Competing Sectors in South Africa

Morehouse College

By Miesha Williams

Abstract

This study examines the extent to which manufacturing labor (reflecting capitalist productivity) can affect agricultural labor (reflecting subsistent productivity) and private investment. This paper also assesses the need for government reform concerning labor and investment incentives. Using quarterly South African Reserve Bank aggregates from 1967:1-2014:4, the implemented structural vector auto-regression (SVAR) is reflective of the savings retention model initially posed by Feldstein and Horioka (1980). Findings suggest that increasing the proper manufacturing labor, even for government fragments, can lead to increased agricultural labor with subsequent positive impacts in investment.

Key Words: investment, labor migration, savings, precautionary savings

JEL: E21, E22, J01

*Special thanks to the AEA Mentoring Program as well as the National Science Foundation for sponsoring the presentations I have made in the development of this work.

Department of Economics, Morehouse College 830 Westview Dr. SW, Atlanta GA, 30314

email: miesha.williams@morehouse.edu

I. Poor farmers in developing countries incur precautionary savings because their incomes are stagnant, and subsequently, their ability to invest suffers (Deaton, 1981). If the majority of the population is employed in the informal sector (i.e. farming), then in the aggregate this behavior does not change. This may be true for developing nations such as South Africa, where 77% of all small businesses are informal (*South African Quarterly Overview and Analysis*, 2014). Still, if the capitalist (i.e. manufacturing firms) accumulates capital that is complementary to the informal sector, then conditions should improve (Lewis, 1954).

After the debt crises of the 1975-1981, the impact of public investment rates on private investment rates for less developed countries suffered (Greene and Villanueva, 1991). Therefore, existing policy suggestions include the impact fiscal government effects can have on non-traded investment (Fielding, 1997), choosing between labor and investment incentives (Ozler and Rodrik, 1992; Blejer and Khan, 1984) and reducing uncertainty (Rodrik, 1991; Oshikoya, 1994). On the other hand, a consensus in the literature is a savings and investment or neoclassical growth model should be used to assess this topic (Jorgenson, 1963; Rama 1993; Greene and Villanueva, 1991; Fielding, 1999).

So, this paper adds to investment literature for South Africa and similar countries by challenging the findings above and using an appropriate model. An intertemporal rendition of the Feldstein-Horioka (1980) savings retention model including labor migration components, as in Lewis'work (1954), and neoclassical foundations is used. The aim is to address the role government in improving investment patterns through savings and labor reforms. Shocks to savings, public and private investment, agricultural and manufacturing labor, as well as inflation and the interest rates are evaluated in a vector auto regression. This paper provides evidence that

incentivizing manufacturing labor that complements agricultural labor and private investment might be beneficial.

This paper is organized as follows. The model, methodology and data are described in section II. Results are discussed in section III. Section IV concludes.

II. In the following model total output is the sum of private sector output:

$$Y_A = h(A, K_{A,} N_A) \quad (1)$$

$$Y_M = f(A, K_{M,} N_M) \quad (2)$$

$$Y = Y_A + Y_M = F(A, K, N) \quad (3)$$

$$where, K = \sum_{1}^{2} K_i \; and \; N = \sum_{1}^{2} N_i.$$

$Y_A \; and \; Y_M$ are agricultural and manufacturing output. Each "firm" in the macroeconomy has linearly additive capital (K_i), labor(N_i) and technology(A)with constant returns to scale.

Since the marginal product of capital is paid the real interest rate, one can write:

$$r\,(R, \pi) = \frac{\partial Y}{\partial K} \qquad (4).$$

Here, r is the real interest rate, R is the nominal interest rate and π is inflation. Now, solving for the change in K and assuming a closed economy so that capital is a function of savings (S), the result is:

$$\partial K = \frac{\partial F(A, K, N)}{r(R, \pi)} = \partial S \quad (5).$$

The empirical model comes from equation (5). The coefficients in each regression represent the marginal effects of the lagged independent variable on the contemporaneous dependent variable:

$$\Delta K_t = b_{11}\Delta G(L)^2{}_t + b_{12}\Delta K(L)^2{}_t + b_{13}\Delta N_A(L)^2{}_t + b_{14}\Delta N_M(L)^2{}_t + b_{15}\Delta S(L)^2{}_t +$$

$$b_{16}\Delta R(L)^2{}_t + b_{17}\Delta \pi(L)^2{}_t + \varepsilon_{kt} \qquad (8)$$

$$\Delta S_t = b_{21}\Delta G(L)^2{}_t + b_{22}\Delta K(L)^2{}_t + b_{23}\Delta N_A(L)^2{}_t + b_{24}\Delta N_M(L)^2{}_t + b_{25}\Delta S(L)^2{}_t + b_{26}\Delta R(L)^2{}_t + b_{27}\Delta\pi(L)^2{}_t + \varepsilon_{st} \qquad (9)$$

Regressions 8 and 9 are evaluated in the context of a 7 variable structural vector auto regression with two distributed lags. Government investment enters each regression to allow for policy analysis. The model is identified using a recursive structure. Shocks to savings (ε_{st}) are exogenous in one causal ordering (i.e. investment is planned). Investment shocks (ε_{kt}) are exogenous in the other ordering (i.e. investment is unplanned).

Hence, data to support the model is listed as follows. Savings and investment variables include gross savings, gross fixed capital formation for the general government, and gross fixed capital formation for private business enterprises. Each is scaled as a fraction of gross domestic product at market prices. Labor variables include the manufacturing employment index and an agricultural labor index. The latter is the sum of the private employment index and the public employment index minus the non-agricultural employment index. Each index is 100 in 2010. The aforementioned variables come from the South African Reserve Bank. The interest rate on treasury bills and the GDP implicit price deflator come from the Federal Reserve Bank of St. Louis. All variables are in first differences. Indices are in log first differences. The data is quarterly, ranging from 1967:1 to 2014:4

III. Figures 1 and 2 are the *accumulated* impulse responses of changes in savings, government and private investments, agricultural and manufacturing labor, as well as inflation and the interest rate. Each column displays a one standard deviation shock to the variable listed above it. Figure 1 shows savings to be first in the recursive ordering and fifth in Figure 2. The assumption is investments are planned in one ordering and unplanned in the other, respectively.

The center lines are the mean value obtained from bootstrapping the impulse response using 1000 draws. The outer lines are the 90%, bootstrapped confidence intervals.

To begin, the first column of graphs in Figure 1 present the impact of a one standard deviation shock to savings. Savings (column 1, row 1) responds by increasing 25%. The vast majority of the response of savings to its own shock looks permanent. One can conclude with 90% confidence a shock to savings results in a permanent increase in savings somewhere between 5% and 30%. Government investment (column 1, row 2) also increases in response to the savings shock. It only increases by 7% between quarters 1 and 2. The remaining responses in column 1 are not significantly different than zero.

Next, column 2 presents the one standard deviation shock to government investment. Government investment increases in response to its own shock along with an increase in savings. Responses to the government investment shock include: a permanent 45% rise in government investment and a temporary10% rise in private investment effectively between quarters 1 and 4. Each response is stable by 4 quarters after the shock. The remaining responses to the government investment shocks are not significantly different than zero.

Inferences can be drawn from the results above. The effective 45% increase in government investment leading to an effective 10% increase in private investment, ceteris paribus, suggests a multiplier effect of 0.22 on private investment alone (i.e. private investment increase by 0.22 times as much as government investment). Since investments respond to government investment shocks as well as savings shocks, it is likely that government and private investments are planned from savings.

Now, responses to a one standard deviation shocks to private investment (column 3), agricultural labor (column 4), and manufacturing labor (column 5) are listed as follows. Savings

permanently decreases by 3% about 4 quarters after the private investment shock is realized. Government investment permanently increases by 10% within 4 quarters after the private investment shock and permanently by 10% 4 quarters after the shock to agricultural labor. Private investment permanently increases by 45%, 12% and 20% in response to private investment, agricultural labor and manufacturing labor shocks, respectively. Agricultural labor increases by 1.4% and 0.4% in response to agricultural labor and the manufacturing labor shocks, respectively. Both responses are stabilized by 4 quarters later. Manufacturing labor increases by 0.4% between 1 and 4 quarters after the shock to investment and permanently increases by 1.5% in response to its own shock by 5 quarters.

Alas, real interest rate components' responses to the private sector shocks follow the patterns listed below. Inflation permanently declines by 0.8% and permanently increases by 0.4% in response to private investment and manufacturing labor shocks, respectively. The responses do not change much 4 quarters after the shocks. The interest rate increases by 4%, 3%, and 6% in response to the private investment, agricultural labor and manufacturing labor shocks. The response of the interest rate begins 2 quarters after the private investment shock and 5 quarters after the agricultural labor shock. Its response to manufacturing labor is permanent.

At this point, inference can be made about the private sector. As private investment increases in response to a private investment shock the real interest rate is increasing at a decreasing rate (taking interest rate and inflation responses into account). Investment is apparently in a very developmental phase. The government needs to actively reinvest in the economy as dissaving occurs. With the right policies, one can expect the average cost of capital to decrease in the very long run. For example, governments lobbying to hire labor producing

farming equipment might be beneficial. This should expand agricultural labor efficiency and private investment, thus leading to declines in the cost of capital as investment expands.

Further, columns 6 and 7 display the responses to one standard deviation shocks to inflation and interest rates. In response to an inflation shock, savings temporarily increases by 6% and inflation is permanently increased by 2%. The increase in savings occurs between quarters 1 and 2, the increase in inflation is stabilized by 4th quarter. Manufacturing labor is permanently decreased by 0.2% in response to the interest rate shock, and the interest rate increased by 12% in response to its own shock. Each response is stabilized by the 5th quarter.

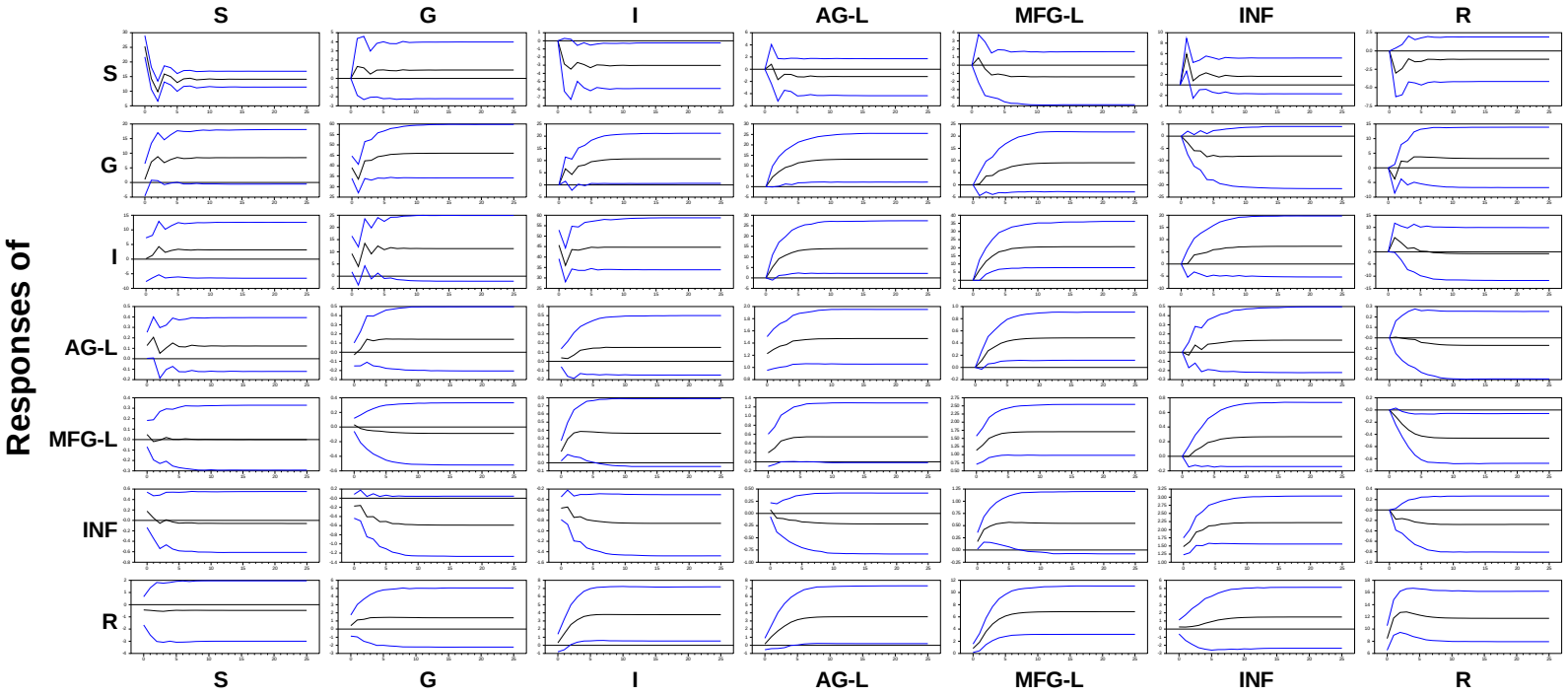
The final two columns of responses indicate savings is precautionary since savings increases with inflation. Perpetual dissaving in this state might be troublesome. The inverse relationship between manufacturing labor and the interest rate shows the return on human capital in the manufacturing sector follows the law of demand. This further suggests manufacturing as the primary channel through which the economy can be improved.

Finally, Figure 2 highlights some of the same results from Figure 1, but the responses in private sector and savings shocks change slightly. Since savings is now ordered 5th, the assumption is that investment is unplanned. Private investment shocks have no statistical relationship with savings. Before the relationship was significant and inverse. There is also no indication of dissaving in order to invest. Another difference is the agricultural labor shock increases manufacturing labor by 0.4% between quarters 2 and 4; however, manufacturing labor shock has no significant effect on any other variable. Unplanned investment must yield smaller advantages than planned investment.

IV. This paper provides evidence for expanding manufacturing labor to improve labor and investment conditions in South Africa. S*pecific* types of manufacturing labor (i.e. labor

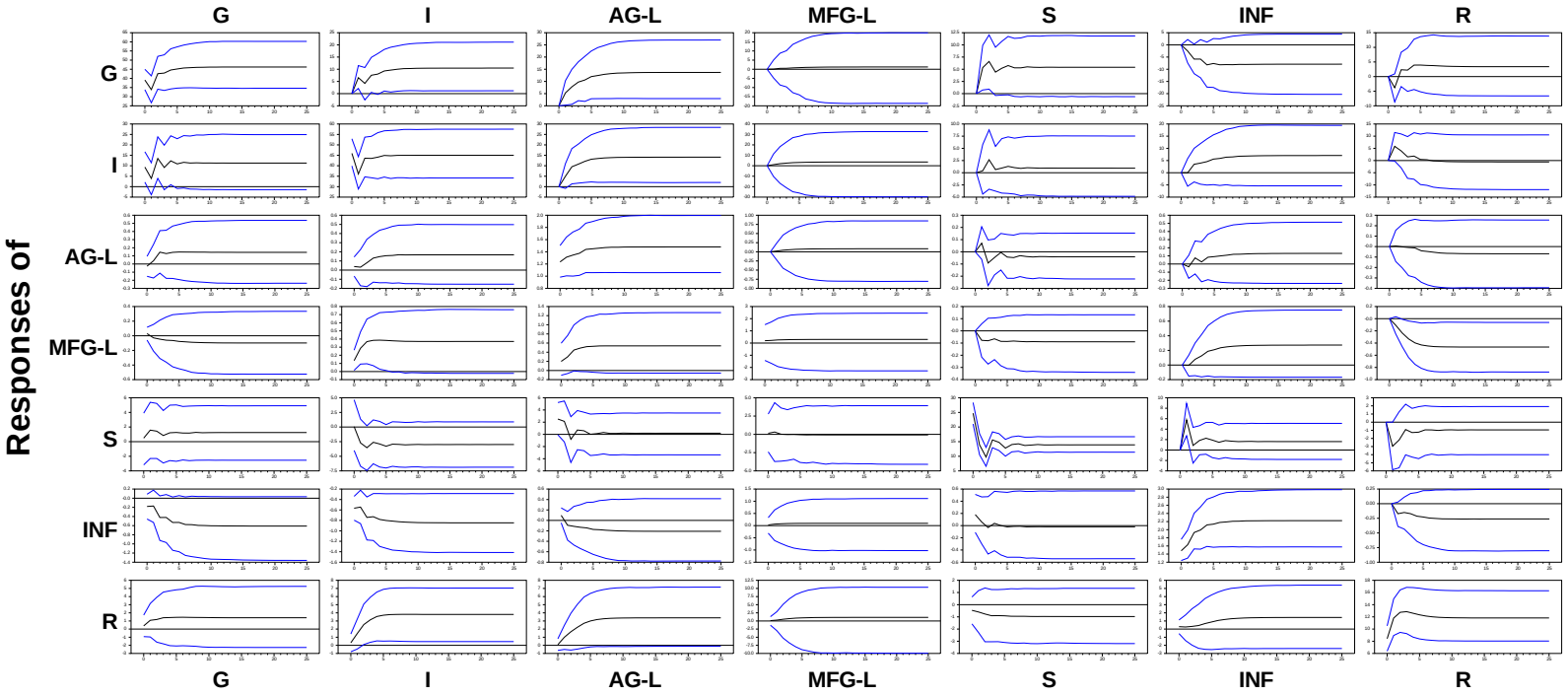
producing farming equipment) can complement agricultural labor and private investment. If capital stock is sparse, savings is largely precautionary and a large portion of the labor market is "informal", then building capital stock indirectly through manufacturing labor, should be preferred. Investment can then be planned from a less precautionary type of savings in the long run as all fragmentations of government adopts this policy.

Figure 1: “Planned Investment Responses”



Note: Figures are easily read in print rather than from a monitor.

Figure 2: “Unplanned Investment Responses”



Note: Figures are easily read in print rather than from a monitor.

References

Blejer, M. I., & Khan, M. S. (1984). Government policy and private investment in developing countries (*Staff Papers-International Monetary Fund*, 379-403.

Deaton, A. (1989). Saving and liquidity constraints (No. w3196). National Bureau of Economic Research.

Feldstein, M., & Horioka, C. (1980). Domestic savings and international capital flows. *The Economic Journal, 90(358)*, 314-329.

Fielding, D. (1997). Aggregate investment in South Africa: a model with implications for political reform. *Oxford Bulletin of Economics and Statistics*, *59*(3), 349-369.

Fielding, D. (1999). Manufacturing investment in South Africa: a time-series model. *Journal of Development Economics*, *58*(2), 405-427.

Greene, J., & Villanueva, D. (1991). Private investment in developing countries: an empirical analysis. *Staff Papers-International Monetary Fund*, 33-58.

Jorgenson, D. W. (1963). Capital theory and investment behavior. *The American Economic Review*, 247-259.

Lewis, W. A. (1954). Unlimited supplies of labour. *Manchester school*.

Oshikoya, T. W. (1994). Macroeconomic determinants of domestic private investment in Africa: An empirical analysis. *Economic development and cultural change*, 573-596.

Özler, Ş., & Rodrik, D. (1992). External shocks, politics and private investment: Some theory and empirical evidence. *Journal of Development Economics*, *39*(1), 141-162.

Rama, M. (1993). Empirical investment equations for developing countries. *Striving for growth after adjustment: The role of capital formation*, 107-143.

Rodrik, D. (1991). Policy uncertainty and private investment in developing countries. *Journal of Development Economics*, *36*(2), 229-242.
South African Quarterly Overview and Analysis, African Development Bank Publication 2014