
An Examination of the Feldstein-Horioka Puzzle for Nigeria: The Mediating Role of Foreign Direct Investment

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Abstract:

The relationship between savings rate and the rate of investments in an economy has been studied under the Feldstein-Horioka hypothesis to detect whether a higher domestic saving rate in a country is correlated with a higher rate of domestic investment. In the case of Nigeria, these rates have been exhibiting a declining trend over the years. As such, this paper was geared towards ascertaining whether the Feldstein-Horioka hypothesis could be valid in Nigeria with a consideration of the influence of foreign direct investment (FDI). The study utilized data from 1981 to 2020 which were analysed using the ordinary least squares (OLS) approach, the autoregressive distributed lag (ARDL) bounds testing approach, and the ARDL error correction. Our findings from the OLS revealed that the without FDI, the saving-retention coefficient is 0.94 while it becomes 0.95 when the FDI is incorporated in the model. From the ARDL result which evidence of existence of long-run relationship was established, the conditional long-run elasticity was obtained to be 0.28 implying that a 1% increase in savings rate increases the rate of investment by 0.28%. Though this coefficient is low, it is still in line with the Feldstein-Horioka hypothesis that domestic investments are spurred by domestic savings.

Keywords: Investment, Savings, Foreign Direct Investment, Feldstein-Horioka Puzzle, Monetary Policy

1. Introduction

The Harod-Domar growth model as one of the traditional growth models has specifically identified the path to growth as being through an increase in savings rate, a decrease in capital-output ratio, and a decrease in capital consumption (Todaro and Smith, 2012). Consistent with the model,

“economic growth is dependent on policies that enhance investment by boosting saving and utilizing that investment more effectively through technical developments” (Harrod, 1939; Domar, 1946; Ekong, Effiong, and Inyang, 2021). It follows from the model that if the national net savings rate is increased, then there will be growth in the overall economy. The big question now is: how do an increase in savings rate culminates to an increase in economic growth? This question can be best answered using the savings-investment gap model. Developing economies are noted with a divergence between savings and investment which has been one of the core models for explaining the rising trend in borrowing in some economies to bridge such gaps.

It follows from the above argument that the path through which savings could translate to growth is through investment. High savings rate will made sufficient savings available for borrowing for investment purposes. With an increase in savings culminating to greater domestic investment, it is expected that such an increase in domestic investment will cause a shift in the aggregate demand curve which is a clear sign of an expansion of output (economic growth in this regards). Another key issue that arises from this is whether an increase in domestic savings rate could lead to an increase in domestic investment. This is where the Felstein-Horioka (FH) puzzle comes in.

Feldstein and Horioka (1980) investigated whether a country's greater domestic saving rate is associated with a higher rate of domestic investment, not only to explore international capital mobility but also to call attention to an optimum savings strategy and the impact of tax adjustments. In a closed economy, for example, national savings policy is determined by the pre-tax marginal product of capital, but in a perfect capital mobility economy, it is determined by the after-tax return to investors. As a result, foreign capital mobility is a key driver of optimum national savings strategy. Similarly, foreign capital movement has ramifications for tax incidence analysis (Akkoyunlu, 2020). A tax on the revenue of all capital utilized in production is paid only by capital owners in a closed economy, but by domestic labour and foreign capital owners in an open economy.

The relationship between saving and investment is critical in creating economic policies aimed at generating high economic growth. Feldstein and Horioka (1980) found that saving-promoting policies had a considerable influence on the amount of investment, hence stimulating economic development. Policies aimed at increasing economic growth through domestic saving, on the other hand, are unsuccessful in an open economy. As a result, it is possible to conclude that the motive for attempting to solve the F-H dilemma derives from a desire to improve the performance of economic policies (İyidoğan and Balıkcıoğlu, 2010).

The FH conundrum has resulted in two parallel lines of literature. Using theoretical foundations and frictions, the first attempted to explain the strong connection between domestic saving and investment under perfect capital mobility. A second body of work concerns an incorrect modelling of the saving and investment connection in attempt to explain the FH issue, as Feldstein and Horioka (1980) employ cross-sectional and time-averaged data to erase the pro-cyclical character of saves and

investment. Nevertheless, the Feldstein and Horioka (1980) methodology is criticized on a number of grounds. These, according to Akkoyunlu (2020), include:

- i. the FH sample period was very short to capture increases in capital mobility in the second half of the 1970s;
- ii. time-averaged data in cross-sectional regressions overestimate or underestimate the true relationship;
- iii. the nature of shocks and the structure of the economy for each country should have been taken into account;
- iv. outliers, the choice of the time period, endogeneity, the regime changes, the omitted variables' bias, a constant in the regression, non-stationarity of variables in levels, and cointegration techniques; and
- v. short-run dynamics of the relationship between savings and investment should have been considered (Choudhry, Kling, & Jayasekera, 2014; Katsimi & Zoega, 2016; Sachs, 1981).

To avoid the limitations of cross-sectional analysis, such as sample selection bias and the failure to take into account country-specific saving-investment structures, structural changes, governmental policies, and country-specific shocks, time-series analysis has been used to examine the saving-investment relationship for individual countries (e.g., De Vita & Abbott, 2002; Miller, 1988; Akkoyunlu, 2020). This study follows this approach along with a consideration of both the short-run dynamics and long-run relationship between savings and investments.

Feldstein and Horioka (1980) examined the extent to which a country's greater domestic saving rate connected with a higher rate of domestic investment for the 21 OECD nations from 1960 to 1974. Feldstein and Horioka (1980) estimated that to be 0.89. Each of the five-year sub-period coefficients (0.85-0.95) is likewise shown to be similar to the overall coefficient. Even after accounting for potential endogeneity of domestic saving and sample selection bias, the results remain unchanged. These findings, however, contradict the perfect international capital mobility theory, implying that the majority of incremental saving stays in the country where it is done, and international capital movements do not respond to international disparities in returns.

To evaluate the Feldstein-Horioka method of measuring capital mobility, Adedeji and Thornton (2006) used data for six African nations using recently developed panel co-integration techniques. Three conclusions can be drawn from the results: (1) savings and investment in panel data are non-stationary series and they are co-integrated; (2) capital was relatively mobile in African countries during 1970–2000, with estimated savings-retention ratios of 0.73 (FMOLS), 0.45 (DOLS), 0.51 (DOLS with heterogeneity), and 0.39 (DOLS with cross-sectional dependence effects); and (3) there was a significant decline in the savings-retention ratio from 1970–85 to 1986–2000. The findings can be taken to mean that capital mobility has grown in African nations.

İyidoğan and Balıkçioğlu (2010) investigated the validity of a level connection between saving and investment rates regardless of the integration order of the series using the bounds testing approach and the 1968–2008 sample for Turkey. The low value of the coefficient in the F-H regression also supports the findings of the cointegration study that claim there is no long-run association. In other words, capital mobility reduces the reliance of domestic saving on national investment, and the F-H problem does not apply to Turkey.

An article examining the correlation between investment and savings in Australia from 1960 to 2007 was described in depth by Kumar, Webber, and Fargher (2011). The dilemma of Feldstein and Horioka is shown to exist, albeit in a weaker version with a lower saving retention coefficient, according to the findings. Savings drives investment in both the short- and long-term, according to Granger causality studies. The findings indicated that Australia may successfully implement policies that prioritize boosting domestic savings in order to increase investment.

Recent studies on the relationship between domestic savings and investment have been conducted. On the basis of long-run regressions, Plakandaras, Gogas, and Papadimitriou (2019) revised the Feldstein and Horioka (1980) capital immobility hypothesis for the case of the European Union and the Eurozone. The Long Run Derivative developed by Fischer and Seater in 1993 was used in the study to investigate capital mobility as a long-run phenomena. The study also runs panel causality tests on the data, which is a standard strategy in this context, to increase the robustness of the conclusions. The empirical results did not support the capital immobility theory in any way.

From 40 African nations for the years 2000–2018, Midagu, Kwela, and Kazadi (2020) re-examined the Feldstein and Horioka (1980) puzzle. The goal was to evaluate how important good governance is to Africa's financial integration effort. It has been found through the use of the Pooled Mean Group Estimator that capital is generally mobile in African nations and that institutional quality, through the prevention of corruption and political stability, strengthens financial integration. North and West Africa are more financially interconnected than the other sub-groups, according to the breakdown of the total sample into sub-groups. Also, there is no discernible shift in the degree of financial integration as a result of the financial crisis of 2007–2008.

The domestic saving and investment correlation proposed by Feldstein and Horioka for Turkey was studied by Akkoyunlu (2020) and evaluated for the whole period (1950–2017) and the two subperiods (1950–1989 and 1990–2017). The long-run elasticity of investment with respect to savings ratio is significant for the entire period as well as for the first sub-period, despite the fact that investment and savings were reported to be positively correlated during the period of constrained capital mobility (1950-1989) and negatively correlated during the period of perfect capital mobility (1990-2017). In a closed economy, the findings support Feldstein and Horioka's theory.

By using the ARDL (with limits testing) technique, the Granger predictive test, the Generalised Impulse Response Function, and the Variance decomposition function, Yeboah and Prempeh (2021)

examined the savings-investment connection for Ghana from 1960 to 2016. According to the findings, a short-term investment would rise by 0.069% for every 1% increase in savings. Savings, it turns out, really encourage short-term investment more than long-term investment. In the short run, a unidirectional causation connecting savings and investment is established via the Granger causality test. Upon the different findings observed in earlier studies, this paper examines the Felstein-Horioka puzzle in the case of Nigeria by using time series data from 1981 through 2020.

2. Stylized Facts

The Nigerian economy has been experiencing declining investment/GDP and savings/GDP ratio over the years. This can be portrayed in Figure 1 where a continuous declining trend exists

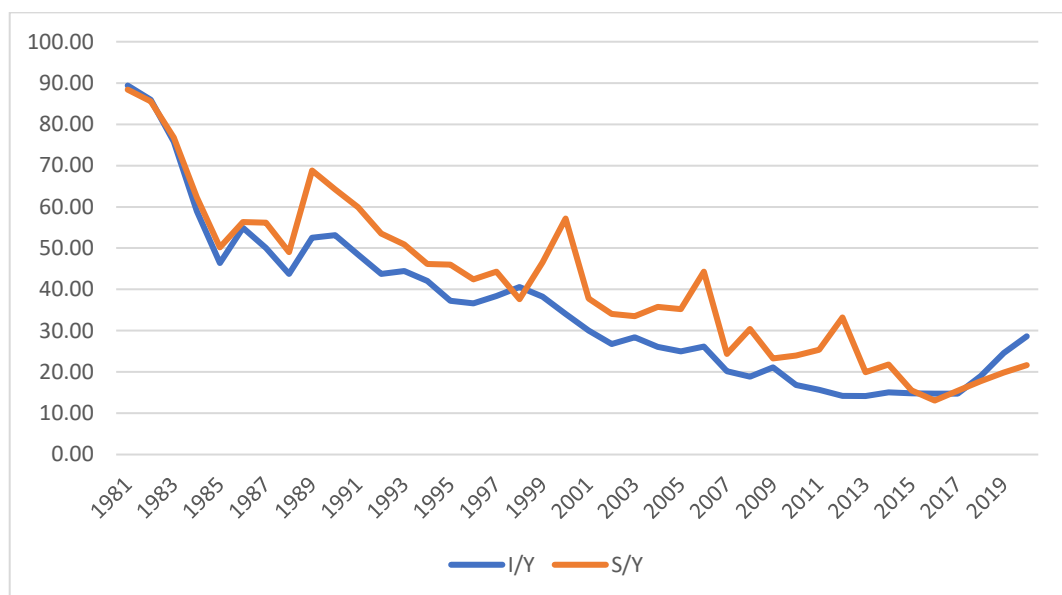


Figure 1: Trend of investment and savings as share of gross domestic product.

The investment/GDP ratio declined from 89.39% in 1981 to 53.12% in 1990 before recording a tremendous decline to 34.05% and 16.82% in 2000 and 2010 respectively. In the same period, the savings/GDP ratio declined from 88.39% in 1981 to 64.21% in 1990 before plummeting to 57.16% and 23.99% in 2000 and 2010 respectively. In 2015, the investment/GDP ratio was 14.83% while that of the savings/GDP ratio was 15.49%. These values declined to 14.72% and 15.47% respectively in 2017 before a mild rising trend set in. The investment/GDP ratio rose from 24.63% in 2019 to 28.65% in 2020; while the savings/GDP ratio also rose from 19.83% to 21.66% respectively in the two periods. One noticeable feature that can be pointed out here is that the investment/GDP ratio declines sharply than the savings/GDP ratio, showing that a one-to-one relationship does not exist between the two variables.

It is worth noting that although the savings-GDP ratio has been exhibiting a declining trend over the years, the cumulative savings for Nigeria has been exhibiting a rising trend (see Figure 2).

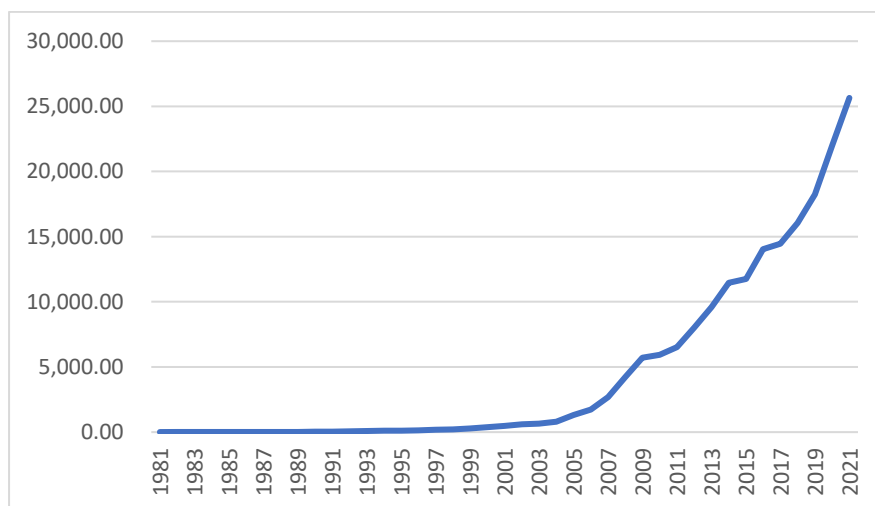


Figure 2: Trend of Cumulative Savings in Nigeria, 1981 – 2021.

Data from the Central Bank of Nigeria (CBN) depicts that the total savings for Nigeria was N6.56 billion in 1981 but rose to N12.52 billion in 1985 thus averaging 9.41 billion within the aforementioned period (see Table 1).

Table 1: Average domestic cumulative savings

Period	Cumulative Savings
1981-1985	9.41
1986-1990	21.86
1991-1995	79.47
1996-2000	235.02
2001-2005	770.07
2006-2010	4,064.73
2011-2015	9,473.37
2016-2020	16,954.46

Source: Researchers' Computation using data from CBN

The cumulative savings averaged N21.86 billion within 1986 to 1990 with a total of N13.93 in 1986 and N29.65 billion in 1990. This was followed by an upward trend to an average of N79.47 billion between 1991 to 1995 with a total of N37.74 and N134.50 billion for 1991 and 1995 respectively. As of 2016 to 2020, domestic savings averaged N16,954.46 billion with a record high of N25,648.26

billion recorded as at 2021. Given the rising trend of savings in Nigeria, it is also necessary to explore the growth rates of savings over the years. Figure 3 captures the behaviour of the growth rate of savings from 1982 to 2021.

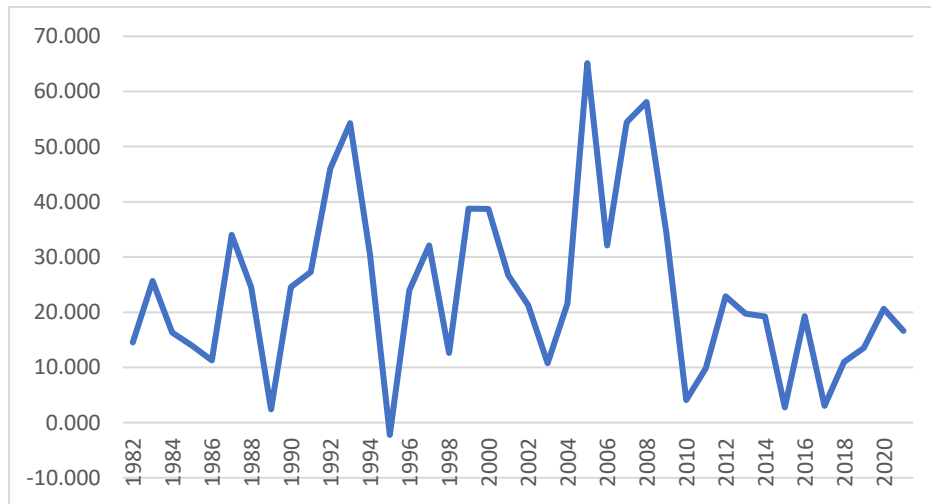


Figure 3: Trend of the growth rate in cumulative savings, 1982 – 2021.

It can be observed that the domestic savings in Nigeria has been exhibiting high degree of instability over the years. What could be quite interesting is that Nigeria has been reporting positive growth rates of savings for all the periods except for 1995 where the growth rate of savings of -2.23 was reported.

Given the cumulative savings so recorded over the years, the investment level has not been maintaining a stable or rising trend, but a fluctuating pattern (see Figure 4).

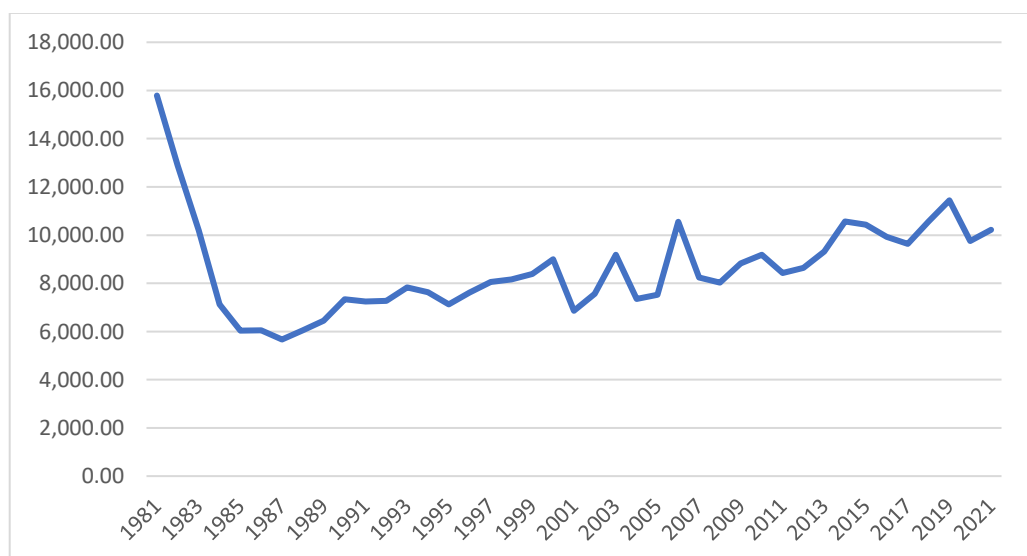


Figure 4: Trend of gross fixed capital formation, 1981 – 2021.

As could be observed from Figure 4, the level of investment (captured by the gross fixed capital formation) has been declining sharply in the 1980s. As could be observed, it declined from N15,789.67 billion in 1981 to N6,032.26 billion in 1985 with a further decline to N5,668.87 billion in 1987. The value of investment in the 1990s and the 2000s still exhibited some form of fluctuation. It can be observed that even as at 2021, the country's investment level could not reach that which was recorded as far back as 1981. In reality, the value of investment was put at N15,789.67 billion in 2021 as against N10,216.82 billion in 2021 which represents a 35.29% decline (Central Bank of Nigeria, 2021).

The average investment in Nigeria on a five-year basis is captured in Table 1.2, and it could still be observed that the average investment level in the early 1980s is far greater than that observed in recent years.

Table 2: Average Gross Fixed Capital Formation

Period	Gross Fixed Capital Formation (₦' Billion)
1981-1985	10,407.05
1986-1990	6,307.03
1991-1995	7,420.57
1996-2000	8,243.17
2001-2005	7,693.43
2006-2010	8,969.54
2011-2015	9,477.91
2016-2020	10,267.18

Source: Researchers' Computation using data from CBN

It could be inferred from Table 1.2 that the average investment within 1981 to 1985 was N10,407.05 billion which was far greater than N6,307.03 billion obtained between 1986 to 1990 (a 39.40 % decline). There was a 17.66% increase in the average level of investment between 1991 to 1995 compared to the previous period as the average level of investment increased to N7,420.57 billion in the stated period. A continuous rising trend was recorded until 2001 to 2005 where the average level of investment plunged to N7,693.43 billion as against N8,243.17 billion in the previous period. A rising trend continued for 2006-2010 (N8,969.54 billion), 2011-2015 (N9,477.91 billion), and for 2016-2020 (N10,267.18 billion).

In terms of the growth rate of investment in Nigeria, Figure 5 captures the high volatility nature of the macroeconomic variable over time. It could be observed that with the high volatility in the growth rate of domestic savings observed in Figure 3, growth rate of domestic investment also

exhibited high level of volatility over the years. The rate was -18.34% in 1982 and plunged to -30.17% in 1984. A sharp recovery was recorded in 1986 as the country recorded a 0.22% growth rate in domestic investment which was short-lived, as the country plunged back to -6.23% in 1987. Subsequently, the country recorded positive growth rates of domestic savings for three consecutive years (1988 to 1990) before returning to a -1.24% growth rate in 1991. The highest growth rate of domestic investment was recorded in 2006 with a growth rate of 40.39%.

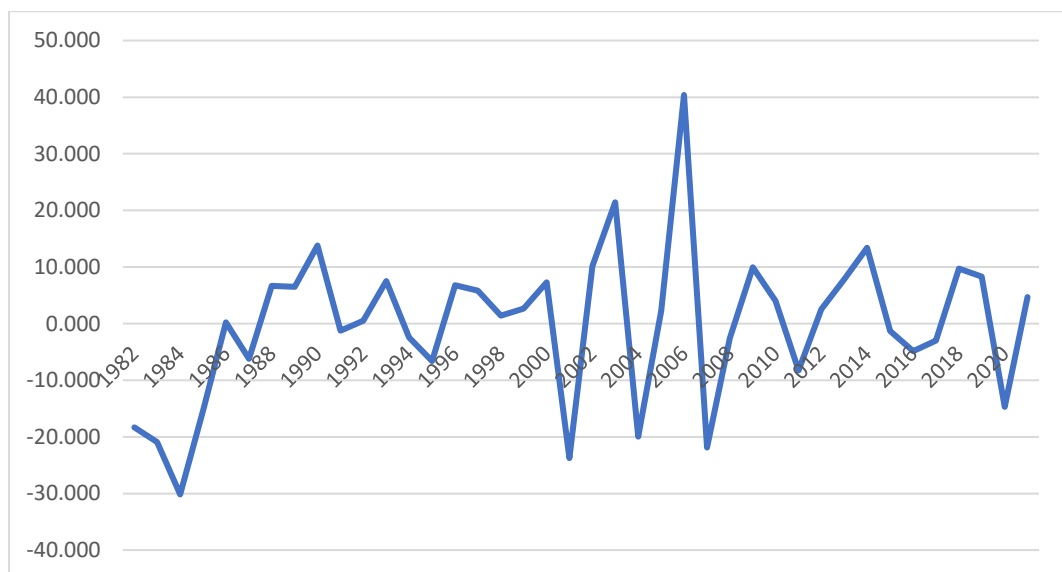


Figure 5: Trend of the growth rate in gross fixed capital formation, 1982 – 2021.

This high growth rate so recorded in 2006 was followed by negative growth rates for the two consecutive years which were -21.90% and -2.60% for 2007 and 2008 respectively. Apart from this huge growth rate, no other periods have so far reported such as the country keeps on recording negative and positive growth rates for some periods over the years. For example, the growth rate of investment in was -1.31% for 2015 while that of 2018 was 9.74%, before reaching -14.72% in 2020 and then to 4.66% in 2021.

The declining trend in savings-GDP ratio and Investment-GDP ratio observed in Figure 1 raises concerns as to whether the declining domestic saving rate in a country is correlated with a declining rate of domestic investment. Hence, this study seeks to examine whether the Feldstein-Horioka puzzle is valid within the Nigeria case. Our analysis will employ both the ordinary least squares approach to estimation, and the autoregressive distributed lag (ARDL) approach in the analysis with data from 1981 to 2020.

3. Research Methodology

3.1 The Data

Data for the study are all obtained from the World Bank database on World Development Indicators, and it covers the period of 1981 through 2020. The data are all expressed in percentages to capture the rate of change in the variables. The key variables in which the data is obtained on are investment as a ratio of gross domestic product ($\frac{I}{Y}$), savings as a ratio of gross domestic product ($\frac{S}{Y}$), and foreign direct investment as a ratio of gross domestic product ($\frac{F}{Y}$). Gross-fixed investments as a share of GDP and total domestic savings as a share of GDP are respectively used to capture domestic investments and savings in Nigeria.

Since our core concern is on the Feldstein-Horioka puzzle that tries to ascertain the degree of correlation between domestic savings rate and the rate of domestic investment, the need to observe the behaviour of these two variables becomes necessary. Figure 2 captures this behaviour over time.

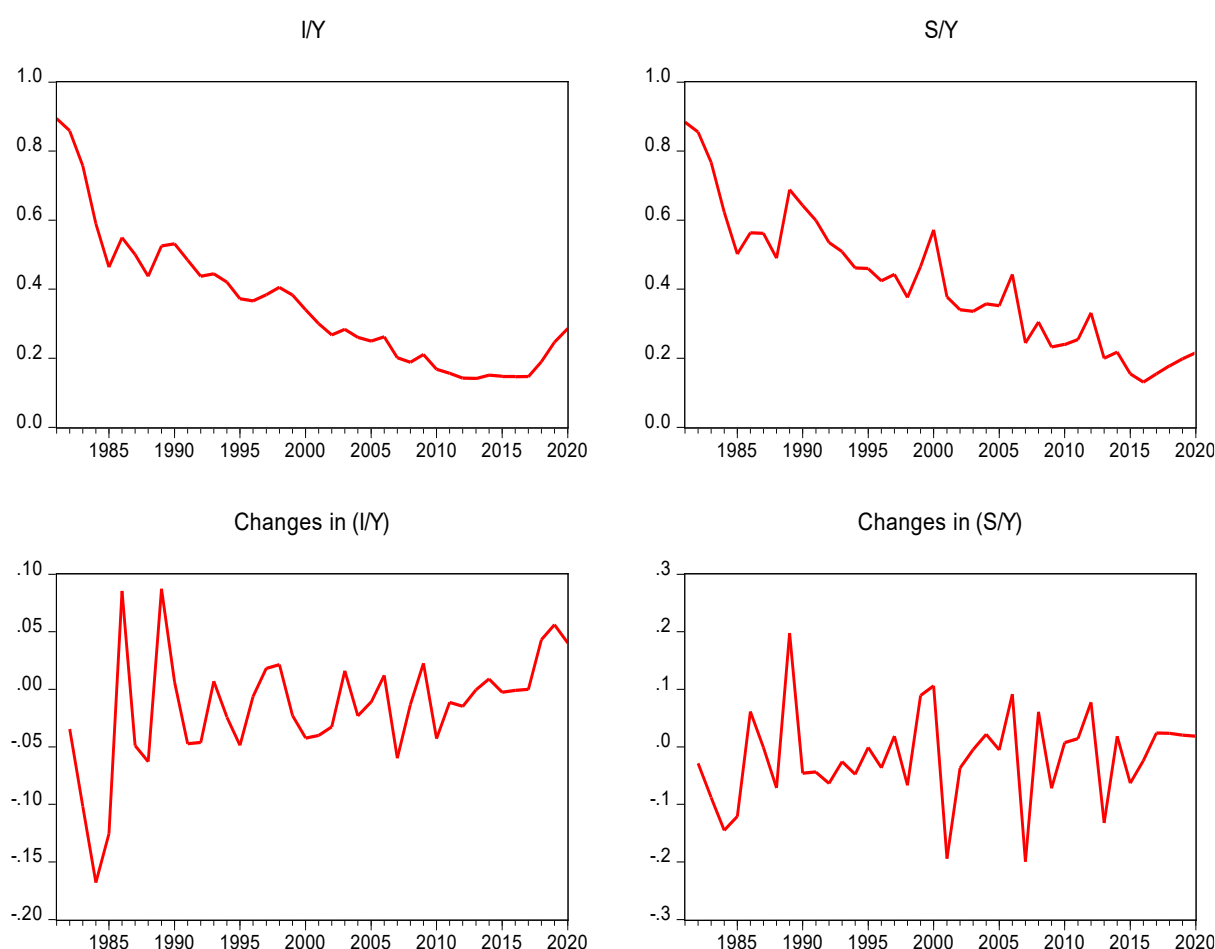


Figure 2: Investment and savings ratios and their rate of change.

A reflection on Figure 2 reveals that the level of investment as a share of GDP has been declining

over the years. This can be linked to the declining savings ratio experienced in the economy over the years. The changes in these variables also reflects high level of volatility over the year, with changes in the savings ratio being more volatile in the 2000s while the changes in the investment ratio tends to be more volatile in the 1980s. It can be adduced from Figure 2 that periods of high savings corresponds to periods of high investments and vice versa.

3.2 The Model

The model of this study follows the original specification by Feldstein and Horioka (1980) in their study to ascertain “whether a higher domestic saving rate in a country is correlated with a higher rate of domestic investment” (Akkoyunlu, 2020). The original model is specified thus;

$$\left(\frac{I}{Y}\right)_i = \theta + \beta_1 \left(\frac{S}{Y}\right)_i + \varepsilon_t \quad (1)$$

Whereby $\left(\frac{I}{Y}\right)_i$ captures the gross domestic investment as a ratio of gross domestic product in country i ; $\left(\frac{S}{Y}\right)_i$ measures gross domestic savings as a ratio of gross domestic product in country i ; β_1 is regarded as savings-retention ratio which is a measure of the extent of capital mobility in the country; and ε_t is the stochastic term.

By incorporating the risk associated with foreign direct investments, Equation (1) becomes:

$$\left(\frac{I}{Y}\right)_i = \theta + \beta_1 \left(\frac{S}{Y}\right)_i + \beta_2 \left(\frac{F}{Y}\right)_i + \varepsilon_t \quad (2)$$

In which $\left(\frac{F}{Y}\right)_i$ is the ratio of foreign direct investment to the gross domestic product, and every other item remains as earlier defined.

In detecting the long-run elasticity of investment-saving ratio in the midst of uncertainties associated with foreign direct investments, Equation (2) can be expressed as:

$$\left(\frac{I}{Y}\right)_t = \theta + \gamma_1 \left(\frac{I}{Y}\right)_{t-1} + \gamma_2 \left(\frac{S}{Y}\right)_{t-1} + \gamma_3 \left(\frac{F}{Y}\right)_i + \varepsilon_t \quad (3)$$

Based on Banerjee et al. (1998), the conditional long-run elasticities of investment ratio with respect to saving ratio is given by $\left(-\frac{\gamma_2}{\gamma_1}\right)$. This can be achieved using an F-test generated through an autoregressive distributed lag (ARDL) bounds test. The decision rule follows that when the F-statistic is below the lower bound, then the null hypothesis of “no cointegration” is upheld; but if the F-statistic is greater than the upper bound, then the null hypothesis is overruled. In a case where the F-statistic lies within the upper and lower critical bounds, then there is need to investigate the order of integration of the variables first for the purpose of obtaining a conclusive inference. This is done using an augmented Dickey-Fuller unit root test.

The need to incorporate the lagged terms and obtain the conditional long-run elasticities points to

the specification of an ARDL model under the established framework. This is done as follows:

$$\Delta\left(\frac{I}{Y}\right)_t = \theta + \gamma_i \sum_{i=1}^p \Delta\left(\frac{I}{Y}\right)_{t-i} + \sum_{i=1}^p \delta_j \Delta\left(\frac{S}{Y}\right)_{t-j} + \sum_{i=1}^p \varphi_k \Delta\left(\frac{F}{Y}\right)_{t-k} + \mu ECT_{t-1} + \varepsilon_t \quad (3)$$

In which Δ captures the difference operator; i, j, and k are the lag length of $\left(\frac{I}{Y}\right)$, $\left(\frac{S}{Y}\right)$, and $\left(\frac{F}{Y}\right)$ respectively; ECT is the error correction term; and μ which is expected to be negative and statistically significant measured the speed of adjustment plus a different way of showing the existence of cointegration concerning investment and saving ratios. Furthermore, long-run causality is established by the ECT , and its significance point toward confirmation of long-run causality from the savings ratio to the investment ratio.

4. Results

4.1 OLS Estimation

The OLS estimation is conducted first by strictly considering the savings ratio as it affects the rate of investments, and then we introduce the FDI to check how its uncertainties could also affect the investments in the domestic economy. The essence is to trace how capital mobility could also affect investment in the domestic economy.

Table 2: Ordinary least squares estimate without foreign direct investment

Variable	Coefficient	Standard Error	t-Statistic	Probability
S/Y	0.9379	0.0525	17.8627	0.0000
C	-3.3805	2.4087	-1.4035	0.1686
R-squared	0.8936	F-statistic		319.0749
Adjusted R-squared	0.8908	Prob(F-statistic)		0.0000

Source: Researchers' computation.

The result indicates that the rate of savings in Nigeria put forth a strong positive and significant influence on the rate of investment. As can be adduced from the coefficient, a 1% increase in the savings rate increases the rate of investment by 0.94% on the average. This finding aligns with the prediction of the Feldstein-Horioka hypothesis that savings is a great predictor of the level of investment. This can further be observed from the high R-squared of 0.8936 which portrays that 89.36% of the total variations in investments in Nigeria is accounted for by the variations in the rate of savings. The overall model is significant given that the F-statistic is significant at the 1% level.

Table 3: Ordinary least squares estimate with foreign direct investment

Variable	Coefficient	Standard Error	t-Statistic	Probability
S/Y	0.9542	0.0515	18.5131	0.0000
F/Y	-4.1705	2.2067	-1.8899	0.0666
C	-2.6699	2.3612	-1.1307	0.2654
R-squared	0.9029	F-statistic	172.1206	
Adjusted R-squared	0.8977	Prob(F-statistic)	0.0000	

Source: Researchers' computation.

In the presence of foreign direct investments, the rate of savings still yields a strong positive and significant influence on the rate of investment in Nigeria. A 1% increase in savings rate culminates to a 0.95% increase in the level of investment in the Nigerian economy. For foreign direct investment, the result reveals a negative and significant influence on the rate of domestic investment. Therefore, a 1% increase in foreign direct investment causes domestic investment to reduce by 4.17% on the average. The implication here is that capital mobility associated with foreign direct investment would likely result in capital flight which could be detrimental to the level of domestic investment. The model clearly reveals that the level of savings and foreign direct investment jointly accounts for 90.29% of the overall variation in the level of investments in the Nigerian economy, as the R-squared of 0.9029 clearly indicates. Meanwhile, the overall model is also statistically significant given that the F-statistic of 172.1206 is significant at the 1% level.

4.2 Unit Root

The data on investment, savings, and foreign direct investment are time series in nature and could be influenced by time. Therefore, it becomes pertinent to ascertain the unit root properties of the variables. This is done using the augmented Dickey-Fuller (ADF) unit root test that incorporates the constant and trend assumption in the estimation. Table 4 reflects on the result so obtained.

Table 4: Augmented Dickey-Fuller (ADF) unit root test result

Variable	ADF Statistic		Order of Integration
	Level	First Difference	
I/Y	-2.2615	-5.2526**	I(1)
S/Y	-4.338**	-----	I(0)
F/Y	-4.3662**	-----	I(0)

Source: Researchers' computation.

A clear inspection of Table 3 reveals that while the investment as a share of GDP only becomes stationary after first difference (being an $I(1)$ variable), both savings and foreign direct investment as a share of GDP are both stationary at level (they are $I(0)$ variables). Hence, we have a model where the variables are in mixed order integration of level and first difference. In this scenario, the appropriate test for cointegration will then follow the autoregressive distributed lag bounds testing approach.

4.3 Cointegration

With our variables being $I(0)$ and $I(1)$, the conventional Engel-Granger cointegration test approach may not be appropriate for use. Thus, the ARDL bound test is deployed to ascertain whether our variables exhibit any form of long-run (levels) relationship. Table 5 and Table 6 present the result of the test without and with foreign direct investment respectively.

Table 5: Bound testing cointegration result without foreign direct investment

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance	I(0)	I(1)
F-statistic	5.0465	10%	3.02	3.51
k	1	5%	3.62	4.16
		1%	4.94	5.58

Source: Researchers' computation.

Based on the decision rule, the F-statistic of 5.0465 is greater than the 5% critical bound value of 4.16 which is a clear indication that the null hypothesis of 'no levels relationship' is rejected. Hence, cointegration exists and a long-run relationship exists between the level of savings and the levels of investment in the Nigerian economy.

Table 6: Bound testing cointegration result with foreign direct investment

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance	I(0)	I(1)
F-statistic	4.3316	10%	2.63	3.35
k	2	5%	3.10	3.87
		1%	4.13	5.00

Source: Researchers' computation.

The cointegration result here also portrays that the F-statistic of 4.3316 is greater than the 5% upper bound critical value of 3.87 hence, the null hypothesis of ‘no levels relationship’ is also rejected. It follows that a long-run relationship exists in the midst of domestic investment, domestic savings, and foreign direct investment in Nigeria. In this regard, we will therefore estimate the ARDL model to obtain the conditional long-run elasticities as well as the error correction model both for the model with and without foreign direct investment.

4.4 Autoregressive Distributed Lag (ARDL) Model Estimation

The ARDL estimation is premised on the existence of levels relationship and the result is presented based on the specified models.

Table 7: Autoregressive Distributed Lag Model result without foreign direct investment

Dependent Variable: I/Y				
Selected Model: ARDL(1, 1)				
Variable	Coefficient	Standard Error	t-Statistic	Probability
I/Y(-1)	0.7818	0.1092	7.1560	0.0000
S/Y	0.3368	0.0882	3.8172	0.0005
S/Y(-1)	-0.2153	0.1048	-2.0550	0.0474
C	1.7290	1.6222	1.0658	0.2938
R-squared	0.9581	F-statistic		266.5350
Adjusted R-squared	0.9545	Prob(F-statistic)		0.0000

Source: Researchers’ computation.

The ARDL result presented in Table 8 indicates that both the rate of savings and the one-period lag of the level of investment has a positive and significant influence on the level of domestic investment in the Nigerian economy. The one-period lag of investment indicates that the past period level of investment increases the current period investment by 0.78% on the average. This portrays that investment is strongly endogenous in predicting itself. Further, the savings rate also has a positive and significant influence on the rate of investment, with a 1% increase being associated with a 0.34% increase in the rate of investment. However, the one-period lag of the rate of savings put forth a negative and significant influence on the rate of investment. Thus, the past period saving rate reduces the current level of investment by 0.22% on the average.

It can be pointed out that the conditional long-run elasticity in the model is $(-(-0.2153)/(0.7818))$ 0.28% showing that a 1% increase in savings ratio increases the investment ratio by 0.28% in the absence of uncertainties associated with foreign direct investment. The model explains 95.81% of

the total variation in the rate of investment, and it is significant as validated by the significance of the F-statistic.

Table 8: Autoregressive Distributed Lag Model result with foreign direct investment

Dependent Variable: I/Y				
Selected Model: ARDL(1, 1, 0)				
Variable	Coefficient	Std. Error	t-Statistic	Probability
I/Y(-1)	0.8510	0.1195	7.1217	0.0000
S/Y	0.2809	0.0965	2.9113	0.0063
S/Y(-1)	-0.2405	0.1052	-2.2859	0.0286
F/Y	2.0439	1.5115	1.3523	0.1852
C	1.8723	1.6068	1.1652	0.2520
R-squared	0.9602	F-statistic		205.0909
Adjusted R-squared	0.9555	Prob(F-statistic)		0.0000

Source: Researchers' computation.

With the foreign direct investment being included in the model, the initial result is still as earlier obtained in reference to the signs and significance but only differs in the magnitude of the parameter estimates. The one-period lag of the rate of investment increases the current rate of investment by 0.85% on the average, while the one-period lag of the rate of savings reduces the rate of investment by 0.24% on the average. The implication here is that the past savings level could not support the current level of investment. However, the current rate of savings causes the rate of investment to increase by an average of 0.28% if it is increased by 1%; while the rate of foreign direct investment put forth an insignificant influence on the rate of domestic investment, though the effect is positive. With the presence of uncertainties associated with foreign direct investment, the conditional long-run elasticity remains $(-(-0.2405)/(0.8510))$ 0.28, implying that a 1% increase in savings ratio increases the investment ratio by 0.28%. This indicates that whether there are uncertainties related to foreign direct investment or not, the conditional long-run elasticities for Nigeria remains the same. Hence, uncertainties in foreign direct investments does not influence the level of domestic investment in Nigeria rather, the key driver of investment is the level of savings as predicted in the Feldstein-Horioka hypothesis. The model explains 96.02% of the total variation in the rate of domestic investment, as captured by the R-squared, and is statistically significant overall.

4.4 Error Correction Model

To check on how the estimated models adjusts to attain long-run equilibrium in the two cases, Table 9 and Table 10 presents the error correction model result.

Table 9: Error correction model result for the model without foreign direct investment

Variable	Coefficient	Standard Error	t-Statistic	Probability
$\Delta(S/Y)$	0.3368	0.0717	4.6945	0.0000
CointEq(-1)	-0.2182	0.0546	-4.0006	0.0003
R-squared	0.4957		Durbin-Watson stat	1.8589
Adjusted R-squared	0.4820		S.E. of regression	3.5953

Source: Researchers' computation.

In the absence of uncertainties associated with foreign direct investment, the short-run error correction model indicates that changes in savings have a positive and significant influence on changes in investment. A 1% increase in savings rate will cause the rate of investment to increase by 0.34% on the average in the short-run. The error correction term is negative and statistically significant as required, and shows that 21.82% of the short-run distortions in the rate of investments is corrected annually for the equilibrium to be restored. This speed of adjustment is quite slow, and it is likely to take about four years and six months for the equilibrium to be fully restored. The R-squared showcases that the savings rate account for 49.57% of the total variation in the rate of investment in the short-run.

Table 10: Error correction model result for the model with foreign direct investment

Variable	Coefficient	Standard Error	t-Statistic	Probability
$\Delta(S/Y)$	0.2809	0.0725	3.8724	0.0005
CointEq(-1)	-0.1490	0.0343	-4.3423	0.0001
R-squared	0.5214		Durbin-Watson stat	1.8935
Adjusted R-squared	0.5085		S.E. of regression	3.5023

Source: Researchers' computation.

In the midst of uncertainties associated with foreign direct investment, changes in savings rate only accounts for about 0.28% increase in investment if increased by 1%. Meanwhile, the error correction term possesses the required qualities and indicates that 14.90% of the disequilibrium in the model

is corrected on a yearly basis for the restoration of long-run equilibrium. Hence, it will take about six years and seven months before the full equilibrium can be restored. This is evidence of a slow pace of adjustment in the model over time. With foreign direct investment, the model explains 52.14% of the total variation in the rate of investment in the Nigerian economy.

5. Conclusions

The economic analysis of the equilibrium level of income portrays that for equilibrium to be achieved, the level of savings must be equal to the level of investment. The importance of saving in the economy is further captured in the Harrod-Domar growth model, where increased savings rate with a reduction in capital consumption will definitely lead to a rise in the capital stock. Savings mobilization is therefore sacrosanct in driving the economy to a sustainable level. In this paper, we examined the Feldstein-Horioka hypothesis which states that “a higher domestic saving rate in a country is correlated with a higher rate of domestic investment”. The study is a country-specific study using time series data from 1981 through 2020. This country-specific study utilizing time series data is regarded as being better as it overcome the drawbacks of cross-sectional analysis like sample selection prejudice, and the negligence of the country-specific saving-investment structure, structural changes, government policies, and country-specific shocks (De Vita & Abbott, 2002; Akkoyunlu, 2020).

Apart from considering the savings-investment relationship, this study also considers the uncertainties in foreign direct investment as it affects the level of domestic investment. The paper utilized both the OLS and ARDL approaches in the analysis of the data. The OLS result portrayed that the Feldstein-Horioka hypothesis is valid in the case of Nigeria hence, savings is paramount in driving the level of investment in the Nigerian economy with or without uncertainties in foreign direct investment. With the ARDL approach, the bounds test supported evidence of cointegration which implies that there is a long-run relationship between savings and investment in the Nigerian economy. The conditional long-run elasticity was estimated to be 0.28 which is a clear indication that the Feldstein-Horioka puzzle is valid in Nigeria, though the proportion of the influence is low. By following the Feldstein-Horioka hypothesis, this study concludes that the level of savings in the Nigerian economy is a crucial variable that influences the level of investment in the economy. This therefore calls for the need for a developed financial system and appropriate monetary policy action that could enhance savings mobilization for the fructification of investments in the country.

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