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Saving-Investment Gap and Economic Growth in Developing Countries: Simulated Evidence from Selected Countries in Africa

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

It is a challenge for most developing countries, especially in Africa, to mobilize domestically enough capital to meet their extensive investment needs because of two main reasons: the undeveloped nature of their financial system and the low rate of access of households to basic financial products. This study analyzes the impacts of persistent savings (S)-investment (I) gaps on economic growth using a sample of 5 developing countries in Africa - Egypt, Côte d'Ivoire, Ghana, Kenya and Nigeria. The methodology of this study is based on a Ramsey model within a general equilibrium framework where consumption and savings are the determinant factors in a typical household's utility function. Calibrations and simulations indicate significant gaps between optimal and actual levels of savings and investment. Furthermore, the findings point out that these gaps are associated with relatively lower growth rates of actual output compared to simulated output, with the notable, but limited, exception of Nigeria until 2019. It accordingly becomes appropriate to suggest policies addressing both the structural and non-structural factors that limit the ability of these developing countries to effectively bolster households' deposits.

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1. INTRODUCTION

Emerging countries in Asia have bolstered the long-established paradigm that identifies domestic savings as the backbone of any sustainable development process. This stylized fact has generated lots of interests among academics and development partners as attested by the extensive body of theoretical and empirical studies that exists on the impact of domestic savings on real output. Another stylized fact is that developing countries in general, and the ones in Africa in particular, present a picture dually characterized by (i) low domestic savings in volume and as a share of gross domestic product (GDP) and (ii) the absence of both tangible and adequate policies to promote domestic savings.

With a financial system that lacks depth and breadth, let alone the absence of strong and effective regulatory institutions, African countries face challenges when attempting to mobilize capital domestically to meet their massive investment needs. It is critical that these countries explore in earnest means and ways to tap into their domestic markets in light of their limited access to international capital markets. Such an approach is viable and has the merit of making these countries less dependent on international capital markets. It also reduces the uncertainty associated with the collection of funds to finance the development of infrastructure systems or support other macroeconomic policy priorities. Indeed, the twofold goal of generating sustained economic growth and making a dent in the level of poverty is unattainable for African countries unless substantial direct investments in the creation, expansion and maintenance of infrastructure are made. In other words, domestic direct investment through domestic savings or domestic capital markets must be the centerpiece of the much-needed infrastructural transformation in African countries.

According to the World Bank's African Development Indicators [1], gross domestic savings as a fraction of GDP across Africa is relatively low. It roughly stood at 20, 17 and 21 per cent in the 1980s, 1990s and 2000s, respectively. Comparatively, these figures were 28, 32 and 32 per cent respectively for Asian countries over the same periods [2].[i]

This paper endeavors to investigate through a dynamic simulation exercise the impacts of persistent and large savings-investment gaps on economic growth. It will derive in the process the costs associated with these low savings rates in terms of economic growth forfeited.

The literature abounds in papers pertaining to savings, capital accumulation and economic growth in both developing and developed countries.

It is impossible to entertain a substantive discussion about savings, capital accumulation and economic growth without referring to the pioneers of economic development and growth models of the likes of [3,4,5,6,7], among others. The common denominator of all these studies remains the indispensable nature of both savings and investment in achieving sustained economic growth.

As elaborated by [8], a country that does not generate enough savings to fund investment must find external sources of funding or incur a cost at the macroeconomic level in the form of "slow progress in [economic] development." Ultimately, such a cost will impact income distribution in a given country.

Many Asian countries (China, Japan and East Asian Tigers) have been renowned for higher rates of savings comparatively to other regions of the globe. These high rates have prompted some scholars such as [9] to examine the optimality of savings, more specifically, as it applies to China. Using an open economy Ramsey model with both perfect and imperfect world capital, they uncover that savings in China are excessive. This finding implies that current generations forgo higher consumption, which leads to a sub-optimal level of consumption in the economy, at equilibrium.

On another note, [10] focuses on India to explore whether or not domestic savings cause economic growth. Their methodology mainly utilizes two well-known estimation techniques in the literature: co-integration and maximum likelihood. In accordance with the neoclassical and post-neoclassical models of economic growth, they establish that savings have long-run effects on income. Furthermore, they find out that growth impacts savings as well - establishing thereby that there is a bidirectional cause and effect relationship between savings and growth. [11] comments on the relationship between the balance of payments of the United Kingdom (UK) and the savings gap. Through a careful analysis of trends in UK's investment-savings gaps from 1960 to 2007, she reaches the conclusion that the balance of payments deficit experienced by this country is proportional in size to the investment-savings gap. To promote savings and reduce this gap, she proposes among other policies the imposition of taxes on consumer credit and mortgages and the subsidy of savings.

In explaining both low savings rates and large savings-investment gaps in developing countries, [12] point to the scarcity of formal financial intermediaries in these environments where informal intermediaries have flourished. For instance, there exist systems such as the Caja de Ahorros in Panama, Susu in Ghana and Ton Ton in Sierra Leone and Islamic banking, among others. Using macroeconomic identities, they determine, in the case of the latter, that savings-investment gaps are worsened as it promotes higher consumption.

This paper is organized as follows. The next section presents some perspectives regarding savings and investment in Africa. Section 3 discusses the macroeconomic model used in this study. In section 4, calibrations are made and results of simulations are shown and commented. Concluding remarks are made in the fifth section.

2. AFRICAN HOUSEHOLDS: SAVINGS PATTERNS AND HABITS

From their independence until the beginning of the 21st century, most developing countries in Africa heavily relied on overseas development assistance (ODA) to fund the bulk of investment needed to prop growth and create a sustainable economic development path. Consequently, the domestic and regional financial markets-as sources of funds - were neglected considering that no or few viable policies were actively implemented to shore up domestic savings, especially households' savings.

For the sample of African countries considered in this study, the average savings rates have hovered between 6 and 23 per cent of GDP since 1980. Ghana for instance reached average savings rates of 6.2, 7.3 and 5.6 per cent in the 1980s, 1990s and 2000s, respectively. These rates have remained modest, especially in the most recent years. Such a situation has underscored the heavy reliance of the country on foreign sources of capital to address its domestic investment needs. It is important to emphasize that all modern economies vie to create a competitive environment to attract foreign investment. However, one cannot stress enough the fact that foreign investment or foreign sources of capital should not be a substitute for domestic investment or domestic sources of capital, which is

essential to sustain economic development and create a balanced growth path less subject to external factors or shocks.

On the other hand, Nigeria has exhibited higher rates of 19.6, 24.7 and 23.9 per cent respectively in the 1980s, 1990s and 2000s.[ii] These rates, although moderate, pale in comparison to those of a developing country such as China, which boasted rates of 35.4, 41.1 and 47.3 per cent, respectively, over the same periods (Fig. 1).

In sum, it appears that domestic savings rates are relatively low in most African countries, except for countries like Nigeria where these rates are moderate. It is noteworthy that the lion's share of domestic savings by African households is in the form of nonfinancial assets [13]. This fact compounds the existing challenges encountered in the mobilization of resources by drastically reducing the pool of resources available through the domestic financial capital market. A natural consequence of such an environment is a rampant savings-investment gap.

Furthermore, the bank access rate remains low in our sample of countries in particular and African countries in general. The latest figures obtained in 2011 show that these rates are below 50 per cent for all countries in our sample (Fig. 2). Diligent efforts to improve the bank access rate will expand a great deal the pool of funds that can domestically be tapped into.

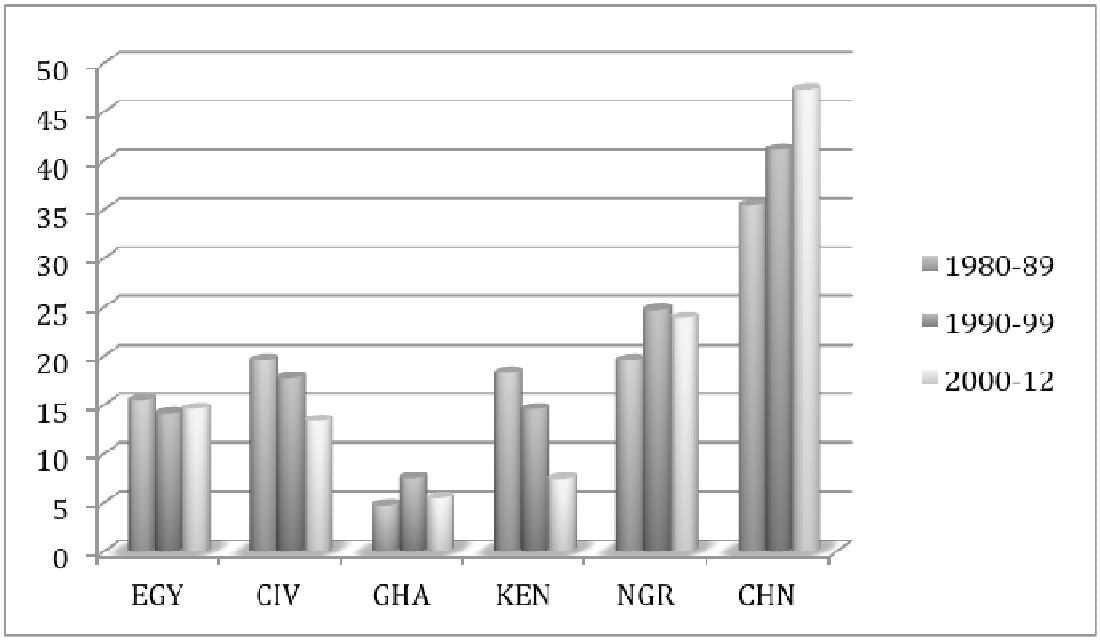


Fig. 1. Gross domestic savings (% of GDP)
Source: World Development Indicators (World Bank).[iii]

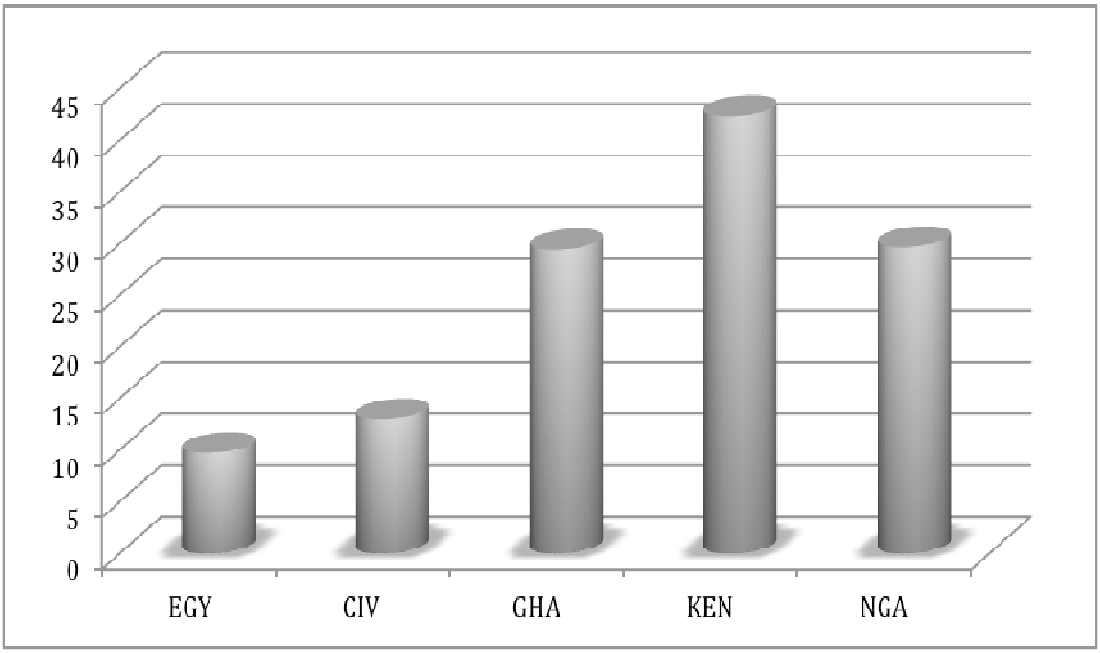


Fig. 2. Rate of Adults with an Account at a Formal Financial Institution (%), 2011[iv]
Source: Global Financial Development (World Bank) and BCEAO (Central Bank of West African States), Annual Report, 2011

3. MODEL

The methodology of this project is based on a Ramsey model within a general equilibrium framework. We assimilate each African developing country to a small-open economy with three sectors-household, firm and government. The model follows [14,15].

3.1 Household Sector

The representative household's lifetime utility depends on savings and consumption, which use up her entire income at each time period. The preferences of a typical household are captured by a (utility) function U(.) that exhibits intertemporal dependency in consumption, through habit formation, and separability between consumption and savings. As a result, U(.) can be defined as

$$U(C_t, S_t) = \alpha\log(C_t - vC_{t-1}) + (1-\alpha)\log(S_t) \quad (1)$$

where C_t and C_{t-1} represent spending on consumption goods at time t and t-1, respectively; and S_t is savings. We assume that both C_t and S_t are nonnegative, and the former is also nonzero. α is the fraction of household's income spent on consumption, while v captures habit formation or any aspect of past consumption patterns subsequently carried over. More specifically, the past refers to the previous period, t-1, only. $0<\alpha<1$ and $v>0$.

v is relevant in this formulation considering that a typical African household is more likely to adopt a rather conservative approach as far as consumption is concerned. Two main rationales could support this fact. First, the average size of a typical African household or

"family" is large, and its definition is culturally different from the one prevailing in Western countries. Second, there is a relatively high poverty rate and a dominant rural population. Thus, it is likely that v will carry a relatively high value.

Optimality for the representative agent is reached when she maximizes her lifetime utility with respect to C_t and S_t subject to the budget constraint:

$$w_t L_t + r_t S_{t-1} + T_t = C_t + S_t \quad (2)$$

where, at time t = 1, 2, 3,…, w_t and r_t are the remunerations of labor and capital respectively. S_t is savings and T_t accounts for government transfers received.

3.2 Firm Sector

Output production is characterized by a Cobb-Douglas function:

$$Y_t = A_t K_t^a L_t^{1-a} \quad (3)$$

where, at time t = 1,2,3,…, Y_t stands for output; A_t captures the state of technology and K_t is a measure of capital stock. Additionally, *a* is the partial elasticity of output with respect to capital – the capital share of output – and (1-a) indicates the partial elasticity of labor with respect to output – the labor share of output. The optimization problem for the typical firm sums up to choosing the appropriate levels of K_t and L_t that maximize its profit. That is,

$$\underset{\{K_t, L_t\}}{Max}\left[A_t K_t^a L_t^{1-a} - r_t K_t - w_t L_t \right] \quad (4)$$

3.3 Government Sector

The government of any representative economy has two sources of revenue: tax and borrowing. The latter is achieved through bonds issuance, while the former applies essentially to consumption in the form of a value added tax (VAT). The revenue collected serves two main purposes and is entirely spent at each time period. On the one hand, it is used to retire previous debt and it helps finance, on the other hand, a variety of social programs and the provision of public goods through transfers to households. Based on these premises, the government budget constraint is set up as follows:

$$\tau_t C_t + b_t = T_t + R_t b_{t-1} \quad (5)$$

where, at time t = 1,2,3…, b_t is borrowing (in the form of bonds issued) and R denotes the world interest rate that applies to borrowing contracted by the government on international capital markets.[v]

Following the definition of the model, we proceed to solving it by deriving the first-order conditions and steady states that will serve as the basis for simulations.

The first-order conditions associated with the representative firm yield

$$r_t = aA_tK_t^{a-1}L_t^{1-a} \tag{6}$$

and

$$w_t = (1-a)A_tK_t^{a}L_t^{-a} \tag{7}$$

Equations (6) and (7) can further be expressed on a per capita basis

$$r_t = aA_tk_t^{a-1} \tag{6'}$$

and

$$w_t = (1-a)A_tk_t^{a} \tag{7'}$$

where, at t = 1, 2, 3,…, k_t represents capital per unit of labor.

The transition law of capital can be written as

$$K_t = (1-\delta)K_{t-1} + I_t \tag{8}$$

where I_t is investment at t = 1,2,3,…

Lemma: S_t is not different from I_t as government's savings does not exist, or is assumed negligible. In other words, $S_t \equiv I_t$.[vi]

Using Equation (1) and lemma 1, Equation (8) becomes

$$S_t = K_t - (1-\delta)K_{t-1} \tag{9}$$

Therefore, the final form of a typical household's budget constraint is:

$$w_tL_t + r_tS_{t-1} + T_t = C_t + K_t - (1-\delta)K_{t-1} \tag{10}$$

The Lagrangian resulting from the optimization problem is written as follows:

$$L = \sum_{t=1}^{\infty}\varepsilon^t\left[\alpha\log(C_t - \nu C_{t-1}) + (1-\alpha)\log(S_t)\right] + \sum_{t=1}^{\infty}E_{t-1}\left\{\varepsilon^t\lambda_t\left[C_t + K_t - (1-\delta)K_{t-1} - w_tL_t - R_tS_{t-1} - T_t\right]\right\} \tag{11}$$

Using Equation (11), the first-order conditions are derived as follows, after rearranging:

$$\lambda_t = \frac{\alpha}{C_t - \nu C_{t-1}} + \frac{\alpha\nu}{C_{t+1} - \nu C_t}\varepsilon \tag{12}$$

$$\varepsilon^t\lambda_t\left[\frac{a(1-a)}{K_t}Y_t + \frac{a(a-1)}{K_t^2}Y_tS_{t-1} - 1\right] = \varepsilon^{t+1}E_t\lambda_{t+1}(1-\delta) \tag{13}$$

$$\varepsilon^{t}(1-\alpha)\frac{1}{S_t}=\varepsilon^{t+1}E_t\lambda_{t+1}R_{t+1} \quad (14)^{vii}$$

The parameters of the model are a, α, δ, v and ε and the identified exogenous variables are R_t, A_t, w_t and r_t and T_t.

3.4 Parameterization and Calibration of the Prototype Model

After deriving the solutions to the economic problem, the simulation processes for the paths of savings and investment, and savings-investment gap, and output can be completed for Egypt, Côte d'Ivoire, Nigeria, Ghana and Kenya. This step requires the parameterization of our model that is summed up in Table 1.

Table 1. The parameter values

Parameters	Source	Values				
		EGY	CIV	GHA	KEN	NGA
a	WDI, AfDB	0.6	0.7	0.7	0.69	0.7
α	WDI, AfDB	0.8	0.85	0.83	0.7	0.65
δ	WDI, AfDB	0.08	0.095	0.086	0.081	0.045
v	Authors	0.6	0.65	0.65	0.65	0.65
ε	WDI, AfDB, IFS	0.891	0.95	0.814	0.842	0.887

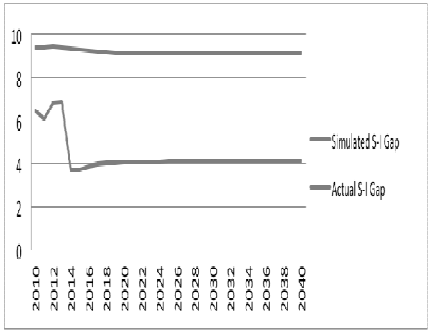
In a second step, the prototype model is calibrated for each country using the year 2010. Simulations are conducted from 2010 to 2040 using the method by [16,17]. As far as the data generating process is concerned, an AR (2) model is used for Côte d'Ivoire and Ghana. For Nigeria and Kenya, an ARMA (2,3) is considered, while an ARMA(3,1) is found to be appropriate Egypt.[viii]

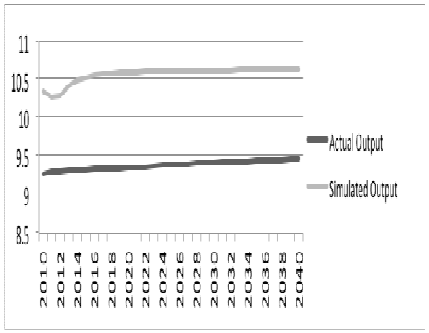
4. RESULTS[ix]

Fig. 3 reports the outcomes of simulations for Côte d'Ivoire (CIV) when the SI gap is contained and reduced. Indeed, from 2010 through 2040, the simulated gap remains on the average 52 per cent lower than actual values. More specifically, this figure hovers around 46, 55 and 54 per cent for the 2010s, 2020s and 2030s, respectively (Table 2). On the other hand, it appears that such a reduction in the gap for this country generates a substantial boost in output. This boost ranges between 10 and 13 per cent over the period of interest through 2040, with an average of 12.5 per cent. In other words, the country's real output level is expected to be about 12.5 per cent higher than actual (real) output, on the average, if it were to diligently implement policies intended to halving the SI gap.

Table 2. Reduction targets in SI gaps (in percentage) [x]

PERIOD	CIV	EGY	GHA	KEN	NGA
2010-2019	46.8371932	19.5196052	75.4863834	74.17878333	-
2020-2029	55.03938464	19.25681193	66.45335995	48.74071509	70.24448219
2030-2040	54.80382436	18.64896329	66.90283	30.54222683	73.04731857
Average	*52.2*	*19.1*	*69.6*	*51.1*	*40*





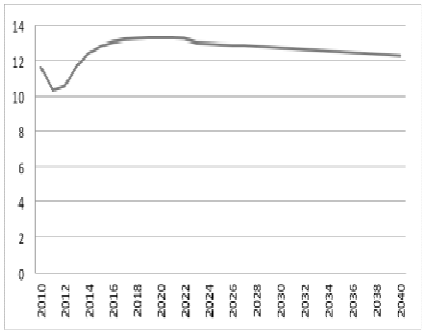
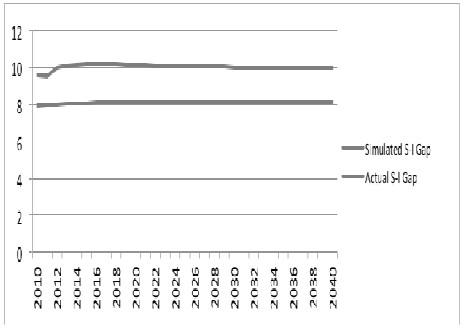
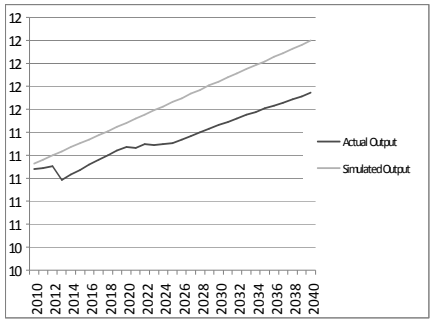


Fig. 3. Côte d'Ivoire





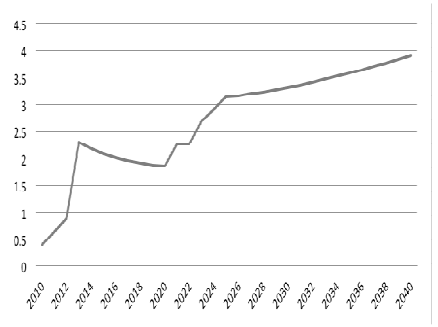


Fig. 4. Egypt

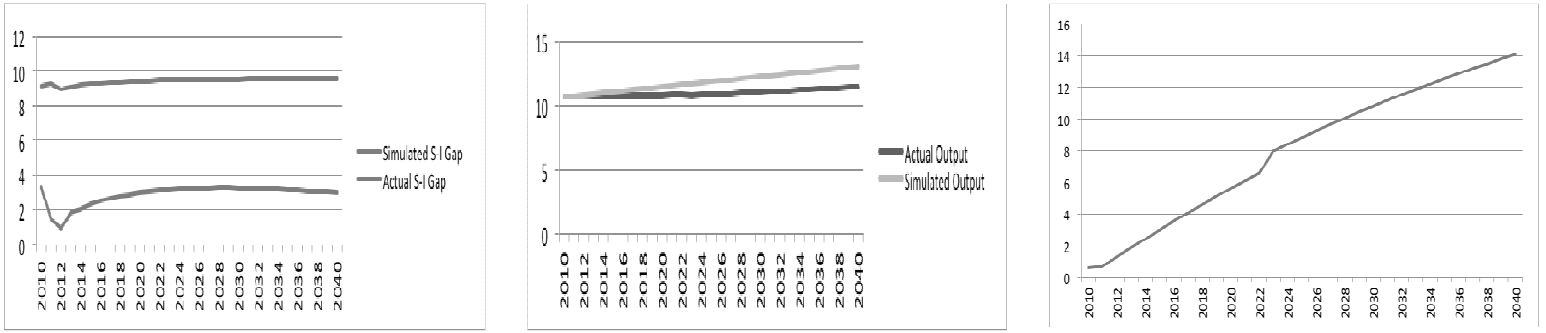


Fig. 5. Ghana

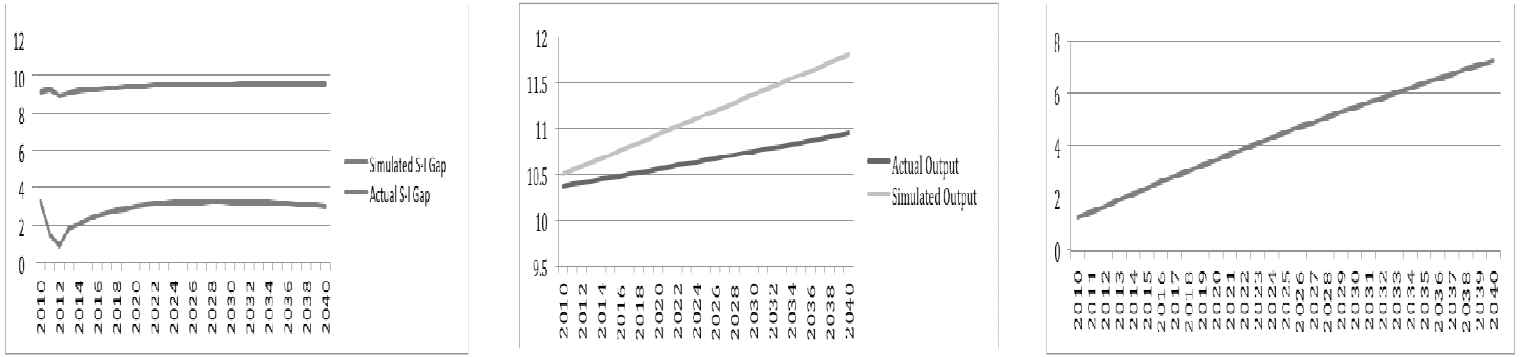


Fig. 6. Kenya

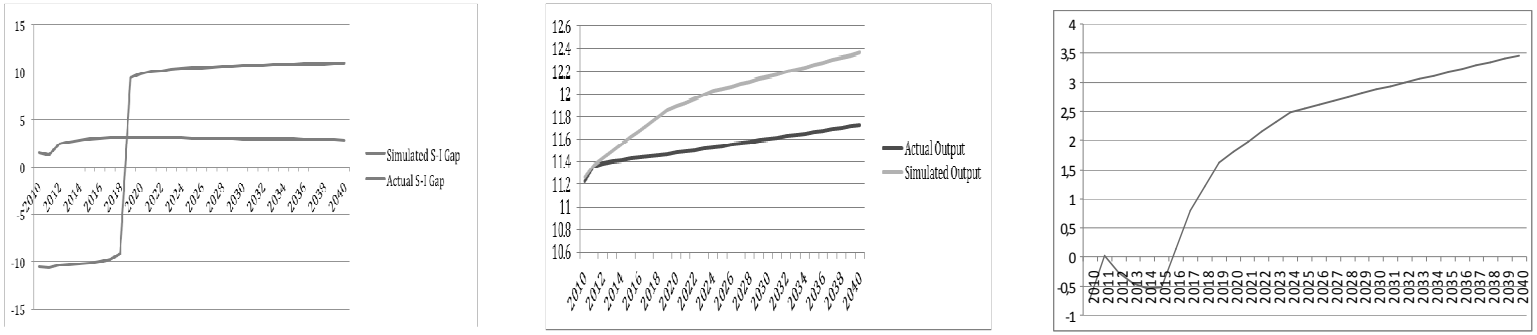


Fig. 7. Nigeria

As far as Egypt (EGY) is concerned, Fig. 4 reveals that the simulated SI gap is about 19 per cent lower than the actual one from 2010 to 2040 (Table 2). By curbing this gap, the study points out that EGY will be able to reach a level of output about 2.7 per cent greater than its actual level, on the average, over the period aforementioned. This figure is relatively small compared to the one of CIV. However, it is noteworthy that these simulations find out that EGY will cross the $1 trillion landmark for RGDP in the vicinity of the year 2035.

As reported in Table 2, the simulated SI gap is found to be 69 per cent below its actual level for Ghana, on the average. This is the largest decrease for the 5-country sample considered in this study (Fig. 5). This figure reaches a peak of 75 per cent in the 2010s. Over the period of interest, the analysis shows that simulated output is about 8 per cent higher than actual output once the reduction target of SI gap is achieved.

For Kenya (KEN) and Nigeria (NGA), the simulations reckon reduction targets of 51 and 40 per cent, respectively, in SI gaps (Figs 6 and 7). These targets in turn bring about an additional real output gain of 4.5 per cent for Kenya and 2 per cent for Nigeria. For the latter country, the real output will cross the $1 trillion mark around 2025, approximately 10 years before Egypt.

Moreover, a peculiarity is noteworthy. Indeed, until around 2019, simulations results indicate that savings surpass domestic investment. As a result, one notices that simulated output globally trails actual output over that time period. This finding is unique to NGA. However, from 2019 onwards, it appears that the trend is reversed as savings lag behind domestic investment.

This fact transpires as well in the comparison between simulated and actual output with the former outpacing the latter.

Overall, this simulation exercise for CIV, EGY, GHA, KEN and NGA has highlighted that a reduction in the SI gap is associated with a faster expansion of real output.

To reduce this gap in practice, concrete steps to reverse the low access rate of households to financial institutions could be taken to grow the available pool of domestic fund to finance domestic investment. Among other measures that could be impactful, a framework should be implemented to drastically reduce or eliminate altogether fees charged to individuals to open and/or operate a bank account - savings or checking. Indeed, these fees prove exorbitant in an environment where tens of millions live with less than a dollar a day. Furthermore, paperwork must be slimmed down to the minimum, as obtaining certain documents, namely identity cards, can prove challenging for many [18]. Another approach that could be contemplated is the introduction of a well-thought subsidy scheme for savings, as advocated by [11].

Moreover, to increase the access of households to financial outlets, para-financial institutions and new technologies should be introduced and expanded. For instance, post offices and other microfinance institutions could be part of the solutions. It is also imperative that authorities develop safeguards that protect all depositors, especially the small ones, as confidence in the financial system is indispensable. This is crucial as illiteracy rates are still high in these developing countries. Indeed, it is unlikely that an illiterate farmer in some remote area will harbor enough confidence to deposit his hard earned income with any institution. As far as new technologies are concerned, the prevalence of cell-phone users in

most African countries can be an asset in promoting mobile banking based on the experiences of countries like Kenya and Nigeria.

5. CONCLUSION

This paper has endeavored to investigate the relationship between SI gaps and output using a Ramsey model within a general equilibrium framework. Simulation exercises for a selection of 5 developing countries in Africa are conducted. Within our framework and the 5 sets of calibrations performed, results seem to conclusively point to positive impacts of reductions in SI gaps on output expansion. This finding suggests that the implementation of effective policies to decrease the SI gap could be considered as a viable option by decision-makers in their attempt to boost economic growth in their respective countries.

All in all, developing countries in general and African countries in particular should earnestly open a new chapter regarding the mobilization of resources to finance their vast investment needs. Mobilizing and relying on - their own - domestic resources should henceforth be front and center of that new chapter, which will usher in the beginning of a new development paradigm in Africa.

Notes

[i] *The Asian countries considered are China, South Korea, Philippines, India, Indonesia, Malaysia and Thailand.*

[ii] *The years 2000s are extended through 2012 to include the most-up-to-date data in this study.*

[iii] *Data from Nigeria were collected from the African Development Bank Socio-economic database [19].*

[iv] *For member states of the West African Economic and Monetary Union, data were unavailable for Côte d'Ivoire and Cape Verde in the WDI database. For other countries in this Union, data show Burkina Faso with the highest rate at 13.4%.*

[v] *These include as well borrowings from bilateral and multilateral partners - World Bank, International Monetary Fund, African Development Bank, and so forth.*

[vi] This lemma, which is commonly derived and used in the macroeconomics literature, does not depart a great deal from a stylized fact in most developing African countries, as public savings is by and large marginal.

[vii] *The intertemporal Euler Equation is:* $\frac{(1-\alpha)}{S_t} = \varepsilon R_{t+1}[\frac{\alpha}{C_{t+1} - \nu C_t} + \frac{\alpha\nu\varepsilon}{C_{t+2} - \nu C_{t+1}}]$. *It is obtained by deriving* $E_t\lambda_t$ *from Equation (12) and substituting in Equation (14).*

[viii] *These models provide the strongest econometric results with White Noise residuals and lowest AIC and SIC values. Furthermore, approximations methods for all solutions were developed following synthesis presented by [20].*

[ix] *For each figure, the third exhibit represents the average percentage increase (or change) in simulated output – above actual output.*

[x] *In the 2010s, savings exceed investment by about 19 per cent for Nigeria. This explains the low average for this country over the entire simulation period.*

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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