy into the grid in South Africa has the potential to attract more investment and create more jobs as a result. In table 3 above, it is evident that during the operational phase, a total number of 480 939 job opportunities will

be created and sustained throughout in South Africa economy due to the Medupi and Kusile power stations. The direct (103 992), indirect (155 553), and induced (221 393) impacts of employment form the total impact

of employment. Of the total employment opportunities created during the operational phase, a significant impact employment impact is realized at induced impact followed by the indirect impact.

Table 3: Operational Phase- Macroeconomic Impact of Medupi and Kusile, 2018 prices, R Millions

	Operational Impact: <i>National</i>			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product	R 40,198	R 26,029	R 40,557	R 106,784
Impact on capital formation	R 223,500	R 60,552	R 92,415	R 376,467
Total impact on employment [job opportunities]	103,992	155,553	221,393	480,939
Skilled impact on employment [job opportunities]	28,601	30,315	60,747	119,663
Semi-skilled impact on employment [job opportunities]	68,096	92,184	113,631	273,911
Unskilled impact on employment [job opportunities]	7,296	33,054	47,015	87,365
Impact on Households				R 69,156
Low Income Households				R 11,483
Medium Income Households				R 14,094
High Income Households				R 43,579
Fiscal Impact				R 31,762
National Government				R 29,310
Provincial Government				R 365
Local Government				R 2,087
Impact on the Balance of Payments				R 50,946

Source: Author's Computation Results

The induced employment of 221 393 job opportunities refers to the number of jobs created where the salaries and wages from the direct employment is being spent. Induced employment level remains high at operational phase as result of economic opportunities that will be created by a sufficient energy supply in the economy in other economic sectors not necessarily related to electricity industry in their nature of business. The indirect employment of 155 553 job opportunities will be the number of jobs that will be created in other sectors because of their increased activity resulting from supplying goods and services to Power Stations for continuous operation such as coal industry. Comparatively, total impact on household income across all households is expected to decline to R69.156 billion at operational phase compared to R125.672 billion during investment (construction) phase.

iii. *The Overall/Combined macroeconomic Impacts*

The Overall / Combined (construction and operational phases) impact of the Medupi and Kusile power stations in 2018 prices is shown in the Table 4 below. The impact of the construction phase was averaged out over the operational period.

Table 4 below indicates that the Medupi and Kusile R223.5 billion (R118 billion + R105 billion) capital investment programme in its own right will:

- Generate additional GDP in the region of R186.3 billion in 2018 prices; of which just over 40% is generated indirectly in sectors supplying inputs to the two power stations and induced in sectors positively affected by the additional payment of salaries and wages. This emphasizes the important role that the two power stations play as a supplier of essential economic infrastructure to the South African economy;
- Generate an additional R397.7.8 billion in new Capital Formation throughout the economy, of which R223.5 billion will be invested directly by Eskom – R223.5 billion of which constitutes new infrastructure investment, with the remainder being replacement of current infrastructure;
- Sustain an additional 534 302 new job opportunities, of which just over 98 484 will be for unskilled workers; thereby significantly contributing to the State's job creation targets;
- Generate just over R75.4 billion in additional household income, of which almost R12.5 billion will accrue to low income households; thereby significantly contributing to the State's target of poverty alleviation; and
- Generate additional Government Revenue of just over R34.5 billion at all three levels of government. The main sources of this government revenue will

be derived from direct and indirect taxes, where direct tax consists mainly of personal income tax and company tax.

Table 4: Overall/Combined - Macroeconomic Impact of Medupi and Kusile, 2018 prices, R Millions

	Combined Impact: <i>National</i>			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product	R 44,196	R 27,872	R 44,235	R 116,302
Impact on capital formation	R 232,646	R 64,210	R 100,805	R 397,661
Total impact on employment [job opportunities]	126,506	166,371	241,425	534,302
Skilled impact on employment [job opportunities]	31,449	32,732	66,252	130,433
Semi-skilled impact on employment [job opportunities]	83,322	98,152	123,912	305,386
Unskilled impact on employment [job opportunities]	11,735	35,487	51,262	98,484
Impact on Households				R 75,440
Low Income Households				R 12,498
Medium Income Households				R 15,291
High Income Households				R 47,650
Fiscal Impact				R 34,531
National Government				R 31,878
Provincial Government				R 394.1
Local Government				R 2,259.2
Impact on the Balance of Payments				R 44,681

Source: Author's Computation Results

At a macroeconomic level, electricity infrastructure investment in Medupi and Kusile power plants have positive effects in the South African economy at both construction and operational phases.

V. CONCLUSION

According to Keynesian economic theory, any injection into the economy via investment capital, government spending or the like will result in a proportional increase in overall income (measured through GDP) at a national, provincial and local level, Eskom Holdings SOC Ltd., 2017).. The basic principle of this theory is that increased spending will have carry-through or multiplier effects or impacts, which result in even greater aggregate spending over time. The multiplier itself is an attempt to measure the size of those carry-through effects or impacts. The multiplier takes all direct and indirect benefits from that investment or the change in demand into account. The size of the impact or the effect on the economy depends on the size of the multiplier in the economy (Eskom Holdings SOC Ltd., 2017).

Various types of analytical tools may be adopted to assess the impact of investment on employment. However, since investment is a

component of the national aggregate demand, a 'Keynesian 'type of demand-driven (multiplier) approach may prove to be the most suitable choice for understanding such questions. The Social Accounting Matrix (SAM) is an accounting platform that offers such an approach (Alarcon, Ernst, Khondker, and Sharma, 2011). The findings of this study are largely based at two levels, which macroeconomic and industry level (microeconomics) both from a gender analysis.

This study thus present results on the impact of electricity infrastructure investment impact on macroeconomic conditions in the South African economy with specific reference to Kusile and Medupi power stations. The Social Accounting Matrix Model application results does show that the infrastructure investment in the two-power station has a positive impact in the South African Economy atthe macroeconomic level. At a macroeconomic level, infrastructure investment shows to have a positive impact on GDP and does add significant value to Gross Fixed Capital Formation in the country at both the construction and operational phase of Kusile and Medupi. Furthermore, household income will be positively impacted by the economy as a result of electricity infrastructure investment.

The SAM-based Model shows that total employment will be positively impacted and labor force with different skills level will unequally benefit. Furthermore, Gross capital formation will be positively impacted. It is against these results that the study concludes that, investment in Kusile and Medupi power stations are good for the country due to their positive macroeconomic impact both at construction and operational phases.

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Analyse Du Pass-Through Du Taux D'intérêt Au Maroc

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Résumé- Letaux d'intérêt du marché monétaire joue un rôle fondamental comme courroie de transmission de la politique monétaire. En effet, à travers ce canal, la banque centrale transmet ses impulsions monétaires au secteur réel de l'économie via les répercussions sur les taux d'intérêt offerts par les institutions bancaires. La connaissance du degré d'ajustement des taux bancaires par rapport aux taux du marché monétaire s'avère incontournable compte tenu du fait que cela permet de mesurer l'efficacité de la politique monétaire à travers le canal du taux d'intérêt.

Cet article est consacré en particulier, à l'examen de la relation entre le taux du marché monétaire et les taux bancaires à travers l'analyse du pass-through et aussi à étudier la présence d'asymétrie dans la dynamique de transmission de la politique monétaire au niveau du système bancaire Marocain. Pour ce, un Modèle à Correction d'Erreur est utilisé pour mesurer le degré de réactivité des taux bancaires suite aux modifications des conditions monétaires.

Motsclés: *pass-through, politique monétaire, canaux de transmission, taux débiteurs, taux créditeurs, taux interbancaire, modèle à correction d'erreur (MCE).*

GJMBR-B Classification: *JEL Code: H29*



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Khalid Harraou

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Pour tester la présence d'asymétrie dans la transmission des chocs monétaires, un modèle à seuil est donc utilisé, lequel est un prolongement du modèle à correction d'erreur. Les résultats des estimations ont révélé un degré élevé dupass-through des taux débiteurs et un faible pour les taux créditeurs, avec des effets asymétriques dans certains cas.

Mots-clés: *pass-through, politique monétaire, canaux de transmission, taux débiteurs, taux créditeurs, taux interbancaire, modèle à correction d'erreur (MCE).*

I. INTRODUCTION

Dans la poursuite de ses objectifs, qui consistent principalement en la stabilité des prix, la Banque Centrale du Maroc dispose de plusieurs canaux de transmission lesquels permettent la mécanisation des impulsions monétaires au niveau du secteur réel de l'économiedu pays.

Suite à une variation des taux du marché monétaire, l'ajustement des taux bancaires se fait de manière plus ou moins rapide selon qu'il s'agit des taux sur les dépôts ou encore sur les prêts, étant donné les coûts d'ajustement supportés par les banques commerciales. La transmission dépendra alors de plusieurs facteurs dont le niveau de développement du marché financier, le degré de concurrence, la volatilité des taux directeurs pour ne citer que ceux-là.

Parmi les points révélateurs dans la littérature économique sur la transmission des impulsions monétaires via le taux directeur sur les taux bancaires, on retient que le pass-through est parfois lent et

incomplet à court terme mais complet à long terme. Ainsi, les changements opérés au niveau du marché monétaire domestique, suite aux décisions de politique monétaire, qui modifient les conditions du marché, se transmettent avec des retards sur les taux bancaires. Ce phénomène se traduit par la notion de viscosité¹ des taux bancaires.

L'une des premières tentatives d'explication de cette viscosité ou encore du degré d'inertie des taux bancaires a été l'œuvre de Stiglitz et Weiss (1981). Le fait est qu'il existe de l'asymétrie informationnelle au niveau du marché bancaire peu concurrentiel, ce qui conduit à un rationnement du marché. Dès lors, les gains espérés des banques sont une fonction des taux d'intérêt sur les prêts.

Etant donné que la probabilité d'avoir un défaut de paiement augmente d'autant que les taux d'intérêt sont élevés, alors toute hausse des taux d'intérêt est susceptible de provoquer une hausse des risques de portefeuille des prêts bancaires par sélection adverse ou aléa moral. Dans cette logique, les banques ne peuvent pas augmenter les taux débiteurs même dans les cas où elles font face aux coûts marginaux. Tout ceci peut se traduire par le fait que les investisseurs prudents seraient découragés et d'autres plus averses au risque seraient attirés par ces taux élevés. Autrement dit, les prêteurs auront tendance à investir dans des projets plus risqués à cause des taux d'intérêt élevés. En effet, l'existence de l'asymétrie informationnelle entre prêteurs et emprunteurs sur le marché des prêts peut générer une certaine viscosité des taux d'intérêt sur les prêts bancaires.

L'objectif de ce papier est d'examiner le degré et la vitesse d'ajustement des taux bancaires suite aux variations des taux du marché monétaire (le degré de pass-through) et à détecter la présence éventuelle d'effets asymétriques dans la dynamique de transmission de la politique monétaire. Pour ce, nous allons recourir à l'estimation d'un Modèle à Correction d'Erreur (ECM) en utilisant des données trimestrielles pour la période 2008-2017, puis une variante du modèle ECM (modèle à seuil) pour étudier la dynamique asymétrique.

¹ La viscosité des taux bancaires s'explique par le fait que ces taux s'ajustent parfois très faiblement et lentement suite aux modifications des conditions du marché découlant des décisions de politique monétaire.

Notre article se fera comme suit : en première partie, nous fournissons une brève revue de la littérature du taux d'intérêt et du pass-through. Dans la suite de ce papier, nous nous intéresserons à la méthodologie adoptée dans le cadre de cette étude, enfin la présentation et l'interprétation des résultats empiriques.

II. CADRE THÉORIQUE

a) Littérature théorique du taux d'intérêt et du pass-through

i. Théorie du taux d'intérêt

Le taux d'intérêt d'un prêt ou d'un emprunt, détermine la rémunération du capital prêté par un agent économique à un autre. Le montant remboursé par le prêteur est égal à la somme du capital et des intérêts. Ce taux du prêt dépend de la durée de prêt, de la nature des risques, de l'unité de compte et des garanties offertes par le prêteur.

La définition du taux d'intérêt a créé plusieurs débats théoriques dans la littérature économique. On présente dans ce qui suit les idées de chaque théorie.

ii. Théorie classique

Selon les classiques, le taux d'intérêt est déterminé par l'offre d'épargne et de la demande d'emprunt. C'est le prix de l'abstinence à la consommation présente pour les ménages épargnants. La demande d'emprunt est créée par les besoins d'investissement. Ce taux d'intérêt égalise donc l'épargne et l'investissement.

▪ La demande d'emprunt

La demande d'emprunt se compose de la demande à des fins productives et de consommation. Le capital est demandé par les investisseurs parce qu'il est productif. Mais la productivité du capital est soumise à la loi des proportions variables. C'est-à-dire la productivité marginale du capital diminue en ajoutant des unités de capital.

Il arrive un moment quand la productivité marginale du capital devienne nulle, et donc l'investisseur à un certain moment n'aura plus intérêt à investir, parce que la productivité devient inférieure au taux d'intérêt. On conclut que la demande du capital est inversement liée au taux d'intérêt. Il y'a cependant d'autres facteurs qui régissent la demande de capitaux, tel que la croissance de la population, le progrès technique, le niveau de la vie de la communauté.

▪ L'offre d'épargne

L'offre du capital dépend de l'épargne. Certains agents épargnent indépendamment du taux d'intérêt, ils continueraient à épargner même si le taux d'intérêt devient nul. Cependant, il y'a d'autres qui épargne parce que le taux actuel les incite à épargner. Cette épargne est une abstinence à la consommation actuelle.

Plus le taux d'intérêt est important, plus les agents seront incités à épargner, plus l'offre de capital sera grande. La courbe d'offre se déplace donc à droite.

▪ L'équilibre de l'offre et de la demande

Le taux d'intérêt est déterminé par l'intersection de la courbe de la demande et la courbe de l'offre. Ceci est montrée dans la figure 1 ci-dessous, avec E point d'intersection des courbes I et S, et Q représente la quantité du capital en offre et en demande à un taux d'intérêt R.

Si le taux d'intérêt augmente, la demande d'investissement diminue et l'offre de capital augmente.

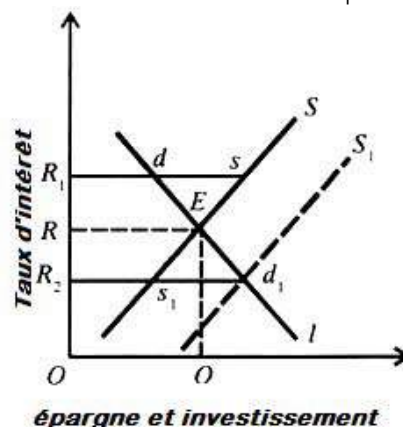


Figure 1: Equilibre entre l'épargne et l'investissement

Cependant, la théorie classique énoncée par Marshall et Pigou a été critiquée par Keynes :

- *Le revenu n'est pas constant mais variable*: la théorie classique suppose que le niveau de revenu est donné, et considère le taux d'intérêt comme un mécanisme d'équilibre entre la demande et l'offre de fonds. Selon Keynes, le revenu est une variable et non une constante et l'égalité entre l'épargne et l'investissement est provoqué par des variations de revenu et non par des variations du taux d'intérêt.
- *L'indépendance entre épargne et investissement* : les deux déterminant du taux d'intérêt : les courbes d'offre et de demande sont considérées comme indépendantes, c'est-à-dire si la demande change, la courbe de demande se déplace sans affecter la courbe d'offre. Mais selon Keynes, les deux courbes sont dépendantes. Un déplacement de la courbe d'investissement en haut, le revenu augmente, ce qui va donner une épargne supérieure et par suite la courbe d'offre se déplace aussi en haut. De même un changement dans la courbe d'offre entrainera une variation de la courbe de demande.
- *Néglige les effets de l'investissement sur le revenu* : la théorie classique néglige l'effet de l'investissement sur le niveau de revenu. Une augmentation du taux d'intérêt par exemple, entrainera une baisse de l'investissement en le

rendant moins rentable. Cela entraînera une diminution de la production, de l'emploi et du revenu. Ce dernier à son tour, entraînera une diminution d'épargne, ce qui est contradictoire à l'affirmation classique selon laquelle l'épargne est une fonction directe du taux d'intérêt.

D'autre part, un faible taux d'intérêt encourage l'investissement, augmente la production, l'emploi et par suite le revenu et l'épargne.

Selon Keynes, l'investissement ne dépend pas du taux d'intérêt mais dépend de l'efficacité marginale du capital. Même si le taux d'intérêt baisse à zéro, Keynes affirme que l'investissement n'aura pas lieu si les l'espérance du profit est faible.

D'autres critiques de la théorie classique c'est qu'elle néglige les autres sources d'épargne, l'hypothèse de plein emploi qui est loin de la réalité, néglige les facteurs monétaires.

iii. *Théorie Keynésienne*

L'approche keynésienne le taux d'intérêt est le prix qui égalise l'offre et la demande de monnaie. C'est le prix de la renonciation à la liquidité. L'épargne est un résidu qui ne dépend pas du taux d'intérêt, en effet c'est le revenu qui s'ajuste pour égaliser l'épargne et l'investissement.

La demande de la monnaie chez Keynes est déterminée par trois motifs : motif de transaction, de précaution et de spéculation. Ce sont les motifs de détention de la liquidité par les agents économiques. Par ailleurs l'offre de monnaie est exogène, elle est déterminée par les autorités monétaires du pays.

▪ *La demande*

Keynes stipule dans son ouvrage « Théorie générale de l'emploi, de l'intérêt et de la monnaie » que le besoin pour la liquidité ou la demande de monnaie se base sur trois motifs:

o *Motif de transaction*

Les individus ont besoin de la monnaie pour effectuer leurs transactions courantes. En effet comme les dépenses se font pendant une période et les revenus sont généralement reçus à la fin de chaque période, les agents économiques ont besoin de la monnaie sous forme d'espèces pour financer leurs transactions.

Le besoin de la monnaie dépend donc de niveau de revenu de chaque agent. Les agents ayant des revenus plus élevés conservent plus d'argent liquide pour répondre à leurs transactions. En d'autres termes la demande de transaction est une fonction croissante de revenu.

$T_{dm} = f(Y)$ où T_{dm} : représente la demande de monnaie pour transaction et Y : le revenu.

o *Motif de précaution*

Puisque l'avenir est incertain, pour Keynes, non seulement les agents détiennent la monnaie pour effectuer des transactions courantes, mais également

pour faire face aux imprévus comme la maladie, la mort, les accidents, le risque de chômage, etc. Le montant de l'argent détenu dans le cadre de ce motif, dépend également du niveau de revenu de l'individu.

Les personnes ayant des revenus plus élevés peuvent se permettre de conserver plus d'argent liquide pour faire face à ces situations d'urgence. Cela signifie que ce type de demande d'argent est également une fonction croissante du revenu.

$P_{dm} = f(Y)$ où P_{dm} : représente la demande de monnaie pour précaution.

o *Motif de spéculation*

Ce type de demande est la vraie contribution de Keynes concernant la demande de la monnaie. Le motif spéculatif se réfère à la volonté des agents économiques de détenir des actifs liquides pour pouvoir profiter des mouvements de marché des titres en fonction des variations de taux d'intérêt.

Le montant détenu dans le cadre de ce motif sert à réaliser des gains en vendant ou achetant des titres selon l'évolution prévue de taux d'intérêt. En effet le taux d'intérêt est inférieur au taux qui compense la préférence pour la liquidité, alors les agents vont renoncer aux placements financiers et conservent des liquidités. Par conséquent la demande spéculative d'argent est une fonction décroissante du taux d'intérêt.

$S_{dm} = f(r)$ où r : le taux d'intérêt.

▪ *La demande totale de monnaie:*

La demande totale de la monnaie est la somme des trois demandes présentes ci-dessus.

$$D_m = T_{dm} + P_{dm} + S_{dm}$$

Compte tenu de la relation inverse entre le taux d'intérêt et la demande spéculative de la monnaie cette demande globale D_m possède une pente négative en fonction de taux d'intérêt.

▪ *L'offre de monnaie:*

L'offre de la monnaie S_m selon Keynes est exogène car, elle dépend de la politique de la banque centrale du pays. Elle est donnée d'une manière institutionnelle.

▪ *La détermination du taux d'intérêt:*

Le taux d'intérêt est déterminé par la confrontation de l'offre et la demande de monnaie.

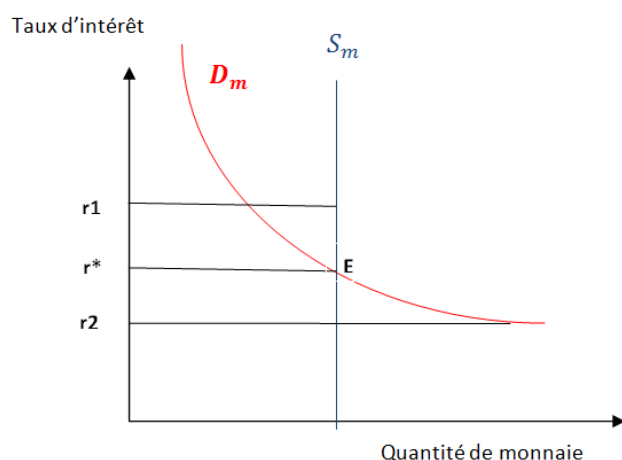


Figure 2: Théorie keynésienne de la monnaie

S_m Est le montant total fourni par la banque centrale. Au point E l'offre de la monnaie égale la demande D_m , ainsi le taux d'intérêt d'équilibre r^* est déterminé.

Si le taux d'intérêt est supérieur au taux d'équilibre r^* l'offre de la monnaie dépassera la demande. Les gens achèteront plus de titres. Par conséquent, leurs prix augmenteront et le taux d'intérêt diminuera jusqu'à ce que la demande de monnaie soit égale à l'offre.

D'autre part, si le taux d'intérêt devient inférieur au taux d'équilibre, la demande de la monnaie dépassera l'offre, les gens vendront leurs titres. Le prix des titres baissera et le taux d'intérêt augmentera jusqu'à ce que nous atteignons le point E. Ainsi, le taux d'intérêt est déterminé uniquement par les variables monétaires.

Toutefois, comme la théorie classique, la théorie Keynésienne présente des limites :

Premièrement, Keynes a critiqué la théorie classique pour le fait qu'elle suppose un niveau d'emploi fixé. La même critique s'applique à la théorie de la monnaie keynésienne puisqu'elle suppose un niveau de revenu donné. En effet pour Keynes c'est l'offre et la demande de monnaie qui détermine le taux d'intérêt. Sans connaître le niveau de revenu on ne peut pas connaître la demande de transaction et la demande spéculative. Par conséquent un changement de revenu entraînera une modification de la demande de monnaie et donc une modification de taux d'intérêt.

On ne peut pas donc déterminer le taux d'intérêt que si le niveau de revenu soit connu et que le niveau de revenu ne peut être déterminé que lorsque le taux d'intérêt est connu. D'où l'indétermination. Hicks et Hansen ont résolu ce problème dans leur analyse IS-LM² en déterminant simultanément le taux d'intérêt et le niveau de revenu.

Deuxièmement, Keynes a rejeté les facteurs réels comme déterminants de la détermination du taux d'intérêt.

Troisièmement, la théorie de Keynes permet de choisir entre la tenue d'obligations risquées et l'argent sans risque. Une personne détient soit des obligations soit de l'argent liquide et non pas les deux en même temps. En réalité l'incertitude et le risque oblige un individu à tenir les deux. Cet écart dans la théorie de Keynes a été rempli par James Tobin. En fait, aujourd'hui, les gens font des choix entre une variété d'actifs.

iv. Théorie des fonds prêtables

La théorie des fonds prêtables vient comme alternative combinant les deux théories : classique et keynésienne. Elle stipule que le taux d'intérêt est déterminé par la confrontation de l'offre et de la demande des fonds prêtables. L'offre intègre les actifs monétaires et non monétaires, de même la demande est composée des liquidités désirées par les agents ainsi que la demande d'investissement.

b) Littérature théorique du pass-through du taux d'intérêt

Le pass-through du taux d'intérêt est une composante clé de la transmission de la politique monétaire à travers le canal du taux d'intérêt, il permet de décrire comment un changement du taux directeur est transmis aux taux débiteur et créateur sur le long terme.

L'estimation numérique des coefficients du pass-through divergent considérablement selon les pays, les marchés. Ceci implique qu'un changement de la politique monétaire produit des différentes réponses au niveau des taux bancaires.

Théoriquement, le pass-through des taux directeurs sur les taux bancaires peut être influencé positivement ou négativement par des facteurs d'ordre institutionnel ou financier. La littérature empirique a permis d'isoler certains déterminants lesquels sont intimement liés à la structure de l'économie et du marché monétaire. Les déterminants du pass-through des taux directeurs sur les taux bancaires :

i. La structure des dépôts bancaires

La littérature économique retient la structure de la dette d'une économie comme facteur explicatif de la vitesse de transmission des impulsions monétaires sur les taux bancaires. En effet, la vitesse de la transmission de la politique monétaire dépend de la structure de la

algébrique et graphique d'un certain nombre de relations posées plus ou moins explicitement par J.M. Keynes dans la théorie générale. Le principal apport du modèle original réside dans la détermination simultanée, en économie fermée, du revenu national et du taux d'intérêt à partir d'une interaction entre les marchés des biens et services (IS) et le marché de la monnaie (LM).

² Le modèle IS-LM est considéré comme une version formalisée des idées de J.M. Keynes, une représentation

dette: si celle-ci est composée principalement des taux variables, la transmission des changements du taux directeur se fait plus rapidement. Par contre, si les dépôts sont soumis à des taux fixes, cette vitesse sera plus faible.

ii. *La concurrence dans le marché bancaire*

Le niveau de concurrence au niveau du marché bancaire joue un rôle fondamental dans la qualité de transmission des chocs monétaires sur les taux offerts par les banques commerciales. Selon que la pression concurrentielle soit plus ou moins forte, l'ajustement des taux bancaires devrait être plus ou moins complet. D'une manière générale, se basant sur certains éléments théoriques et empiriques, il est admis que la transmission des impulsions monétaires sur les taux bancaires se fait de manière nettement plus rapide dans une économie où la pression concurrentielle entre banques est très élevée (Cottarelli et Kourelis³).

Une des approches retenues pour évaluer l'influence de la concurrence sur le pass-through consiste à déterminer l'indice de concentration. Il s'agit de calculer le ratio entre le total des actifs d'une banque ou d'un groupe de banques par rapport au total des actifs du système bancaire.

iii. *L'inflation*

L'inflation est l'un des facteurs qui détermine le pass-through du taux directeur sur les taux débiteurs et créditeurs, car elle permet un réajustement par les prix relatifs (Mojon, 2000). En effet l'inflation croît à un rythme supérieur que celui des taux d'intérêt bancaires (nominaux), dans ce cas le taux d'intérêt réel diminue. Les banques augmentent leurs taux débiteurs car la baisse des taux d'intérêt réel représente une dégradation des profils bancaires, et par suite alimente la demande du crédit. La présence d'inflation peut donc améliorer la vitesse et la qualité de transmission.

Même s'il est difficile de conclure sur l'effet de l'inflation sur la vitesse de la transmission, plusieurs études empiriques ont donné des résultats favorables d'un effet négatif. Si on a une forte inflation, le taux d'intérêt réel sera très faible. Cet effet peut être nuisible à la transmission, car les agents économiques sont affectés différemment par les variations du taux monétaire qui seront compensés et amortis par la forte inflation.

iv. *La croissance économique*

La croissance peut avoir un impact positif sur le pass-through de la politique monétaire. En effet la croissance agit positivement sur l'investissement et l'endettement.

En présence d'une croissance économique, et si une forte demande est anticipée avec de bonnes

perspectives en termes de profits et de débouchés, les entreprises anticipent une hausse de l'activité économique, alors elles seront incitées à investir. Toute hausse de la croissance économique engendre une hausse préalable au niveau d'investissement⁴.

Pour financer leurs investissements, les entreprises ont recours soit au crédit, soit à la finance directe. Cette augmentation de la demande et du volume des crédits peut agir positivement sur le pass-through.

v. *La volatilité des taux directeurs*

L'incertitude au niveau de la politique monétaire, a un impact négatif sur la capacité des banques à ajuster leurs taux. En effet un niveau d'incertitude élevé induit un risque de taux d'intérêt, par conséquent des coûts d'ajustement supérieurs.

Sachant que les emprunteurs sont averses au risque, ils préfèrent des taux fixes, ceci poussera les banques à privilégier la stabilité de leurs taux, et vont adopter un comportement de lissage des variations du taux monétaire.

Le niveau d'incertitude est lié empiriquement à la variance du taux directeur. En effet, une variance importante du taux directeur se traduit par une viscosité dans le pass-through. La crédibilité de la politique monétaire agit positivement sur la transmission des variations du taux directeur aux taux bancaires.

III. LES CANAUX DE TRANSMISSION DE LA POLITIQUE MONÉTAIRE

Les canaux de transmission jouent un rôle primordial dans la prise de décision des banques centrales, ce qui a donné lieu à plusieurs travaux théoriques qui cherchent à identifier les spécificités de chaque canal de transmission et pour voir comment il opère. Il existe plusieurs canaux de transmission de la politique monétaire, elles diffèrent entre elles selon l'importance accordée soit au taux d'intérêt, au taux de change, à la monnaie ou au crédit.

a) *Canal du taux d'intérêt*

C'est le canal le traditionnel de la littérature économique, et le canal principal dans la théorie keynésienne dans le modèle IS-LM. Ce canal peut être décomposé en deux étapes : l'impact du changement du taux directeur sur l'ensemble des taux d'intérêt et l'impact des taux d'intérêt sur l'activité économique et sur les prix. Le mécanisme de transmission peut être schématisé comme suit :

Une politique monétaire expansionniste produit une baisse du taux d'intérêt réel « *ir* » en présence de prix rigides à court terme, cette baisse diminue le coût du capital et augmente les dépenses d'investissement,

³ Cottarelli, C., and A. Kourelis (1994), Financial Structure, Bank Lending Rates, and the Transmission Mechanism of Monetary Policy, IMF Staff Papers, 41(4), 587-633.

⁴ Multiplicateur keynésien

et l'accroissement de la demande mène à une augmentation du volume de la production.

En injectant de la liquidité, la banque centrale agit sur les taux à court terme, alors que le taux à long terme est une fonction des taux courts anticipés, selon la théorie des anticipations de la structure par terme des taux d'intérêt (Fisher⁵ 1993).

Cependant les taux à moyen et long terme sont les variables clés de la transmission de la politique monétaire par ce canal, vu qu'ils encouragent l'investissement et par suite augmentent le revenu global. Ce canal du taux d'intérêt peut être aussi analysé à travers l'effet de substitution et l'effet revenu qui affectent les décisions de consommation et d'épargne des ménages. En effet, une baisse du taux d'intérêt réduit le coût du crédit et la rémunération de l'épargne, ce qui induit un effet de substitution, et par là, favorise la consommation immédiate et défavorise l'épargne.

Concernant l'effet revenu, une baisse du taux d'intérêt, augmente la valeur actualisée des actifs financiers, ce qui mène à une appréciation du patrimoine des ménages. Il en résulte, donc, une augmentation du revenu permanent des ménages et ensuite augmente leur demande de bien de consommation.

En résumé, la transmission à travers le canal du taux d'intérêt s'effectue sur deux étapes. D'une part, la transmission des politiques monétaire du taux directeur au taux d'intérêt, et d'autre part l'impact des taux à long terme sur les agrégats macroéconomiques.

b) Canal du crédit

Le canal de crédit désigne l'ensemble des facteurs agissant sur l'offre et la demande du crédit et leur influence sur l'ensemble des agrégats macroéconomiques comme sur le comportement d'investissement ou de la consommation des agents économiques.

Le canal du crédit est étroitement lié au canal du taux d'intérêt, sauf que les travaux sur le canal du crédit cherchent à analyser les facteurs qui peuvent amplifier la transmission du canal du taux d'intérêt. Le canal du crédit revêt trois formes selon la littérature théorique (Mishkin⁶, 1996) :

- Canal des prêts bancaires : agit sur les conditions de l'offre de crédit au sein du système bancaire.
- Canal du bilan : s'intéresse à la structure et la santé financière des emprunteurs.
- Canal du patrimoine : analyse le comportement des consommateurs en matière d'acquisition de biens durables et de logements.

Les banques commerciales attribuent les crédits en fonction des actifs que l'emprunteur peut donner comme garantie, cependant le prix de ces actifs est sensible aux changements du taux d'intérêt, une hausse du taux d'intérêt par exemple peut entraîner une baisse des prix des actions. Par conséquent une diminution de la valeur des actifs en garantie, entraîne une augmentation du taux d'intérêt et donc une diminution de l'offre de crédit, et par suite une moindre croissance de l'activité économique.

L'efficacité du canal du crédit relève donc de deux conditions principales, la première est la capacité de la banque centrale à affecter le pouvoir des banques commerciales à attribuer les crédits. Ensuite la substituabilité imparfaite entre le crédit bancaire et les autres sources de financements (Cecchetti⁷, 1997).

c) Canal du taux de change

Une variation du taux directeur se répercute aussi sur l'activité économique par le canal du taux de change d'une manière généralement plus rapide.

Dans une économie ouverte, et en régime de change flexible, la transmission des fluctuations du taux d'intérêt vers le taux de change est assurée par la condition de la parité non couverte du taux d'intérêt. Cette dernière relie le taux d'intérêt domestique et le taux d'intérêt à l'étranger aux taux de change futur anticipé. Par la suite, une diminution du taux d'intérêt domestique par rapport au taux d'intérêt étranger, décourage les investisseurs étrangers, donc une dépréciation de la monnaie nationale, et par conséquent les produits nationaux deviennent plus compétitifs sur le marché étranger, augmentant ainsi les exportations et la demande globale.

La banque centrale peut utiliser encore ce canal de transmission pour réduire l'inflation importée. En effet une augmentation du taux d'intérêt domestique, encourage les investisseurs à la recherche de placements plus rentables, ce qui va entraîner une appréciation de la monnaie nationale, et donc le prix des importations diminue.

IV. CADRE EMPIRIQUE

a) Méthodologie de l'étude

Afin d'estimer le pass-through des taux d'intérêt débiteurs et créditeurs, nous pouvons opter pour les Modèles à Correction d'Erreurs à équation unique. Le soubassement de la spécification adoptée repose sur l'approche de « Cost of funds » (De Bondt, 2002-2005), qui formalise la transmission du taux sur le marché monétaire vers les taux débiteurs et créditeurs. Cette relation se base ainsi sur l'existence d'un coût marginale pour les banques.

⁵ Fisher, Irving, The Debt-Deflation Theory of Great Depressions, *Econometrica*, October 1933, n° 1, p. 337-357.

⁶ Mishkin, F.S. (1996) the Channels of Monetary Transmission: Lessons for Monetary Policy. NBER Working Paper No. 5464.

⁷ Cecchetti, Stephan G., Distinguishing Theories of the Monetary Transmission Mechanism, Federal Reserve Bank of St. Louis Review, May-June 1995, p. 77, p. 83-97.

i. *Cointégration asymétrique*

Si les taux débiteurs, créditeurs et le taux interbancaire sont intégrés d'ordre un (les séries ne sont pas stationnaires en niveau, mais stationnaires en première différence), une relation de long terme existe entre eux, et s'écrit sous la forme :

$$r_t = \mu + \beta m_t + u_t \quad (1)$$

Avec r_t les différents taux bancaires, m_t le taux interbancaire, u_t représente le terme d'erreurs, μ une constante (Taux de marge)⁸, β étant coefficient (positif) de pass-through de long terme. Lorsque ce coefficient est égal à 1, on parle de pass-through complet. Dans ces conditions, les variations du taux sur le marché monétaire sont totalement transmises vers les taux débiteurs et créditeurs. Cependant, il existe des éléments qui atténuent l'ampleur du pass-through, notamment, une faible élasticité de la demande de crédit et de l'offre de dépôts, en raison d'une faible concurrence entre les banques, et les problèmes d'asymétrie d'information, (De Bondt, 2005).

Pour tester l'existence de la relation de cointégration, Engle et Granger ont proposé une méthode qui consiste à estimer la relation (1), et tester la stationnarité des résidus estimés $\hat{u}_t$. Si la stationnarité des résidus est vérifiée, la relation d'ajustement peut être formulée sous forme d'un modèle à correction d'erreurs.

$$\Delta r_t = \sum_{i=1}^k \phi_i \Delta r_{t-i} + \sum_{j=0}^l \gamma_j \Delta m_{t-j} + \alpha \hat{u}_{t-1} + \varepsilon_t \quad (2)$$

Dans cette équation (2), les paramètres γ et ϕ mesurent respectivement la réaction des taux bancaires suite aux changements courants et retardés du taux interbancaire et à leurs propres changements retardés ; α représente la vitesse d'ajustement vers l'équilibre de long terme.

Enders et Granger (1998) ont développé la procédure Engle-Granger, en introduisant un modèle à correction d'erreurs asymétrique, lequel est une variante du modèle initial (2). Il permet de savoir si les taux d'intérêt bancaires s'ajustent différemment aux chocs monétaires selon qu'ils sont en dessous ou en dessus du niveau d'équilibre. Les auteurs utilisent deux types de modèles :

- Le modèle autorégressif à seuil (TAR: Threshold AutoRegressive Models) dans lequel l'ajustement est asymétrique selon la grandeur de la déviation par rapport à l'équilibre

- Le modèle M-TAR (Momentum-Threshold Auto Regressive Models), dans lequel l'ajustement est asymétrique selon la dynamique de cette déviation.

Enders et Siklos (2001) généralisent le test de cointégration asymétrique pour le cas multivarié.

Le test de la cointégration asymétrique suit les étapes suivantes :

- Estimation de la relation de long terme:

$$r_t = \mu + \beta m_t + u_t$$

- Estimation du modèle des résidus:

$$\Delta \hat{u}_t = (1 - I_t) \rho_1 \hat{u}_{t-1} + I_t \rho_2 \hat{u}_{t-1} + \sum_{i=1}^k \theta_i \Delta \hat{u}_{t-i} + \varepsilon_t \quad (3)$$

Avec $\hat{u}_t$ les résidus estimés et I_t une fonction indicatrice qui montre la position de la déviation du taux d'intérêt par rapport au niveau d'équilibre pour un seuil donné τ :

Pour le modèle TAR :

$$I_t = \begin{cases} 1 & \text{si } \hat{u}_{t-1} \geq \tau \\ 0 & \text{si } \hat{u}_{t-1} < \tau \end{cases}$$

Pour le modèle M-TAR :

La fonction indicatrice est définie par rapport à la variation du terme de correction d'erreur

$$I_t = \begin{cases} 1 & \text{si } \Delta \hat{u}_{t-1} \geq \tau \\ 0 & \text{si } \Delta \hat{u}_{t-1} < \tau \end{cases}$$

- Tester l'hypothèse: $H_0: \rho_1 = \rho_2 = 0$ avec Φ - statistic de Enders et Siklos (2001). Rejeter l'hypothèse nulle signifie que les variables sont cointégrées.

Il importe de souligner que l'absence de la cointégration constitue un moyen de mesure de la qualité de la transmission. Cela dit, lorsque la relation de cointégration est mauvaise ou inexistante, ceci signifie que la transmission se fait très difficilement, par contre elle parfaite en situation inverse.

- Tester l'hypothèse $H_0: \rho_1 = \rho_2$ avec F-statistic. Rejeter l'hypothèse nulle signifie que les variables sont cointégrées asymétriquement.

Dans les études économiques, les modèles avec $\tau = 0$ sont particulièrement intéressants, car l'asymétrie est liée aux écarts positifs et négatifs de la valeur d'équilibre. Ceci dit, le cas où τ est inconnu et doit être estimé avec ρ_1 et ρ_2 , est aussi important.

Pour estimer ce τ , Enders et Siklos (2001) utilise la procédure développée par Chan (1993).

Pour notre cas, on utilise les modèles M-TAR avec seuil inconnu, puisque on n'a pas des arguments solides en faveur de la restriction ex-ante du seuil à zéro. Si la cointégration asymétrique est vérifiée, le modèle à estimer sera :

⁸ Désigne le pourcentage de gain ou de perte réalisé par la banque, c'est la marge d'intermédiation qui représente la différence entre le prix de vente et le coût d'achat de la monnaie.

$$\Delta r_t = \sum_{i=1}^k \varphi_i \Delta r_{t-i} + \sum_{j=0}^l \gamma_j \Delta m_{t-j} + \alpha_1 I_t (r_{t-1} - \mu - \beta m_{t-1}) + \alpha_2 (1 - I_t) (r_{t-1} - \mu - \beta m_{t-1}) + \varepsilon_t \quad (4)$$

b) L'asymétrie à court terme

Avec l'asymétrie potentielle dans le mécanisme de correction des erreurs, il pourrait être pertinent d'étudier le comportement des taux bancaires pour tester l'existence d'une asymétrie dans leurs ajustements à court terme, selon le sens de variation du taux interbancaire⁹. Le modèle (4) peut être étendu pour tenir compte de ces asymétries à court terme comme suit :

$$\Delta r_t = \sum_{i=1}^k \varphi_i \Delta r_{t-i} + \sum_{j=0}^l d_t^- \gamma_j^- \Delta m_{t-j} + \sum_{j=0}^l d_t^+ \gamma_j^+ \Delta m_{t-j} + \alpha_1 I_t (r_{t-1} - \mu - \beta m_{t-1}) + \alpha_2 (1 - I_t) (r_{t-1} - \mu - \beta m_{t-1}) + \varepsilon_t \quad (5)$$

Avec :

$$d_t^+ = \begin{cases} 1 & \text{si } \Delta m_t \geq 0 \\ 0 & \text{si } \Delta m_t < 0 \end{cases} \text{ et } d_t^- = \begin{cases} 1 & \text{si } \Delta m_t < 0 \\ 0 & \text{si } \Delta m_t \geq 0 \end{cases}$$

Tel que les coefficients correspondants respectivement à une augmentation/baisse du taux interbancaire possèdent les exposants "+" / "-".

En conservant cette notation le modèle de cointégration symétrique qui inclut une asymétrie dans l'ajustement à court terme s'écrit :

$$\Delta r_t = \sum_{i=1}^k \varphi_i \Delta r_{t-i} + \sum_{j=0}^l d_t^- \gamma_j^- \Delta m_{t-j} + \sum_{j=0}^l d_t^+ \gamma_j^+ \Delta m_{t-j} + \alpha (r_{t-1} - \mu - \beta m_{t-1}) + \varepsilon_t \quad (6)$$

Si la cointégration n'est pas vérifiée, le modèle à estimer :

$$\Delta r_t = \sum_{i=1}^k \varphi_i \Delta r_{t-i} + \sum_{j=0}^l d_t^- \gamma_j^- \Delta m_{t-j} + \sum_{j=0}^l d_t^+ \gamma_j^+ \Delta m_{t-j} + \varepsilon_t \quad (7)$$

Pour chacune des trois spécifications, l'asymétrie à court terme sera évaluée en testant :

- (i) l'égalité des paramètres qui mesurent la réaction immédiate des taux bancaires suite à une augmentation de taux interbancaire, avec ceux qui mesurent la réaction suite à une baisse ($\gamma_0^+ = \gamma_0^-$).
- (ii) l'égalité des paramètres qui mesurent les réactions pendant deux différentes périodes ($\gamma_i^+ = \gamma_j^- \forall i, j$). Si on rejette cette égalité, on a une asymétrie due à un effet de retard échelonné.
- (iii) l'égalité de la somme des paramètres qui mesurent la réaction suite à une augmentation du taux

interbancaire, avec la somme de ceux qui mesurent la réaction suite à une baisse ($\sum_{j=0}^l \gamma_j^- = \sum_{j=0}^l \gamma_j^+$)

Pour résumer, la méthodologie consiste à tester dans un premier temps l'existence et la typologie de la relation de cointégration entre les taux bancaires et le taux interbancaire. Sur la base de ces tests on choisit le

modèle approprié parmi les trois spécifications¹⁰. Ensuite on teste la présence d'une asymétrie potentielle à court terme, finalement analyser les principales caractéristiques du pass-through.

c) Les données

Dans le cadre de ce travail nous aurons à utiliser neuf variables : Le taux débiteur global (rl), taux des comptes débiteurs et crédits de trésorerie (rlcdct), taux des crédits à l'équipement (rlc Equip), taux des crédits immobiliers (rlcimm), taux des crédits à la consommation (rlCons), taux créditeur pondéré (rd), taux des dépôts à 6 mois (rd6m), taux des dépôts à 12 mois (rd12m), et le taux interbancaire (rm).

Les données sont collectées sur une base trimestrielle et couvrent la période allant du premier trimestre de l'année 2008 au quatrième trimestre 2017. Elles proviennent du site de Bank Al-Maghrib. Les tests et estimations sont faites à l'aide des logiciels statistiques : STATA 13 et Eviews 8.

d) Tests de cointégration

i. Test de stationnarité des séries

Les tests¹¹ de stationnarité des processus temporels s'avèrent nécessaires pour notre modélisation vue que le traitement de stationnarité est une étape primordiale pour spécifier l'ordre d'intégration des séries et déterminer de quel type de non-stationnarité¹² s'agit-il. En effectuant le test de Dickey-Fuller Augmenté (Annexe 2.1), il en ressort les résultats suivants :

¹⁰ Les trois spécifications sont : Absence de cointégration, cointégration symétrique et cointégration asymétrique.

¹¹ Nous parlons :

- Dickey Fuller augmenté et le test de Phillips-Perron, utilisés souvent en pratique, dont l'hypothèse nulle est la présence d'une racine unitaire et donc la non stationnarité.
- KPSS : le test de Kwiatkowski-Phillips-Schmidt-Shin qui pose la stationnarité comme hypothèse nulle.

¹² La non stationnarité soit de type TS « Trend Stationary », ou de type DS « Differency Stationary ».

⁹ Sznajderska (2012) étudie l'effet des facteurs qui peuvent augmenter l'asymétrie : l'activité économique, la liquidité bancaire, la crédibilité de la banque centrale et les anticipations des agents économiques.

Tableau 1: Test de stationnarité pour les variables

Variable	Etiquette	Stationnarité en niveau	Type de processus
rm	Taux interbancaire	Non stationnaire	DS et I(1) ¹³
rl	Taux débiteur global	Non stationnaire	DS et I(1)
rlcdct	Taux des comptes débiteurs et crédits de trésorerie	Non stationnaire	DS et I(1)
rlcEquip	Taux des crédits à l'équipement	Non stationnaire	DS et I(1)
rlimm	Taux des crédits immobiliers	Non stationnaire	DS et I(1)
rlCons	Taux des crédits à la consommation	Non stationnaire	DS et I(1)
rd	Taux créditeur pondéré	Non stationnaire	DS et I(1)
rd6m	Taux des dépôts à 6 mois	Non stationnaire	DS et I(1)
rd12m	Taux des dépôts à 12 mois	Non stationnaire	DS et I(1)

Source: Calcul de l'auteur

Les résultats des Tests ont révélé que toutes les séries sont stationnaires en différence première, ce qui laisse présager la présence de relations de cointégration entre elles.

e) *Test de cointégration asymétrique*

Pour tester l'asymétrie à long terme de la réponse des taux bancaires aux variations du taux interbancaire, on procède par l'approche de Enders and Siklos (2001) afin de distinguer les effets positifs et négatifs des résidus obtenus de la relation de long terme.

Le test de Enders et Siklos (2001) se base sur les modèles TAR et M-TAR pour tester l'existence et

l'asymétrie de la cointégration pour les deux cas: $\tau = 0$ et τ inconnu.

Les résultats de ces tests sont présentés dans le tableau 2. Les valeurs critiques des tests ont été trouvées avec les simulations Monte Carlo. La décision se base sur la comparaison des valeurs calculées avec les valeurs critiques :

Si $F\text{-joint}(\Phi) > F\text{-critique}$, On rejette l'hypothèse nulle ($H_0 : \rho_1 = \rho_2 = 0$), ce que signifie que les variables sont cointégrées. Dans ce cas, on passe au test de l'asymétrie de la cointégration des variables : Si $F\text{-equal} > F\text{-critique}$, on rejette l'hypothèse nulle ($H_0 : \rho_1 = \rho_2$), ce que signifie que les variables sont cointégrées asymétriquement.

Tableau 2: Test de la cointégration asymétrique avec seuil inconnu

	Seuil estimé (Threshold)	Test statistic		Valeur critique simulée 10%	
	τ	F-joint (Φ)	F-equal	F-joint (Φ)	F-equal
RI	0,2243	8,2934	1,3982	6,1970	4,5384
RIcdct	-0,3140	7,8958	1,6055	6,2445	4,6262
RIcEquip	0,1471	8,8988	2,6963	5,8218	4,5664
RIlimm	-0,1172	4,0592	3,0869	8,0493	8,2094
RICons	0,0335	3,8579	1,4762	8,9009	8,2644
Rd	0,1764	5,55818	6,0134	5,7641	4,6713
rd6m	0,0745	3,3103	1,7459	5,8039	4,7156
rd12m	-0,0412	3,3698	3,3906	8,0819	8,0676

Source: Calcul de l'auteur

¹³ I(1) : série intégrée d'ordre 1.

D'après les résultats du test de cointégration asymétrique, aucune variable ne présente une asymétrie dans l'ajustement à long terme à l'exception du taux créditeur pondéré.

La relation d'ajustement pour le taux créditeur pondéré portera sur une formulation TAR asymétrique à long terme avec seuil inconnu.

f) Test de cointégration symétrique

Pour les taux qui n'ont pas vérifié la relation de cointégration asymétrique, on procède à tester l'hypothèse de la cointégration symétrique avec le test de Enders and Granger :

On estime d'abord la relation de long terme avec les variables en niveau, puis on effectue un test de stationnarité des résidus estimés. Si la série des résidus est stationnaire, alors les séries sont cointégrées. Les résultats de l'estimation de la relation de long terme pour les taux bancaires sont :

- 1) $rl_t = 3,270913 + 0,9397049 rm_t$
- 2) $rlcdct_t = 2,935369 + 1,058582 rm_t$
- 3) $rlEquip_t = 2,38875 + 1,128036 rm_t$
- 4) $rlimm_t = 4,774567 + 0,3757415 rm_t$
- 5) $rlCons_t = 6,022514 + 0,3950081 rm_t$
- 6) $rd_t = 2,958438 + 0,2295384 rm_t$
- 7) $rd6m_t = 2,920821 + 0,1726211 rm_t$
- 8) $rl_t = 3,07862 + 0,2344469 rm_t$

Les résultats du test de stationnarité des résidus de chaque équation sont présentés dans le tableau ci-dessous, le test¹⁴ est effectué sur la série des résidus et les décisions sont prises au niveau de 5% et de 10%.

Tableau 3: Test de stationnarité des résidus de chaque équation

Equation	Stationnarité des résidus	
	Au niveau de 5%	Au niveau de 10%
(1)	Stationnaires	Stationnaires
(2)	Stationnaires	Stationnaires
(3)	Stationnaires	Stationnaires
(4)	Non stationnaires	Stationnaires
(5)	Non stationnaires	Stationnaires
(6)	Non stationnaires	Stationnaires
(7)	Non stationnaires	Non stationnaires
(8)	Non stationnaires	Stationnaires

Source: Calculé de l'auteur

D'après ces résultats on trouve que tous les taux bancaires sont cointégrés avec le taux interbancaire, à l'exception des taux: crédit immobilier,

crédit consommation, crédit à 6 mois et crédit à 12 mois.

Puisque l'hypothèse de cointégration n'est pas vérifiée pour les taux des crédits immobilier crédit consommation, crédit à 6 mois et crédit à 12 mois, l'estimation de la relation d'ajustement portera sur une formulation ARDL en première différence.

Concernant les autres taux qui présente une cointégration symétrique, la relation d'ajustement portera sur un modèle à correction d'erreur symétrique à long terme.

Les résultats des tests précédents nous permettent de choisir les spécifications des modèles pour chaque taux étudié :

¹⁴ Test de Dickey – Fuller Augmenté.

$$\Delta r l_t = \sum_{i=1}^k \varphi_i \Delta r l_{t-i} + \sum_{j=0}^l d_t^- \gamma_j^- \Delta r m_{t-j} + \sum_{j=0}^l d_t^+ \gamma_j^+ \Delta r m_{t-j} + \alpha(r l_{t-1} - \mu - \beta r m_{t-1}) + \varepsilon_t$$

$$\Delta r l c d c t_t = \sum_{i=1}^k \varphi_i \Delta r l c d c t_{t-i} + \sum_{j=0}^l d_t^- \gamma_j^- \Delta r m_{t-j} + \sum_{j=0}^l d_t^+ \gamma_j^+ \Delta r m_{t-j} + \alpha(r l c d c t_{t-1} - \mu - \beta r m_{t-1}) + \varepsilon_t$$

$$\Delta r l c E q u i p_t = \sum_{i=1}^k \varphi_i \Delta r l c E q u i p_{t-i} + \sum_{j=0}^l d_t^- \gamma_j^- \Delta r m_{t-j} + \sum_{j=0}^l d_t^+ \gamma_j^+ \Delta r m_{t-j} + \alpha(r l c E q u i p_{t-1} - \mu - \beta r m_{t-1}) + \varepsilon_t$$

$$\Delta r l i m m_t = \sum_{i=1}^k \varphi_i \Delta r l i m m_{t-i} + \sum_{j=0}^l d_t^- \gamma_j^- \Delta r m_{t-j} + \sum_{j=0}^l d_t^+ \gamma_j^+ \Delta r m_{t-j} + \varepsilon_t$$

$$\Delta r l C o n s_t = \sum_{i=1}^k \varphi_i \Delta r l C o n s_{t-i} + \sum_{j=0}^l d_t^- \gamma_j^- \Delta r m_{t-j} + \sum_{j=0}^l d_t^+ \gamma_j^+ \Delta r m_{t-j} + \varepsilon_t$$

$$\Delta r d_t = \sum_{i=1}^k \varphi_i \Delta r d_{t-i} + \sum_{j=0}^l d_t^- \gamma_j^- \Delta r m_{t-j} + \sum_{j=0}^l d_t^+ \gamma_j^+ \Delta r m_{t-j} + \alpha_1 I_t (r d_{t-1} - \mu - \beta r m_{t-1}) + \alpha_2 (1 - I_t) (r d_{t-1} - \mu - \beta r m_{t-1}) + \varepsilon_t$$

$$\Delta r d 6 m_t = \sum_{i=1}^k \varphi_i \Delta r d 6 m_{t-i} + \sum_{j=0}^l d_t^- \gamma_j^- \Delta r m_{t-j} + \sum_{j=0}^l d_t^+ \gamma_j^+ \Delta r m_{t-j} + \varepsilon_t$$

$$\Delta r d 12 m_t = \sum_{i=1}^k \varphi_i \Delta r d 12 m_{t-i} + \sum_{j=0}^l d_t^- \gamma_j^- \Delta r m_{t-j} + \sum_{j=0}^l d_t^+ \gamma_j^+ \Delta r m_{t-j} + \varepsilon_t$$

g) *Test d'asymétrie de la relation d'ajustement à court terme :*

Pour spécifier la forme finale des modèles, il est primordial de tester l'asymétrie de la relation d'ajustement à court terme des taux bancaires, selon le sens de variation du taux interbancaire.

Pour ce faire, on commence par une estimation des modèles spécifiés dans le paragraphe précédent, puis on teste les hypothèses suivantes :

- (i) 'égalité des paramètres qui mesurent la réaction immédiate des taux bancaires suite à une augmentation de taux interbancaire, avec ceux qui mesurent la réaction suite à une baisse ($\gamma_0^+ = \gamma_0^-$).
- (ii) 'égalité des paramètres qui mesurent les réactions pendant deux différentes périodes ($\gamma_i^+ = \gamma_j^- \forall i, j$). Si on rejette cette égalité, on a une asymétrie due à un effet de retard échelonné.
- (iii) 'égalité de la somme des paramètres qui mesurent la réaction suite à une augmentation du taux interbancaire, avec la somme de ceux qui mesurent la réaction suite à une baisse ($\sum_{j=0}^l \gamma_j^- = \sum_{j=0}^l \gamma_j^+$)

Pour estimer ces modèles, quatre retards ont été introduits afin de prendre en compte la dynamique

de court terme existante entre les taux bancaires et le taux interbancaire.

Après estimation, on procède aux choix du nombre de retards en se basant sur le critère AIC (Akaike Information Criteria). Pour chaque taux bancaire le nombre de retards est :

Tableau 4: Nombre de retards retenus pour chaque modèle

Taux bancaire	Nombre de retards retenus
rl	3
Rlcdct	1
rlcEquip	2
Rlimm	4
rlCons	3
Rd	1
rd6m	1
rd12m	1

Source: Calcul de l'auteur

Les résultats des estimations des modèles sont présentés dans les tableaux suivants:

Tableau 5: Pass-through des taux bancaires.

(Modèle ECM ajustement asymétrique à court terme)

	rl	rlcdct	rlcEquip
Pass-through de long terme	0,9397	1,0585	1,1280
Pass-through immédiat pour une baisse du taux interbancaire	0,7724 (0,076)	0,8137 (0,072)	0,3959 (0,507)
Pass-through immédiat pour une hausse du taux interbancaire	-0,2503 (0,847)	-0,3936 (0,586)	-0,1667 (0,857)
Vitesse d'ajustement	-1,3084	-0,7602	-1,0455
$\bar{R}^2$	0,2552	0,3971	0,5132
$H_0: \beta = 1$ (p-value)	0,5204	0,6598	0,2799
$H_0: \gamma_0^+ = \gamma_0^-$ (p-value)	0,4894	0,2154	0,7851
$H_0: \gamma_0^+ = \gamma_0^- \& \gamma_j^+ = \gamma_j^-$ (p-value)	0,9215	0,2663	0,2999
$H_0: \sum_{j=0}^J \gamma_j^+ = \sum_{j=0}^J \gamma_j^-$	0,7863	0,8728	0,8397

Remarque: Les chiffres entre parenthèses représentent la probabilité associée à chaque coefficient estimé.

Source: Calcul de l'auteur

Le tableau 5 montre que les taux débiteur(rl), taux comptes débiteurs et crédits de trésorerie(rlcdct) et taux du crédit à l'équipement(rlcEquip) sont symétriques à court terme, ce que nécessite une nouvelle estimation sans prendre en considération la dynamique

asymétrique à court terme. La nouvelle forme des trois modèles sera comme ce que suit :

$$\Delta r_t = \sum_{i=1}^k \varphi_i \Delta r_{t-i} + \sum_{j=0}^l \gamma_j \Delta m_{t-j} + \varepsilon_t$$

Tableau 6: Pass-through des taux bancaires.

(Modèle TAR avec seuil inconnu et ajustement asymétrique à court terme)

	Rd
Seuil (τ)	0,1764
Pass-through de long terme	0,2295
Pass-through immédiat pour une baisse du taux interbancaire	0,0703
Pass-through immédiat pour une hausse du taux interbancaire	1,2685
Vitesse d'ajustement pour une déviation au-dessous de l'équilibre	0,1791
Vitesse d'ajustement pour une déviation au-dessus	-0,0821
$\bar{R}^2$	0,4761
$H_0: \beta = 1$ (p-value)	0,0000
$H_0: \gamma_0^+ = \gamma_0^-$ (p-value)	0,0053
$H_0: \gamma_0^+ = \gamma_0^- \& \gamma_j^+ = \gamma_j^-$ (p-value)	0,0022
$H_0: \sum_{j=0}^J \gamma_j^+ = \sum_{j=0}^J \gamma_j^-$	0,1658

Remarque: Les chiffres entre parenthèses représentent la probabilité associée à chaque coefficient estimé.

Source: Calcul de l'auteur

Le tableau 6 montre que l'ajustement à court terme de taux créditeur pondéré(rd) est asymétrique.

Tableau 7: Pass-through des taux bancaires.
(ARDL)

	rlimm	rlCons	rd6m	rd12m
Pass-through de long terme	0,9397	0,3950	0,1726	0,2344
Pass-through immédiat pour une baisse du taux interbancaire	0,7724 (0,076)	0,6485 (0,008)	0,1722 (0,383)	-0,0527 (0,768)
Pass-through immédiat pour une hausse du taux interbancaire	-0,2503 (0,847)	-0,2485 (0,763)	0,9162 (0,009)	1,1711 (0,000)
$\bar{R}^2$	0,2552	0,2828	0,3255	0,4465
$H_0: \beta = 1$ (p-value)	0,5204	0,0000	0,0000	0,0000
$H_0: \gamma_0^+ = \gamma_0^-$ (p-value)	0,4894	0,3380	0,0955	0,0043
$H_0: \gamma_0^+ = \gamma_0^- \& \gamma_j^+ = \gamma_j^-$ (p-value)	0,9215	0,3380	0,0298	0,0010
$H_0: \sum_{j=0}^J \gamma_j^+ = \sum_{j=0}^J \gamma_j^-$	0,7863	0,5392	0,3773	0,4781

Remarque: Les chiffres entre parenthèses représentent la probabilité associée à chaque coefficient estimé.

Source: Calcule de l'auteur

On peut conclure d'après le tableau 7 que le taux de crédit immobilier (rlimm) et le taux de crédit à la consommation (rlCons) sont symétriques à court terme. Cependant le taux de dépôts à 6 mois (rd6m) et le taux de dépôts à 12 mois (rd12m) présentent une asymétrie d'ajustement à court terme.

h) Résultats finals

La réestimation des modèles en éliminant l'ajustement asymétrique à court terme pour tous les taux débiteurs, donne les résultats suivants:

Tableau 8: Pass-through des taux bancaires.
(Modèle ECM ajustement symétrique à court terme)

	rl	rlcdct	rlcEquip
Pass-through de long terme	0,9397	1,0585	1,1280
Pass-through immédiat	0,6559 (0,052)	0,4294 (0,178)	0,3019 (0,485)
Vitesse d'ajustement	-1,2312 (0,001)	-0,7681 (0,001)	-1,0329 (0,006)
$\bar{R}^2$	0,3556	0,3808	0,4968
$H_0: \beta = 1$ (p-value)	0,5204	0,6598	0,2799

Remarque: Les chiffres entre parenthèses représentent la probabilité associée à chaque coefficient estimé.

Source: Calcule de l'auteur

Tableau 9: Pass-through des taux bancaires.
(ARDL à ajustement symétrique à court terme)

	rlimm	rlCons
Pass-through de long terme	0,9397	0,3950
Pass-through immédiat	0,2524 (0,431)	0,5159 (0,011)
$\bar{R}^2$	0,431	0,2424
$H_0: \beta = 1$ (p-value)	0,5204	0,0000

Remarque : Les chiffres entre parenthèses représentent la probabilité associée à chaque coefficient estimé.

Source: Calcule de l'auteur

Pour les taux créditeurs, qui présentent une asymétrie dans l'ajustement à court terme, les résultats sont présentés dans les tableaux suivants:

Tableau 10: Pass-through des taux bancaires.

(Modèle TAR avec seuil inconnu et ajustement asymétrique à court terme)

	Rd
Seuil (τ)	0.1764
Pass-through de long terme	0,2295
Pass-through immédiat pour une baisse du taux interbancaire	0,0703 (0,694)
Pass-through immédiat pour une hausse du taux interbancaire	1,2685 (0,000)
Vitesse d'ajustement pour une déviation au-dessous de l'équilibre	0,1791 (0,527)
Vitesse d'ajustement pour une déviation au-dessus de l'équilibre	-0,0821 (0,557)
$\bar{R}^2$	0,4761
$H_0: \beta = 1$ (p-value)	0,0000
$H_0: \gamma_0^+ = \gamma_0^-$ (p-value)	0,0053
$H_0: \gamma_0^+ = \gamma_0^- \& \gamma_j^+ = \gamma_j^-$ (p-value)	0,0022
$H_0: \sum_{j=0}^J \gamma_j^+ = \sum_{j=0}^J \gamma_j^-$	0,1658

Remarque: Les chiffres entre parenthèses représentent la probabilité associée à chaque coefficient estimé.

Source: Calcul de l'auteur

Tableau 11: Pass-through des taux bancaires.

(ARDL à ajustement asymétrique à court terme)

	rd6m	rd12m
Pass-through de long terme	0,1726	0,2344
Pass-through immédiat pour une baisse du taux interbancaire	0,1722 (0,383)	-0,0527 (0,768)
Pass-through immédiat pour une hausse du taux interbancaire	0,9162 (0,009)	1,1711 (0,000)
$\bar{R}^2$	0,3255	0,4465
$H_0: \beta = 1$ (p-value)	0,0000	0,0000
$H_0: \gamma_0^+ = \gamma_0^-$ (p-value)	0,0955	0,0043
$H_0: \gamma_0^+ = \gamma_0^- \& \gamma_j^+ = \gamma_j^-$ (p-value)	0,0298	0,0010
$H_0: \sum_{j=0}^J \gamma_j^+ = \sum_{j=0}^J \gamma_j^-$	0,3773	0,4781

Remarque: Les chiffres entre parenthèses représentent la probabilité associée à chaque coefficient estimé.

Source: Calcul de l'auteur

i) Interprétation des résultats finales

i. Le pass-through des taux débiteurs

Les résultats des estimations des modèles retenus pour les taux bancaires débiteurs, en utilisant les données trimestrielles allant du premier trimestre 2008 au quatrième trimestre 2017, sont présentés dans le tableau 12.

Au Maroc, ces estimations ont révélé que le pass-through de long terme est complet pour la majorité des taux débiteurs, soit un ajustement de: 93, 97% pour le taux débiteur global, 105,85% pour le taux des comptes débiteurs et crédits de trésorerie, 112,8% pour le taux des crédits à l'équipement et 93,97% pour le taux des crédits à l'immobilier. Cependant, le taux de crédit à la consommation présente un faible ajustement à long

terme, qui est de 39,5% suite à un choc de 1% du taux interbancaire.

Pour le taux débiteur global, taux des comptes débiteurs et crédits de trésorerie et le taux crédit à l'équipement, le mécanisme de correction d'erreur est symétrique, ce que signifie qu'ils s'ajustent de manière uniforme.

Le pass-through à court terme est symétrique, et est indépendant du sens de variation du taux

interbancaire. Il s'agit d'une transmission immédiate de 65,59% pour le taux débiteur global, 42,94% pour le taux des comptes débiteurs et crédits de trésorerie, 30,19% pour le taux des crédits à l'équipement, 25,24 % pour le taux des crédits à l'immobilier et 51,59% pour le taux du crédit à la consommation.

Tableau 12: Pass-through du taux interbancaire aux taux débiteurs

	Pass-through de long terme	H_0 : Pass – through complet ?	Pass-through immédiat	Vitesse d'ajustement	$\bar{R}^2$
<i>rl</i>	0,9397	0,5204	0,6559 (0,052)	-1,2312 (0,001)	0,3556
<i>rlcdct</i>	1,0585	0,6598	0,4294 (0,178)	-0,7681 (0,001)	0,3808
<i>rlcEquip</i>	1,1280	0,2799	0,3019 (0,485)	-1,0329 (0,006)	0,4968
<i>rlimm</i>	0,9397	0,5204	0,2524 (0,431)	-	0,431
<i>rlCons</i>	0,3950	0,0000	0,5159 (0,011)	-	0,2424

Remarque: Les chiffres entre parenthèses représentent la probabilité associée à chaque coefficient estimé.

Source: Calcul de l'auteur

ii. Le pass-through des taux créditeurs:

Le pass-through de long terme du taux créditeur pondéré est incomplet (22,95%). Le mécanisme de correction d'erreur est asymétrique : quand le taux créditeur pondéré est en dessous de sa valeur d'équilibre de plus de $\tau = 0,1764\%$, il s'ajuste vers l'équilibre plus rapidement pour la baisse qu'à la hausse (17,91% de la déviation est corrigée dans le premier trimestre, contre seulement 8,21% dans le cas d'une déviation supérieure au seuil τ). Ce comportement peut être due à la forte compétitivité entre les banques pour attirer des fonds locaux, destinés à remplacer en partie leurs dettes extérieures. Cette viscosité peut être encore liée aux différents coûts d'ajustement auxquels les banques font face.

En ce qui concerne le pass-through à court terme, il s'ajuste d'une manière asymétrique. En effet,

une hausse de taux interbancaire se transmet plus rapidement qu'à la baisse (126,85% contre 7,03%).

Pour les taux des dépôts à six mois et à douze mois, l'ajustement à long terme est symétrique. L'hypothèse de la transmission complète est rejetée. En effet, pour les taux des dépôts respectivement à six et à douze mois, la transmission à long terme est estimée à: 17,26% et 23,44%.

L'ajustement à court terme des taux des dépôts à six mois et à douze mois, est similaire à celui de taux créditeur pondéré : ils s'ajustent plus rapidement à la hausse qu'à la baisse (91,62% contre 17,22% pour le taux à six mois et 117,12% contre 5,27% pour le taux à douze mois).

Tableau 13: Pass-through du taux interbancaire aux taux créditeurs

	Pass-through de long terme	H_0 : Pass – through complet ?	Pass-through immédiat	Vitesse d'ajustement	Seuil (τ)	$\bar{R}^2$
<i>rd</i>	0,2295	0,000	↓rm : 0,0703(0,694) ↑rm : 1,2685(0,000)	$< \tau$: 0,1791(0,527) $> \tau$: -0,0821(0,557)	0,1764	0,476 1
<i>rd6m</i>	0,1726	0,000	↓rm : 0,1722(0,383) ↑rm : 0,9162(0,009)	-	-	0,325 5
<i>rd12m</i>	0,2344	0,000	↓rm : -0,0527(0,768) ↑rm : 1,1711(0,000)	-	-	0,446 5

Remarque: Les chiffres entre parenthèses représentent la probabilité associée à chaque coefficient estimé.

Source: Calcul de l'auteur

Le pass-through est influencé par certains facteurs institutionnels et financiers de façon positive ou négative. Ces facteurs peuvent apporter des différences constatées d'un pays à un autre au niveau de la qualité de la transmission. Les principaux facteurs ayant une influence directe et significative sur le pass-through sont : la concurrence bancaire, la structure des dépôts, la volatilité des taux d'intérêt, l'inflation et la croissance.

La concurrence bancaire est un facteur déterminant pour la transmission de la politique monétaire aux banques de détails. En effet plus le marché bancaire est un marché concurrentiel, plus les banques vont se soucier de voir leurs marges bénéficiaires se rétrécir, ce que les poussera à répondre le plus rapidement possible aux variations de taux directeur, surtout en revue à la baisse, pour s'approprier plus de clients sur le marché bancaire. Ainsi l'écart entre le taux interbancaire et les taux bancaires sera d'autant plus petit et le pass-through tendra à être plus complet.

A l'inverse, si on est en présence d'une concurrence imparfaite, due à l'existence d'un monopole ou oligopole, le pass-through sera caractérisé par la présence d'inertie ou de viscosité. C'est le cas du système bancaire marocain, qui de nature oligopolistique.

La non parfaite substituabilité entre les crédits bancaires et la finance directe est un autre problème qui nuit à la concurrence du secteur bancaire marocain. Le sous-développement des marchés financiers au Maroc, fait de notre économie, une économie de crédit bancaire et non pas une économie de marchés financiers.

Ainsi, les entreprises n'ont pas d'autre choix que de se financer via le crédit bancaire, ce qui les pousse à se soumettre aux conditions d'octroi de crédits dictées par les banques, et ceci est surtout valable pour les très, petites et moyennes entreprises (TPME) qui n'ont pas un grand pouvoir négociateur contrairement aux grandes firmes.

En ce qui concerne la structure des dépôts bancaires pour le cas du Maroc, elle est marquée par la dominance des crédits à taux fixes, qui représentent 84% du volume total des crédits. Cette structure défavorise la transmission de la politique monétaire et affaiblit le pass-through.

Pour ce qui est de l'inflation au Maroc, elle reste maîtrisée par les autorités monétaires. En effet le taux d'inflation est auteur de 2% le long de la période 2000-2017. Il est passé de 1,9% en 2001 à 0,7% en 2017, avec des pics remarquables à savoir celle de 2009 où il atteint 3,7 % et ceci s'explique par les effets de la crise financière de 2008.

En 2015 les prix de barils de pétrole ont connu une chute remarquable, de ce fait le Maroc a bénéficié de cette baisse et le taux d'inflation était de 0,4%.

Concernant la croissance au Maroc, elle est toujours dépendante de la pluviométrie, ce qui explique

la forte volatilité de sa composante non-agricole. Durant les dernières années, la croissance s'est inscrite en une tendance baissière. Cet essoufflement de la croissance, impacte l'investissement et donc la demande anticipée. Et puisque les entreprises ont recours au crédit pour financer leurs investissements, la demande des crédits va baisser ce qui agit négativement sur le pass-through.

V. CONCLUSION

Le présent papier a comme objectif principal l'estimation de la vitesse d'ajustement des taux bancaires en réaction aux chocs sur le marché monétaire et aussi de tester une éventuelle présence d'asymétrie dans la transmission des décisions monétaires. Pour cela, les taux débiteurs et créditeurs ont été retenus. Les données ont été collectées sur une base trimestrielle de Bank Al-Maghrib et nous avons utilisé plusieurs modèles pour estimer les coefficients de pass-through des chocs monétaires.

Les résultats ont révélé que les taux bancaires sont très réactifs aux variations du taux interbancaire, à l'exception du taux du crédit à la consommation et des taux créditeurs qui sont peu réactifs et présentent une viscosité dans la transmission, laquelle constitue une entrave à l'efficacité de la politique monétaire.

D'autre part, le modèle à seuil utilisé pour le taux créditeur pondéré, a permis d'isoler les effets asymétriques dans la transmission des variations du taux interbancaire à long et à court terme. En effet, on a pu remarquer que ce taux est très visqueux à la hausse tandis qu'ils s'ajustent plus rapidement à la baisse (17,91%) suite à un choc négatif sur le marché monétaire. Parallèlement, les taux sur les dépôts à six et à douze mois s'ajustent symétriquement sur le long terme, tandis que l'ajustement sur le court terme est asymétrique et est plus visqueux à la baisse que à la hausse.

Tout compte fait, nous pouvons dire que le faible niveau de développement du marché financier marocain, sa structure oligopolistique, l'asymétrie de l'informationnelle sont des facteurs explicatifs potentiels du faible degré de pass-through des chocs monétaires au marché bancaire. Aussi, on peut ajouter le faible niveau de l'activité économique.

Finalement, on peut dire que le passage prévu d'un régime de change fixe, à un régime de change plus flexible voire totalement flottant, permettra à la politique monétaire d'avoir une certaine autonomie (Triangle de Mundell), comme il jouera un rôle essentiel dans le développement du marché financier marocain, avec l'ouverture totale du compte capital et la mobilité libre des capitaux.

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Information Communication Technology Tax Reforms and Tax Compliance in Rwanda Case of Rwanda Revenue Authority in Gasabo District

By Daniel Twesige, Faustin Gasheja, Jonas Baryandama & Uwamahoro Alexis

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Abstract- The purpose of this study was to examine the contribution of ICT tax reforms in the tax compliance in Rwanda Taking Gasabo district as the case study. Objective: The objectives of the study were to assess the various ICT tax reforms and their contribution on tax compliance in Rwanda and to establish a relationship between ICT tax reforms and tax compliance in Rwanda. Descriptive and explanatory research design was used. The study population comprised of 128 employees of RRA from which 56 were selected using the Yemen's formula. Data was collected from both primary and secondary sources using questionnaire and documentation. The findings from the survey revealed that ICT tax reforms have contributed significantly on the tax compliance in Rwanda. The results further revealed a strong relationship between ICT tax reforms and tax compliance in Rwanda. The researchers recommended that although, a strong relationship between variables were identified, ICT tax reforms only contributes 56% on the tax compliance, other factors such as tax education and tax penalties should be enhanced to increase the tax compliance.

Keyterms: *ICT, tax reforms, tax compliance.*

GJMBR-B Classification: *JEL Code: H20*



Strictly as per the compliance and regulations of:



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Keywords: ICT, tax reforms, tax compliance.

1. INTRODUCTION

Tax revenue is very important for every government in the world as it enables the government to acquire assets and to cater for other operating expenses. More importantly, tax revenues enable the governments to reduce over dependence on foreign debts and grants to finance its operation.

Effective tax collection is to minimize revenue losses by detecting and preventing external tax evasion, i.e. smuggling, and as well all other forms of evasion. Several causes to revenue losses are encountered such as understatement of sales, omission of some transaction in recording, tax evasion and others to minimize the tax liability. Generally, organizations perform a fraud risk assessment and evaluate related internal control in revenue loss detection and control for better revenue generation (Ndungu, 2013). When the Revenue protection system is unable to detect and prevent such practices a lot of taxes remain uncollected and it can cause huge losses in tax revenues of the government (Land, 2004).

Due to increased need of increasing the tax base, many governments and other public sector organizations invested billions of money in information

communication technology in order to provide better delivery services to its citizens and offer more effective government management. Ideally, online billing service is nothing but the process of delivery of bills and invoices in the electronic mode. The electronic billing system is also widely accepted by various government organizations for the benefit of people at large. The electronic billing system can be used to transact with a particular service provider or in general with all the service providers utilized by the user. While it is true that online billing has many advantages it also has some disadvantages. Some of the advantages of the electronic billing system include; The online billing services are one of the least expensive forms of billing when compared to the traditional billing, the electronic billing system also is absolutely hassle free as one can protect the bill with the help of password and can be opened only by the recipient. The electronic billing also provides a great advantage of saving time and effort that are normally lost in a traditional billing system.

All tax authorities have limited resources; lower than they need to ensure compliance with the obligations of each taxpayer owing tax. Consequently, effective tax administration requires that the tax be collected in a way that builds confidence among taxpayers and demonstrates that the system is working properly. This is why the tax authorities must rely on a Methodology for determining the most rational allocation of resources (Horn, 2013).

Several administrations have adopted information technology in their quest to combat noncompliance a case in point is the introduction of EBM in order to curb the value-added tax (VAT) payable on sales. The introduction of EBM typically requires considerable effort and has costs both for the administration and for the taxpayers that are affected by the requirements of the new rules. Despite their widespread use, and their considerable cost (Nchoe, 2003).

a) Problem Statement

The expansion of the tax base in Rwanda is increasingly recognized as an important policy goal, as an increase in domestic revenue sources promises to reduce aid dependence and reduce dictionary consequences of taxes on externally traded goods. E-

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filing is one of advanced e-governance system adopted in developed countries. This technology in billing has been adopted in Rwanda since August 2013 and ever since its adoption, there has been a considerable expansion of tax base.

Ndayisenga and Shukla (2016) found out that both electronic tax management system which consist of Tax Payment System, Mobile Tax Payment System and electronic Billing Machine System contributes to timely tax payment and reduced operational cost for both RRA staffs and clients. According to RRA (2014) before introduction of EBM, revenue collection using e-filing and e-payment was low and tax administration weak and this made the revenue collection authority fail to meet the targets. But after introduction as revealed by IMF (2014) the use of EBM has made considerable contribution across the country in terms raising the numbers of tax payers and increasing revenue collection. However, we cannot tell whether the achievements at national level reflect the reality in decentralized government entities specifically in Gasabo district due to lack of empirical evidence on it.

b) *Objectives of the Study*

- i. To assess the contribution of ICT tax reforms in tax compliance in Rwanda.
- ii. To establish a relationship between ICT tax reforms and tax compliance in Rwanda.

c) *Research Hypotheses*

- i. ICT tax reforms have contributed significantly to the tax compliance in Rwanda.
- ii. There is a significant relationship between ICT tax reforms and tax compliance in Rwanda.

II. THEORETICAL AND CONCEPTUAL FRAMEWORK

This section provides a theoretical and conceptual framework of the literature that relates to the study variables.

a) *Theoretical review*

The theories which anchored this study include the following

i. *Fiscal exchange theory*

The theory suggests that the presence of government expenditures may encourage tax compliance from the taxpayers. Tax compliance among society increases with perception of the availability of public goods and services being developed in relation to the tax paid (Moore, 1998). It suggested that government can increase tax compliance by providing goods and services that citizens prefer in a more efficient and accessible manner, emphasizing that taxes are necessary for the receipt of government services. Accordingly, taxpayers are concerning with what they are getting in return for their tax payments in the form of

public services. In this perspective, taxation and the provision of public goods/services become catalysts to taxpayer in compliant to the tax paid (Horn, 2013).

This theory is more practical and acceptable because, it advocates individual willingness to comply without direct coercion. Furthermore, it serves the government from high collection costs resulting from enforcement measures. According to this theory it can be said that whatever much the government or administrative authority adopt modern systems of collecting tax, the effectiveness of tax/revenue collection depends on the public services provided by the government to the tax payers

ii. *Social influences theory*

Human behavior in the area of taxation is influenced by social interaction in the same way as other forms of behavior Compliance behavior towards the tax systems may therefore be affected by the behavior of an individual's reference groups such as relatives, neighbors, and friends. If a taxpayer knows many people in his group who evade taxes, his commitments to comply will decline. On the other hand, social relationships may also help motivate individuals to comply and shy away tax evasion behavior in fear of the social sanctions imposed once discovered (Samson, 2012).

This theory to a large extent, support the fiscal exchange theory also noted that the society with government advocating good governance has better chances to comply with laws and orders including tax laws might create a tax payment culture among the society members. The implication of this theory is that in paying tax; behavior or culture of the society concerned intervene the processes. Therefore, for the government to attain 'big results' in tax collection there is the need for the tax collection agencies to carry out aggressive tax compliance campaigns that will assist in shaping behaviors of community members to become enthusiastic/keen in paying tax (Snavel, 1990).

iii. *Effective tax collection theory*

The standard theory of optimal taxation posits that a tax system should be chosen to maximize a social welfare function subject to a set of constraints. The literature on optimal taxation typically treats the social planner as a utilitarian: that is, the social welfare function is based on the utilities of individuals in the society (Slemrod, 2010). In its most general analyses, this literature uses a social welfare function that is a nonlinear function of individual utilities. Holtzman (2007) states that tax collection is the value of the tax payer's own time and resources along with any out of pocket costs paid to the tax preparers and other advisors, invested to ensure collection with the laws and also stated that tax collection is the provision of tax information at the proper time and ensuring returns accurately report tax liability.

Gideon and Alouis (2013) wrote that an efficient national revenue collection system is the hub of every public administration system and the cornerstone of sound fiscal management. It enables governments to finance budget deficits from domestic sources, thus dissuading recourse to offshore sourcing.

Tax collection can either be through voluntary tax collection or involuntary tax collection. Voluntary tax collection involves obeying the tax laws without any state enforcement actions that leads to maximizing revenues because administration costs are low in both the economic and psychic sense. The government wastes little money and time in collecting the tax and tax payers suffer little alienation in parting with their money (Onoja & Iwarere, 2015).

b) *Conceptual review*

i. *ICT tax reforms*

Digitalization of the tax system has been a major concern of many countries. In August 2013, legislation was introduced in Rwanda, to assist firms' book-keeping, to level the playing field amongst all retailers, and, most importantly, to reduce tax evasion for value added tax (VAT). This legislation, announced in Ministerial Order 002/13/10, and the accompanying Commissioner General (CG) rules. All the reforms in Rwanda's tax base system were aimed at improving tax collections, administrations, and above all tax compliance. In a bid to improve tax compliance, Rwanda Revenue Authority (RRA) decided to opt for electronic tax management system which includes e payment, e filling and electronic tax education in order to improve on tax collection in the country. These tax reforms include the EBM, online declaration and payment and online tax registration.

Naibei & al, (2011) conducted a study to find out reasons for the adoption of Electronic Fiscal Devices in tax collection in Kenya. Interviews and questionnaires were used as the main instruments for data collection. Primary and secondary data were collected and analyzed. From the findings of the study, the most common stated reasons for adoption of this new system of tax collection were to secure sales information followed by enhancing tax compliances. Also the findings indicated that the system was introduced so as to reduce invoice fraud in Kenya which was being conducted before. The study recommended that, the effective use of these machines in tax collection will remove the day to day conflicts between the taxpayers and the government particularly the tax authority.

Naibei, *et al*, (2011), conducted a study on the purpose of assessing the impact of use of Electronic Tax Registers (ETRs) on Value Added Tax (VAT) compliance among private business firms in Kisumu city, Kenya. Results revealed that effective and regular use of ETR has a significant impact on the Value Added Tax (VAT) compliance. Based on the research findings

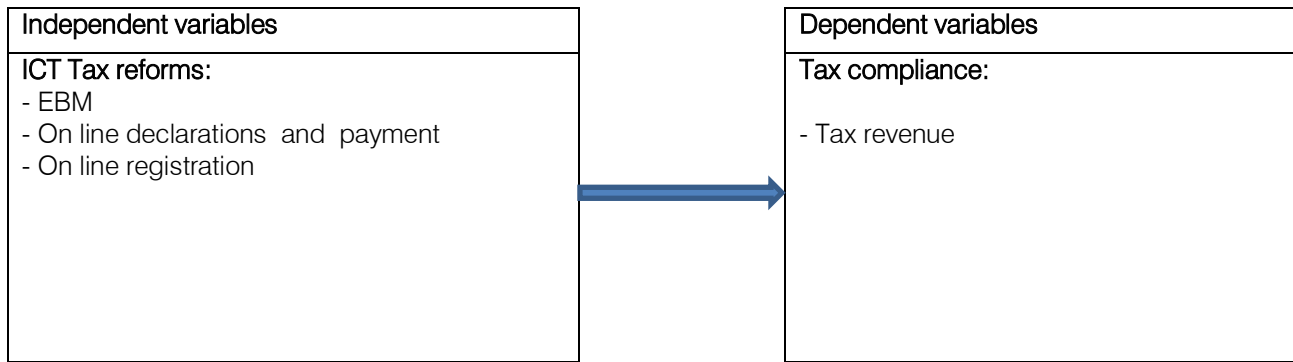
the study concluded that use of ETR has a significant impact on VAT compliance in Kenya. However, the study also recommended that the government needed appropriate strategies to overcome challenges which may face the users of ETRs machines.

Yalemtesfa (2011) conducted a study on the importance of using EBM to increase revenue collection in Ethiopia. The findings from the study indicated that, the use of EBM reduce the operation cost of the government that was incurred to collect VAT as well as improve the business income of taxpayers. Also the study indicated that while EBM improving the efficiency and effectiveness of government operations also provides timely and accurate tax information to businesses and increases the availability of electronic tax filing. The study concluded that introduction of EBM helped to decreases tax evasions and need to create enough awareness and strong regular audit follow up to get those fruit full benefit of using EBM. The study recommended that creating awareness of the people by newspapers, pamphlets, with attractive radio and television programs is very important in eliminates the tax evasions and can enhance the efficiency of the ERCA.

ii. *Tax compliance*

According to (OECD, 2010), the extent to which compliance (e.g. filing, reporting and payment) has been improved as a result of revenue body activities would clearly be an indication of a revenue body's effectiveness. There are four basic tax compliance obligations of citizens and businesses that generally speaking must be administered by all revenue bodies in accordance with their respective tax laws: to register for tax purposes; to file tax returns on time (i.e. by the date stipulated in the law); to correctly report tax liabilities and to pay taxes on time.





Source: Researcher's intention, 2019

Figure 2.1: Conceptual framework

Figure 2.1 above show the relationship between variables. The independent variable which is ICT tax reforms is measured by EBM reforms, online declaration and payment and online registration. These have got a direct effect on tax compliance which is measured by tax revenue.

III. RESEARCH METHODOLOGY

a) Research design

This study used descriptive and cause research design. Descriptive research design was used to describe ICT tax reforms. Cause research design was used to establish the relationship between ICT tax reforms and tax compliance in Gasabo district.

b) Population of the study and Sample size

The target population for this study included employees of RRA Gasabo branch. The total number of population used in this study was 128 employees of RRA in Gasabo district and 5 representatives of tax payers in Gasabo district. Yamane's (1967) formula was used to calculate sample sizes. $n = \frac{N}{1+N(e)^2}$

Where n is the sample size, N is the population size and e is the level of precision.

$$n = \frac{128}{1 + 128(0.1)^2} = \frac{128}{2.28} = 56.14 \approx 56$$

c) Sampling techniques

Stratified random sampling is a method of sampling that involves the division of a population into smaller groups known as strata. In stratified random sampling, the strata are formed based on members' shared attributes or characteristics. This implies that sample size of each categories of tax collectors and tax auditors was selected by using stratified random sampling techniques. Among 128 employees of RRA in Gasabo, the researcher selected only 56 employees from different department which included 8 officers in charge of tax collection and tax audit in large tax payers,

31 officers in charge of tax collection and tax audit in Small & medium and 7 officers in charge of tax collection and tax audit in each sector of Gasabo district in each sector of Gasabo district

d) Methods of data collection

To get this information the researcher went on field and collect raw data from the employees of RRA. In this study, questionnaire was used to collect primary data. The primary data was based on the research objectives of the study. Secondary data is the data that is already in existence and found in published reports, books and internet (Saunders *et al.*, 2007) and may be used by researcher for their studies (Krishnaswami and Ranagnatham, 2006). In this research, the secondary data was collected from reviewing existing from reports at RRA Gasabo Branch

e) Data analysis

The data were analyzed by using both descriptive statistics and inferential statistics such as Pearson's correlation was used to analyze the data. The data was then analyzed using descriptive statistics such as frequencies, percentages, mean and standard deviation. Findings were presented using tables for further analysis and to facilitate comparison. Inferential statistics through the use of multiple regression model was used were used to establish the relationship between the study variables. The independent variables were measured by EBM, Online declaration and payment (ODP), online tax registration (OTR). On the other hand, tax compliance was measured by tax revenue (TR)

$$TR = F(\text{EBM}, \text{ODP}, \text{OTR})$$

$$TR = \beta_0 + \beta_1 \text{EBM} + \beta_2 \text{ODP} + \beta_3 \text{OTR} + \alpha$$

IV. RESULT AND DISCUSSION

This section presents the findings of the study, the analysis and interpretation of the results Findings were derived from the questionnaires to employees of RRA Gasabo branch. It attempts to analyze data

generated from the study which include qualitative and quantitative information collected from the respondents.

RRA in the aims of facilitating tax collection in Gasabo district.

a) *Assessment of the contribution of EBM in Gasabo district*

The study sought to find out the appreciation of respondents on electronic billing machine adopted by

Table 1: Assessment of the contribution of EBM in Gasabo district

	SD		D		N		A		SA		Mean	St. Dev
	fi	%	fi	%	fi	%	fi	%	fi	%		
Standardization of the tax payment	1	1.8	2	3.6	4	7.1	6	10.7	43	76.8	4.57	.91
Automation of the tax payment	1	1.8	4	7.1	2	3.6	8	14.3	41	73.2	4.54	.97
EBM is used in computerization of tax collection	1	1.8	2	3.6	0	.0	15	26.8	38	67.9	4.55	.83
EBM is used in integration of the tax system with other government systems	0	.0	0	.0	0	.0	12	21.4	44	78.6	4.79	.41
To bring innovation in the tax payment	0	.0	0	.0	0	.0	45	80.4	11	19.6	4.20	.40
Clients check tax statement easily from any business location by use of EBM	0	.0	7	12.5	2	3.6	8	14.3	39	69.6	4.41	1.04
Clients produce invoice easily by use of EBM	0	.0	2	3.6	1	1.8	3	5.4	50	89.3	4.80	.64
EBM is used to records sales and controller	0	.0	7	12.5	2	3.6	8	14.3	39	69.6	4.41	1.04
Electronic billing machine system has made tax auditing/accountability easier	0	.0	3	5.4	3	5.4	9	16.1	41	73.2	4.57	.83
EBM has made communication easy with clients	2	3.6	3	5.4	8	14.3	8	14.3	35	62.5	4.27	1.12
EBM has make taxation service more assured than conventional method	2	3.6	2	3.6	8	14.3	8	14.3	36	64.3	4.32	1.08
EBM has made tax service more accessibility and available	0	.0	2	3.6	1	1.8	9	16.1	44	78.6	4.70	.69
Overall mean on use of EBM											4.52	0.81

Source: Primary data, 2019

The results indicated that 1.8% of respondents strongly disagreed, 3.6% of respondents disagreed, 7.1% of respondents were neutral whereas 10.7% of respondents agreed and the majority 76.8% of respondents strongly agreed that EBM is important because its standardization of the tax payment and was rated with very high *mean* of 4.57; (*SD* = 0.91) which implies that respondents have heterogeneity perception on this assertion.

The findings show that 1.8% of respondents strongly disagreed, 7.1% of respondents disagreed, 3.6% of respondents were neutral whereas 14.3% of respondents agreed and the majority 73.2% of respondents strongly agreed that EBM is automation of the tax payment and was rated with very high *mean* of 4.53; (*SD* = 0.97) which implies that respondents have heterogeneity perception on this assertion.

The findings illustrated that 1.8% of respondents strongly disagreed, 3.6% of respondents disagreed while 26.8% of respondents agreed and the majority 67.9% of respondents strongly agreed that EBM is used in computerization of tax collection and was rated with very high *mean* of 4.55; (*SD* = 0.83) which implies that

respondents have heterogeneity perception on this assertion. The findings illustrated that 12.5% of respondents disagreed and 3.6% of respondents were neutral while 14.3% of respondents agreed and the majority 69.6% of respondents strongly agreed that EBM is used to records sales and controller and was rated with very high *mean* of 4.41; (*SD* = 1.04) which implies that respondents have heterogeneity perception on this assertion.

The findings indicated that none of respondents disagreed or strongly disagreed whereas 21.4% of respondents agreed and the majority 78.6% of respondents strongly agreed that EBM is used in integration of the tax system with other government systems and rated with high *mean* 4.79 and homogeneity standard deviation equal to 0.41 this implies that respondents have the same view regarding to EBM is used in integration of the tax system with other government systems.

The findings show that none of respondents disagreed or strongly disagreed whereas 19.6% of respondents strongly agreed and the majority 80.4% of respondents agreed that EBM bring innovation in the tax

payment and rated with high mean score 4.2 and standard deviation equal to 0.40 which implies that homogeneity perception.

The results from the table above indicated that 12.5% of respondents disagreed and 3.6% of respondents were neutral while 14.3% of respondents agreed and the majority 69.6% of respondents strongly agreed that clients pay tax easily from any business location by use of electronic billing machine: This was indicated by a very high mean of 4.41 and a heterogeneity standard deviation of 1.04.

The results show that 3.6% of respondents disagreed, 1.8% of respondents were neutral while 5.4% of respondents agreed and the majority 89.3% of respondents strongly agreed that clients produce invoice easily by use of electronic billing machine and was rated with very high mean score of 4.80 and ($SD = 0.64$) . This implies that respondents have heterogeneity perception.

The results show that 62.5% of respondents strongly agreed that electronic billing machine has made communication easy with clients and rated with very high mean score of 4.27 and ($SD=1.12$) Hence respondents have heterogeneity perception on how EBM services has made communication easy with clients. This findings are in the line with Geetha and Sekar(2012), One of the most important advantages of a billing and currency counting machine is that it saves a lot of time and manual efforts. Productivity can be easily increased with these machines. A billing machine proves to be advantageous in producing the sum totals for various money transactions and to generate the bills faster and accurately.

The findings indicated that 3.6% of respondents strongly disagreed, 3.6% of respondents disagreed and 14.3% of respondents were neutral whereas 14.3% of respondents agreed and the majority 64.3% of respondents agreed that EBM has make taxation service more assured than conventional method and was rated with high mean score 4.32 and standard deviation equal to 1.08 implies that heterogeneity perception response.

The results show that 73.2% of respondents strongly agreed that electronic billing machine system has made tax auditing/accountability easier and was rated with very high mean score 4.57 and $SD= 0.83$ implies that heterogeneity perception responses that tax auditing/accountability become easier.

The results show that 73.2% of respondents strongly agreed that electronic billing machine system has made tax auditing/accountability easier and was rated with very high mean score 4.57 and $SD= 0.83$ implies that heterogeneity perception responses that tax auditing/accountability become easier.

The results show that 3.6% of respondents disagreed, 1.8% of respondents were neutral whereas

16.1% of respondents agreed and the majority 78.6% of respondents strongly agreed that EBM has made tax service more accessibility and available and was rated with very high mean score 4.7 and $SD= 0.69$ implies that heterogeneity perception responses that EBM has made tax service more accessibility and available. The tax payers said that they used to have problems of keeping records for tax assessment before using EBM. But now with EBM, it is easy, simple and fast. The bad part about it is that I do not like to pay too much tax to the government". The comment above clearly shows that the EBM is beneficial and what is required is education to the tax payers about its benefits for the country at large.

The overall view of respondents on electronic billing machine services was rated with very high mean score 4.52 which implies a strong evidence of the existence of the fact and standard deviation of 0.81 great than 0.5 which implies that respondents have heterogeneity perception on the use of electronic billing machine in Gasabo district. From the findings quoted in the above passage permitted researcher to share the same views of respondents on the fact that EBM are adopted and used in Gasabo as mean of collecting VAT but remains some doubt because all respondents did not have the same view as indicated above. This was due to the analysis on what efficacy the EBM is expected to provide on ease of tax-collection. In fact, the understanding for the necessity is one but also the willingness to use EBM is another issue. To this perspective, participants to the study asserted that as EBM use is still new means of tax-clearance while changes is a process, they continue enforcing sensitizations on both sellers to use EBM and any buyer to request an invoice of EBM until this will be implemented to all services. Yet, in optimist's views, the respondents accept that the numbers of those who use EBM is increasing consider the period that this new means of paying taxes has been integrated in Rwanda.

b) On line declaration and payment

The study sought to assess the contribution of online tax declaration and payment on tax compliance in Gasabo district.

Table 4.7: Assessment of online declaration and payment on tax compliance

	SD		D		N		A		SA		Mean	St. Dev
	fi	%	fi	%	fi	%	fi	%	fi	%		
All registered taxpayers file their returns on time.	0	.0	1	1.8	0	.0	3	5.4	52	92.9	4.89	.45
The system is able to track taxpayers who do not file their returns.	0	.0	0	.0	6	10.7	45	80.4	5	8.9	3.98	.45
Taxpayers are able to declare and pay actual taxes on time.	1	1.8	0	.0	0	.0	49	87.5	6	10.7	4.05	.52
Taxpayers who do not file their returns are followed up.	0	.0	0	.0	1	1.8	35	62.5	20	35.7	4.34	.51
Taxpayers are able to keep records, file returns and pay tax on time without intervention of tax officials.	0	.0	0	.0	0	.0	4	7.1	52	92.9	4.93	.26
All taxpayers are aware of the consequences of delay or non remittance of tax.	0	.0	1	1.8	2	3.6	8	14.3	45	80.4	4.73	.62
All taxpayers disclose income earned for tax purpose.	0	.0	2	3.6	1	1.8	3	5.4	50	89.3	4.80	.64

Source: Primary data, 2019

The findings show that 1.8% of respondents disagreed while 5.2% of respondents agreed and the majority 92.9% of respondents strongly agreed that all registered taxpayers file their returns on time and this statements was rated and has very high mean core equal to 4.89; SD=0.45). This implies that respondents have homogeneity perception responses.

The findings show that none of respondents disagreed or strongly disagreed and 10.7% of respondents were neutral whereas 8.9% of respondents strongly agreed and the majority 87.5% of respondents agreed that the system is able to track taxpayers who do not file their returns and this statements was rated and has high mean core equal to 3.98; SD=0.45). This implies that respondents have homogeneity perception responses on above statements.

The findings indicated that 1.8% of respondents strongly disagreed whereas 10.7% of respondents strongly agreed and the majority 87.5% of respondents agreed that taxpayers are able to declare and pay actual taxes on time and was rated with high mean score 4.05 and standard deviation equal to 0.52 implies that heterogeneity perception response.

The findings show that none of respondents disagreed or strongly disagreed whereas 7.1% of respondents strongly agreed and the majority 92.9% of respondents agreed that taxpayers are able to keep records, file returns and pay tax on time without intervention of tax officials and this statements was rated and has high mean core equal to 4.93; SD=0.26). This implies that respondents have homogeneity perception responses on above statements.

The findings show that none of respondents disagreed or strongly disagreed and 1.8% of

respondents were neutral whereas 35.7% of respondents strongly agreed and the majority 62.5% of respondents agreed that taxpayers who do not file their returns are followed up and has high mean core equal to 4.34; SD=0.51). This implies that respondents have heterogeneity perception responses on above statements.

The findings show that 1.8% of respondents disagreed and 3.6% of respondents were neutral while 14.3% of respondents agreed and the majority 80.4% of respondents agreed that all taxpayers are aware of the consequences of delay or non remittance of tax and this statements was rated and has high mean core equal to 4.73; SD=0.62). This implies that respondents have heterogeneity perception responses on above statements.

The results demonstrated that 3.6% of respondents disagreed and 1.8% of respondents were neutral while 5.4% of respondents agreed and the majority 89.3% of respondents agreed that all taxpayers disclose income earned for tax purpose and this statements was rated and has high mean core equal to 4.80; SD=0.64). This implies that respondents have heterogeneity perception responses on above statements.

The overall view of respondents on the level of tax compliance in Gasabo district was rated at very high mean score 4.53 which implies there is strong existence fact and standard deviation equal to 0.49 which implies that respondents have the same view regarding to the level of tax compliance in Gasabo district was very high in Gasabo district via using electronic billing machine. These findings are in the line with Kakembo, (2007), revealed that tax compliance is

significantly positively related to revenue collection. Mutuality one of the components of relational norms was also found to be significantly related to tax compliance. He said Intention to pay taxes is also significantly positively related to attitudes and tax compliance which would help to increase on domestic revenue. Therikildsen, (2004) said that the act of tax counseling improves on tax compliance of tax payers, hence increasing performance in revenue collection in a country. He found out that the objective of tax counseling is to assist taxpayers in matters related to tax and encourage the voluntary submission of accurate tax returns and payment of taxes. Generally, tax counseling offices provide advice on the interpretation and application of tax laws, procedures for filing returns and applications.

Regarding the aspect of tax maximization RRA indicated that, the introduction of EBM has improved tax collection to make revenue available for carrying government services. The RRA official said; it is much easier to identify who did not pay tax or use the device since we monitor each device separately and identify problems. We can see all users of the devices through the device mac address. We normally see taxpayers who fail to use the device properly. However for those not registered we cannot monitor their tax payment behaviour." They however remarked that there are still a lot of tax payers that are not fully using the EBM to maximize tax collection. In contrast, tax payers merely commented and accepted that it is a government procedure or duty to increase tax collection. One of a tax payer reported that; "we pay tax but we don't see

any changes in social services, we see officials gaining and we continue to suffer as a community.

After that we understand the position of participants to the study on how they perceive the awareness of taxpayers to use EBM in their service and in line of verifying the achievement of our second objective, researcher further consulted the services of RRA, especially in the Department of EBM and asked recorded data on the improvement has be done in the tax-collection since the EBM has been integrated. In addition, these recorded data permit the researcher to attain the main aim of the research topic in ensuring whether really the use of EBM for the taxpayers has contributed to the increase of tax collection. For adequacy of data we asked this question; "Please show us how the taxes have increased from 2012 to 2016 through the use of EBM."The recorded data have been represented in the following table according the period of our research. The findings are consistent with Naibeiet *al.*(2011) found that the most common stated reasons for adoption of this new system of tax collection were to secure sales information followed by enhancing tax compliances and also the findings indicated that the system was introduced so as to reduce invoice fraud in Kenya which was being conducted before.

c) Online tax registration in Gasabo district

The study sought to assess the level of tax registration in Gasabo district. The respondents were asked where agreed or disagreed with the statements regarding tax registration. The results from the respondents were summarized in the table below.

Table 3: Online tax registration and tax compliance

	SD		D		N		A		SA		Mean	St. Dev
	fi	%	fi	%	fi	%	fi	%	fi	%		
Every taxpayer identified is always registered.	3	5.4	0	0.0	0	0.0	8	14.3	45	80.4	4.64	.94
A quick check is done on taxpayers to establish if they are correctly registered.	3	5.4	5	8.9	0	0.0	10	17.9	38	67.9	4.34	1.20
The ranking of eligible tax payable is based on taxpayer's income.	0	0.0	3	5.4	3	5.4	11	19.6	39	69.6	4.54	.83
Tax offices are effective in identifying and registering all potential taxpayers.	1	1.8	2	3.6	3	5.4	10	17.9	40	71.4	4.54	.89
Identification methods are effective in registering all potential taxpayers.	0	0.0	4	7.1	1	1.8	15	26.8	36	64.3	4.48	.85
All registered tax payers are followed up to find out if they are active.	4	7.1	2	3.6	2	3.6	4	7.1	44	78.6	4.46	1.19
All taxpayers' basic information are collected and recorded on a timely basis.	4	7.1	5	8.9	2	3.6	5	8.9	40	71.4	4.29	1.30
Taxpayers are able to register without intervention of tax officials.	1	1.8	3	5.4	1	1.8	10	17.9	41	73.2	4.55	.91
Overall mean											4.48	1.01

Source: Primary data, 2019

The results indicated that the majority 80.4% of respondents strongly agreed that every taxpayer identified is always registered with (Mean =4.64 and standard deviation of 0.94), 67.9% of respondents strongly agreed that a quick check is done on taxpayers to establish if they are correctly registered with (Mean =4.34 and standard deviation of 1.20), 69.6% of respondents strongly agreed that the ranking of eligible tax payable is based on taxpayer's income with (Mean =4.54 and standard deviation of 0.83), 71.4% of respondents strongly agreed that tax offices are effective in identifying and registering all potential taxpayers with (Mean =4.54 and standard deviation of 0.89), 61.8% of respondents strongly agreed that identification methods are effective in registering all potential taxpayers with (very high Mean =4.48 and standard deviation of 0.85), 78.6% of respondents strongly agreed that All registered tax payers are followed up to find out if they are active with (very high mean =4.46 and standard deviation of 1.19), 71.4% of respondents strongly agreed that all taxpayers' basic information are collected and recorded on a timely basis

with (very high mean score =4.29 and standard deviation of 1.33) and finally 73.2% of respondents strongly agreed that taxpayers are able to register without intervention of tax officials. with (Mean =4.55 and standard deviation of 0.91). The overall view on respondents on the level of tax registration in Gasabo district was very high with mean score 4.48 which implies a strong evidence of the existence of the fact and standard deviation was 1.01 which implies that respondents have heterogeneity perception on the level of tax registration in Gasabo district. The RRA official said; it is much easier to indentify who did not pay tax or use the device since we monitor each device separately and identify problems. This findings is consistent with RRA (2017), said that the aim of RRA in introducing EBM is to increase the registration of all taxpayers in the national database and the issuing of a national PIN for everybody. If the political will exists that all taxpayers or even all citizens should be registered under national PINs, incentives have to be created to encourage people to register with the national tax authorities

Table 4: Tax revenue by tax type

Revenue	2012/2013		2013/2014		2014/2015		2015/2016		2016/2017	
	(Rwf bn)	%	(Rwf bn)	%	(Rwf bn)	%	(Rwf bn)	%	(Rwf bn)	%
PAYE	174.1	26.7	185.9	24.3	205.4	23.9	229.7	23.3	257.7	23.70
Profit tax	105.2	16.1	122.2	16.0	150.7	17.5	159.3	16.1	190.5	17.50
VAT	199.7	30.6	259.1	33.9	286.2	33.3	323.2	32.8	352.4	32.40
Excise tax	99.8	15.3	110.4	14.5	120.6	14.0	138.1	14.0	134.2	12.30
Import duty	48.2	7.4	57.9	7.6	63.5	7.4	75.1	7.6	76.5	7.00
Other	25.0	3.8	27.9	3.7	32.7	3.8	61.3	6.2	75.6	7.00
Total revenue	651.9	100	763.4	100	859.1	100	986.7	100	1,086.8	100

Source: RRA, report (2012-2016)

The table above indicated tax revenue by tax type in Rwanda, the results indicated that VAT has been increased after introducing electronic billing machine in Rwanda where in 2012/2013, VAT was 199.7(30.6%) out of total revenue; In 2013/2014, VAT was 259.1(33.9%) out of total revenue. In 2014/2015, VAT was 286.2(33.3%) out of total revenue. In 2015/2016, VAT was equal to 323.2(32.8%) out of total tax revenue in Rwanda while in 2016/2017, VAT was equal to 352.4 (32.4%) out of total tax revenue in Rwanda. This implies that after implementation of electronic billing machine VAT has been increased over the last five years.

Relationship between ICT tax reforms and tax compliance

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.748 ^a	.560	.450	6.72758

a. Predictors: (Constant), EBM, online declaration and payment, online registration

The results show that 56% of the variation in the tax compliance is caused by ICT tax reforms. This shows that there is strong relationship between ICT tax reforms and tax compliance.

Table 6: ANOVA^b

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	454.176	1	454.176	8.345	.001 ^a
	Residual	90.521	5	18.104		
	Total	544.697	6			

a. Predictors: (Constant), EBM, online declaration and payment, online registration

b. Dependent Variable: Tax revenue

The test on the strength of the model to be able to predict tax revenue shows that the model is statically significant since the P-value is less than 5%. This

therefore means that the independent variables can statistically predict the tax compliance.

Table 7: Coefficients^a

	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.494	.116		4.758	.002
	EBM	.907	.260	.427	3.488	.030
	Online declaration and payment	.365	.154	.249	2.370	.050
	Online registration	3.476	1.087	.455	3.198	.037

a. Dependent Variable: Tax revenue

Results in table 7 show the strength of each variable in the predication of the dependent variable. The result shows that all variables are statistically significant since their P- values are less than 5%. The results further revealed that there is positive relationship between EBM, online tax declaration and payment and on line tax registration and tax compliance.

V. CONCLUSION AND RECOMMENDATIONS

a) Conclusion

The findings established that ICT tax reforms contributes to timely tax payment and reduced operational cost for both RRA staffs and clients. The system has also made clients pay tax from any business location, has made communication collaboration between tax payers easier, has made tax auditing/accountability easier and lastly has increased Revenue collection. Analyses of the relationship between ICT tax reforms and tax compliance have indicated a strong relationship. However, the results indicated that ICT tax reforms only contribute 56% on the tax compliance. Therefore, ICT tax reforms are not complete measures of tax compliance other factors which enhances tax compliance should be considered.

b) Policy Recommendations

The researcher has come up with the following recommendations in order to support electronic tax management system and revenue collection in Rwanda

- Other factors such as tax education and tax penalties should be employed to enhance tax compliance since ICT tax reforms only contributes 56% on the tax compliance.
- RRA should employ skilled personnel with more experience on network management in order to ensure the reliability of network and a need to train the taxpayer on the use ICT in the tax management.
- RRA management should keep on upgrading their e tax technology in order to have an up to date system for effective service delivery

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Domestic R&D Intensity, Technology Transfer and Growth of Productivity: An Empirical Investigation of Tunisian Case

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GJMBR-B Classification: *JEL Code: C51, D24, F14, O33*



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1. INTRODUCTION

Endogenous growth models emphasize innovation as the engine of growth. In the first generation endogenous growth models of Romer (1990), Grossman and Helpman (1991) and Aghion and Howitt (1992), TFP growth is positively related to the levels of R&D. This leads to an assumption of scale effects in ideas production, i.e., new ideas are proportional to the stock of knowledge. However, these models are not consistent with the evidence. In particular, Jones (1995) shows that the significantly increasing number of scientists and engineers engaged in R&D in the US since the 1950s has not been followed by a concomitant increase in the growth rate of TFP, thus refuting the first-generation R&D-based endogenous growth models. Consequently, endogenous growth theory has evolved into the two following second-generation theories: semi-endogenous growth models and Schumpeterian growth theory. The semi-endogenous models of Jones (1995), Kortum (1997) and Segerstrom (1998) abandon the scale effects in ideas production by assuming diminishing returns to the stock of R&D knowledge. Thus, R&D has to increase continuously to sustain a positive TFP growth. The Schumpeterian growth models of Aghion and Howitt (1998), Dinopoulos and Thompson

(1998), Peretto (1998), Young (1998), Howitt (1999) and Peretto and Smulders (2002) maintain the assumption of constant returns to the stock of R&D knowledge. However, they assume that the effectiveness of R&D is diluted due to the proliferation of products as the economy expands. In other term, to ensure sustained TFP growth, R&D has to increase over time to counteract the increasing range and complexity of products that lowers the productivity effects of R&D activity. Endogenous growth theory has also increasingly focused on the roles of technology transfer and absorptive capacity in explaining productivity growth across countries (Eaton and Kortum, 1999; Howitt, 2000; Xu, 2000; Griffith et al., 2003, 2004; Kneller and Stevens, 2006; Madsen et al., 2009). Absorptive capacity captures the idea that the benefit of technological backwardness enjoyed by a laggard country can be enhanced if it has sufficient capability to exploit the technology developed in the frontier countries (Abromovitz, 1986).

Despite the rapid progress in the quality of studies and econometric techniques, the assessment of the effects of R&D productivity and spillovers through empirical analysis remains a controversial subject. To make the empirics of the theoretical model tractable, it is necessary to overcome a series of methodological and conceptual difficulties. In this paper, we first attempt to develop an endogenous model of technology accumulation that incorporates as crucial determinants, domestic innovation efforts, human capital, distance to technology frontier and the diffusion of foreign technology through import of high-tech products and foreign direct investment. Then, several alternative regressions are estimated and many graphical analyses are used to investigate the empirical effects of research intensity, human capital and technology transfer on productivity growth in Tunisia over the period 1976 to 2010.

The rest of the paper is structured as follows. The second section presents the theoretical model of technology accumulation and the regression equations to estimate. The third section reports empirical results with necessary interpretations. The last section concludes.

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II. TECHNOLOGY ACCUMULATION MODEL

The basic idea behind endogenous growth theories is that in the long run the main underlying determinant of economic growth is the long-run growth rate of total factor productivity (TFP), which in turn depends mainly on the rate of technological progress. Theoretical modeling and empirical investigations in this field have been the subject of an increasing attention in the literature to understand the differences between developed and undeveloped countries. There are two obvious candidates to explain the different levels of TFP across countries or across regions within countries. The more important one is the amount of research carried out in that region/country. A vast literature investigating the national sources of economic growth (e.g., Cameron, 2003) underlines the linkage between R&D expenditures TFP, and growth. The second one is human capital. A sufficient level of knowledge in the workforce is necessary to acquire and exploit technology. The literature analyzed a third important channel that can affect TFP. Since developing countries carry out little or, insignificant R&D activities, the degree of technological diffusion from countries close to the frontier is likely to be one of the key drivers to accelerate the TFP growth in those developing economies (Savvides and Zachariadis, 2005). Coe and Helpman (1995) stress the role of international trade in driving technological spillovers through the imitative process that determines the technological performance of countries that cannot sustain an endogenous technological growth process. Foreign Direct Investment (FDI) by the Multinational Corporations (MNCs) may be another channel for the international transmission of technology (Savvides and Zachariadis, 2005). Distance to the frontier also plays a particularly important role in the convergence debate. Countries that are more backward technologically may have greater potential for generating rapid growth than more advanced countries (Gerschenkron, 1952), essentially because backwardness reduces the costs of creating new and better products (Howitt, 2000). However, backwardness needs not automatically lead to growth since the increasing complexity of products requires large investments in knowledge in order to take advantage of the technology developed elsewhere (Aghion *et al.*, 2005).

Based on these theoretical models and empirical findings, we propose to develop an endogenous model of productivity growth that incorporates as key variables, domestic innovation, human capital, distance to technology frontier and the transmission of foreign technology through import of high-tech products and foreign direct investments. Empirical findings identify that the theoretical specification of the technology accumulation function

the most consistent with data takes the following general form:

$$\dot{A} = f(X, A) \times (S^f)^{\gamma} \quad (1)$$

Where, A is the level of TFP or, knowledge and $\dot{A}$ is the change in TFP. The function $f(X, A)$ indicates domestic innovation, X indicates R&D input, measured by either the flow of R&D labor, or the flow of productivity adjusted R&D expenditure on labor or human capital and S^f stands for the international technology transmission. The function f takes the following general form $f(X, A) = \lambda \left(\frac{X}{Q}\right)^{\sigma} A^{\kappa}$, where, λ is a parameter of research productivity, σ is a duplication parameter ($0 < \sigma \leq 1$), κ is the return to knowledge and Q is the product variety ($Q \propto L^{\beta}$ or $Q \propto Y^{\beta}$). L is employment or population, Y is the output and β is a parameter indicating product proliferation. The ratio between X and Q is termed as research intensity. In literature different indicators are used to measure research intensity like, $\left(\frac{R}{Y}\right)$, $\left(\frac{L_R}{L}\right)$ or $\left(\frac{H_R}{L}\right)$, where R indicates the real R&D expenditure, L_R is the number of scientists and engineers engaged in R&D and $H_R = hL_R$, where, h is the human capital level.

To develop the model of S^f , our approach is largely based on the studies of (Coe & Helpman, 1995, Lichtenbergh & Van Pottelsberghe, 1998, Savvides and Zachariadis, 2005, Islam, 2010 and Madsen *et al.*, 2013). These authors have tried to model the transfer of foreign technology via import of technologically advanced products and foreign direct investment.

International technology spillovers from import are measured by an import-ratio weighting scheme as follows:

$$S_i^{mf} = \sum_{j \neq i}^n \left(\frac{m_{ij}}{Y_j} \right) A_{sup} \quad (2)$$

Where, i stands for the host country (*it's Tunisia in this study*), n indexes Tunisia's import partners (*example l'EU-15 in our case*) and m_{ij} is Tunisia's import of high-technology products from country j .

We indicate by Y_{Leader} the output of the leader partner. This country is assumed to be close to the technology frontier and having the highest level of knowledge noted by A_{sup} . At any period of time it's possible to express the output of a partner country as follow: $Y_j = \gamma_j Y_{Leader}$, where γ_j is a positive constant. So that, it's possible to define S_i^{mf} by the following general form:

$$S_i^{mf} = (n/\mathfrak{N}) \left(\frac{\sum_{j \neq i}^n \frac{m_{ij}}{n}}{Y_{Leader}} \right) A_{sup} = (n/\mathfrak{N}) \left(\frac{M}{Y_{Leader}} A_{sup} \right) \quad (3)$$

Where, (M/Y_{Leader}) is ratio of the total average value of imports to the output of the leader. Technology transfer via foreign direct investment will be modeled in

the same way. International technology spillovers from foreign direct investment (FDI) are measured by an FDI-ratio weighting scheme as follows

$$S_i^{fdif} = \sum_{j \neq i}^n \left(\frac{fdi_{ij}}{K_j} \right) A_{sup} \approx (n/\mathfrak{N}) \frac{FDI}{K_{Leader}} A_{sup} \approx (n/\mathfrak{N}) \left(\frac{FDI}{Y_{Leader}} A_{sup} \right) \quad (4)$$

Where, $Y_j \propto K_j$ and K_j is the physical capital in the country j . FDI is the total average value of inward FDI flows from partners. We assume that the country i has the technological level A_i and all other variables are defined as before. Note that "distance to frontier" has been measured using the relative gap of Tunisia's TFP to the leader's one $(A_{sup} - A_i)$. This difference indicates

the technological gap in terms of the number of varieties. Based on works of (Hammami & Menegaldo, 2001; Cecchini et al., 2008; Ang & Madsen, 2013), the integrated model describing the international technology transfer can be specified by the following general function:

$$S^f = (S_i^{mf})^a \times (S_i^{fdif})^b \quad (5)$$

Where, a and b are the elasticities of technology transfer via import and FDI, respectively. If we replace the different elements of Eq.5 by their expressions, we obtain the following model:

$$S^f \equiv (n/\mathfrak{N})^{ab} \left(\frac{M}{Y_i} \right)^a \times \left(\frac{FDI}{Y_i} \right)^b \left(\frac{A_{sup} - A}{A_{sup}} \right)^{ab} A^{ab} \quad (6)$$

If we replace S^f and $f(X, A)$ by their expressions and the domestic R&D intensity by the ratio $\left(\frac{H_R}{L} \right)$, we obtain the following equation:

$$\dot{A} = \delta (n/\mathfrak{N})^{ab\gamma} \left(\frac{H_R}{L} \right)^\theta \left(\frac{M}{Y_i} \right)^{a\gamma} \left(\frac{FDI}{Y_i} \right)^{b\gamma} \left(\frac{A_{sup} - A}{A_{sup}} \right)^{ab\gamma} A^{\kappa+ab\gamma} \quad (7)$$

If we replace the parameters $(a\gamma)$, $(b\gamma)$, $(ab\gamma)$ et $(\kappa+ab\gamma)$ by ϵ , τ , γ et $\emptyset$, respectively, we obtain the following integrated model of technology accumulation:

$$\dot{A} = \delta' \underbrace{\left(\frac{H_R}{L} \right)^\theta}_{\text{Domestic innovation}} \underbrace{\left(\frac{M}{Y} \right)^\epsilon \left(\frac{IDE}{Y} \right)^\tau}_{\text{International technology spillovers}} \underbrace{\left(\frac{A_{sup} - A}{A_{sup}} \right)^\gamma}_{\text{Distance to frontier}} \underbrace{A^\emptyset}_{\text{Externality effect}} \quad (8)$$

Where, $\delta' > 0$ is a parameter of research productivity. We assume that $0 \leq \theta < 1$ and $0 \leq \emptyset < 1$. Log-linear transformation of Eq.8 gives the empirical model as follows (Ha and Howitt, 2007):

$$g_A = \alpha_0 + \alpha_1 \log \left(\frac{L_R}{L} \right) + \alpha_2 \log h + \alpha_3 \log \left(\frac{A_{sup} - A}{A_{sup}} \right) + \alpha_4 \log \left(\frac{M}{Y} \right) + \alpha_5 \log \left(\frac{IDE}{Y} \right) + \varepsilon \quad (9)$$

Where, ε are identically and normally distributed shocks with zero mean and constant variance. In the above equation, TFP growth, or the left-hand term should be stationary (Ha and Howitt, 2007; Zachariadis, 2003), because in steady state, TFP growth should be constant. This model is estimated in the tunisian economy context over the period 1976 to 2010. This country is from the southern shores of the

Mediterranean that has signed the bilateral partnership agreements with the EU-15. In order to upgrade its economic sectors, it's necessary to have certain choices to make, as well as reform and modernization efforts to deploy. Since the resources are limited, it needs to invest constantly in education and encourage enterprises and industrial support institutions to integrate innovation and R&D into their strategies.

Besides modernizing and improving the competitive capacity of the national industrial system, other factors, such as foreign direct investment and trade liberalization, especially with Europe, contribute to the productivity growth in Tunisia.

III. EMPIRICAL RESULTS AND INTERPRETATIONS

a) Data and measurement Issues

The basic dataset for this study combines variables from different sources. In order to calculate the TFP growth rate, we follow growth accounting decomposition procedure by considering an aggregate production function, where a country's real gross domestic product (GDP), Y , is stated as: $Y = AK^\alpha H^{1-\alpha}$, where K is real physical capital stock and L is the total labor force. It is measured in log as follow: $\log A = \log y - \left(\frac{\alpha}{1-\alpha}\right) \log \left(\frac{k}{y}\right) - \log h$. Where y is the output-worker ratio (Y/L) and k is the capital-worker ratio (K/L). Capital's income share (α) is set to 0.30 following Gollin (2002). The ratio (k/y) is constructed using from various issues; Penn World Table (PWT version 6.3) and World Bank. The individual worker's human capital h is obtained from the estimation of a Macro-Mincer model integrating the number of years of schooling and the quality of education in nonlinear form. Average years of schooling in the population aged 15 and over and the ratio of public education expenditure to GDP as a proxy for quality of education are extracted from Barrow and Lee (2010) schooling dataset and Institute of Quantitative Studies (IQS), respectively. This study treats human capital as affecting domestically produced technological innovation and firms' absorptive capacity of new knowledge.

The R&D intensity is measured by the proportion of scientists and engineers engaged in R&D to the total labor force (see Ha and Howitt, 2007; Madsen, 2008; Madsen et al., 2009). It is parameterized by the variable $\left(\frac{L_R}{L} \approx u_R\right)$. Data on R&D activities and innovation in Tunisian firms (carried out by the Ministry of Scientific Research and Competences) is obtained from the innovation survey conducted by the Ministry of Scientific Research and Competences and a various issues of the UNESCO Statistical Yearbook. The ratio of the import of technologically advanced products to GDP and the ratio of FDI inflow to GDP are parameterized by the variables MY and $FDIY$ respectively. Data are collected from WDI (2007), the IMF dataset and the Institute of Quantitative Studies. Distance to the frontier $(A_{sup} - A)/A_{sup}$ is measured by the TFP relative gap between the EU-15 and Tunisia. It's indicated by the variable DTF .

b) Estimation results

Estimation results are reported below in Table 1 (Appendix A). The impact of domestic R&D intensity ($\log u_R$) on the productivity growth is negative (-0.069), but not significant at 5% significance level in all alternative regressions. These findings don't provide support for the Schumpeterian theory (Aghion & Howitt, 2009; Ang & Madsen, 2012; Islam, 2010; Vandenbussche, Aghion & Meghir, 2006). There are several reasons for this surprising finding. Chellouf, Outtara and Dou (1999), for example, show that in Tunisia only a very limited effort was made to increase funding for scientific research. The innovation is negatively affected because there is no efficient cooperation between industrial firms and partners (universities, research centers, foreign corporations, etc.). In Tunisia, the economy is dominated by public sector, with an excessive control and a centralized authority. This leads to a fragmented strategy of the Research and Innovation value chain, biased by a sectorial approach. To gather all stakeholders and to produce a common ground for a coherent Innovation Agenda, it's necessary to support interface agencies involved with scientific research, to assist the R&D programs and initiatives implementation, to facilitate the Tech Transfer through collaborative projects (Hatem, 2007).

Figure 1 (Appendix B) shows a non significant relationship between R&D intensity and the average TFP growth rate over the period 1976-2010. Many reasons explain this result. One possible reason is that Tunisia allocated an insufficient amount of financial resources to the R&D, as suggested by the low estimated level of its expenditure of the GDP. In addition, the statistics on the researchers in Tunisia include a non-negligible proportion of student researchers with master and doctorate degree. It's important also to note that productive sector in Tunisia is dominated by very small enterprises with less than five employees, with little money to invest in an R&D department and more generally in the innovation activities.

Our estimations identify that human capital has a positive impact on technology accumulation but not highly significant. One percentage point increase in the human capital creates a 0.05 percentage point increase in the average growth rate of the TFP. This finding does not strongly support the recent endeavour of the Tunisian government in improving the whole nation's education level. It can be explained by a mismatch between training and the needs of productive structures ("Education, Labor Market and Development: The Requirements of Adequacy", 1999). Tunisia has to deepen their efforts in innovation by improving the efficiency and adaptability of skilled workers as well as by adopting external know-how via more active technological collaborations with foreign partners, local laboratories, and universities.

By removing the non significant variable (R&D intensity) from the regression equation, the statistical significance of the explanatory variables was improved except for the human capital (column 2). A new interactive variable ($Loghu_R$) that combine between skill level and the number of scientists and engineers engaged in R&D was created. The results show that this interactive variable has a positive impact on productivity growth (0.031), but not significant. This confirms the Schumpeterian theory of endogenous growth that considers that the rate of technological progress depends positively on the intensity of domestic R&D corrected by the skill level.

The estimated coefficients of distance to frontier are positive and statistically significant at the 5% level in all alternative regressions. In other word, the further a country lies behind the technology frontier, the greater will be its potential to accelerate productivity growth. These results are consistent with the results of Griffith *et al.* (2003, 2004). Figure 2 (Appendix B) shows that the relationship between technical progress and the distance to frontier is positive but not linear. The productivity growth is negative for a reduced gap ($DTF \leq 73\%$). Beyond this value, TFP growth is found to be enhanced by the distance to technology frontier. For a large technology gap the productivity growth is not very important. This implies that catch-up will be more difficult, complex and very expensive for a high technological distance.

The estimated coefficients of import of technologically advanced products are highly significant in all columns. A one percentage point increase in this variable creates an increase in the average growth rate of the TFP by more than 0.5 percentage points. This finding confirms that this variable is an important channel for the international transmission of technology in Tunisia. It is in line with the results of (Baumol, 1993; Mansfield and Romeo, 1980), among others. The graphical analyses show that the relationship between technical progress and the import of technology is not linear (see Figure 3). The productivity growth is very low for a reduced ratio ($\frac{M}{Y} \leq 25\%$) and the positive impact on the accumulation of technology doesn't appear only beyond this value.

Estimations reveal some surprising results concerning the effects of the variable $FDIY$ on technology accumulation. Its coefficient is negative and significant thereby rejecting the idea that foreign direct investment constitutes incentives for innovation in Tunisia. One percentage point increase in the share of FDI creates a reduction of 0.11 percentage point in the average growth rate of the TFP. This result doesn't support the theory that consider FDI an important factor of building local technological capabilities for developing countries, and an important channel through which international diffusion of knowledge and

technology takes place. Several reasons can explain this unexpected result. In Tunisia, the large share of FDI is concentrated in low value-added activities, including an external control of sourcing, and reliance on expatriates in managerial and technical positions. This is aggravated by the weak domestic absorptive capacity through a very limited effort to increase funding for scientific research and barriers in the domestic business climate.

The economic literature shows that developing countries need to focus more on the acquisition and assimilation of foreign technology through imitation and cooperation with multinational firms, given the high cost of creating new and better products (Howitt, 2000). In addition, technology transfer is not systematic (Sjöholm, 1999). It is closely related to the "absorptive capacity" (Blomström *et al.*, 2000). For this purpose, we create multiplicative variables to measure the importance of the absorptive capacity in the technology spillovers. Some alternative regression will be estimated in the next section.

c) *Technology spillovers and Absorptive capacity*

Countries may differ in their effort and ability to understand and adopt new technologies compatible to their local condition which is popularly known as 'absorptive capacity' (Arrow, 1969). Abromovitz (1986) and Nelson and Phelps (1966) assume that absorptive capacity depends on the level of human capital, whereas Fagerberg (1994) and Griffith *et al.* (2003, 2004) assume that the absorptive capacity is a function of domestic innovation activities.

Tables 2 and 3 (Appendix A) summarize estimated results of TFP growth with absorptive capacity for Tunisia. Our empirical results (column1 in table 2) show a negative and significant relationship between the interactive term ($Logu_R \times LogFDIY$) and the TFP growth rate. The second column shows that the human capital based absorptive capacity exhibit negative relation with productivity but not significant (-0.148). This implies a weak complementarity between the two factors to generate productivity gains. This result is contradictory to the empirical findings results that found positive and statistically significant relationship between human capital based absorptive capacity and TFP growth. It seems that this result is explained by the existence at the lack of learning capacity and concentrated FDI in low value added activities.

Interestingly, while incorporating interaction term between $FDIY$ and distance to frontier ($LogDTF \times LogFDIY$) in the regression, the independent effect of FDI indicator becomes positive (0.13) but statistically non significant. The coefficient associated to the multiplicative variable is positive (0.967) and significant. This implies that, the further a country lies behind the technology frontier, the greater will be technology spillover from FDI. Figure 4 (Appendix B) shows that the

real relationship between technical progress and the interactive term ($\text{LogDTF} \times \text{LogFDIY}$) is positive but not linear. For a technological gap less than 74%, the correlation is positive. Beyond this threshold value, the correlation becomes negative.

Empirical evidences identify that knowledge spillovers through the channel of imports are not only important because they play an important role for growth in endogenous growth models but also because trade has often been highlighted as playing a key role in facilitating convergence (see for example Nelson and Wright, 1992). The idea behind this spillover hypothesis is that the variety and the quality of intermediate inputs are predominantly explained by R&D and, therefore, productivity is a positive function of R&D.

To test the degree of complementarity between the import of technologically advanced products and FDI to have technology transfer, we create the interactive variable ($\text{LogMY} \times \text{LogFDIY}$) (regression 4 in Table 2). The idea behind this spillover hypothesis is that the local absorptive capacity measured by the degree of openness of the country. The estimated coefficient is positive (0.48) but statistically non significant at the five percentage significance level. This result clearly explains the low technological potential of FDI inflows into Tunisia, which justifies the lack of interaction between the two variables. In other hand, technology spillovers from import of high-tech goods depend on domestic R&D intensity and the distance to technology frontier. For this reason two interactive variables ($\text{LogMY} \times \text{Logu}_R$ and $\text{LogMY} \times \text{LogDTF}$) are incorporated in the model (Table 3).

Our estimations show that the impact of ($\text{LogMY} \times \text{Logu}_R$) on the growth rate of TFP is negative but not significant. A positive and significant correlation is between productivity growth and the interactive variable ($\text{LogMY} \times \text{LogDTF}$). We remark that by the introduction of this last multiplicative variable, the effect of human capital becomes more significant. The total marginal effect (independent and interactive) of imports of technologically advanced goods on productivity growth is given by the coefficient α_{MY} formulated by the following relation $\alpha_{MY} = 0.696 + 0.415 \times \text{LogDTF}$, (regression 2). If we use the average value of LogDTF calculated over the period 1976-2010 in this equation, we obtain a $\alpha_{MY} = 0.57$. This empirical value shows that the import of technologically advanced is a main vector of the transmission of foreign knowledge in Tunisia. Its effect is positive and more enhanced by the distance to technology frontier. The graphical representation of the relationship between TFP growth and ($\text{LogMY} \times \text{LogDTF}$) is reported in the figure 5. This graph confirms the presence of a positive impact of the import of technology. This effect is important for a high technological gap but negative reduced distance.

IV. CONCLUSION

This paper aims to investigate the determinants of productivity growth in the Tunisian economy context over the period 1976 to 2010. We first examine the effects of key determinants such as domestic innovation, skills, etc. on the productivity growth. We then attempt to show how these effects are moderated by liberalization as measured by the opening up to foreign investment and by import of technologically advanced products, especially from Europe.

Empirical results show that the impact of domestic R&D intensity on the productivity growth is negative but not significant in all alternative regressions. The effect of foreign direct investment is significantly negative. Its interactive effect with capital human on the productivity growth is also negative but not statistically significant. This implies the weak complementarity between the two factors to generate productivity gains. Apparently, Tunisia needs to have reached a certain level of development in education, technology, infrastructure before being able to benefit from a foreign presence in their markets. Our findings confirm that the import of technologically advanced products is an important channel for the international transmission of technology in Tunisia. Its effect on the knowledge accumulation is positive and more enhanced by the distance to technology frontier. Our results identify also that human capital has a positive but not significant impact on technology accumulation in Tunisia. Despite the high priority given by Tunisia to education and training young people, the capacity for innovation is still limited. The role of human capital is rather more significant in the assimilation and absorption of foreign technology.

An innovation strategy for Tunisia should therefore focus not only on creating technology, but also on technology adoption and adaptation. Tunisian firms have to deepen their efforts in innovation by improving the efficiency and adaptability of skilled workers as well as by adopting external know-how via more active technological collaborations with foreign partners, local laboratories, and universities.

APPENDIX

Appendix A: List of regression tables

Table 1: R&D Intensity, Distance, Foreign R&D capital and TFP Growth

Dependant Variable: Total Factor Productivity $\Delta \text{Log}(A)$			
	(1)	(2)	(3)
Logu _R	-0.069 (-0.95)		
Logh	0.059 (1.82)	0.040 (1.65)	
Loghu _R			0.031 (1.61)
LogDTF	1.53** (2.55)	1.479** (3.56)	0.94** (2.45)
LogFDIY	-0.128** (-4.03)	-0.127** (-6.87)	-0.09** (-5.32)
LogMY	0.589** (2.14)	0.560** (3.00)	0.51** (2.33)
_Cons	-1.46 (-1.47)	-1.296 (-1.82)	-1.285 (-1.6)
Fisher	211.69	97.03	74.04
R-squared	0.98	0.98	0.97

Note: Figures in parentheses () are t-values significant at 5% level (**).

Table 2: Foreign Direct Investment, Absorptive Capacity and TFP Growth

Dependant Variable: Total Factor Productivity $\Delta \text{Log}(A)$				
	(1)	(2)	(3)	(4)
Logh	0.045 (1.58)		0.084 (1.90)	0.049 (1.1)
LogDTF	1.635** (4.92)	1.538** (2.46)		1.12** (2.69)
LogFDIY	-0.198** (-6.64)	-0.138** (-4.08)	0.130 (1.1)	-1.66 (-1.37)
LogMY	0.509** (2.31)	0.563 (1.66)	0.894** (4.84)	
Logu _R × LogFDIY	-0.070** (-2.03)			
Logh × LogFDIY		-0.148 (-1.14)		
LogDTF × LogFDIY			0.967** (2.36)	

LogMY × LogFDIY				0.48 (1.31)
_Cons	- 1.094 (-1.38)	-1.281 (-1.02)	-2.81** (4.80)	(- 0.37** (2.87)
Fisher	331.92	36.36	143.44	26.60
R-squared	0.98	0.96	0.93	0.95

Note: Figures in parentheses () are t-values significant at 5% level (**).

Table 3: Imports of foreign technology, Absorptive Capacity and TFP Growth

Variable dépendante: $\Delta \text{Log}(A)$			
	(1)	(2)	(3)
Logu _R	-0.056 (-1.08)		
Logh	0.052** (2.47)	0.040** (3.41)	0.042 (1.73)
LogFDIY	-0.123** (-6.04)	-0.128** (-6.81)	-0.121** (-4.59)
LogDTF			1.644** (2.71)
LogMY	0.693** (4.86)	0.696** (.03)	0.511 (1.79)
LogMY × LogDTF	0.492** (3.84)	0.415** (4.55)	
LogMY × Logu _R			-0.013 (-0.55)
_Cons	- 1.767** (-3.23)	- 1.843** (-3.44)	- 1.143 (-1.13)
Fisher	268.46	37.64	334.85
P-value	0.03	0.00	0.00
R-squared	0.98	0.98	0.97

Note: Figures in parentheses () are t-values significant at 5% level (**).

Appendix B: List of figures

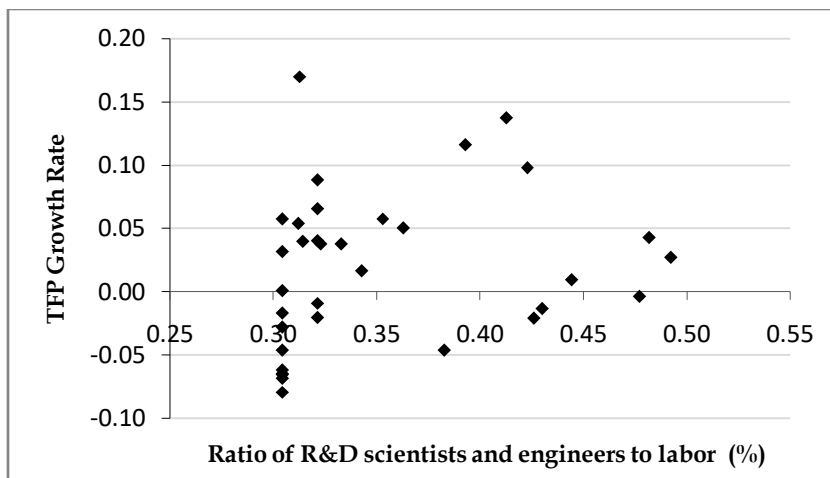


Figure 1: Domestic R&D intensity versus TFP growth (1976 – 2010)

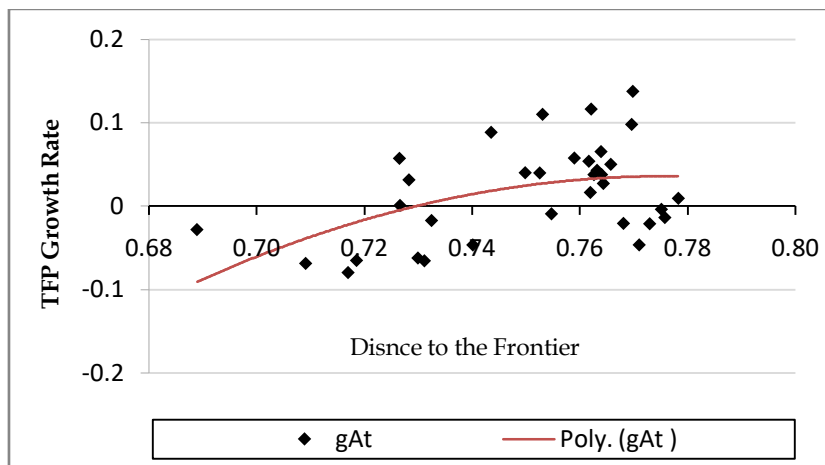


Figure 2: Distance to the frontier versus TFP growth (1976 – 2010)

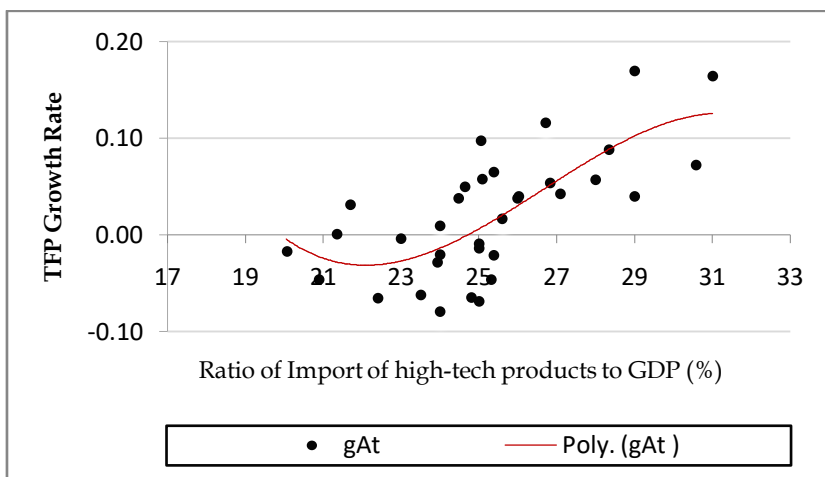


Figure 3: Import of foreign technology versus TFP growth (1976 – 2010)

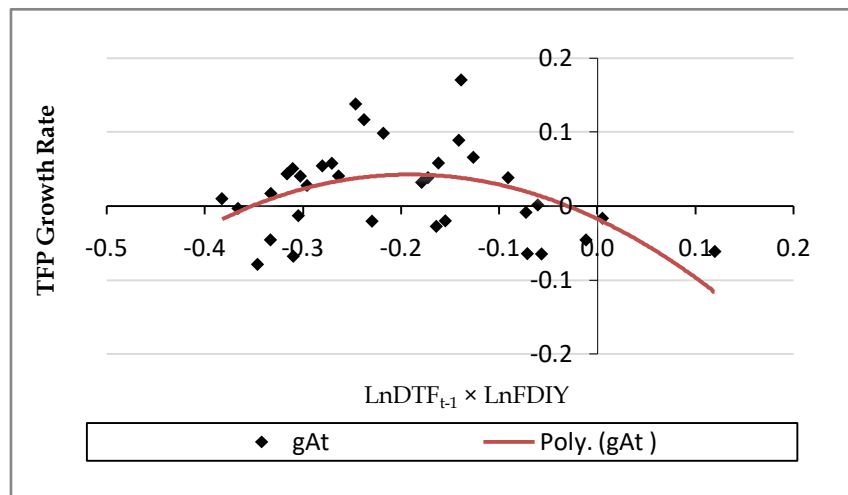


Figure 4: Interactive variable ($\text{LogDTF} \times \text{LogFDIY}$) versus TFP growth(1976 – 2010)

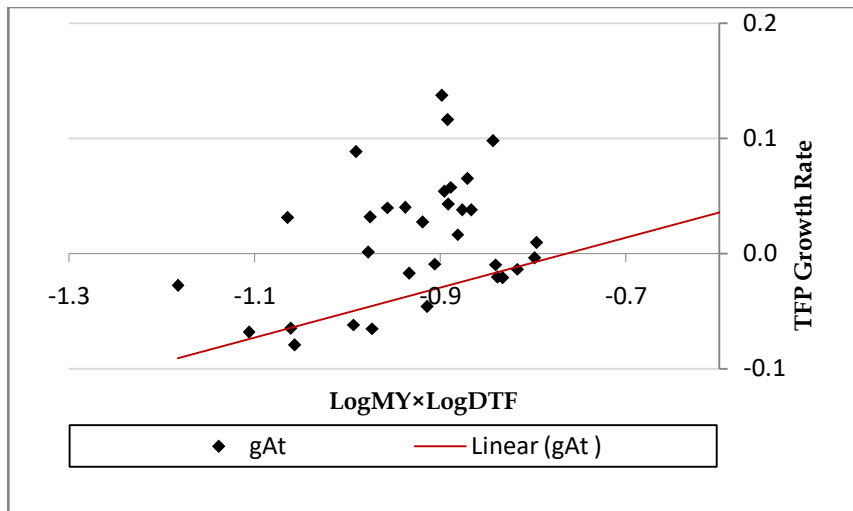


Figure 5: Interactive variable ($\text{LogDTF} \times \text{LogMY}$) versus TFP growth(1976 – 2010)

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Social System as the Environment of Economic Processes

By Alexander Sharov

Abstract- Everything that we know about the economy, for the most part, is not true. The reason for this lies in the false definition of the concept of economics. It is said because of the absence of economic space definition and the subject of economic exchange. The economic exchange is an exchange for the purpose of making a profit. The profit formation is possible only in a certain economic space on the basis of debt obligations invested in production.

Keywords: macroeconomics, social system, profit.

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I. TERMS

Labour owners are people who sell their skills and abilities temporary or who do certain jobs for hire. They manage their labour in order to generate income (profit). These include all employees.

Asset owners are people who own the means of production such as capital, firms and companies. Asset owners employ labour owners for the production and distribution of material goods and services. They manage their assets in order to generate income (profit).

Resource owners or government are people who control the state property and natural resources such as state budget, municipal property, land and water available. The resource owners employ labour or company owners to produce and preserve resources. They manage national and municipal resources in order to generate income (profit). These include officials of various ranks who use or distribute state and municipal budgets.

An element of a social system is a group of people who own one type of property, which is the main source of their income (profit).

Social system is a society organized to conduct economic exchange between elements of the social system.

Macroeconomics as science has a variety of terms and definitions to describe the processes of exchange and distribution material goods but it rarely pays attention to the environment in which these processes occur. In fact, we are accustomed to perceiving economic processes without paying attention to the environment. Out of habit, we take this environment as a multitude of economic subjects or we mean that we are dealing with an economic system consisting of firms and households. What could be interesting about this? - The subjects differ from each other in their economic relationships, This main

difference is the difference between a seller and a buyer. Here comes the fatal error of all economic theories. Nobody thinks about the subject of a sale, considering it obvious that the subject of the exchange is some goods! Everything that is sold or exchanged is a commodity. We are in the trap of our own naivety. We can not find differences between economic entities depending on the product. So we consider everyone who sells and buys goods as subjects of economic relationships. This undetermined mass of economic entities, therefore, is an economic space or an economic system. The uncertainty of the number of groups of goods multiplied by the uncertainty of the number of sellers and buyers (households and firms) creates such a scale of uncertainty in the behaviour of this system that it questions the reliability of any macroeconomic theory itself. As a result, all existing theories have a lot of limitations, only within which they are true. Heuristic methods also do not allow us to understand economic processes with acceptable reliability for several reasons:

The social environment is not described as the basis of economic space.

The criterion for economic human behaviour and its role in the economic space are not defined.

Macroeconomics does not take into account changes in the social environment as the cause of changes in economic processes.

I will explain my view of the economy from the point of view of the social environment that forms the economic space and ensures economic processes.

I will begin by saying that the very concept of economics requires change. It does not meet the objectives of economic research. Not to mention the need to combine macroeconomics and microeconomics in a single discipline based on common parameters. Give up the usual misconceptions that today are called economics. Cast doubt on what was taught at universities. Think and ask yourself whether the economy is a set of relationships connected with production and economic activity? Why the exchange of material goods is an economic process? Can we say that economics is the science of rational behaviour or choice that economists are aware of if we are not sure of our own rationality? And if we consider rational behaviour or choice to strive for profit, then economics is the science of profit. No more no less. All that any economist seeks is to find a way to increase

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profits. But profit does not arise from the exchange of material goods or trade, as opposed to benefits. The benefits do not depend on the structure of society but arise from personal relationships between people.

The benefit can be a profit but the profit is a benefit only when there is an economic exchange in a society organized in a certain way. It would be naive to assume that the addition of benefits entails the emergence of profit, as if from transferring apples from one pocket to another suddenly oranges will arise. Profit does not arise from the exchange of material goods for money - the equivalent of this good, therefore, the purchase itself is deprived of the possibility of making a profit. The exchange of one dollar for a commodity valued at one dollar does not change the amount of property either from the seller or the buyer. There is no profit. Therefore, the process of buying some material goods is not an economic one although it is accompanied by benefits for both participants in the exchange.

If you do not agree with such an obvious conclusion and prove the emergence of profit as a result of multiple transactions then you will simultaneously prove the existence of losses equal to the amount of profit. As a result, the profit will remain only a special case not peculiar to all participants of such an exchange and consequently a microeconomic parameter. While adhering to my definition of economics I affirm that all societies create profits at the macroeconomic level and then distributes them at the microeconomic level. Profits are not a combination of particular cases of their occurrences. Profit is not a product of successful entrepreneurship and trade. On the contrary, entrepreneurship and trade are the means to distribute the existing profits.

The second misconception is the view that material goods (some of them are known as consumer goods) are an economic parameter or property of an economic category. The consumption of material goods does not create profit, and therefore is not of an economic nature. Material goods cannot serve as an economic criterion of differentiation in society, as well as the particular case of profit from the exchange of material goods. If we define the profit as the difference between revenue and costs which manifests itself at the time goods sale, then it will depend on the costs generated in the production process or even much earlier. The number of characters that influence production costs, and therefore profit, will be significant even in simple cases.

Profit may be positive but the manufacturer does not receive it because it is not distributed in his favour. Hypothetically we can never define it as the sum of the profits of all economic entities that are accepted by such modern economies. Consequently, this means that we cannot talk today about economic management. But as soon as we define the structure of the economic

environment where all its participants are divided into groups according to the economic basis, then the economy will become a tool for managing society. As a criterion for dividing society into groups, I identified property that is at a higher level than material goods. The owners of this property are grouped together and constitute a single economic environment in which this property is converted into profit.

There are three types of property needed to create profits: resources, assets and labour. The owners of these property types are grouped together and constitute the economic space (the environment) that I called the social system (6), pp. 107-115 DOI: Economy of Social Systems, or General Economic Theory: 10.15640/jeds.v6n3a11URL: <http://dx.doi.org/10.15640/jeds.v6n3a1>). The division of ownership occurs according to the predominant ownership of one of the properties. Three types of owners or three elements of the system are labour owners, asset owners and the owners of the resources (government).

The economic and social behaviour of a person determines the property that he owns. Property is a source of income and its owner acts in his property interests. It is possible to increase the value of labour, assets and resources by combining them to produce material goods. As the separation of elements (the increase in the number of owners of only one property), the need for interaction between the elements increases. And given the fact that the division of property contributes to the growth in productivity and profits then the division of property becomes economically viable.

Prior to the division of ownership, production could be organized by one person assuming that a person own at the same time labour, resources and assets. His goal was to produce material goods that determined his well-being. The choice of the production type was determined by the presence of certain resources, production equipment, skills and the need for material benefits. After the division of society into owners, the goal of production is profit (monetary reward). Profit from the participation in production or exchange gives the property owner the opportunity to receive material benefits, regardless of the production in which he participates. The material goods themselves become exclusively a commodity, the sale of which brings income to the production participants. The gap between production and consumption as a result of property division means the beginning of the economic exchange. Economic exchange implies the freedom to choose how to use the property and this choice is directed towards greater income. Greater income contributes to more efficient use of the entire social system. In the absence of freedom to dispose of property, or in the absence of property itself, there is no desire for profit (increased income). There is no profit formed. There are no economic relations. Therefore,

before the formation of the first social systems, we knew nothing about the economy.

Production is present in any society, unlike profit, which arises only in a social system or an economic society, where the division of property is social in nature. The emergence of profit and its distribution among the elements of the system suggests that at the time of the conditional start of economic exchange the cost of labour, assets and resources is lower than the cost of labour, assets and resources at the conditional end of this exchange. Over time the ownership of the entire social system grows. This growth ensures the issue of money on the basis of new debt obligations. Issued money is invested in production, attracting more labour, resources and assets to the exchange.

As a result of the expanded exchange, more material goods are produced, which increases the ownership of the system as a whole. The distribution of additional material goods increases the value of resources, assets and labour. The increase in the money supply leads to an increase in the commodity mass, raising the volume of production and consumption to a higher level, and the system again needs a new issue for profit. The exchange process is as follows: (money + new debt) - (product + new product) - (money + profit). Each exchange cycle is accompanied by a monetary emission with an increase in investment in production, the attraction of a greater labour quantity or quality, assets and resources, and a new profit. In the social system, the emission and the corresponding investments become profit. The exchange relations between the elements become economic (with a view to making a profit). The profits of social system distribution conditions between the elements can change. Not all the elements increase their ownership in proportion to the money issued. As a result, the property of one or two elements can not only increase, but also decrease. This would lead to participation reduction in the of the property element in the exchange. This reduction will affect other elements changing the need for all property in exchange and causing economic fluctuations. The interrelationships between the three elements are not as primitive as the relationship of supply and demand between households and firms. On the other hand, it not so complex that we cannot build a reliable mathematical model of the social system economy.

For the formation of profits by the social system, it is necessary to fulfill two conditions:

The ability to emission

The ability to invest money in production

Additional emission money increases aggregate demand, to which the social system responds with an increase in the production of goods or an increase in prices. And here we are faced with the problem of

unreasonable emissions, which could lead to higher prices and inflation.

Preferably the emission should be carried out for the purpose of investment in production. The issuer should not use equity funds for direct profits bypassing investment in production. The issuer must have a liquid property to ensure the money solvency before the commodity is produced and secure. The ideal issue is the government since it itself does not participate in the production either as an investor or as a producer. The government always has liquid resources. The investment of issued money in production is done by the owners of the assets, for which they must have profit incentives to expand the production or to modernize it.

For a social system, asset owner preferences to invest in expanding production or into increasing productivity are important. In the first case, the direction of investment coincides with the growth of production. In the second case, it is not. Investment into increasing productivity not only does not increase the production of material goods but also further reduces the use of labour and resources in production. This is accompanied by a decrease in material goods consumption and rising prices. The social system money supply does not decrease with the decline in production, which is a consequence of the low production profitability for assets owners. In varying degrees, when the money supply exceeds the produced commodity with the background of low return on assets then the price increases are inevitable.

The social system will inevitably be subject to economic fluctuations in growth and recession. The expansion of production invariably leads to an increase in the share of labour and government and the decrease in the share of assets (asset profitability). Investment in productivity restores the profitability of assets and production expansion becomes possible. Economic fluctuations are justified by the nature of the social system which cannot be changed without abandoning profits and economic development, which destroys the social system itself.

Economic stability, which most economists see as the constant expansion of production, is the process of increasing the share of labour and reducing the share of assets. Therefore, achieving economic stability is possible only with a constant reduction in the labour value or the assets owners profits. In any case, one of the elements will be destroyed and with it the social system. The economic recession is not a flaw in the system. It is a mechanism for adapting the system to new exchange conditions.

Considering that aggregate demand, which is equal to the amount of system elements ownership (Aggregate demand = labour cost + asset value + resource cost) does not decrease while maintaining emissions and investment in production, its dependence on "propensity to save" is absurd. Economic growth is

characterized by growth in consumption by labour owners and the government. From the formula of aggregate demand, it can be seen that economic growth inevitably leads to a decrease in the share of assets, which means investments will be directed not to expanding production, but to modernizing it in order to change the conditions for the distribution of the profit.

With the growth of aggregate demand as a result of emissions, the property of all elements may increase without contradicting the owners' interests. But this situation is not stable to ensure constant economic growth. A physical increase in assets will still lead to a decrease in the percentage of assets in profits. As long as the profit of the assets remains positive, the production expansion will continue. As soon as the assets owners profit decreases to the minimum value then the easiest and the fastest way to restore it is to increase prices. This naturally leads to a sales decrease. An increase in the cost of labour and resources is perceived as a general increase in prices. A drop in asset returns looks like a decline in demand and assets owners behave in accordance with the general state of the economy.

What does a formed social system give to society? First of all, the division of society into three elements prevents the direct dependence of one element profit on the other element profit loss contrary system of two elements. Systems with weakly isolated elements can also be attributed to them. If we assume that we are dealing with an economic system consisting of two elements, then the aggregate demand in it will be equal to the sum of the two elements properties as, for example, owners of assets and labour. The profit of one system element will directly depend on the second element losses which will invariably lead to the dominance of the first element over the second.

Such "social systems" are well known to us as the slave or the feudal systems. One element controls all the property in such systems. Naturally, economic exchange in such a system is impossible. The social system of two elements, if it is possible, is an unstable formation. Having formed as a system of two elements, it will immediately form the third element. This way the capitalist society was formed (capitalism). The formation of an assets owners element is impossible without the formation of labour owners element.

Socialism destroyed the assets owners element. This led to the destruction of the labour owners element. The right to dispose of labour as a property in a socialist society was lost. We can call things as you please and accept capitalism as a system of two elements. We can even assume that there is a socialist economy but all this does not reflect reality. Speaking of economics, we will always talk about the social system of three elements.

In the social system of three elements, the one element profit does not directly depend on the other

element losses. For each element of the system, the source of profit is the total aggregate demand. The aggregate demand growth is ensured by government money issue. As natural resources at government disposal, money is the same resource. Money has value only when exchanged within the system. Emission without investment provokes prices to rise. The social system through investment in production converts the money issue resource into profit. Unlike natural resources, emission money is a resource whose value is negligible and this resource is unlimited.

Using it as a catalyst, the social system uses the necessary amount of labour, assets and other resources not previously used in exchange. This makes the economy of the system "inflationary" and arising from nothing. Additional money launches additional metabolic processes between elements increasing the society wealth. Inflationary economic growth has no limits. Lack of natural resources and labour is compensated by productivity growth. The growth of social system wealth does not depend on population size, life expectancy, geography or climate.

Any society may be in a state of social system formation and historically it is a long process. Any society may follow the path of its destruction and we know that this may be a rapid process. The revolutions in Cuba and Venezuela did not lead these countries to prosperity. Natural and climatic resources cannot be used to enrich society outside the social system. The lack of economic environment for profit creation remains the main cause of their distress. States that have not formed a social system or destroyed it often resort to the use of military force to improve their financial situation. They do not have the possibility to get rich through different methods. They process resources into wealth with low efficiency compared with the social systems. This inevitably leads to economic backwardness. It is enough to compare East and West Germany to make sure that the formed social system has the advantage over the destroyed one.



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By Alisva Cárdenas-Pérez

University of the Armed Forces ESPE

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Abstract- This paper reflects on the interdisciplinary practice between Accounting and Economy, which presents some examples of how accounting applies some theories and methods of the economy generating new methodological currents. The interpretative-critical method is used which concludes that Accounting requires the use of Economics theories and methods exposing cases where Accounting's objects are theoretically based in the Economy. It addresses the issue without exhausting it, leaving open the door to new research in the field of interdisciplinary and accounting transdiscipline.

Keywords: *interdisciplinary, transdiscipline, IASB, interpretative method, critical accounting.*

Resumen- Este trabajo reflexiona sobre la práctica interdisciplinar entre la Contabilidad y la Economía, en donde se exponen algunos ejemplos de cómo la contabilidad aplica algunas teorías y métodos de la Economía generando nuevas corrientes metodológicas. Se utiliza el método interpretativo-crítico mediante el cual se concluye que la Contabilidad requiere del uso de teorías y métodos de la Economía exponiendo casos en donde objetos propios de la Contabilidad se basan teóricamente en la Economía. Se aborda el tema sin agotar el mismo, dejando abierta la puerta a nuevas investigaciones en el campo de la interdisciplina y transdisciplina contable.

Palabras clave: *interdisciplina, transdisciplina, IASB, método interpretativo, contabilidad crítica.*

I. INTRODUCCIÓN

Este trabajo parte de una revisión de los planteamientos de Roslender y Dillard (2003), investigadores críticos interpretativistas, dentro del proyecto de perspectivas interdisciplinarias sobre contabilidad (IPA, en inglés *Interdisciplinary Perspectives on Accounting*), que muestran, desde su nacimiento hasta su maduración, un enfoque de estudios contables que privilegia conscientemente la ejecución de la filosofía de la práctica. Los autores advierten que para quienes deseen ingresar a este tipo de estudios contables sin una continua expansión del horizonte interdisciplinar deben tener cuidado que el proyecto no se degenera en 'tiranía' o 'inercia'.

De ahí han surgido las reflexiones de algunos investigadores contables como Merchant (2008), Josiah, Burtin y Haslam (2010), Fronti (2015), entre otros, sobre las posibilidades interdisciplinarias entre la Contabilidad y otras ciencias. Como punto importante se menciona la existencia del '*Interdisciplinary*

Perspectives on Accounting Research Group' (IPARG) que, en base al conocimiento de sus miembros ubicados en diferentes zonas geográficas del mundo, busca aportar a la evolución del conocimiento científico contable y a la praxis filosófica del mismo en la sociedad.

Atendiendo lo anterior, en el caso de la Contabilidad crítica, su interdisciplina se vincula prioritariamente con la Sociología, de tal manera que según Fronti (2015), podría ser considerada por otros investigadores como un análisis hecho mediante 'la lente' de esta disciplina. Esta investigadora encontró que, la interdisciplina contable no se hace sobre toda la ciencia sino sobre algunos 'segmentos' de la misma, los cuales en ciertos casos están formados y, en otros, están en proceso de formación, siendo para ambos casos de igual relevancia al brindar la oportunidad de lograr 'tradición' y adquirir la caracterización de 'segmento interdisciplinario'.

Es así que, atendiendo las investigaciones contables sobre interdisciplinariedad que se han podido focalizar, para efectos de este estudio se considera dos secciones: la primera, presenta la interdisciplina de la contabilidad con otras ciencias, a partir de las investigaciones realizadas por los investigadores contables que, desde diferentes posturas filosóficas, hacen el ejercicio de demostrar los segmentos de la Contabilidad en los que se está incrementando el proceso interdisciplinar así como, determinar las teorías y métodos de otras ciencias que se están aplicando a la Contabilidad, atendiendo a lo que Fronti (2015) considera como un llamado de 'cooperación' que debe primar entre las ciencias que busquen vincularse.

La segunda parte, se concentra en discutir sobre la interdisciplina de la Contabilidad con la Economía, partiendo con la Teoría Marxista – Economía política que según Tinker (1977) son los inicios de la misma y en donde se revisa con brevedad el valor razonable como un objeto que a pesar de ser un concepto propio de la Contabilidad Financiera se afianza en la Economía como teoría científica.

Finalmente, se presentan unas reflexiones finales que permitan la discusión científica sobre las posibilidades que oferta la interdisciplina entre la Contabilidad y la Economía, como aporte en la evolución de ambas ciencias, lo cual permitirá la evolución de ambas ciencias y el incremento del acervo científico de las ciencias sociales.

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II. LA INTERDISCIPLINA DE LA CONTABILIDAD CON OTRAS CIENCIAS

El aporte que la corriente investigativa crítico interpretativista e interpretativista brinda a la investigación contable, mediante el desacuerdo de que el observador esté separado del objeto de estudio, es muy importante, como lo han demostrado Roslender y Dillard (2003), desde el proyecto de perspectivas interdisciplinarias en contabilidad (IPA), en donde bajo un enfoque de ampliación de conocimientos y considerando los puntos en acuerdo y desacuerdo de los críticos contables intentan encontrar los aportes que las diferentes ciencias pueden hacer a la contabilidad y cómo ésta puede evolucionar como ciencia mediante el cambio de paradigma de lo netamente cuantitativo a lo cualitativo.

Existen investigadores como Fronti (2015), que han estudiado sobre la interdisciplina contable, buscando encontrar posibles vinculaciones de la Contabilidad con otras disciplinas, las cuales pertenecen a la Contabilidad Crítica y a la Contabilidad Social, siendo esta última un claro ejemplo de que la investigación contable se desarrolla utilizando teorías, metodologías y métodos de varias disciplinas. La metodología vista desde el lenguaje genera brechas, y por esas brechas, es que el investigador puede encontrar los vacíos existentes, por tanto, se debe considerar que el discurso nunca será inocuo.

La Contabilidad no escapa de esa realidad, pues así como Berge y Luhmann (1967), hablan de las instituciones como un fenómeno social, es Searle (1997-2009) quien les empieza a llamar instituciones y aporta fundamentos a una teoría poderosa como lo es el institucionalismo; en el caso de la Contabilidad el principal exponente es Richard Laughlin (1987), quien creó el modelo de teoría de esqueleto basado en Habermas (1984 -1987); por su lado, Foucault (1982) se interesó por la historia y, otros autores como Derrida (1995), se interesaron por el lenguaje. Este escenario deja ver las innumerables posibilidades existentes para que la Contabilidad avance en la construcción y entendimiento de su conocimiento con apoyo en otras ciencias.

Se podría decir entonces que, la Contabilidad tiene su existencia mediante su afianzamiento en las teorías y modelos de otras ciencias; en nuestra opinión sería una grave falta a la humildad del conocimiento contable pensar que en la actualidad todo está descubierto y que no hay ninguna otra cosa que se pueda descubrir dentro de este campo. Por tanto, resulta interesante buscar nuevas formas de coadyuvar a la evolución del conocimiento de la ciencia contable, y para ello no se puede dejar de lado otras ciencias, buscando coincidencias pero también divergencias en la forma de abordar determinados objetos de estudio que, aún sin darnos cuenta, se encuentran en el diario

vivir, lo que les confiere una importancia latente en el individuo común que busca satisfacer sus constantes deseos y necesidades.

Lo dicho hasta aquí, no intenta afirmar que buscar la interdisciplina de la contabilidad con otras ciencias sea la única forma de realizar una evolución o aporte a la misma, sino que existe la posibilidad de abordar los problemas contables a partir de la luz de otras ciencias, que sin subyugar la ciencia contable a otras disciplinas permita utilizar diferentes enfoques, teorías, métodos o metodologías, conduciendo a la contabilidad a dar solución a los problemas propios de su conocimiento.

En relación a lo expuesto, es preciso acotar que Roslender y Dillard (2003), hacen énfasis en las diferencias sobre la existencia de una relación de "suplemento" de aquella de "complemento" de la disciplina que acompaña a la Contabilidad. Esta diferencia radica en que, la disciplina contable inicia utilizando ciertos aspectos de la otra ciencia como un "suplemento" y conforme aumentan los grados de intensidad esta situación se convierte en un "complemento" entre la ciencia contable con aquella ciencia de donde obtuvo su teoría, enfoque o método.

En este punto, adentrándonos en este proceso de cavilación es preciso subrayar lo afirmado por Morín (1994) quien manifiesta que

El espíritu hiperdisciplinario va a devenir en un espíritu de propietario que prohíbe toda incursión extranjera en su parcela del saber. Se sabe que en el origen la palabra disciplina designaba un pequeño fuste que servía para autoflagelarse, permitiendo por lo tanto la autocrítica; en su sentido degradado la disciplina deviene en un medio de flagelación a los que se aventuran en el dominio de las ideas que el especialista considera como de su propiedad. (s/n)

A la luz de lo expuesto por Morín (1994), se puede decir que el proceso de búsqueda de la interdisciplina, devela que es necesario considerar que es un paso que requiere de una mentalidad abierta, en donde el conocimiento no se lo puede tomar de manera aislada ni atribuible a la propiedad individual de una disciplina y que por tanto no pueda ser aplicado en otra disciplina. Partiendo de que, las ideas, los pensamientos y los actos que se realizan a partir de estos, constituyen el patrimonio dinámico del diario vivir, por tanto no se debería tratar de definir un sistema de valores que sea único para toda la humanidad puesto que esto es, precisamente, lo que da un valor agregado y aporta al sustento del pensamiento y su posterior aplicación mediante los actos.

Es decir que, más allá de aceptar que lo existente es algo inamovible e imposible de cambiar, se debe empezar por definir las posturas reflexivas que coadyuven a la creación de nuevas concepciones y representaciones, mismas que en correspondencia a

los datos hermenéuticos puedan ser sometidos a los supuestos de cualquier tipo de detracciones, objeciones o cuestionamientos que fomenten su consolidación y aceptación científica. En las ciencias contables, esto no puede ser distinto, por tanto se debe establecer un juicio prudente, que basado en supuestos relativos, devenga en la creación de una coexistencia con otras ciencias que sin dejar de ser coherentes entre sí, lleven a una construcción de puntos de reflexión, de diálogo, de discusión entre la sociedad y el entorno, apuntado a la generación de una equidad vista, como dice Bonil, Sanmartí, Tomás y Pujol (2004) "desde el diálogo entre individuos y colectividades y, por otro lado, por el diálogo entre dependencia y autonomía." (p.7)

¿Es por tanto la interdisciplina una manera adecuada para la creación de nuevas concepciones dentro de la disciplina contable? Tal como lo dice Morín (1994) al hablar sobre la interdisciplinariedad

El ejemplo de la hominización y la del ecosistema muestran que, en la historia de las ciencias, hay rupturas de encierros disciplinarios, de sobrepasamiento o transformaciones de disciplinas por la constitución de un nuevo esquema cognitivo, lo que Hanson llamaba la retroducción. El ejemplo de la biología molecular muestra que esos sobrepasamientos y transformaciones pueden efectuarse por la invención de hipótesis explicativas nuevas, lo que Pierce llamaba la abducción. La conjunción de nuevas hipótesis y del nuevo esquema cognitivo permiten articulaciones, organizativas o estructurales, entre disciplinas separadas y permiten concebir la unidad de lo que estaba hasta entonces separado. (s/n)

Disociando lo dicho por Morín (1994), en nuestra opinión, al pensar en nuevos supuestos o esquemas cognitivos dentro de la disciplina contable, promueve que esta ciencia vaya en una evolución de concepción de la necesidad de segmentación o desfragmentación de la misma, que aunque resulta imperceptible para el individuo común, subyace dentro de su conocimiento del mundo y la realidad en la que realiza sus acciones.

Para ejemplo de esta reflexión tenemos la Contabilidad Financiera, la misma que ha resultado de la adhesión del análisis financiero al contable, lo que ha dado pie a la concepción de un estudio contable – financiero que ayude a la toma de decisiones gerenciales por parte de los inversionistas externos. En este caso, podemos considerar como la determinación del valor razonable de los activos -cuya determinación sobrepasa el análisis contable individual- toma concepciones financieras como el valor presente para poder realizarlo, siendo probablemente una aplicación de un concepto que sobrepasa lo netamente disciplinal

llegando a una posible complejidad dentro de ambas disciplinas.

Estas observaciones nos llevan a revisar algunas reflexiones de otros autores como Bonil, Sanmartí, Tomás y Pujol (2004), quienes al hablar sobre la complejidad estudian las obras de Morín y las sintetizan de la siguiente forma

Las primeras referencias al paradigma de la complejidad las da Morin (1977, 1980, 1984, 1986, 1991, 1994, 1995, 1996), en contraposición a lo que denomina paradigma de la simplificación. Éste plantea la necesidad de construir un pensamiento complejo y la importancia de una acción ciudadana orientada por una forma de posicionarse en el mundo que recupera los valores de la modernidad. Morin (2001), define siete principios básicos que guían el pensamiento complejo, considerándolos complementarios e interdependientes. Sitúa el principio sistémico *osíc* organizacional bajo el que se relaciona el conocimiento de las partes con el conocimiento del todo; el principio hologramático que incide en que las partes están dentro del todo y el todo está en cada parte; el principio retroactivo que refleja cómo una causa actúa sobre un efecto y, a su vez, éste sobre la causa; el principio recursivo que supera la noción de regulación al incluir el de autoproducción y auto-organización; el principio de autonomía y dependencia en el que expresa la autonomía de los seres humanos pero, a la vez, su dependencia del medio; el principio dialógico que integra lo antagónico como complementario; el principio de la reintroducción del sujeto que introduce la incertidumbre en la elaboración del conocimiento al poner de relieve que todo conocimiento es una construcción de la mente. Paralelamente, a estos principios orientadores del pensamiento complejo, Morín plantea lo que denomina "política de civilización", orientadora de valores y de la acción, introduciendo la denominada "estrategia ecológica de la acción". (p.6)

Todo esto parece confirmar que, lo que permite a una ciencia o disciplina propagar una semilla de donde nacerá una nueva disciplina, es la apertura de la mentalidad investigativa y el rompimiento del claustro de una disciplina en sí misma; sin embargo, es preciso discurrir que esto no significa que se lo hará de cualquier forma, sino, considerando algunos principios básicos que se complementan pero al mismo tiempo son interdependientes.

En lo que respecta a la Ciencia Contable, a nuestra opinión, consideramos que esta forma de dar cara a la solución de los problemas disciplinarios de la Contabilidad y su posterior aplicación en el ejercicio profesional conllevan a una evolución del pensamiento contable, rebasando lo netamente físico y tangible como la existencia de un debe y un haber, llevándonos

a una manera de pensar que permita al empresario o individuo común cambiar ese *status*, transformando los debes en haberes, lo cual es un concepto tan antiguo como la hominización del hombre y no es otra cosa que transformar las pérdidas en triunfos, en la búsqueda vehemente de la felicidad.

Para finalizar esta primera parte de reflexión, consideramos importante acotar un último discurso de Bonil et al. (2004) sobre el paradigma de la complejidad, en donde afirman que

Constituye una opción filosófica ideológica que ofrece nuevas posibilidades para una revolución conceptual, y abre nuevos caminos para la formación de una ciudadanía capaz de pensar y construir un mundo más justo y sostenible. Incluye valores éticos, valores epistémicos y valores de acción. (p.7).

De acuerdo a esto, entonces se puede decir que existe un universo infinito de posibilidades para ampliar el espectro del conocimiento, tanto como las circunstancias son variables, así también el espectro cambia y eso nos lleva a que las diferentes disciplinas busquen la necesidad de una cohesión que puede ser interdisciplinaria, transdisciplinaria o multidisciplinaria, misma que –bajo la guía de un pensamiento complejo– pueda generar campos “policompetentes” que ayuden a resolver las nuevas emergencias cognitivas y a dar explicación a nuevas hipótesis y supuestos lógicos, dando paso a la constitución de dominios disciplinarios emergentes que operarán a futuro en un sistema teórico común.

III. LA INTERDISCIPLINA DE LA CONTABILIDAD CON LA ECONOMÍA

Como se ha podido encontrar, muchas otras ciencias y disciplinas son el resultado de la cohesión entre unas y otras. En lo específico de la Contabilidad, Fronti (2015), en su investigación sobre la Contabilidad crítica y las perspectivas interdisciplinarias de la Contabilidad con otras ciencias, manifiesta que

La economía -y sobre todo la economía neoclásica- ha sido la fuente de conceptos tales como el valor o la riqueza para la Contabilidad, y por lo tanto base para la discusión y evaluación de alternativas (Roslender y Dillard, 2003). La teoría económica positivista puede ser utilizada para explicar la elección entre varias alternativas de medición para el segmento de la Contabilidad financiera. Generalmente se fundamenta la elección de un método contable en términos de la mejor forma de reflejar la condición financiera de la empresa y los resultados de sus operaciones en un período. Pero existe un planteo alternativo que propone un camino que podría resultar más satisfactorio para explicar por

qué las empresas eligen un método particular de contabilización en términos de la teoría económica positivista (Dhaliwal y Schepanski, 1984). La teoría de la firma (o teoría económica de la empresa, desarrollada por Ronald Coase y Oliver Williamson) puede ser aplicada para que los informes financieros reflejen mejor los modelos de negocio de las empresas. La mencionada teoría puede ayudarnos a entender por qué las empresas existen y por qué los precios de mercado están disponibles para algunos productos pero para otros no lo están (Singleton-Green, 2014). Este tipo de investigación que vincula la Contabilidad con la Economía suele aplicarse a funciones de producción, curvas de utilidad y eficiencia de mercado. (p. 77).

Analizando las reflexiones de Fronti (2015), se puede decir que, a pesar que la Economía es una de las ciencias desde la cual la Contabilidad se nutre al momento de indagarse soluciones a los problemas contables mediante la presentación de posibles alternativas, reflexionarlas, debatirlas y cuestionarlas; también afirma que su uso no es aplicado a toda la Contabilidad sino para un segmento de ella que necesita dar cuentas de la elección entre esas ‘varias alternativas’ y que ese segmento, es la Contabilidad Financiera. A esto, autores como Biondi, Glover, Jamal, Ohlson, Stephen, Penman, Sunder, Tsujiyama (2012), lo llamaron los problemas exantes y expost, dado que para tomar decisiones de tipo financiero es necesario cifras prospectivas, es decir, futuras, a semejanzas de una evaluación de proyectos.

Siguiendo en la reflexión sobre lo expuesto por Roslender y Dillard (2003) citado por Fronti (2015), es importante meditar en la afirmación sobre la ‘teoría de la firma’, que explica la base sobre la cual las empresas eligen un método particular de contabilización; esta teoría para Fronti (2015) es el resultado de una interdisciplina entre la Economía y la Contabilidad que se aplica a las funciones de producción, curvas de utilidad y eficiencia de mercado.

Así también, Tarzijan (2003) realizó un estudio sobre la teoría de la firma de Ronald Coase (1973), determinando que la misma se originó ante una necesidad de comprender el por qué existen las firmas y qué es lo que determina su ámbito de acción. La intencionalidad de esta teoría radicó en investigar las estrategias, tareas, objetivos y procesos en la toma de decisiones gerenciales, buscando dar respuesta a la pregunta de si comprar en el mercado o fabricar internamente un cierto insumo o servicio afectaría el ámbito y límites de una firma, por tanto, afectaría su estrategia.

La conclusión a la que llegó Coase (1973) con esta teoría es que, la decisión de establecer una firma por parte de un empresario se basa en su estimación

de que la producción interna de ese bien o servicio es más eficiente que adquirirla externamente, así como, la decisión de expandir o aminorar la integración vertical de la empresa o entrar a una nueva línea de negocio parte de esa misma concepción.

Para Tarjizán (2003), esta teoría tiene una complementariedad con la administración estratégica, lo cual se da a través del concepto de ventaja competitiva, es decir existe una interdisciplina entre la Administración Estratégica y la Economía que da como resultado la concepción de esta teoría; sin embargo, de cara a la Contabilidad, no es menos cierto el análisis realizado por Fronti (2015), al encontrar que –la teoría de la firma- vincula la Contabilidad (*Financiera*) con la Economía, al aplicarse a los estados financieros con la intención de que los informes reflejen mejor las posibilidades de nuevos modelos de negocios en las empresas.

Considerando lo expuesto, probablemente Coase (1937) al preguntarse ¿por qué existen las firmas? llegó a una respuesta que en la actualidad, a la luz de Morín (1995), conllevaría el uso de un pensamiento complejo y la generación de una teoría multidisciplinaria, puesto que articula tres disciplinas: parte del concepto económico de la Economía (teoría de la producción) y cohesiona la Contabilidad Financiera (información financiera) así como la Administración Estratégica (ventaja competitiva). Bajo esta premisa, la autora concuerda con Tarjizán (2003) sobre que no habría “teorías” diversas, sino más bien una teoría para un fenómeno complejo.

De manera semejante, existen otros conceptos que la Contabilidad ha tomado desde la Economía, como el de *Fair Value* o Valor razonable (en español), concepto que surge en las normas presentadas por el *Financial Accounting Standards Boards* (FASB) y el *Internacional Accounting Standards Boards* (IASB). Parafraseando a Gómez, De la Hoz y López (2011), este concepto parte de la necesidad que tiene la sociedad de medir las transacciones que las empresas realizan diariamente a fin de conocer la realidad económica, ante lo cual afirman que

Durante mucho tiempo se utilizó como método de medición el valor histórico; sin embargo, la necesidad de información financiera sobre el valor real del negocio, ha originado la incorporación de otros métodos, como son: costo corriente, valor realizable, valor presente, valor razonable, entre otros; para medir los elementos (activo, pasivo, patrimonio neto, ingresos y egresos) de los estados financieros. Una de las críticas a la información financiera es que no refleja la situación financiera real de la organización, originando a través del tiempo la incorporación de nuevos métodos de medición, siendo el más reciente el valor razonable que se aplica a algunas partidas de los elementos

de los estados financiero, dando respuesta a la necesidad de los usuarios de recibir información real y oportuna sobre las actividades económicas y sociales realizadas por la organización. (p.609).

De lo expuesto por los autores, se devela que, en primera instancia la Contabilidad tomó como su base teórica la teoría del valor (Smith, 1776), es decir que parte de la ciencia económica para clarificarla y dar respuesta al problema de la falta de información *fiable* que permita a la sociedad tener un escenario claro de lo que ocurre en un mercado o lo la real situación económica de una empresa o negocio. En definitiva, la desconfianza en la información económica siempre ha sido una constante dentro de la sociedad, como lo exponen Casal, Peña, Vilorio y Maldonado-Veloza (2011), al decir que

La asimetría de la información existirá generalmente por omisión de ciertas características de los bienes que afectarán la calidad de la información. Akerlof llama la atención a la omisión de información importante sobre la calidad de los bienes producto de la intencionalidad y, entonces, presenta la deshonestidad como un costo de las transacciones. La deshonestidad representa un costo elevado en las transacciones debido a que los tratos deshonestos pueden desplazar a los honestos e irremediablemente terminar con el mercado. Se puede decir que el costo de la deshonestidad tiene dos componentes: el costo del engaño y el costo de terminar con el mercado. (p.115)

La preocupación de los autores, se refiere a la falta de información completa del mercado, es decir aquel acto en donde la información sobre la calidad de los bienes intencionalmente se esconde, lo cual al ser una deshonestidad ocasiona un alto costo que puede llevar a la extinción de un mercado particular. En opinión de la autora, lo dicho por Casal et al. (2011), significa la pérdida de confianza que se puede dar desde lo referente a una persona (alguien a quien se considera un amigo o amiga) como a un sistema económico y financiero particular; ambas situaciones son de difícil recuperación, puesto que constituyen un desafío y el pago de un costo que, en base a esta analogía, va desde lo social hasta lo netamente económico.

Recobrar la confianza, una vez perdida, implica un acto de esperanza, de creer en esa cosa o persona que nos ha fallado, es decir, querer hacer confiable todo aquello que provenga de esa fuente. En la Contabilidad como en la Economía, la confiabilidad es un asunto primordial, por tanto la veracidad es un principio que va más allá de lo netamente moral y ético, pues subyace a esto, porque su aplicación dependerá del pensamiento crítico y de la ideología que se posea.

Volviendo al tema que nos ocupa y continuando con esta reflexión crítica interpretativa, en

segunda instancia sería conveniente preguntarse ¿cómo la Contabilidad a partir de la Economía puede entregar información veraz y confiable para todos sus usuarios? Esta interrogación, es probablemente, la base del concepto del valor razonable, este objeto de estudio que en la actualidad ha generado una serie de debates y discusiones científicas precisamente sobre la base de su concepción. Por ejemplo, Belda (2008), refiriéndose a la crisis financiera de Estados Unidos afirmó que “Es, a principios de este siglo, cuando nos volvemos a encontrar con situaciones de sobrevaloración de activos financieros cuyo ajuste tiene una consecuencia, en mayor o menor grado, sobre la economía real” (p. 19). Sobre esto, Belda (2008) devela cómo las hipotecas *subprime* del año 2008, generaron una crisis financiera que se inició en el año 2007 y que confluyó finalmente en una desconfianza de la fiabilidad del valor razonable en el cálculo del valor de los activos, situación dada por los fallidos del mercado hipotecario en Estados Unidos.

Por su parte, la firma de contadores Ernst & Young (2005), en su publicación sobre *How fair is fair value?* o ¿Cuán razonable es el valor razonable? (en español), se refieren a las Normas Internacionales de Información Financiera NIIF (IFRS sus siglas en inglés) realizando una reflexión crítica sobre la aplicación del valor razonable en las empresas y compañías, en donde afirman que

El uso de la medición del valor razonable en la información financiera está equilibrado entre, por un lado, la provisión de información confiable y comprensible y, por otro, la provisión de información potencialmente engañosa y confusa para el inversor. (p.9).

En otras palabras, el uso del valor razonable en los informes financieros ayuda a equilibrar la información confiable y comprensible contra aquella información que es engañosa y confusa, considerando que, en experiencia de Ernst & Young (2005), para muchas compañías las ganancias y la equidad reportada bajo las NIIF serán diferentes y más volátiles que aquellas reportadas bajo las normas contables nacionales; es por ello que el IASB considera que el valor razonable es simplemente la base de medición más relevante, lo que significa que los reportes financieros bajo NIIF involucran un proceso no solamente de reconocimiento de activo/pasivo sino también de medición inicial (a valor razonable), remediación (igualmente a valor razonable), y finalmente de des reconocimiento. (Ernst & Young, 2005)

Parafraseando a Macve (2014), quien en su publicación sobre valor razonable y conservadurismo en *The British Accounting Review* realizó un énfasis en los aspectos de la historia de la contabilidad, la auditoría, los negocios y las finanzas desde la antigua Mesopotamia hasta la China moderna, para poder entender la teoría contable financiera moderna se debe

considerar algunas versiones recientes de la historia (contable), mismas que se centran en la manera en que los principios contables ‘conservadores’ (considerados aquellos que se basan en el costo histórico) han ido modernizándose de tal manera que, en la actualidad, se han constituido en un apoyo para la evaluación de las empresas.

Macve (2014), reflexiona sobre que las firmas y los gerentes, las perspectivas y los riesgos, son fuentes de información que tanto los inversionistas como otras partes en los mercados de capital necesitan conocer para superar la asimetría de información que existe entre ellos y los gerentes corporativos, las cuales se generan en casos como los cálculos de subvenciones y beneficios. Este estudio, a nuestra opinión, afianza la reflexión sobre que el principio de veracidad de la información continua radicado en la confianza que se tenga en la misma, y esta confianza es un hilo muy delgado, en uno de los extremos está la Contabilidad y en el otro la Economía; esto no quiere decir que las consideraciones conceptuales previas sean irrelevantes, simplemente significa que se apoya lo afirmado por Macve (2014) sobre que, por ejemplo, el reconocimiento de la asimetría del costo de las subvenciones vs los beneficios anticipados futuros han agregado aún otro factor que indetermina la consistencia de los activos/pasivos, mientras aumentan las posibilidades de pretender mantener -a la vista de los usuarios de la información contable- una ‘good accounting’, es decir una eficiente gestión de resultados.

Así también, en la búsqueda de otras formas de interdisciplina entre la Contabilidad con otras ciencias, podemos citar a Konchitchki, Luo, Ma y Wu (2015), quienes realizaron una investigación que involucra la Contabilidad y la Macroeconomía, la cual parte de la teoría de riesgos, intitulada *Accounting-based downside risk, cost of capital, and the macroeconomy* o Riesgo de liquidez basado en la contabilidad, costo del capital y macroeconomía (en español). En esta investigación, los autores exploran las implicaciones que conlleva el riesgo a la baja de las ganancias para luego poder evaluar el riesgo de las empresas y así valorarlas adecuadamente mediante su relación con el costo del capital.

La modelación del Riesgo de Disminución de Ganancias (EDR) realizado por Konchitchki et al. (2015), se define en relación con las ganancias esperadas como el nivel de referencia y permite predecir que las empresas que tienen un alto riesgo de obtener ganancias tendientes a la baja, experimentan un desempeño operativo altamente negativo durante el periodo subsiguiente, por tanto, tienen una mayor sensibilidad ante los estados macroeconómicos que tienden a la baja, esto provoca que se vinculen con mayor fuerza a las ganancias atribuidas y otras relaciones de riesgo medidas en esta investigación.

Resulta importante para los fines de interdisciplina de la Contabilidad con la Macroeconomía, revisar que a partir de la teoría del riesgo financiero, Konchitchki et al. (2015) encontraron que el costo de las implicaciones de capital para el EDR es principalmente atribuible al riesgo de reducción de la acumulación; en nuestra opinión, esto señala el rol importante que juega la Contabilidad de precisar y detener el riesgo elemental de las empresas, permitiendo demostrar los roles clave que juega la disciplina contable no solo de valuación sino también de evaluación de riesgo empresarial, demostrando que es posible medir el riesgo a la disminución de las ganancias procedente de los informes financieros presentados por las empresas, esto da una nueva luz sobre el vínculo entre la contabilidad y la macroeconomía.

Llegados a este punto, se puede apreciar entonces que la Contabilidad no está exenta de la práctica interdisciplinar; podríamos decir que existen objetos de estudio como el valor razonable, que evidencia como la disciplina contable se ha valido de la Economía para generar nuevos segmentos de su propia estructura, basándose en teorías económicas como la teoría del valor-trabajo, siendo el punto de partida para la teoría de los costos históricos. Resulta importante entonces, diferenciarlos de los costes económicos, dado que estos al considerar el coste de oportunidad han permitido a la Contabilidad establecer teorías basadas en ecuaciones matemáticas como la de los costos totales, que resultan de la diferencia entre costos variables y costos fijos, lo que fomenta la base del costo histórico.

En torno a lo dicho, lo revelado en este documento, comprueba que la Contabilidad y la Economía poseen posibilidades de cohesión, las mismas que en nuestra opinión, pueden ser abordadas con la ayuda de la aplicación del pensamiento complejo de Morín (1994), pudiendo devenir en la creación de un amplio escenario de interdisciplina entre ambas ciencias y hacia la transdisciplina; sin embargo, esto no puede investigarse desde las posturas positivistas tradicionales, siendo preciso pasar de estos enfoques hacia aquellos que permitan dar cuentas de los problemas contables que la sociedad atraviesa y que, basándose en el estudio del comportamiento social, lleva a la Contabilidad a establecerse en las Ciencias Sociales.

Por tanto, es preciso privilegiar la construcción del conocimiento contable que lo lleve a una evolución mediante la transición de lo netamente cuantitativo al estudio de las relaciones intersubjetivas, el llevar a efecto esta acción, dará al investigador una mayor comprensión de la realidad social en la que se desarrolla la Contabilidad, permitiéndole no solamente descubrir la misma sino re-descubrirla mediante la

aplicación de la concepción gadameriana de la hermenéutica, es decir con un método interpretativo.

IV. CONCLUSIONES PRELIMINARES

La Contabilidad, emerge de la necesidad de revelar la realidad económica de los mercados de una forma fiable, partiendo de un principio de confianza en la información financiera que es presentada por los agentes económicos. Cuando se provocan asimetrías de información, esta confianza se pierde puesto que la realidad económica con lo reflejado en los estados financieros no coincide y provoca una incertidumbre que genera costos, pudiendo ser de tipo social como económicos.

En base a esto, se encuentra que la Contabilidad ha ido afianzándose en teorías de otras disciplinas como la Economía, para poder dar cuentas a la sociedad de la información que a ésta le interesa. Se precisa en este estudio tres casos específicos de lo manifestado, el primero en la "teoría de la firma", el segundo ejemplo, se encuentra en la concepción del *Fair Value* o valor razonable, y un tercer caso, en la modelación del Riesgo de Disminución de Ganancias (EDR).

La intención de esta investigación no es agotar el tema, sino permitir a los investigadores contables que reflexionen sobre las posibilidades infinitas que entregan las teorías de otras ciencias para estudiar problemas de la Contabilidad. En este documento de reflexión se han podido encontrar los puntos concordantes en donde se ha establecido procesos de interdisciplina, sin embargo, no es menos cierto que lo dicho por Morín (1994) sobre que aquellas ciencias que se creen dueñas únicas de sus conocimientos están condenadas a la extinción, podría llevarse a efecto si no se busca compartir las experiencias, los resultados buenos y malos, las aplicaciones en el campo profesional de los conocimientos contables y económicos que permitan un progreso científico dentro del campo de las Ciencias Sociales.

Finalmente, este documento concluye que es posible llevar a la Contabilidad a ubicarla en otro contexto científico, lo cual puede realizarse mediante el uso de un pensamiento complejo que al rebasar lo netamente cuantitativo y afianzado en la hermenéutica gadameriana, permita llevarla a una construcción del pensamiento contable no solo interdisciplinario sino transdisciplinario que sirva de base a los entes emisores de normas contables sobre la aparición de nuevos problemas o conflictos de ideologías que deban ser considerados para la elaboración, corrección o aclaración de las normas contables existentes.

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Student's Intention to Conduct Research Studies: The Case Study of Final Year Undergraduates in the Department of Finance, University of Sri Jayewardenepura, Sri Lanka

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Abstract- This research attempts to answer the question "Do undergraduates have an intention to do research?" The study took place at the Department of Finance, Faculty of Management Studies and Commerce, University of Sri Jayewardenepura, Sri Lanka, and the respondents are the final year undergraduate of the department. Following theoretical findings of Sachithra (2015), and Pacifica and Thomson (2011), the study looked at the attitudes of students in doing research within the degree program and the gender differences in the preference for doing research. The quantitative approach is the methodology adopted and used a questionnaire as the data collection tool, and it consists of both open and close-ended questions. Percentage analysis and coding are the main analytical tools used for analyzing data, and supplemented by graphs, charts, and tables. Findings reveal that students' attitudes have a significant impact on their intention to do research. Further, gender difference too affects whether students intend to do research. In conclusion, it can be stated that the male students have a higher preference to do research than female students and the intention to do research varies with the degree program the students follow along with their preferred job in the future.

Keywords: *intention to do research, student attitudes, gender difference, undergraduates in finance.*

GJMBR-B Classification: *JEL Code: F63*



Strictly as per the compliance and regulations of:



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Abstract- This research attempts to answer the question “Do undergraduates have an intention to do research?” The study took place at the Department of Finance, Faculty of Management Studies and Commerce, University of Sri Jayewardenepura, Sri Lanka, and the respondents are the final year undergraduate of the department. Following theoretical findings of Sachithra (2015), and Pacifica and Thomson (2011), the study looked at the attitudes of students in doing research within the degree program and the gender differences in the preference for doing research. The quantitative approach is the methodology adopted and used a questionnaire as the data collection tool, and it consists of both open and close-ended questions. Percentage analysis and coding are the main analytical tools used for analyzing data, and supplemented by graphs, charts, and tables. Findings reveal that students' attitudes have a significant impact on their intention to do research. Further, gender difference too affects whether students intend to do research. In conclusion, it can be stated that the male students have a higher preference to do research than female students and the intention to do research varies with the degree program the students follow along with their preferred job in the future.

Keywords: *intention to do research, student attitudes, gender difference, undergraduates in finance.*

I. INTRODUCTION

The study intends to uncover the preference of final year undergraduates' to conducting a research. The specific student group which the study focuses on is the final year undergraduates who are pursuing a special degree in Finance at the Faculty of Management Studies and Commerce, University of Sri Jayewardenepura, Sri Lanka. Finance undergraduates could choose between conducting a research study or engage in an internship as part of their degree program. Thus, it is timely and relevant to know their intention to doing research in the context that it is not a compulsory subject. Within literature, Sachithra (2015) found that undergraduates' beliefs, attitudes, self-efficacy, and motivation about research could influence their interest in doing research and 'there is no difference between male and female undergraduates regarding beliefs about research relevance and its complication. Methodologically the study takes a quantitative approach, and the data collection tool is a questionnaire

consisted of both open and close-ended questions. Questions were analyzed using percentage analysis. Data are presented with the use of tables, graphs and charts. Coding was used to analyze the open – ended questions.

II. LITERATURE REVIEW

The literature on the intention of undergraduates to do research can be categorized under attitudes and gender of the students. Accordingly following is a review of literature relating to the above categories.

a) Student's Attitudes

A study done by Pacifica and Thomson (2011), examined possible differences between premed and non-premed students in their influences to do research and expectations of research. Questionnaire responses from 55 premed students and 80 non-premed students were analyzed. No differences existed in the hope of doing research between the two groups, but attitudes toward science and intrinsic motivation to learn more about science were significantly higher for non-premed students. Premed students, most of who are pursuing medicine are not motivated to learn more about science, but motivated to help people. They viewed research as a way to help them become doctors and to rule out the possibility of research as a career. Non-premed students participated in research studies to learn more about a specific science topic and gain experience that may be helpful in graduate school research.

Another study was done by Sachithra (2015) in order to understanding the research interest of undergraduates of a B.Com degree programme and to identify the factors that encompass undergraduates' research interest. Acknowledging the prior studies, the study has found that undergraduates' beliefs, attitudes, self-efficacy, and motivation about research could influence their interest in doing research.

b) Gender Differences

According to Sachithra (2015), there is no difference between male and female undergraduates regarding beliefs about research relevance and its complication. However, male undergraduates

demonstrate comparatively positive attitudes towards research. Self-efficacy of conducting research is higher in female undergraduates though they compose a negative attitude towards research.

Review of literature reveals that studies regarding the intention of undergraduates to do research are not many in number and especially regarding the students specializing in the field of Finance. Accordingly, a gap exists in literature and, this research intends to address this gap and shed light to a grey area.

III. THE OBJECTIVE OF THE STUDY

This study aims at answering the question "Do undergraduates have an intention to do research?" with a special reference to the final year undergraduates pursuing a special degree in Finance.

IV. METHODOLOGY

Methodologically this study takes a quantitative approach and uses a questionnaire consisting of both open and close-ended questions. Quantitative research methods enable the researcher to use a larger sample and to collect data in a relatively shorter period (Rahman, 2017). Within quantitative method, questionnaire is a popular tool for collecting data. It is a well-established data collection instrument in social science research for collecting data on participants' social characteristics, present and past behavior or attitudes and beliefs and reasons for actions concerning the topic under investigation (Bulmer, cited in Bird, 2009).

V. DATA, ANALYSIS AND DISCUSSION

The study used only primary data collected through the questionnaires. The research population is the final year students following the BSc Finance (special) Degree program. A questionnaire was developed with 16 questions in order to assess the undergraduates' preference for conducting research. A questionnaire was administered via the Learning Management System (LMS) to the total population of 150 students. Questions included were as follows: personal information, intention to do further studies after graduation, type of employment preferred after graduation, whether completed any professional courses, intention to do a research study in the

upcoming semester and reasons and opinion on making the research study compulsory for final year students.

Close-ended questions are analyzed using percentage analysis, and coding is used to analyze the open-ended questions. Data are presented using tables, graphs and charts. Data were analyzed based on following subtopics: personal information, intention to do further studies after graduation, type of employment preferred after graduation, whether completed any professional courses, intention to do a research study next semester and reasons and opinion on making the research study compulsory for final year students. The response rate of the survey lies at 42%. The following section comprises the analysis and discussion.

a) Personal Information

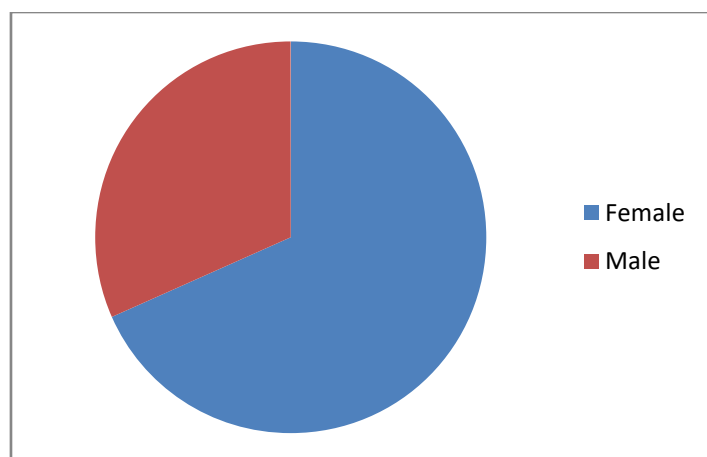
Gender composition of the Respondents

Although the sample consists of both male and female undergraduates within the degree program majority of the students are females. This gender imbalance is reflected in the analysis of the gender composition given below in Table 1 and Figure 1.

Table 1: Gender composition of the Respondents

Female	Male
41	19

Source: Survey Data



Source: Survey Data

Figure 1: Gender composition of the Respondents

Classification of respondents based on their native place

The analysis given in Table 2 below is about the native background of the respondents and, it is revealed

that 58% of the respondents come from an urban background while 42% belongs to the rural areas.

Table 2: Native place of respondents

Female		Male		Total	
Urban	Rural	Urban	Rural	Urban	Rural
26(72%)	15(60%)	09(28%)	10(40%)	58%	42%

Source: Survey Data

b) *Intention to do Further Studies*

Whether the respondents intend to do further studies is analyzed and presented below in Table 3.

Percentage analysis reveals that male students intention to do further studies is higher than their female counterparts.

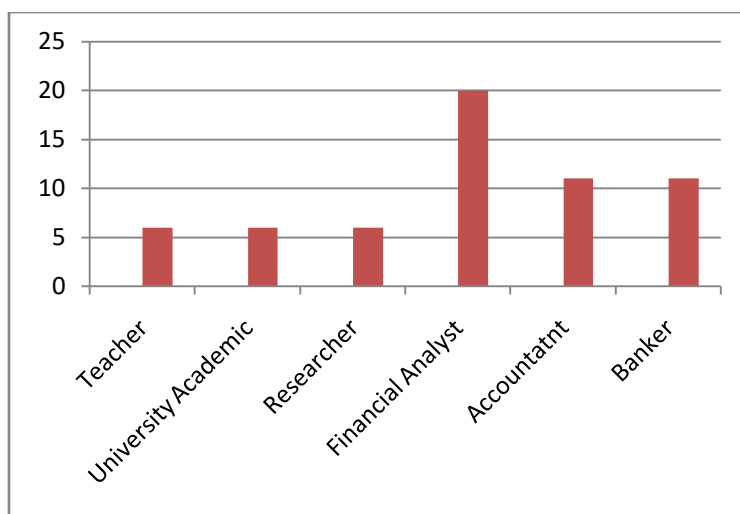
Table 3: Intention to do Further Studies

Female		Male	
Yes	No	Yes	No
25 (60%)	16 (40%)	16 (84%)	03(16%)

Source: Survey Data

c) *Type of employment preferred after graduation*

According to the analysis given in Figure 2 below, Financial Analyst is the most preferred employment after graduation, and it follows Accountant and Banker. Researcher and Teaching at School or University are the least preferred employments.



Source: Survey Data

Figure 2: Type of employment preferred after graduation

d) *Completed/Following a professional course*

More female students than male students completed/follow professional study programs with percentages of 88 and 74 respectively.

Table 4: Completed/Following a professional course

Female		Male	
Yes	No	Yes	No
36(88%)	05(12%)	14(74%)	05(26%)

Source: Survey Data

e) *Intention to do a research study as part of the degree program*

Only nine respondents, four females and five males respectively prefer to do a research study as part

of their degree program. This analysis is given in Table 5 below followed by the reasons given by respondents for their preference to do research.

Table 5: Intention to do a research study as part of the degree program

Female	Male
4	5

Source: Survey Data

Reasons given by the nine respondents who expressed their willingness to do a research study as part of the degree program are: a research study is important in pursuing further studies, gather a broader knowledge on a specific preferred subject area and ability to relate theory to practice.

In contrast, more than 75% of the respondents who are not intending to do researches bring about the fact that going for internship training is more valuable than doing a research. Other reasons for not intending to do a research are: not interested in doing research, no sufficient time to engage in a research study and conducting a research study is a stressful task.

f) *Opinion on making the research study compulsory for the degree program*

Only a few respondents have expressed their opinion and, the analysis is given below in Table 6. Accordingly, four female students and three male students are of the view that the research study should be a compulsory component of the degree program. Only one female student and one male student have pointed out that it has to be an optional subject. In contrast, 25 respondents namely 17 females and eight males, are in the view that the research study should not be made compulsory for the degree program.

Table 6: Opinion on making the research study compulsory for the degree program

Female			Male		
Yes		No	Yes		No
Compulsory	Optional		Compulsory	Optional	
04	01	17	03	01	08

Source: Survey Data

VI. CONCLUSION

Contrasting the findings of Pacifica and Thomson(2011), regarding the intention to do research among medical students due to their interest to serve people, this study reveals that students in Finance prefer internship training to research because internship training becomes an added qualification when applying for jobs. This can be further verified with the use of preference of respondents on the job they are willing to do in the future. Accordingly, the most preferred job of the respondents is the post of Financial Analyst followed by preferences for being an Accountant or a Banker with the least preference for jobs such as Teacher, Researcher, or University Academic. Adding to the same majority of the respondents are of the view that a research study should not be made compulsory for a degree program in Finance. Agreeing with Sachithra (2016), this study reveals that male students' preference for doing research is slightly higher than female students' liking for the same. This finding can be strengthened by the fact that more male students prefer further studies than the female students. Accordingly, intention to do research varies with the degree program the students follow and their preferred job in the future is a valid conclusion. Further, considering the gender implication on doing/ not doing research studies it can be stated that the male students prefer researching than female students.

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Effect of Macroeconomic Indicators on Agricultural Output in Nigeria

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Abstract- This study investigated the effect of macroeconomics indicators' dynamics on agricultural output in Nigeria. The study modeled exchange rate, interest rate, money supply and inflation volatility, against agricultural output using quarterly time series data for the period 1981:1 to 2018:4 (from various publications of the Central Bank of Nigeria Statistical Bulletin and National Bureau of Statistics). The data were analysed using descriptive and econometrics techniques. The volatility series of inflation was generated by employing the standard deviation while the level of volatility was established by employing the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) technique. The regression model was estimated with the fully modified ordinary least square (FMOLS) estimation method to capture the effect of the macroeconomic indicators on agricultural output. The trend analysis showed that both inflation rate and agricultural output were unstable for the period under study. The results show that inflation rate in Nigeria is volatile over the period of study and inflation volatility has a negative but significant impact on agricultural growth. Exchange rate and cost of fund also possess varying impacts on agricultural output and therefore, the study recommends that moderate expansionary monetary policy measures that is guided by stable exchange rate environment is appropriate to curtail the dynamics of inflation rate and its derogatory impact on agricultural output in Nigeria.

Keywords: exchange rate, interest rate, money supply, inflation volatility, agricultural output, Nigeria

GJMBR-B Classification: FOR Code: B22



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Effect of Macroeconomic Indicators on Agricultural Output in Nigeria

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Abstract- This study investigated the effect of macroeconomics indicators' dynamics on agricultural output in Nigeria. The study modeled exchange rate, interest rate, money supply and inflation volatility, against agricultural output using quarterly time series data for the period 1981:1 to 2018:4 (from various publications of the Central Bank of Nigeria Statistical Bulletin and National Bureau of Statistics). The data were analysed using descriptive and econometrics techniques. The volatility series of inflation was generated by employing the standard deviation while the level of volatility was established by employing the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) technique. The regression model was estimated with the fully modified ordinary least square (FMOLS) estimation method to capture the effect of the macroeconomic indicators on agricultural output. The trend analysis showed that both inflation rate and agricultural output were unstable for the period under study. The results show that inflation rate in Nigeria is volatile over the period of study and inflation volatility has a negative but significant impact on agricultural growth. Exchange rate and cost of fund also possess varying impacts on agricultural output and therefore, the study recommends that moderate expansionary monetary policy measures that is guided by stable exchange rate environment is appropriate to curtail the dynamics of inflation rate and its derogatory impact on agricultural output in Nigeria.

Keywords: exchange rate, interest rate, money supply, inflation volatility, agricultural output, Nigeria.

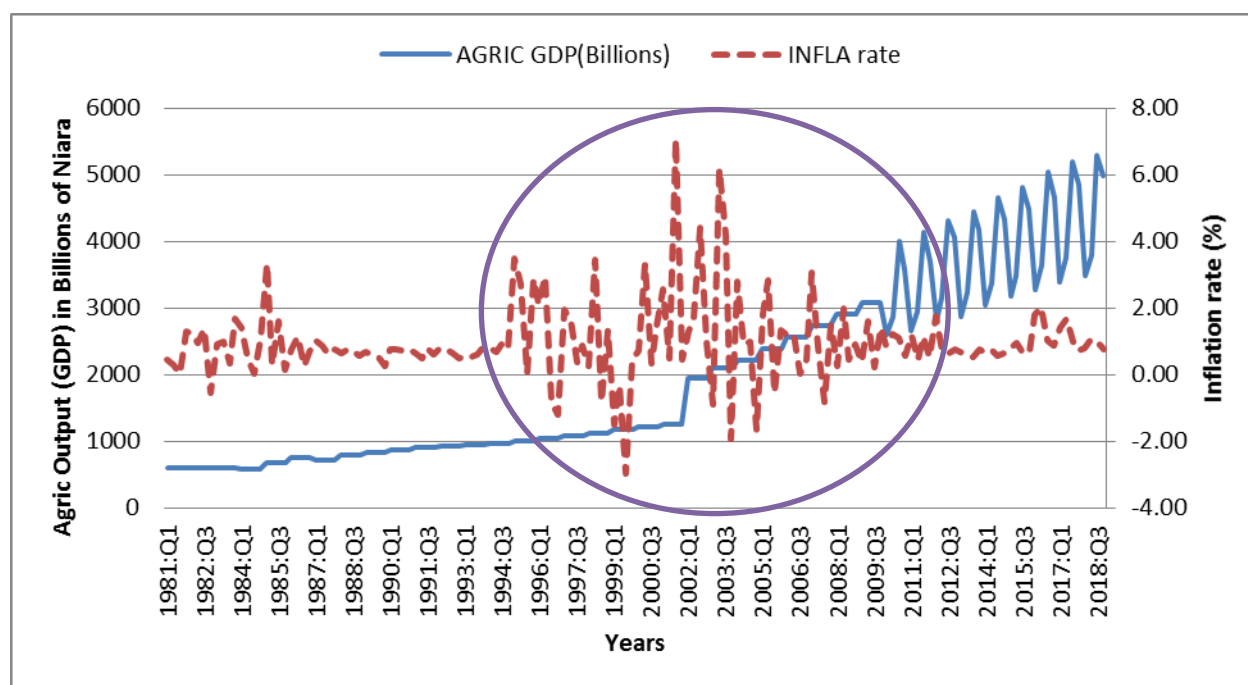
1. INTRODUCTION

The issue of inflation volatility is a recurrence decimal in the challenges confronting developing countries (Danmola, 2013), creating serious concern among stakeholders (the government, monetary authority, various sectors of the economy and the people) in the economy. This is due to its adverse effects on the economy, which have been widely documented in countries of diverse economic structures and monetary policy frameworks (Omotosho and Doguwa, 2011). These include higher risk premium, hedging costs, and unforeseen redistribution of wealth, economic instability and reduction in overall economic growth. Countries with high inflation have significantly higher levels of volatility, which invariably impacts on sectoral or aggregate growth negatively.

Figure 1 below shows the trend of both inflation rate and agricultural output from 1981:1 to 2018:4. There is consistency in the direction of both variables, showing

fluctuations all through the period of consideration, especially the inflation rate. The persistent fluctuation of the inflation rate calls for concern as per what its effect (coupled with other macroeconomic indicators) will be on a real sector like agriculture. The importance and place of agriculture in Nigeria economy growth and development make it a worthwhile effort to examine the effects of macroeconomic indicators dynamic on agricultural output. Over the time as inflation rate increased, agricultural output also increased, although agricultural output fluctuated during the upward movement over the period.

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Source: Author's Computation, (2019)

Figure 1: Trend of Inflation Rate and Agricultural Output in Nigeria from 1981:1 to 2018:4

The investigation into inflation volatility and its impact has involved a number of methods in which Generalised Autoregressive Conditional Heteroscedasticity (GARCH) is one. For example, country's headline Consumer Price Index (CPI) series conditional variance was estimated with its attendance impacts on other macro-economic variables (Idowu and Hassan, 2010; Udoh and Egwaikhide, 2008; and Adamgbe, 2004). Rother (2004) considered discretionary fiscal policies and inflation volatility and suggests that discretionary fiscal policies has contributed to inflation volatility in a range of Organisation for Economic Co-operation and Development (OECD) countries between 1967 and 2001. Fielding (2008) used monthly time-series data on the prices of 96 individual products in the 37 states of Nigeria to analyse the factors that drive inflation volatility. Average inflation rates, transport and communication infrastructure, consumer access to credit markets and urbanization were found to be significant determinants of volatility.

However, previous studies in Nigeria have failed to evaluate the impact of inflation volatility on individual sectors of the economy like agricultural sector, industrial sector, etc. Given the incessant crisis in the petroleum sector, fluctuation in the barrel price of oil, the experienced recession in the economy, the agricultural sector has found considerable attention to boost the Nigerian economy. The question then is: To what extent are volatilities of selected macroeconomic indicators impacting on agricultural growth in Nigeria? The study

estimated this impact for Nigeria by using quarterly data for the period 1981 to 2018.

II. THEORETICAL FRAMEWORK

The cost-push theory of inflation was considered to analyse the impact of inflation volatility on agricultural growth in Nigeria. According to Kalkuhl *et al* (2013), the production of agricultural commodities is dependent on external circumstances. These external circumstances cause the cost of agricultural produce to rise.

Increase in aggregate demand generally results in price rise. However, when there is increase in costs (independent of any increase in aggregate demand), prices may still rise. According to Ahuja (2012), increase in prices of raw materials (especially energy inputs such as rise in crude oil prices) as well as rise in wage rate of labour can bring about cost-push inflation. Danmola (2013) argued that inflation-created problems in Nigeria led the government to devalue the currency (naira). This in turn causes the price of imported goods to rise, leading to increase in cost of production (since Nigeria imports a lot of raw materials needed for production).

III. MODEL SPECIFICATION

a) Determination of Inflation Volatility

To determine the level of inflation volatility in Nigeria, this study generated the volatility of inflation by employing the Generalised Autoregressive Conditional Heteroscedasticity (GARCH) techniques. Engle (2001) used an autoregressive time series approach to account

for persistence in volatility estimation. He assumes that the volatilities are conditional on each other over time. Engle's model, which is sometimes referred to as the Normal ARCH model, is defined as:

$$\sigma_t^2 = \alpha_0 + \alpha_1 r_{t-1}^2 \quad (1)$$

where both the intercept (α_0) and the parameter coefficient (α_i) are non-negative so that the volatility

estimation is positive. The returns are also assumed to be normally distributed with a mean of zero and variance of σ_t^2 , conditional on all information up to the current time.

Today's volatility may not depend only on yesterday's returns hence many lags of returns can be included in the model. This is called the ARCH (q) model:

$$\sigma_t^2 = \alpha_0 + \alpha_1 r_{t-1}^2 + \dots + \alpha_q r_{t-q}^2 = \alpha_0 + \sum_{i=1}^q \alpha_i r_{t-i}^2 \quad (2)$$

The avoidance of the large values of q in Engle's ARCH model by Bollerslev (1986) resulted in the generalized autoregressive conditional heteroscedasticity (GARCH) model. The GARCH model allows for a longer memory process with more flexibility. The GARCH model assumes normality, and includes previous estimates of volatility in the calculation:

$$\sigma_t^2 = \alpha_0 + \alpha_1 r_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \quad (3)$$

the GARCH model can be extended to the GARCH (q, p) model (like in the case of ARCH model extended to the ARCH (q) model). This follows that:

$$\sigma_t^2 = \sum_{i=1}^q \alpha_i r_{t-i}^2 + \sum_{i=1}^p \beta_i \sigma_{t-i}^2, \quad (4)$$

where the intercept and the coefficients must be non-negative to ensure that the volatility estimate is positive.

The GARCH model above is typically called the GARCH (1, 1) model. The (1,1) in parentheses is a standard notation in which the first number refers to how many autoregressive lags, or ARCH terms, appear in the equation, while the second number refers to how much moving average lags are specified, which here is often called the number of GARCH terms. (1,1) simply implies to the first order autoregression.

Rule of Thumb

If $\alpha + \beta < 0.5$, there is no volatility,

$\alpha + \beta \rightarrow 1$, there is volatility, and

$\alpha + \beta > 1$, there is overshooting (i.e. excessively volatile)

Where α and β represent ARCH and GARCH respectively.

$$AGR_t = f(IFV_t, MS_t, EXR_t, INR_t) \quad (6)$$

The above model is expressed explicitly in log-linear form as:

$$\ln AGR_t = \alpha_0 + \sum_{i=0}^n \alpha_1 IFV_t + \sum_{i=0}^n \alpha_2 \ln MS_t + \sum_{i=0}^n \alpha_3 EXR_t + \sum_{i=0}^n \alpha_4 INR_t + \mu_t \quad (7)$$

Where;

$\ln AGR_t$ represents natural logarithm of agricultural output

IFV_t represents inflation volatility

$\ln MS_t$ represents natural logarithm of money supply

b) Macroeconomic Indicators and Agriculture Output

Having established the volatile nature of selected macroeconomic indicators considered by the study. The paper employed the fully modified ordinary least square (FMOLS) estimation method to empirically analyse the effect of the dynamics of these macroeconomic indicators on agricultural output. The responsiveness of agricultural output to macroeconomic volatility was established.

The model follows:

$$AGR_t = f(IFV_t) \quad (5)$$

Where;

AGR_t represents agricultural output

IFV_t represents inflation volatility

The paper concentrated on inflation rate and exchange rate volatility due to two main reasons: first, the general price movement gives the value for most agricultural output and also regulates the demand for and supply of agricultural produces in the market. Second, the currency rate determines the inclusion of foreign investment and further regulates the foreign market or trade of agricultural products. Therefore, the paper extended equation (5) to include a representative of cost of fund i.e. the interest rate, which is seen to determine the access to funding and borrowing by the agricultural sector agents (farmers and agripreneurs), respectively. Hence, equation (6).

EXR_t represents exchange rate

INR_t represents interest rate

Σ represents summation

n represents the quarter 2018:4

i represents the quarters 1981:1, 1981:2, 1981:3, ... n

μ_t represents the error term

The a priori expectation of all the variables (inflation volatility inclusive) are expected to have missed impact on agricultural output. Thus, the parameters of estimation are expected to be:

$$\alpha_0 > 0, \alpha_1 < 0, \alpha_2 > 0, \alpha_3 < 0 \text{ and } \alpha_4 < 0.$$

IV. DATA DESCRIPTION

The study make used of quarterly time-series data from various published Central Bank of Nigeria (CBN) statistical bulletin from 1981 to 2018 to analyze the impact of inflation volatility on agricultural growth in Nigeria. The model specification consists of agricultural output (AGR) measured in billion naira, inflation rate (IFR) which is in percentage change, exchange rate (EXR) is the value of naira to one US dollar, interest rate

(INR) is in percentage. Agricultural output is made-up of crop production, livestock, forestry and fishing. Thus, agricultural output is measured by the production made in these four sections. Inflation volatility (IFV) is measured by the fluctuations or instability in the rate of inflation using the GARCH technique. The residual of the GARCH estimates is extracted and the series was used as a measure of the inflation volatility.

Exchange rate is the price of the Nigerian naira for another country's currency. Interest rate is simply a rate paid for the use of money. A decrease in interest rate will lead to an increase in inflation (i.e. demand-pull inflation) as the demand for money will rise. Table 1 shows the summary of the data for all variables in the model. This shows the spread of the data employed in the study.

Table 1: Descriptive Statistics

Statistics	Agric. GDP (AGR)	Exchange Rate (EXR)	Interest Rate (INR)	Inflation Rate (IFR)
Mean	1923.38	109.09	17.84	0.97
Median	1193.08	106.07	17.58	0.76
Std. Deviation	1318.08	102.64	5.03	1.22
Variance	1.737×10^6	10530	25.33	1.48
Skewness	0.843	1.26	0.48	1.43
Kurtosis	-0.461	1.73	1.75	6.67
Range	4712.50	454.69	29	10.06
Minimum	575.88	0.57	9	-2.98
Maximum	5288.30	455.26	38	7.08
Number of observations	152	152	152	152

Source: Authors' Computation (2019)

V. MODEL ESTIMATION

The empirical estimations and interpretation were reported in this section. This is divided into two main thrust: first, the paper establish the level of volatility present in the selected macroeconomic indicators and second, determine the effect of these macroeconomic indicators (exchange rate, inflation rate, and interest rate) on agricultural outputs in Nigeria.

a) The Volatility Level in selected Macroeconomic Indicators

The paper examined the volatile attributes of selected macroeconomic indicators selected (i.e. inflation and exchange rate). The results were depicted in Table 2. It shows that using the GARCH methodology,

inflation rate and exchange rate are significantly volatile. The GARCH coefficients shows that the inflation volatility is not explosive however, the pressure of reaching an explosive area is observed from the growth of general prices. The exchange rate was also volatile and it indicates the high risk associated to exchange rate driving investments.

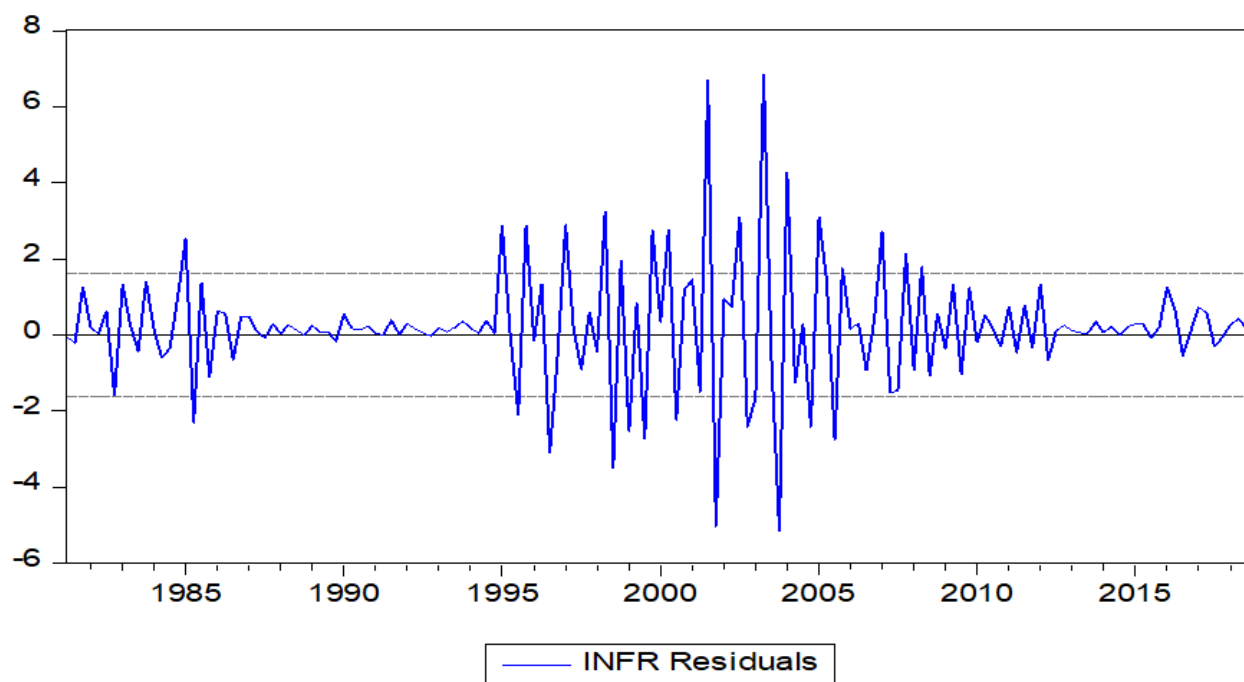
Table 2: Test for the existence of Volatility

	Inflation Rate		Exchange Rate	
	Coefficient	Prob.	Coefficient	Prob.
Mean Equation:				
Lagged Value of Inflation	0.7712	0		
Lagged Value of Exchange rate			0.6783	0
Variance Equation				
ARCH (1)	0.3016	0.0127	0.1809	0.0005
GARCH (1)	0.6945	0	0.3845	0.0023
Constant	0.0722	0.0005	0.0402	0

Source: Computed by Authors (2019). The GARCH (1, 1) model is estimated to ascertain the form of volatility that existed in the selected macroeconomic indicators. The $(a+b) > 1$ represents that the volatility is explosive (Engle, 2001), while $(a+b) < 1$ stands for volatility persistence in the selected macroeconomic indicators in Nigeria. The normal distribution of the macroeconomic indicator trend is estimated by the BFGS with Marquardt steps and after 21 iterations the convergence of the persistence in volatility was achieved. There are 151 observation after estimation adjustments.

Based on the summation of the coefficients of ARCH and GARCH estimators, it is evident that inflation and exchange rates in Nigeria for the period 1981:1 to 2018:4 are volatile and the convergence might not be recommended soon (i.e. $\alpha + \beta$ tends towards 1: $0.3016 + 0.6945 = 0.9961$). Figure 2 established the volatile nature of the residuals of inflation rate. This implies that inflation rate volatility began rising momentum in 1995

when the old price regulation was abolished due to change in government. Between 2000 and 2005 the volatile nature of inflation rate increased tremendously with rising pressure until 2008. This is evident on the trend significantly falling outside the empirical threshold given by default.



Source: Authors' Computation (2019)

Figure 2: Inflation Rate Residuals

b) *Determining the Effects of Macroeconomic Indicators Dynamics on Agricultural Output*

Table 3 consists of models I– IV were estimates of the effect of the dynamics of macroeconomic indicators on agricultural output. Inflation rate volatility has substantial adverse effect on agricultural output in all the models estimated. This effect was majorly pronounced in model III which is the model of concern in the paper. This suggests that the frequent changes in the general price of agricultural produces discourage production in the agricultural sector. The findings corroborate the submission of Kalkuhl et al. (2013), which confirm that the effect of price volatility cannot be undermined in making decision that will propel output growth in the agricultural sector. Compared to model 1, the impact was slightly lower, which shows that with the absence of cost of fund, the effect of inflation volatility will be significantly felt in the agricultural sector. It is apparent that, the absence of the interest rate activities in the model had remove the possibility of the expansionary effect of optimal cost of fund – easy access to finance by the agents of agricultural sector.

The implication of the effect of inflation volatility on agricultural output is central on the attitude and prospective investment returns of agricultural sector investors. First, in terms of attitude, the harmful effect of inflation volatility will make the downward price trajectories of the agricultural produces unpredictable and thus, increases the magnitude of expected losses observed in investment. Second, the gradual decrease in the prospective investment returns could discourage the volume of investment channel to agricultural sector in the short and medium terms, respectively. The effect of interest rate in model III (model of reference) has adverse effect on agricultural output in Nigeria. This is evident when compared with what was experienced in other models, as the effect seems to be consistent. The response from interest rate is supported by the findings of Fielding (2008) and Idowu and Hassan (2010). These studies found that the cost of funds had adverse effect on agricultural output. In the work of Idowu and Hassan (2010), the inclusion of interest rate was justified to control for the disparity in access to fund by the agricultural sector as against other sectors of the economy. While the work of Omotosho and Dougwa (2011) found contradictory result, the reason proffered

was that the number of observation considered covered by the study was characterized by the crises.

The exchange rate has positive effect on agricultural output. The depreciation of the naira against the universal unit of measurement has significant effect on the cost of production and the tradability of agricultural produces. This effect can be explained on the ground that rising exchange rate (decline in naira value) has increasing effect on cost of production as the economy is highly import dependent. More so, it also has an indirect effect on tradability of agricultural products. This tradability effects occur has a result of exports dynamics and cyclical trade deficit of agricultural produces.

The results indicate that rising inflation rate increases agricultural output under the period considered in the study. This implies that the concurrent increases in both the general price level and the prices of agricultural produces stimulate agricultural output and therefore, necessitates the moderate increase in prices of agricultural produce to encourage investment in the Nigeria's agricultural sector. This effect was robust to changes in the specification of the model. Hence, positive effect of inflation rate on agricultural output remains dominant across the alternative specification of the models. All the results possess varying degree of explanatory prowess, and most of the specifications show that the explanatory power of variation is consistent to changes in specification and adjustment of observation, as shown by the adjusted R-squared.

Robustness Check:

The regression result shows that there is a positive relationship between agricultural output and money supply (*MS*) as well as interest rate (*INR*); as the coefficients are positively signed. The agricultural output is negatively related to inflation volatility and exchange rate. The F-statistic value of the model is statistically significant. The coefficient of determination (R^2) of the model is very high (98.6%) which indicates that about 98.6 percent of the variation in agricultural output is jointly explained by the explanatory variables specified. The value of the adjusted R^2 (0.9859) which is over 98% reaffirms the high goodness of fit and it signifies that over 98.6% variations did not merely result from the use of multiple variables in the model.

$$\ln AGR = -1.627 - (7.24 \times 10^{-06})IFV + 1.156\ln MS - 0.006EXR + 0.031INR \quad (8)$$

With respect to the signs of the independent/explanatory variables, not all the variables are rightly signed as it does not confirm with the a-priori expectations. The result indicates that a unit increase in money supply and interest rate would bring about 1.1564 and 0.03088 increase respectively in agricultural output implying a positive relationship. On the other hand, inflation volatility and exchange rate which are

negatively signed indicates that they have an inverse relationship with agricultural output. This implies that a unit increase in these variables (i.e. inflation volatility and exchange rate) will bring about -7.24 and -0.006414 units decrease in agricultural output.

The implication of the above result with respect to the variable of interest (is that inflation volatility) is that it has a negative influence on agricultural output. Initially,

in the early years agriculture contributed largely to the economy, however, due to the discovery of crude oil the investment to this sector and contribution from this sector to the economy has reduced. As the pivotal

sector for any economy in its prime, the neglect of this sector has led to a fluctuation in agricultural output and as such the sector did not experience a consistent upward movement in growth.

Table 3: Effect of Macroeconomic Indicators on Agricultural output (Dependent Variable AGDP)

Variables	Model I Coefficients	Prob.	Model II Coefficients	Prob.	Model III Coefficients	Prob.	Model IV Coefficients	Prob.
Exchange Rate	3.6329	0.0143			2.0903	0.0696	2.1308	0.0638
Inflation Rate	16.2265	0.796	27.4496	0.5828	18.5844	0.6999		
Interest Rate			-56.0363	0	-51.7992	0	-51.9735	0
Money Supply	-	-	-	-	-	-	-	-
Inflation Rate Volatility	-62.4253	0.0006	-43.1047	0.003	-42.3549	0.0024	-39.2582	0.0014
Constant	63.5908	0.6931	75.293	0.0004	7.9528	0.0001	80.8734	0.0001
Trend	20.3604	0	29.1802	0	24.7022	0	24.6862	0
Diagnostic Statistics								
R-Squared	0.8599		0.8907		0.8934		0.8938	
Adjusted R-Squared	0.8561		0.8877		0.8898		0.8909	

Source: Authors' compilation. Estimations for all models were conducted through the Fully Modified OLS (FMOLS). The first model presents a model of inflation and exchange rate volatilities with no control variables (the without control model). The second model concentrated on the effect of changes in general price level on agricultural output. The third model is the equation of interest and it is used to guide the interpretation of the study ($AGDP = a_0 + a_1EXR + a_2INF + a_3INR + a_4FV + e_t$). The fourth model considered exchange rate and inflation volatility. The effect of inflation was not considered in this model to ensure that currency dynamics contribution to agricultural output is specifically identified and quantified. The control measure was introduced to enable readers to understand the effect of cost of financial access of firms in the sector on agricultural output. The underlying data is arranged in monthly order and ranges from 1981 to 2018.

VI. CONCLUSION

This study investigated the impact of volatilities of selected macroeconomic indicators on agricultural growth in Nigeria. First, this research established the existence of inflation volatility in the Nigerian economy for the period under study using GARCH techniques. With a volatility level of 0.9961, inflation rate in Nigeria can be described as volatile. It was observed that inflation volatility has a significant, negative impact on agricultural growth for the period 1981:1 to 2018:4. This study concludes that inflation volatility in Nigeria has a strong and negative influence on agricultural growth in Nigeria. This is in line with the study of Idowu and Hassan (2010) which discovered that inflation negatively influences real growth.

a) Policy Recommendation

As the agricultural sector is the pivotal sector for an economy like that of Nigeria, there is need to consider the effect of inflation volatility on this vital sector. Based on the findings of this study, the study recommends the following:

1. The government needs to put in place measures aimed at maintaining price stability in the country. The government could employ fiscal policy measures such as the built-in stabilizer under

compensatory fiscal policy, since fiscal policy is mainly for stabilization.

2. The government should increase its investment on the agricultural sector so as to revive the sector as the improvement of this vital sector would have a positive multiplier effect on the economy.
3. Appropriate institution and 'checks' should be put in place to monitor the government's investment into the agricultural sector and ensure that the allocation to the agricultural sector is properly utilized.

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Once you are designated as MARSBA, you may send us a scanned copy of all of your credentials. OARS will verify, grade and certify them. This will be based on your academic records, quality of research papers published by you, and some more criteria.

It is mandatory to read all terms and conditions carefully.



AUXILIARY MEMBERSHIPS

Institutional Fellow of Open Association of Research Society (USA)-OARS (USA)

Global Journals Incorporation (USA) is accredited by Open Association of Research Society, U.S.A (OARS) and in turn, affiliates research institutions as “Institutional Fellow of Open Association of Research Society” (IFOARS).

The “FARSC” is a dignified title which is accorded to a person’s name viz. Dr. John E. Hall, Ph.D., FARSC or William Walldroff, M.S., FARSC.



The IFOARS institution is entitled to form a Board comprised of one Chairperson and three to five board members preferably from different streams. The Board will be recognized as “Institutional Board of Open Association of Research Society”-(IBOARS).

The Institute will be entitled to following benefits:



The IBOARS can initially review research papers of their institute and recommend them to publish with respective journal of Global Journals. It can also review the papers of other institutions after obtaining our consent. The second review will be done by peer reviewer of Global Journals Incorporation (USA). The Board is at liberty to appoint a peer reviewer with the approval of chairperson after consulting us.

The author fees of such paper may be waived off up to 40%.

The Global Journals Incorporation (USA) at its discretion can also refer double blind peer reviewed paper at their end to the board for the verification and to get recommendation for final stage of acceptance of publication.



The IBOARS can organize symposium/seminar/conference in their country on behalf of Global Journals Incorporation (USA)-OARS (USA). The terms and conditions can be discussed separately.

The Board can also play vital role by exploring and giving valuable suggestions regarding the Standards of “Open Association of Research Society, U.S.A (OARS)” so that proper amendment can take place for the benefit of entire research community. We shall provide details of particular standard only on receipt of request from the Board.



Journals Research
inducing researches

The board members can also join us as Individual Fellow with 40% discount on total fees applicable to Individual Fellow. They will be entitled to avail all the benefits as declared. Please visit Individual Fellow-sub menu of GlobalJournals.org to have more relevant details.



We shall provide you intimation regarding launching of e-version of journal of your stream time to time. This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.



After nomination of your institution as “Institutional Fellow” and constantly functioning successfully for one year, we can consider giving recognition to your institute to function as Regional/Zonal office on our behalf.

The board can also take up the additional allied activities for betterment after our consultation.

The following entitlements are applicable to individual Fellows:

Open Association of Research Society, U.S.A (OARS) By-laws states that an individual Fellow may use the designations as applicable, or the corresponding initials. The Credentials of individual Fellow and Associate designations signify that the individual has gained knowledge of the fundamental concepts. One is magnanimous and proficient in an expertise course covering the professional code of conduct, and follows recognized standards of practice.



Open Association of Research Society (US)/ Global Journals Incorporation (USA), as described in Corporate Statements, are educational, research publishing and professional membership organizations. Achieving our individual Fellow or Associate status is based mainly on meeting stated educational research requirements.

Disbursement of 40% Royalty earned through Global Journals : Researcher = 50%, Peer Reviewer = 37.50%, Institution = 12.50% E.g. Out of 40%, the 20% benefit should be passed on to researcher, 15 % benefit towards remuneration should be given to a reviewer and remaining 5% is to be retained by the institution.



We shall provide print version of 12 issues of any three journals [as per your requirement] out of our 38 journals worth \$ 2376 USD.

Other:

The individual Fellow and Associate designations accredited by Open Association of Research Society (US) credentials signify guarantees following achievements:

- The professional accredited with Fellow honor, is entitled to various benefits viz. name, fame, honor, regular flow of income, secured bright future, social status etc.



- In addition to above, if one is single author, then entitled to 40% discount on publishing research paper and can get 10% discount if one is co-author or main author among group of authors.
- The Fellow can organize symposium/seminar/conference on behalf of Global Journals Incorporation (USA) and he/she can also attend the same organized by other institutes on behalf of Global Journals.
- The Fellow can become member of Editorial Board Member after completing 3yrs.
- The Fellow can earn 60% of sales proceeds from the sale of reference/review books/literature/publishing of research paper.
- Fellow can also join as paid peer reviewer and earn 15% remuneration of author charges and can also get an opportunity to join as member of the Editorial Board of Global Journals Incorporation (USA)
- • This individual has learned the basic methods of applying those concepts and techniques to common challenging situations. This individual has further demonstrated an in-depth understanding of the application of suitable techniques to a particular area of research practice.

Note :

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- In future, if the board feels the necessity to change any board member, the same can be done with the consent of the chairperson along with anyone board member without our approval.
- In case, the chairperson needs to be replaced then consent of 2/3rd board members are required and they are also required to jointly pass the resolution copy of which should be sent to us. In such case, it will be compulsory to obtain our approval before replacement.
- In case of “Difference of Opinion [if any]” among the Board members, our decision will be final and binding to everyone.

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PREFERRED AUTHOR GUIDELINES

We accept the manuscript submissions in any standard (generic) format.

We typeset manuscripts using advanced typesetting tools like Adobe In Design, CorelDraw, TeXnicCenter, and TeXStudio. We usually recommend authors submit their research using any standard format they are comfortable with, and let Global Journals do the rest.

Alternatively, you can download our basic template from <https://globaljournals.org/Template.zip>

Authors should submit their complete paper/article, including text illustrations, graphics, conclusions, artwork, and tables. Authors who are not able to submit manuscript using the form above can email the manuscript department at submit@globaljournals.org or get in touch with chiefeditor@globaljournals.org if they wish to send the abstract before submission.

BEFORE AND DURING SUBMISSION

Authors must ensure the information provided during the submission of a paper is authentic. Please go through the following checklist before submitting:

1. Authors must go through the complete author guideline and understand and *agree to Global Journals' ethics and code of conduct*, along with author responsibilities.
2. Authors must accept the privacy policy, terms, and conditions of Global Journals.
3. Ensure corresponding author's email address and postal address are accurate and reachable.
4. Manuscript to be submitted must include keywords, an abstract, a paper title, co-author(s) names and details (email address, name, phone number, and institution), figures and illustrations in vector format including appropriate captions, tables, including titles and footnotes, a conclusion, results, acknowledgments and references.
5. Authors should submit paper in a ZIP archive if any supplementary files are required along with the paper.
6. Proper permissions must be acquired for the use of any copyrighted material.
7. Manuscript submitted *must not have been submitted or published elsewhere* and all authors must be aware of the submission.

Declaration of Conflicts of Interest

It is required for authors to declare all financial, institutional, and personal relationships with other individuals and organizations that could influence (bias) their research.

POLICY ON PLAGIARISM

Plagiarism is not acceptable in Global Journals submissions at all.

Plagiarized content will not be considered for publication. We reserve the right to inform authors' institutions about plagiarism detected either before or after publication. If plagiarism is identified, we will follow COPE guidelines:

Authors are solely responsible for all the plagiarism that is found. The author must not fabricate, falsify or plagiarize existing research data. The following, if copied, will be considered plagiarism:

- Words (language)
- Ideas
- Findings
- Writings
- Diagrams
- Graphs
- Illustrations
- Lectures



- Printed material
- Graphic representations
- Computer programs
- Electronic material
- Any other original work

AUTHORSHIP POLICIES

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1. Substantial contributions to the conception and acquisition of data, analysis, and interpretation of findings.
2. Drafting the paper and revising it critically regarding important academic content.
3. Final approval of the version of the paper to be published.

Changes in Authorship

The corresponding author should mention the name and complete details of all co-authors during submission and in manuscript. We support addition, rearrangement, manipulation, and deletions in authors list till the early view publication of the journal. We expect that corresponding author will notify all co-authors of submission. We follow COPE guidelines for changes in authorship.

Copyright

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Appealing Decisions

Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

Declaration of funding sources

Global Journals is in partnership with various universities, laboratories, and other institutions worldwide in the research domain. Authors are requested to disclose their source of funding during every stage of their research, such as making analysis, performing laboratory operations, computing data, and using institutional resources, from writing an article to its submission. This will also help authors to get reimbursements by requesting an open access publication letter from Global Journals and submitting to the respective funding source.

PREPARING YOUR MANUSCRIPT

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.



Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

- a) A title which should be relevant to the theme of the paper.
- b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
- c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
- d) An introduction, giving fundamental background objectives.
- e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
- f) Results which should be presented concisely by well-designed tables and figures.
- g) Suitable statistical data should also be given.
- h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

- i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
- j) There should be brief acknowledgments.
- k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.



FORMAT STRUCTURE

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in a research paper?" Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.



Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

PREPARATION OF ELETRONIC FIGURES FOR PUBLICATION

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

TIPS FOR WRITING A GOOD QUALITY MANAGEMENT RESEARCH PAPER

Techniques for writing a good quality management and business research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of management and business then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.



6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice. Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.



21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium through which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

INFORMAL GUIDELINES OF RESEARCH PAPER WRITING

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.



- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.



Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- o Report the method and not the particulars of each process that engaged the same methodology.
- o Describe the method entirely.
- o To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- o Simplify—detail how procedures were completed, not how they were performed on a particular day.
- o If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- o Resources and methods are not a set of information.
- o Skip all descriptive information and surroundings—save it for the argument.
- o Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.



Content:

- o Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- o In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- o Present a background, such as by describing the question that was addressed by creation of an exacting study.
- o Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- o Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- o Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- o Do not include raw data or intermediate calculations in a research manuscript.
- o Do not present similar data more than once.
- o A manuscript should complement any figures or tables, not duplicate information.
- o Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- o You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- o Give details of all of your remarks as much as possible, focusing on mechanisms.
- o Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- o One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- o Recommendations for detailed papers will offer supplementary suggestions.



Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



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