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The Synergy amongst Manufacturing Sector, Agricultural Sector, Services and Gross Domestic Product 1980 to 2020

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Abstract. The study evaluated the synergy amongst the manufacturing sector, agricultural sector, service sector, and the gross domestic product between 1980 and 2020. The aim is to assess the inter-relationship amongst them for the period of 40 years. A unit root test and cointegration test was carried on the data to determine the level of stationarity and long-run effect. VAR (impulse response function) and Toda-Yamamoto methods of data analysis were carried out. The result indicated no relationship amongst all the variables except gross domestic product to manufacturing which has a relationship, but manufacturing has no influence over the gross domestic product based on the Toda-Yamamoto. It is evidenced that in Nigeria, the interdependence among GDP, agricultural sector, manufacturing sector and the service sector does not really exist based on result in which there is proven significant relationship and causality. This study, therefore, recommended that a strong nexus policy be made and implemented to the later to ensure that the formerly existing nexus among the sectors will be restored.

Keywords: synergy, manufacturing, agriculture, service, GDP, VAR, impulse response

Introduction

The agricultural sector has remained the largest and arguably the most important sector of the economy. Agriculture contributes to the gross force in Nigeria (Aigbokhan, 2001). It is estimated to be the largest contributor to the non-oil foreign exchange. A strong agricultural sector is essential to economy development both in its own rights and to stimulate and support the growth of industries. Economy growth has gone hand in hand with agricultural progress stagflation in agriculture is the principal explanation for poor economy performance, while rising agricultural activities has seen the most concomitant of successful industrialization (Ukeje, 1999). The labour-intensive character of the sector reduces its contribution to the GDP. One of the constraints of the growth in Nigeria has been the slow development of the agricultural sector.

The manufacturing sector of any economy worldwide is reputed to be the engine of growth and a catalyst for sustainable transformation and national development. This is because of its enormous potentials as a tool for creating wealth, generating employment, contributing to the country's gross domestic product as well as alleviating poverty among the citizenries. The experiences of the developed countries of the world and the emerging economies of China, India, North Korea, Malaysia and Singapore shows that there is a positive correlation between the aforementioned indicators of the performance of the manufacturing sector and national growth and development. Thus, for many up-coming countries like Nigeria, the development of the manufacturing sector is an imperative for meaningful and sustainable national growth.

According to Abiodun (2020), the Nigerian service sector has been able to display impressive results despite tough economic circumstances. In 2014, Nigeria's rebased gross domestic product sectoral composition shifted toward the service sector and away from the oil sector. The service sector accounted for 54.8% of the rebased GDP, with the largest contributors being wholesale and retail trade contributing 16.27%, real estate contributing 8.37%, and Information and Communication contributing 11.04%. The service sector has the potential to increase economic growth in Nigeria. Diversifying and harnessing the full benefits

of the service sector will reduce Nigeria's over-reliance on the oil sector, as innovations in the service sector play a crucial role in increasing both the productivity levels and also economic growth through innovation expenditures and innovation activities in general. The service sector is a crucial component of every country's economy, and it has been identified as a sector with the capability to become a significant driver of sustained growth in Africa. The Nigerian service sector consists of several industries such as banking, retail and wholesale trade, tourism, real estate, telecommunications, motion pictures (Nollywood), information and communication technology, entertainment, and education. The service sector is currently the fastest growing sector in the world. It accounts for a significant proportion of gross domestic product in most countries and makes significant contribution to the share of total employment. As of 2015, service sector contribution to Nigeria's GDP stood at about 60%, with an average of about 33% of employment share compared to 7% for industry.

Given the importance of these sectors and their contribution to Nigeria's GDP, this study seeks to examine relationship among agricultural sector, service sector and manufacturing sector in Nigeria since they are expected to positively affect one another.

Literature Review

Theoretical Review

Schumpeterian Growth Models

Schumpeterian growth models gather specific kind of economic growth models, which are produced by the endogenous process innovation and introduction of product. The "Schumpeterian growth" term honours the name of Joseph Schumpeter, who defined the progress of capitalism via creative process. Schumpeterian growth models are nearer in essence to Schumpeter's thinking than those that put emphasis on learning by doing, physical capital accumulation and human capital accumulation as foundations of growth process in the economy (Dinopoulos, 2006).

The Schumpeterian model of growth has the natural property that neoteric discovery make products obsolete and old technologies. In addition, this creative obliteration lineament in sequence has both normative and positive consequences. On the normative side, in case of development and future research that recent innovation has positive externalities. In case of positive side, it suggests a negative link between future and current body of research, which emerges in the presence of matchless in the likelihood of cyclical patterns of growth and also balances the growth equilibrium (Aghion, Howitt & Peñalosa, 1998).

Previous Schumpeterian growth models had analysed the link between long run growth and trade patterns by using a variety of approaches. They produced product cycle trade that is constructed on the observation which many goods are discovered in the developed countries and their manufacture shifts to developing countries as they are in the low level of technology and they have imitated in this case. Moreover, the determinants of growth rate examined by this model had also analysed Schumpeterian models in open economies. According to Prior endogenous growth models, there are three comprehensive channels which convey from the impact of openness policy with regard to economic sector to long run growth. First channel is trade, the long run rate of growth and innovation as well as the profitability of R&D investment increase due to increasing size of the market. Secondly, economic openness through simplifying the information exchange, raises the productivity of researchers and the field of knowledge spillovers. Thirdly, there is the trade openness (Dinopoulos, 2006).

Empirical Review

Adenomon (2013) investigated the impact of agriculture and industry on GDP in Nigeria from 1960 to 2011. The ADF test for stationarity was carried out for GDP, agriculture, and

industry. The result revealed stationarity of the series at 1% level of significance. Thereafter we model the time series using VAR and SVAR models. The results from the VAR model revealed that agriculture contributed about 58% to GDP while industry contributed about 32% to GDP in Nigeria. The study further revealed from the SVAR models that agriculture and industry contributed to the structural innovations of GDP in Nigeria but more contribution resulting from agriculture. The work therefore recommended that special incentive should be given to farmers and infrastructural facilities should be provided while new approaches should be vigorously and honestly pursued by the Nigerian government to restore the glory of the industrial sector in Nigeria. This work is covered the period of 1960 to 2011 which does not give a true picture of true position of current relationship between agriculture and GDP and this work covers wider relationship between agriculture and GDP and verse versa

Joe (2013) evaluated the effectiveness of manufacturing sector in promoting economic development in Nigeria. This is very essential in the Nigerian economy is characterized by GDP dependence on manufacturing output. Indices of exchange rate, capacity utilization, electricity supply and industrial output are hereby studied for the period of 1985-2007 with respects to the effectiveness of manufacturing sector in promoting economic development in Nigeria.

A simple linear and multiple regression model was used for this project and criteria were examined. From the findings of this research work, it was observed that manufacturing sector constitute an integral part of the industrial base of any nation. They form the foundation on which the industrial sector of any nation must be built. It is logical, therefore, to say emphatically, that without a properly developed manufacturing sector base, there can be no industrialization of any sound foundation on which a sustainable economic growth and development could be based. This work uses data for time series but unit root was not carried out on the data the result likely a spurious result.

The effect of non-oil components export on the economic growth in Nigeria continue to be debated and tested in order for turning around of the nation's economic outlook for the future good, by strengthen non-oil export growth and success and also promote a non-oil export culture.

This paper extends the previous empirical studies on the issue providing some evidence from time series data period over 1980 – 2011. In this study, the dependent variables are agricultural, manufacturing and services sector whereas the independent variable is the gross domestic product (GDP). The model was tested using unit root test, ordinary least square (OLS), serial correlation LM test and heteroskedasticity test to analyse the significant contribution between the dependent and independent variables. The result shows that agricultural and services sector of non-oil export component contributed significantly to the economic growth (GDP) of Nigeria. Also the result presents that there is no correlation and heteroskedasticity problem.

Oluwatoseye (2013) examined the relationship between GDP, Agricultural sector and manufacturing sector in Nigeria, he extends the previous empirical studies on the issue providing some evidence from time series data period over 1980 – 2011. In this study, the dependent variables were agricultural, manufacturing and services sector whereas the independent variable is the gross domestic product (GDP). The model was tested using unit root test, ordinary least square (OLS), serial correlation LM test and heteroskedasticity test to analyse the significant contribution between the dependent and independent variables. The result shows that agricultural and services sector of non-oil export component contributed significantly to the economic growth (GDP) of Nigeria. Also, the result presents that there is no correlation and heteroskedasticity problem.

Finally, this paper draws some policy implications for the further studies to focus on the non-oil export component in Nigeria so must ensure a turnaround of the nation's economic outlook (growth).

Ojeka (2016) investigated the constraints to agricultural development in Nigeria using time series data spanning the period 1970 – 2010 and contemporary econometric methods of unit root test, co-integration and error-correction mechanism. Empirical findings reveal that rainfall, exchange rate and food export (lag one) are the most significant positive determinants of agricultural output in Nigeria. However, food imports, diversion of funds meant for agricultural purposes and low technology diffusion in agriculture are among the factors identified as constraints to agricultural development in Nigeria. The study recommends among others, maintenance of stable and favourable exchange rate regime, and the pursuance of programs that will bolster partnerships between research institutions and other stake holders in agriculture as a route to facilitating agricultural development and hence, economic development in Nigeria. This research work would examine agricultural sector and its contribution to GDP and how GDP has impacted agriculture as well.

Gap(s) in Literature

From the empirical literature reviewed in this study, a lot of studies have investigated the relationship between Agricultural sector, manufacturing sector, Service Sector, and contribution to GDP. Adenomon (2013) investigate the impact of agriculture and industry on GDP in Nigeria from 1960 to 2011. Joe (2013) evaluates effectiveness of manufacturing sector promoting economic development in Nigeria between 1985 and 2007. Oluwatoseye (2013) examines relationship between GDP, agriculture sector and manufacturing sector from 1980 to 2011. Ojoke (2016) investigated constraint to agricultural development in Nigeria using time series data between 1970 and 2010. This study covered the gap by examining the synergy among Agricultural sector, service sector, manufacturing sector and GDP for the period from 1980 to 2020.

Methodology

Research Design

Expost-factor research design is employed in the study. An *expost-facto* research design is very appropriate for this study because it describes the statistical association between two or more variables. The use of this design allows for the testing of expected relationship between and amongst this variable and the making of predictions regarding these relationship (Kothari, 2004)

Data Description and Sources

This study adopted secondary data (time series data). Empirical investigation was carried out on the basis of the sample covering the period 1980 to 2020 on yearly basis. Gross domestic product (GDP) was used as an indicator of economic growth. The other variables used are manufacturing sector output, Agricultural sector output, and service sector. All these variables were collected from Central Bank of Nigeria, Statistical Bulletin (2020).

Methods of Analysis and Model Specification

The method of estimating the nexus of the relationship among these variables economic growth, manufacturing sector output, Agricultural sector output, and service sector is the Vector Autoregressive model (VAR) and Toda Yamamota (TY). The Vector Autoregressive model is adopted for this work because it is commonly used for forecasting systems of interrelated time series and for analysing the dynamic impact of random disturbances on the

system variance. The VAR model sidesteps the need for structural modelling by treating every endogenous variable in the system as a function of the lagged values of all endogenous variables in the system. While the Toda-Yamamota was applied to determine the causality among the variables.

The structural form is VAR in-first difference:

$$\Delta GDP_t = \alpha o + \sum \alpha_1 \Delta\, MAN_{t-1} + \sum \alpha_2 \Delta AGR_{t-1} + \sum \alpha_2 \Delta SER_{t-1} + U_t \ldots \quad (1)$$

$$\Delta MAN_t = \alpha o + \sum \alpha_1 \Delta GDP_{t-1} + \sum \alpha_2 \Delta AGR_{t-1} + \sum \alpha_2 \Delta SER_{t-1} + U_t \ldots \quad (2)$$

$$\Delta AGR_t = \alpha o + \sum \alpha_1 \Delta MAN_{t-1} + \sum \alpha_2 \Delta GDP_{t-1} + \sum \alpha_2 \Delta SER_{t-1} + U_t \ldots \quad (3)$$

$$\Delta SER_t = \alpha o + \sum \alpha_1 \Delta MAN_{t-1} + \sum \alpha_2 \Delta AGR_{t-1} + \sum \alpha_2 \Delta GDP_{t-1} + U_t \ldots \quad (4)$$

Toda-Yamamoto Model:

$$GDP_t = \beta_0 + \sum \beta_1 GDP_{t-i} + \sum \beta_2 GDP_{t-i} + \sum \beta_3\, MAN_{t-i} + \sum \beta_4\, MAN_{t-i} + U_t$$

$$GDP_t = \beta_0 + \sum \beta_1 GDP_{t-i} + \sum \beta_2 GDP_{t-i} + \sum \beta_3\, AGR_{t-i} + \sum \beta_4\, AGR_{t-i} + U_{2t}$$

$$GDP_t = \beta_0 + \sum \beta_1 GDP_{t-i} + \sum \beta_2 GDP_{t-i} + \sum \beta_3\, SER_{t-i} + \sum \beta_4\, SER_{t-i} + U_{3t} \quad (5)$$

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$$SER_t = \beta_0 + \sum \beta_1 SER_{t-i} + \sum \beta_2 SER_{t-i} + \sum \beta_3\, GDP_{t-i} + \sum \beta_4\, GDP_{t-i} + U_{nt}$$

Where

GDP_{t-1} = economic growth at time t-1
MAN_{t-1} = manufacturing sector output at time t-1
AGR_{t-1} = Agricultural output at time t-1
SER_{t-1} = Service Sector at time t-1
U_{t1}, U_{t2} U_{t3} and U_{t4} = are the error term

Impulse Response Function

Because the VAR result is difficult to interpret, this study adopted the impulse response and variance decomposition methods of analyses for interpretation. An impulse response function traces out the response of a variable of interest to an exogenous shock. Often the response is portrayed graphically, with horizon on the horizontal axis and response on the vertical axis. In the vast majority of applications, the exogenous shock is unobservable because it is a linear combination of unobservable regression disturbances. In other words, the impulse response functions can be used to produce the time path of the dependent variables in the VAR, to shocks from all the explanatory variables. If the system of equations is stable any shock should decline to zero; an unstable system would produce an explosive time path.

Estimation and Results

Table 1: Unit root Test

Variables	Level of stationarity	First Diff	Level of significance
GDP	*I*(0) 4.429	*I*(1) - 3.601**	-1.949
MAN	*I*(0) -0.410	*I*(1) - 5.019**	-1.949
AGR	*I*(0) 1.824	*I*(1) - 6.686**	-1.949
SER	*I*(0) 0.545	*I*(1) - 6.028**	-1.949

Source: Author's computation

Table 1 shows the unit root for the variables estimate through the application of Augmented Dickey Fuller methods. The result revealed that all the variables were stationary at the first difference and all the variables are integrated at order 1, i.e I(1). Since it has been established that the variables for this study have been found to be non-stationary, it necessary to correct the non-staionarity to stationary. One very important way of resolving this is to

differencing the series successively until stationary is achieved and then use the stationary series for regression analysis (Gujarati, 2009).

Table 2: Co-integration result

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None	0.344471	39.02567	47.85613	0.2593
At most 1	0.274759	22.97777	29.79707	0.2472
At most 2	0.198849	10.77020	15.49471	0.2260
At most 3	0.059854	2.345362	3.841466	0.1257
Hypothesized No. of CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
None	0.344471	16.04791	27.58434	0.6617
At most 1	0.274759	12.20756	21.13162	0.5273
At most 2	0.198849	8.424839	14.26460	0.3372
At most 3	0.059854	2.345362	3.841466	0.1257

Table 2 shows the result of the cointegration with Trace statistic and Max-Eigen statistic. The Max-Eigen statistics conforms to the result of the Trace statistics. This implies that therefore, the variables are not co-integrating and there exist no long-run relationship. Hence, the need for the estimation of the Vector Auto-regression (VAR) and Toda-Yamamota (TY) to examine the causality among the variables.

Table 3: Lag length selection

VAR Lag Order Selection Criteria
Endogenous variables: GDP AGRIC MAN SERV
Exogenous variables: C
Date: 02/23/22 Time: 14:09
Sample: 1980 2020
Included observations: 37

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1495.226	NA	1.84e+30	81.03922	81.21337	81.10062
1	-1359.301	235.1129	2.84e+27	74.55681	75.42757*	74.86379*
2	-1353.847	8.253992	5.18e+27	75.12689	76.69427	75.67946
3	-1322.359	40.84965*	2.44e+27*	74.28968*	76.55368	75.08785

Table 3 shows the result of the lag length selection. It indicated that the best or optimum lag length is at 3.

Figure 1 (Appendix) shows four panels of A, B, C and D with four graphs each, of impulse response indicating how innovations in respective AGR, MAN and SER affect GDP in Nigeria over a period of 41 years. A value of zero means that the MAN, AGR and SER have no effect on GDP and vice versa and if it continues on the same path it would be that there is no shock. A positive or negative value indicates that the shock would cause the variable to be above or below its natural path.

The first panel *A* (1), in Figure 1, shows the response of GDP to a shock in GDP. It indicated that, there was a positive effect from the first year to the eighth year. Also, from panel *A* (2), the result shows the response of GDP to a shock in AGR. It indicated that, AGR was not stable i.e. there was fluctuation of GDP as a result of a shock in AGR. It became negative from

the fifth year to the seventh year but became positive to the tenth years. Also, from panel *A* (3), the result shows the response of GDP to a shock in MAN. It indicated that, GDP was positive but low all through from the first year to the seventh, but slipped into negative and remained so until the tenth year. In *A* (4), the result shows the response of GDP to a shock in SER. It indicated that, GDP was positive and high all through from the first year to the tenth, but started dropping at the seventh year but remained positive.

The second panel B (1), displays the response of AGR to a shock in GDP. It was observed that there a large cyclical fluctuation in AGR. There was a positive effect from the first year to the fourth year. But slipped into negative from the fifth year. The graph B (2) indicated that a shock of AGR in itself indicated that there was a consistent fall in AGR from first years to the fourth year, which slipped into negative until there was a positive increase in the eighth year. The graph B (3) showed that a shock in the MAN maintained a positive but fluctuating effect on the AGR but late slipped into negative in the ninth year. The graph B (4) showed that a shock in the SER also maintained a positive but fluctuating effect on the AGR but entered into negative in the eight year and remained negatively low.

From the panel C (1, 2, 3 & 4) a shock in the GDP, MAN and SER affected the MAN by pushing the MAN in the later year being the tenth year into negative. Indicating that these sectors have not significantly impacted the MAN sector. However, the effect of SER on itself impacted positively and significantly from the first year to the tenth year. Lastly, from the panel D (1, 2, 3 & 4) a shock in the GDP, AGR, MAN and SER affected the SER negatively.

Table 4: Toda-Yamamota Causality Test

S/N	Variable	Direction	df	X^2	P-value	Decision
1	GDP & AGR	AGR→ GDP	3	5.111	0.1638	No Causality
		GDP → AGR	3	2.289	0.5145	
2	GDP & MAN	MAN → GDP	3	1.823	0.6097	GDP→ MAN
		GDP → MAN	3	18.398	0.004	
3	GDP & SER	SER → GDP	3	8.743	0.0329	No Causality
		GDP → SER	3	1.665	0.6446	
4	AGR & MAN	MAN → AGR	3	1.847	0.5145	No Causality
		AGR → MAN	3	3.676	0.2987	
5	AGR & SER	SER → AFR	3	2.0243	0.5674	No Causality
		AGR → SER	3	0.8218	0.8442	
6	MAN & SER	SER → MAN	3	5.9121	0.1160	No Causality
		MAN → SER	3	2.3307	0.5067	

The result of the causality test using the Toda-Yamamota method is presented in Table 4. The result showed that all the causal relationships indicated no causality except for the relationship between GDP and MAN. Here, the result indicated that GDP causes MAN but MAN does not cause GDP.

Discussion of Findings

Given that all the causal relationships indicated no causality except for the relationship between GDP and MAN. Here, the result indicated that GDP causes MAN but MAN does not cause GDP. This result is not consistent with the study of Adenomon (2013) who investigated the impact of agriculture and industry on GDP in Nigeria from 1960 to 2011. The results from the VAR model revealed that agriculture contributed about 58% to GDP while industry contributed about 32% to GDP in Nigeria. Furthermore, the outcome does not also agree with

the findings of Joe (2013) who evaluated the effectiveness of manufacturing sector in promoting economic development in Nigeria.

From the findings of this research work, it was observed that manufacturing sector constitute an integral part of the industrial base of any nation. They form the foundation on which the industrial sector of any nation must be built. It is logical, therefore, to say emphatically, that without a properly developed manufacturing sector base, there can be no industrialization of any sound foundation on which a sustainable economic growth and development could be based.

The result does not also agree with Oluwatoseye (2013) who found that agricultural and services sector of non-oil export component contributed significantly to the economic growth (GDP) of Nigeria.

Conclusion

It is evidenced that in Nigeria, the interdependence among, GDP, agricultural sector, manufacturing sector and the service sector does not really exist based on result, in which there is proven significant relationships and causality. This study therefore, recommended that a strong nexus policy be made and implemented to the later so as to ensure that the formerly existing nexus among the sectors will be restored.

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Appendix

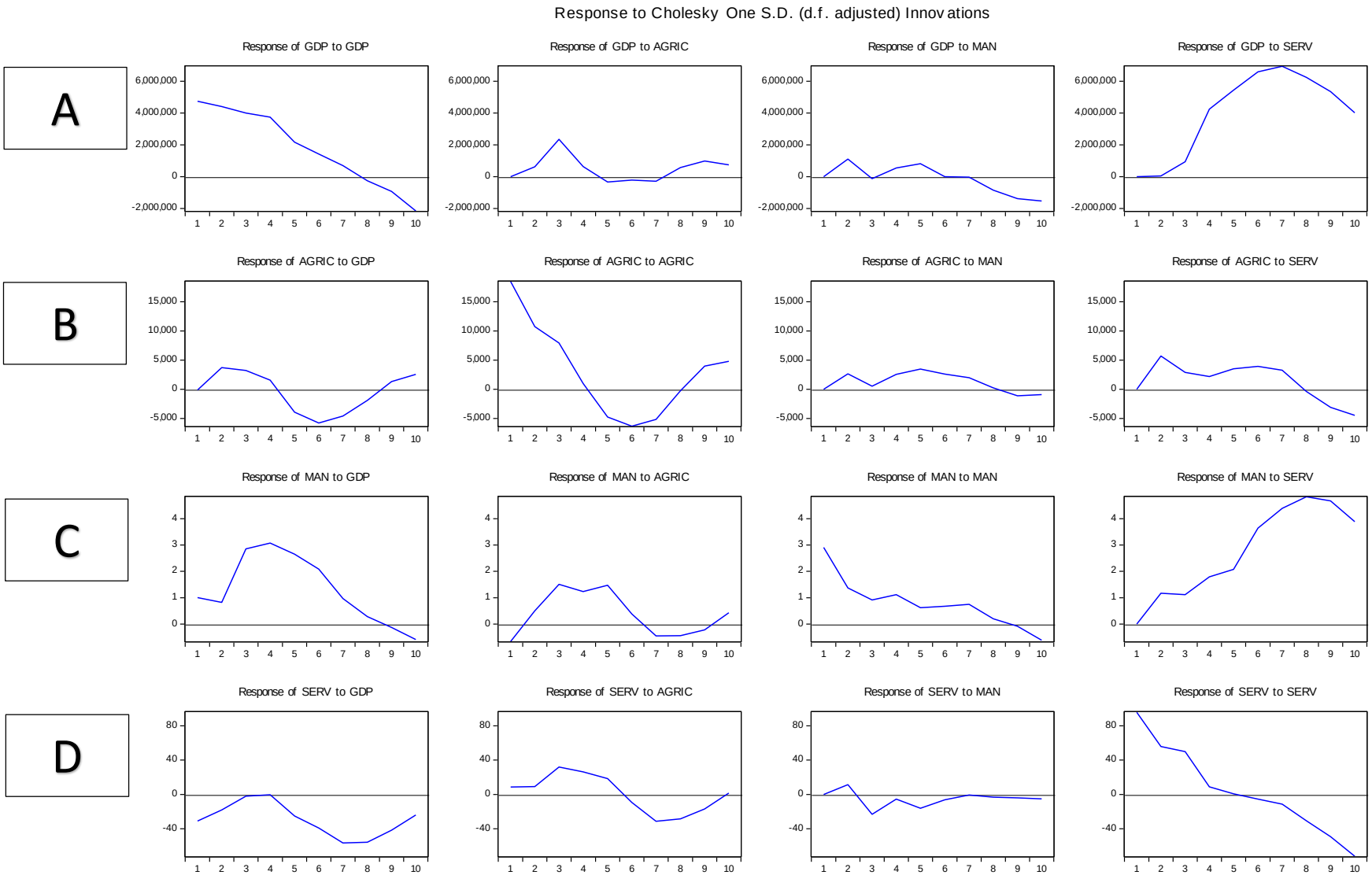

Figure 1: Impulse Response Function