Liberalized Interest Rates in Developing Countries

Revisiting the McKinnon-Shaw Model

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Abstract

This paper is an empirical assessment of interest rate liberalization effects, the McKinnon-Shaw model, on economic growth through the channels of savings, investments, and factor proportional changes, in less developed countries (LDCs). The sample used for empirical test is an unbalanced panel dataset that comprises 100 randomly selected LDCs, and 22 advanced countries covering annual time-series from 1983 to 2007. The empirical results in this paper are obtained by static panel data methods using fixed-effects pooled Least Squares estimations. These results show that the savings responsiveness to interest rate liberalization is significantly negative, thus, contradicting the McKinnon-Shaw model. Likewise, the liberalized interest rates in LDCs seem to favor investment in capital-intensive projects and not labor-intensive projects as promised by the model. Furthermore, investment responsiveness to the liberalized interest rates in LDCs is highly insignificant statistically as well as economically. Most importantly, growth in LDCs was not retarded prior to the 1970's as proposed by the McKinnon-Shaw model. However, it is found to have deteriorated after interest rate liberalization.

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I. Introduction:

It has been nearly four decades since the debate over interest rate liberalization[1] in less developed countries (LDCs) was initiated by the influential theses of Ronald I. McKinnon and Edward J. Shaw in 1973. Both authors argued that the underdevelopment in these LDCs was in part due to the excessive government interventions in their financial markets. These interventions– interest rates ceilings on deposits and loans, directed credit schemes, controls on capital inflows and outflows, capital market restrictions, as well as public ownership of financial institutions – were dubbed as 'financial repression'[2]. Moreover, both authors declared this financial repression as the main obstacle inhibiting or impeding economic growth of these countries. McKinnon (1973) and Shaw (1973) strongly recommended liberalizing financial markets particularly interest rates as a necessary condition for faster growth in LDCs.

The works of McKinnon (1973) and Shaw (1973) later became known as the McKinnon-Shaw model. This model was strongly advocated by the Bretton Woods institutions (such as the International Monetary Fund and the World Bank). Any funds forwarded to LDCs were conditioned upon financial liberalization according to the McKinnon-Shaw model. Consequently, these LDCs were coerced to implement massive structural adjustment programs (SAPs) in the two decades of the 1980s and 1990s. The despair and immediate needs of their citizens, coupled with no-choice policy advice given by the Bretton Wood institutions, left LDCs no room to recognize the inconsistencies and potential long term negative effects stemming from

[1] Liberalization means removing all legal and institutional constraints imposed on interest rates such as interest rate ceilings...etc. Cho (1986)

[2] Financial repression, in this context, can be defined as a set of regulations, laws, and other restrictions imposed by the government on its financial sector and markets that inhibit the financial intermediaries of an economy from functioning at full capacity.

liberalizing financial sectors. These LDCs were forced to seize on any policy or instrument recommended as a solution to their problems (Page, 1993).

Today, as part of these SAPs, most LDCs have liberalized their financial markets, particularly interest rates, under the guidance of the IMF and the World Bank. Of these, a sample of 100 countries has been randomly selected to construct an index of interest rate liberalization.

These countries, as seen in Table 1.A, do exhibit liberalized interest rates (used as a proxy for financial liberalization) that are all positive over the 25 year time period when compared to the advanced economies over the same time span.

Table 1.A. Five Year Average Real Interest Rates % in Sample Countries:

	Less Developed Economies			Advanced Economies		
Year	Mean	Median	St. Dev	Mean	Median	St. Dev
1983-1987	0.4	2.0	12.4	6.3	6.3	2.5
1988-1992	3.7	3.0	10.1	7.4	7.2	2.6
1993-1997	9.3	7.4	15.7	5.5	5.8	3.2
1998-2002	11.4	9.9	12.4	4.5	4.8	3.0
2003-2007	6.6	5.8	8.2	3.4	3.5	2.1

Source: World Development Indicators (WDI)- ©2009 The World Bank Group

Since its inception in 1973, the McKinnon-Shaw model has attracted considerable debate resulting in an enormous body of work, theoretical and empirical. The financial meltdown of 2008, that stemmed from the *laissez faire* (liberalized) financial markets in developed countries, has raised some serious questions about the viability of the McKinnon-Shaw model. Surprisingly, the same policies that were phrased by two authors as 'repressive' have helped thwart the worst financial crisis after the Great Depression. On one hand, developed countries

resort to monetary and credit expansion policies in order to minimize the duration and severity of the worst financial crisis since the Great Depression[3]. On the other hand, the LDCs are still being advised to implement the same neo-liberal policies of *laissez faire* markets that caused the financial meltdown, "In these (Asian) economies, gradual increases in policy rates such as those expected by markets in April 2010 still would leave monetary policy stances reasonably accommodative, but would help signal the authorities' commitment to safeguard price stability" IMF (2010, p. 33)[4].

One wonders why the policymakers in these LDCs are coerced to believe in the efficiency of free financial markets, when as recent as 2008, the global economy was on the verge of collapse due to the same free financial markets; why do mainstream economics textbooks still teach us that today's banking is no different from the centuries old passive activity: deposits-first-loans-second, thus limiting gross investment to the bank-held deposits only, while gross credit available in most of the developed countries exceeds their GDPs by as much as 250% (about $ 40 trillion in the case of the US economy, two and a half times its GDP)? Why do mainstream economists ignore the role of credit lines, overdraft limits, ...etc. (the instruments that were introduced more than half a century ago, as noted by Keynes and Joan Robinson), in money creations? Instead students are taught to view money creation from the lenses of the IS/LM model, being a supply-led function only, denying any role to the prevailing demand-led money creation functions; and why do mainstream economists still preach us that inflation, everywhere and always, is a demand-led, monetary phenomenon, that can be circumvented by the magic wand of the independent central banks?!

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[3] For example, policy rates are kept low at 0 % implying negative real interest rates; massive bailout packages for certain industries; directed credit schemes to specific sectors such as auto manufacturing and construction; restrictions through provisions such as 'Buy American'.

[4] For details see: World Economic and Financial Surveys – Regional Economic Outlook – Asia and Pacific, IMF (April, 2010)

These and so many other questions still remain unanswered, and unfortunately, we may never find answers to these questions, because answers may be based on ideological commitment as Stiglitz (1994, p. 20) rightly calls this type of approach as," based on an ideological commitment to an idealized conception of markets that is grounded neither in fact nor in economic theory". More important perhaps is the fact that even decades of failed market reform experiments in the LDCs have not yet convinced the folks at the IMF and the World Bank to let go their insistence on implementing the ideological neo-liberal policies in these LDCs.

All of the above questions warrant theoretical and empirical assessment of the McKinnon-Shaw model which is the manifestation of these neo-liberal policies. Due to the limited scope of this study, however, this paper will confine itself to the key propositions of the McKinnon-Shaw model arising from its key hypothesis of positive responsiveness of savings, investment, factor proportional changes, and economic growth to the liberalized interest rates in LDCs.
The rest of the paper proceeds as follows: Section 'II' presents a brief review of the McKinnon-Shaw model and its fundamental theoretical propositions followed by their detailed critique; Section 'III' reviews theoretical and empirical work that has been performed to debate the propositions of this model; Section 'IV' formulates data and methodology used to test the empirical validity of the model; Section 'V' presents the empirical results and their analytical assessment; Section 'VI' concludes this study.

II. The McKinnon-Shaw Model:

Both McKinnon (1973) and Shaw (1973) argue that the repressive financial policies adopted by the LDCs towards their financial sectors and markets - interest rates ceilings on deposits and loans, directed credit schemes, controls on capital inflows and outflows, capital market

restrictions, as well as public ownership of financial institutions - amount to 'financial repression'. This financial repression, as argued by McKinnon and Shaw, discourages savings and breeds inefficient capital allocation that inhibits economic growth in these countries. Shaw (1973, p. 34) notes that "distortions of financial prices including interest rates and foreign exchange rates impede the real rate of growth and the real size of the financial system relative to nonfinancial magnitudes. In all cases this strategy has stopped or gravely retarded the development process". McKinnon (1973, p. 162) states that, "financial reform ends the chronic dissipation of savings in low return foreign investment".

The key argument of the McKinnon-Shaw model, therefore, is that savings are a positive function of real interest rates (McKinnon 1973, p. 67; Shaw 1973, p. 77); and repressing the interest rates below their market levels discourages savings, hence undermining development of the financial intermediaries in these countries. The consequence of repressing interest rates is capital flight and stifled quality and quantity of domestic investment that result in inhibiting or impeding economic growth. Capital, therefore, becomes a scarce commodity in these countries due to the fact that the level of the profit rate (interest rate), according to McKinnon-Shaw model, reflects the relative scarcity of "capital" in any economy. Liberalized interest rates, on the other hand, helps mobilize savings and bolsters capital intensity by retaining the scarce capital at home resulting in higher levels of domestic investment that further stimulates economic growth. Investment, according to this model, is constrained by savings that are deposited at financial intermediaries. When savings are deposited at financial institutions, they are converted into credit and loans and supplied to the prospective investors by these financial institutions. Moreover, both authors argue that since capital is scarce (due to the low level of profits, interest rates) and labor is abundant in these LDCs, this mix of capital-scarcity and labor-abundance

should warrant investment in labor-intensive projects. However this is not the case, according to their argument, thanks to the repressed low interest rates that discourage investment in labor-intensive projects, and make capital-intensive projects look more attractive to the investors in these LDCs. This in turn distorts the optimal capital-labor factor proportion in these LDCs resulting in suppressed demand for labor and further exacerbating unemployment and income dispersion. Shaw (1973, p. 11) maintains that "Investment flows to capital intensive production even though capital is scarce and labor plentiful". To sum up, Shaw (1973, p. 121) states that, "the argument for liberalization in finance is that scarcity prices for savings increase rates of saving, improve savings allocation, induce some substitution of labor for capital equipment, and assist in income equalization".

While listing distortions in the economy due to the financial repression via holding interest rates at below-market-levels, this model identifies the following theoretical propositions[5].

- Savings are constrained by the repressed low interest rates that restrict their flow from households to financial intermediaries. Conspicuous consumption of unproductive assets is induced, which further deteriorates saving levels.

- In any economy, credit availability for investment as well as consumption is restricted to the savings deposited at financial intermediaries. Repressed below-market interest rates, therefore, result in constrained credit availability and low investment levels.

- The relative scarcity of "capital" in the LDCs must warrant higher level of profits on capital but when the profits on capital (interest rates) are mechanically kept below market

[5]For a detailed survey of literature, see Kapur (1976), Galbis (1977), Fry (1978, 1980, 1996), Roe (1982), Khatkhate (1988), Gelb (1989), and Balassa (1991).

levels, as is the case in financially repressive LDCs, then these low profits on capital encourage capital flight which results in domestic financial assets being substituted with foreign assets.

- Repressed low interest rates induce entrepreneurs towards capital-intensive rather than labor-intensive investments, thus creating a bias in favor of capital-intensive projects which distorts the optimal capital-labor factor proportions in the economy.

- Investment quality is deteriorated since credit rationing and direct credit schemes (due to financial repression) create a bias against high-yielding and quality investment projects.

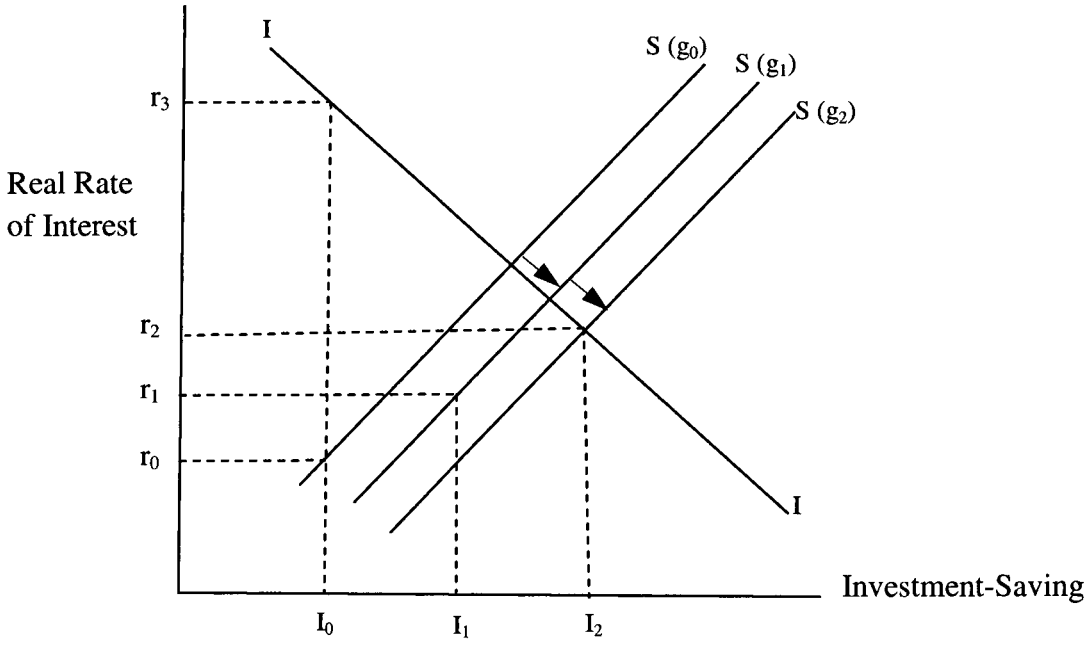
- Repressed low interest rates also induce self-financing investment behavior. Self-financing harms the economy in two ways: Financial development is constrained by this self-financing behavior because savings are not deposited at financial institutions but instead invested directly; these self-financed investors lack the skills and expertise to select the best investment projects available.

- Another drawback stemming from financial repression in the LDCs, as per this model, is that financial intermediaries have no incentives to spend on loan assessments or borrowers screening when granting credit and loans. This further deteriorates their portfolio quality resulting in constraining financial development.

- More importantly perhaps, while high levels of savings spur economic growth in any given economy, low levels of savings retard economic growth, implying unidirectional causality running from savings to growth. The LDCs that practice financial repression, therefore, put the development and growth of their economies at risk by having low levels of savings which retard growth.

Graphically, workings of the McKinnon-Shaw model can be seen in the figure below which has been reproduced from Fry (1978) and Arrieta (1988)[6].

Here savings '*S*' and investment '*I*' (drawn on horizontal axes) are a positive function of real interest rate '*r*' (drawn on the vertical axes) at different growth levels '*g*' (drawn on horizontal axes). The 'r_0' represents financially repressed rate of interest paid by the financial institutions on savings 'S_0' deposited. Since investment is equivalent to the forthcoming



savings, the investment level under financial repression is limited and represented, in the graph, by point 'I_0', which explains, according to the model, the low levels of investment in LDCs that practice financial repression. The lending rate 'r_0' due to the limited supply of savings, can surge higher to 'r_3', provided that there are no ceilings imposed on these lending rates. But if the lending rates are also repressed, as is the case under financial repression in

[6] Note that this graph ignores the credit creation which is an important ingredient of investment in any economy.

many LDCs, this must cause credit rationing inducing only self-financing investment projects, which further hampers the investment quality and quantity. Liberalizing interest rates, on the other hand, will have a positive effect on savings and growth, which can also be seen in the same figure, where the liberalized interest rate moves first from 'r_0' to 'r_1'and consequently from 'r_1' to 'r_2'. This movement results in the savings curve shifting to the right, first from 'S_0' to 'S_1'and consequently from 'S_1' to 'S_2'. The investment level will also increase with the increase in savings, thus moving first from 'I_0' to 'I_1' and consequently from 'I_1' to 'I_2'. These higher levels of investment further stimulate economic growth, as can be seen in the graph as well, moving first from 'g_0' to 'g_1' and then from 'g_1' and 'g_2'. The equilibrium rate of interest that clears the financial markets and that equates savings and investment, according to the McKinnon-Shaw model, is 'r_2' as depicted in the above figure.

It is, therefore, in the best interest of the financially repressed economies, as recommended by this model, to emancipate their financial sectors and markets from the 'financial repression' and let the *laissez faire* (liberalized) financial markets determine the rates of return on savings and investment (the interest rates).

Critique:

In the neoclassical synthesis, the preceding outlined theoretical propositions of the McKinnon-Shaw model appear straightforward because of the neoclassical ideological commitment. But when subjected to an indiscriminate analysis, none of these propositions hold ground, as we shall see. While discussion presented here focuses on theoretical aspects of the key propositions of this model, the empirical examination of these propositions will follow in Section 'V'.

1. The first proposition inferred by this model is that liberalized high interest rates stimulate savings. This proposition is essentially derived from the neoclassical intertemporal consumption-savings model of the household. This model, which is taught in mainstream macroeconomic theory, captures the intertemporal effects of changes in real interest rates on saving and consumption decisions of the household. Higher real interest rate implies a higher price for current consumption relative to future consumption, thus inducing the household to consume less and save more in the current period. This is called the intertemporal substitution effect. However according to Williamson (2004) – who himself is a mainstream economist and author of a macroeconomics text book – there is no theoretical guarantee that aggregate levels of consumption or savings will react to the changes in real interest rates as predicted by the consumption-savings model, since agents are borrowers and lenders as well. For lenders, there is an income effect along with the substitution effect. A rise in real interest rates, for lenders, translates into more income, making consumption less expensive in the current period as opposed to borrowers. Lavoie & Godley (2001) and Zezza & Santos (2004), who analyze the role of monetary policy in a stock-flow consistent macroeconomics growth model, conclude that changes to interest rates controlled by monetary authorities may give conflicting results, since adverse effects of a rise or a fall in real interest rates is countered by the income effect obtained through higher or lower interest payments which may increase or decrease household income and consumption.

While ambiguity can be realized at the core of the McKinnon-Shaw model, negative correlation between interest rates and consumption, i.e., the substitution effect appears to have dominated neoclassical discussions of saving functions. It seems that the McKinnon-Shaw model advocates the creation of a huge army of 'functionless investors' as Keynes (1936, p. 376) called them. In

the concluding notes of *The General Theory*, Keynes (1936, p. 372) argues," The outstanding faults of the economic society in which we live are its failure to provide for full employment and its arbitrary and inequitable distribution of wealth and incomes". As Rochon (2009) puts it, "Keynes's argument was simple: savings do not depend on the rate of interest, but rather on investment, which itself depends on lower rates of interest. In order to promote full employment, it was necessary, according to Keynes, to let the rate of interest fall to a suitably low level, or as low as possible. This, Keynes (1936) wrote, 'would mean the euthanasia of the rentier, and, consequently, the euthanasia of the cumulative oppressive power of the capitalist to exploit the scarcity value of capital. (Rochon, 2009, p. 61)

Contrary to the neoclassical belief, a positive correlation between interest rates and consumption had already been recorded by Joan Robinson some fifty years ago (Lavoie, 1992, p. 365-66).

"A permanent fall in the level of interest rates relatively to the rate of profit has reduced the rentiers' share in profits (assuming that dividends have not been raised correspondingly), and this is likely to have a more important effect in reducing the proportion of consumption to profits than any effect there may be of lower interest in increasing the ratio of consumption to rentier income" (Robinson, 1956, p. 253).

Moreover, the McKinnon-Shaw model neglects what has been described as, "the most important distinction between types of income is that between firms and households" by Robinson (1962, p. 38). Taking this argument further, Lavoie (1992) stresses that firms' retained earnings are an important element of the investment function; Lavoie (1992) goes on to demonstrates – see the following equation (2.1) – that growth of savings 'g_s' (given household propensity to save 'S_h';

interest and dividend income of household '*i*'; and firms retained earnings '*r*') is *negatively* correlated to the real interest rate.

$$g_s = (r - i) + S_h\, i = r - (1 - S_h)\, i \qquad (2.1)$$

"The equation (2.1) confirms that the rate of growth of savings is reduced whenever the interest rate is higher. Higher interest rates redistribute income from firms to household, whose propensity to save is lower than that of firms. High interest rates thus induce more consumption, not less, as the neoclassical authors would say on the basis of a naïve model of the individual" (Lavoie 1992, p. 365).

2. The second proposition of the McKinnon-Shaw model postulates that credit availability, the main ingredient of investment, is constrained by savings deposited at financial intermediaries. This proposition stems from the neoclassical view of a passive financial banking and exogenously supply-led money. According to this view, while money is exogenously supplied, loans or credit are created by deposits at banks. As Minsky (1986, p. 252) puts it, "In the neoclassical synthesis, banking – especially commercial banking– is mechanical, static, and passive; it has no significant impact upon the behavior of the economy. In this theory, the effects of banking are fully captured by the money supply, changes in the money supply, and transitory movements of interest rates". In reality, banking is dynamic and financial intermediaries do not wait for deposits to grant credit or loans. Expansion or contraction of credit does not depend on the volume of deposits, but on the creditworthiness of borrowers. 'The amount of advances the banks can make is limited by the demand from good borrowers' (Robinson, 1952, p. 29).

Lavoie (1992, p. 177) elaborates on defining this good borrower by summarizing the norms that establish what a good borrower is, and that these norms change with circumstances.

a) The banking system fixes a rate (or a set of rates) for the money market and then lends however much borrowers ask for provided that they can offer satisfactory collaterals. *[Translated from Le Bourva (1959, p. 719) by Lavoie (1992, p. 177)]*

b) Commercial bank loan officers must ensure that loan requests meet the bank's income and asset collateral requirements. They must in general satisfy themselves as to the credit-worthiness of the project and the character of the borrower. It is precisely for these reasons that banks develop client relationships with their borrowers. (Moore, 1988, p. 24)

c) At any one time the volume of bank lending or its rate of expansion is limited only by the availability of credit-worthy borrowers. When trade prospects are good or when the money value of borrowers; assets (collateral) rises as a result of a rise of prices, the demand for bank credit rises, but by the same token the credit-worthiness of potential borrowers also improves, so that the demand for and the supply of credit move simultaneously in the same direction. (Kaldor, 1981, p. 15)

Credit and money, therefore, are endogenously determined variables, and their supply is not limited to deposits at banks or mechanically controlled by central banks, but it is responsive to demand. (Minsky, 1986, p. 253) This endogeneity of credit and money can be observed at three levels, as Lavoie (1992, p. 177) summarizes them:

> "First, there is endogeneity at the junction between the firm and the private bank. When firms worthy of credit ask for a loan, banks create one. A flow of money is being created as soon as a new loan is being awarded to a firm. In this sense, we may say that the flow of money is credit-driven and demand-determined (Moore, 1988a, p. 19), or we may say that money has been generated by income flows (Davidson, 1972, p. 227). 'Money is created when banks make loans. The act of creation is also an act of expenditure and (therefore) of income creation' (Godley and

Cripps, 1983, pp. 82-3). Secondly, there is endogeneity at the junction between the household and the bank. When households take a portfolio decision with respect to their wealth, the money which they desire to keep has already been created when banks made loans. This residual demand for money is necessarily accommodated by the commercial banks. The stock of money is thus demand-determined, and the main determinant of this demand is the finance motive, related to the income generated by the initial flow of loans. An accessory determinant is naturally the rate of interest and its structure, that is the portfolio decision. Thirdly, there is endogeneity at the juncture between the commercial bank and the central bank. The latter must provide the high-powered money that the former requires. Again, when reserve requirements come into effect, the loans inducing such requirements have already been made."

3. The third proposition of the McKinnon-Shaw model has two implications that deserve a detailed analysis: The relative scarcity of capital in LDCs, and perfect asset substitutability.

a) Capital Scarcity & Intensity: Although the debate over capital scarcity and intensity (the Cambridge capital controversies in the 1960's) rendered the neoclassical theory of capital (as well as their production functions) without solid foundations, this debate was still relatively fresh and heated in early 1970's at the time of the McKinnon-Shaw model's debut. Surprisingly, this model ignores the results of the Cambridge capital controversies, and still justifies and advocates the higher liberalized interest rates in the LDCs on the basis of capital scarcity theory that automatically rewards higher marginal productivity to capital (MPK) against labor (MPL).

For the record, even neoclassical authors themselves acknowledged their surrender in this debate, "We wish to make it clear for the record that the nonreswitching theorem associated with us is definitely false. We are grateful to Dr. Pasinetti..." (Levhari and Samuelson, 1966)

Lavoie (2000, pp. 59-60) sums up the fallacy of neoclassical capital scarcity theory by stating that,

> "Capital reversing renders meaningless the neoclassical concepts of input substitution and capital scarcity or labor scarcity. It puts in jeopardy the neoclassical theory of capital and the notion of input demand curves, both at the economy and industry levels. It also puts in jeopardy the neoclassical theories of output and employment determination, as well as Wicksellian monetary theories, since they are all deprived of stability. The consequences for neoclassical analysis are thus quite devastating. It is usually asserted that only aggregate neoclassical theory of the textbook variety — and hence macroeconomic theory, based on aggregate production functions — is affected by capital reversing. It has been pointed out, however, that when neoclassical general equilibrium models are extended to long-run equilibria, stability proofs require the exclusion of capital reversing (Schefold 1997). In that sense, all neoclassical production models would be affected by capital reversing."

One may wonder, if the neoclassical theory is so obviously flawed, why a vast majority of graduate schools still teach this theory. Joan Robinson has already answered this question by writing in "The Production Function and the Theory of Capital," (1953–1954, p. 81):

> "The production function has been a powerful instrument of miseducation. The student of economic theory is taught to write $Q = f(L, K)$ where L is a quantity of labor, K a quantity of capital and Q a rate of output of commodities. He is instructed to assume all workers alike, and to measure L in man-hours of labor; he is told something about the index-number problem in choosing a unit of output; and then he is hurried on to the next question, in the hope that he will forget to ask in what units K is measured. Before he ever does ask, he has become a professor, and so sloppy habits of thought are handed on from one generation to the next."

b) The perfect asset substitutability: The McKinnon-Shaw model's notion that repressed market interest rates cause capital flight stems from the assumption of perfect asset substitutability. But international assets are imperfect substitutes. Palley (2004, p. 222) refutes the perfect asset substitutability assumption by stating that,

> "the existence of a 'home currency' preference is confirmed empirically by the relatively undiversified state of investor portfolios. The significance of these arguments and findings is that international assets are 'imperfect substitutes' and simple interest parity will not hold. More generally, both PPP and interest parity reflect a tradition in economics that emphasizes market arbitrage based on the law of one price. PPP reflects the application of this tradition to international goods market. Interest parity reflects its application to international financial markets".

Lavoie and Seccareccia (2004, p. 9) caution us that increased capital mobility should not be confused with asset substitution. "While globalization has certainly brought more capital mobility and asset substitution, empirical evidence clearly rejects the assumption of perfect asset substitutability, as well as the validity of the purchasing power parity and the uncovered interest parity (UIP) hypothesis." In fact, they deem financial restrictions necessary to safeguard against speculation, "Financial repression restrictions keep in check and control speculation. Such speculation is led by waves of pessimism or irrational exuberance." (ibid, p. 10)

4. The fourth proposition derived from the McKinnon-Shaw model deals with the optimal factor proportion in the LDCs, which should –according to this proposition– favor the labor-intensive projects against capital-intensive projects in these LDCs.

As shown in the preceding argument, the fallacy of the scarcity of capital theory renders capital intensity theory false as well. Following the debate over capital theory, Bhaduri (1980) argues

that there is no clear physical meaning that can be attributed to the notion of physical capital intensity. This means, in Bhaduri's words, that an economy may be claimed to have a higher or lower degree of "capital intensity" depending on which particular physical index one happens to choose. Given such arbitrariness, the whole notion of physical "capital intensity" must be recognized as a completely meaningless concept; even if the entire valuation problem of "capital" could be ignored, neoclassical capital theory would be no closer to a self-consistent logical structure." Bhaduri continues, "Since 'capital intensity' cannot be defined independently of the profit rate (interest rate), no meaning can be attributed to the neoclassical slogan that the level of the profit rate reflects the relative scarcity of 'capital' in an economy. For the value of capital per worker need not bear any systematic relation to the profit rate". (Bhaduri, 1982, p. 89)

Furthermore, Robinson (1953-4, 1975a) underlines the fact that the neoclassical production function with factor substitution is set in a timeless world. The McKinnon-Shaw model, inspired by the neoclassical production function, assumes that when labor is substituted for capital, the new machines and new technology can be installed instantaneously and without cost (which is not the case, particularly in the LDCs). This model also assumes capital as a given endowment and as a primary input, ignoring the fact of reproducibility of capital. (Lavoie, 1992, p. 27)

5. The fifth proposition blames credit rationing and direct credit schemes for the inferior investment quality, and consequently retarded economic development, in the LDCs.

Chang (2003, p. 22) refutes this proposition in his famous article "Kicking Away the Ladder" by asserting that:

> "...these were the policies that were used by the developed countries in order to achieve economic development. The historical fact is that when they were developing countries

themselves the developed countries used virtually none of the policies that they are recommending to developing countries. Nowhere is this discrepancy between historical facts and today's conventional wisdom bigger than in the area of industrial, trade and technology policies."

6. The sixth proposition implies that low interest rates induce self-financing investment behavior. The proposition goes against Keynesianism that came to the rescue as recently as 2008, when OECD countries, to spur investment, slashed their policy rates to almost 0% (resulting in negative real rate of interest across these countries). I have alluded to this during the argument over the first proposition of savings, as Rochon (2009, p. 61) wrote, "Keynes's argument was simple: savings do not depend on the rate of interest, but rather on investment, which itself depends on lower rates of interest. In order to promote full employment, it was necessary, according to Keynes, to let the rate of interest fall to a suitably low level, or as low as possible."

7. The seventh proposition postulates that the poor portfolio quality of banks in the LDCs stems from the lack of incentives to spend on loan assessments or borrowers screening when granting credit and loans. In fact, the poor portfolio quality of banks is a much bigger issue in the developed countries than in the LDCs, and it is speculation, greed and 'banking activism' (hallmark of *unrestricted* financial markets) that cause this poor portfolio quality. Minsky (1987, p. 252) cautions us about it, "This banking activism affects not just the volume and the distribution of finance but also the cyclical behavior of prices, incomes, and employment. Dimand (2004, p. 198) writes about Minsky and Tobin on the instability of a monetary economy: "Minsky and Tobin shared with Keynes a profound concern with the threat to macroeconomic stability posed by the volatility of unstable, *unrestricted* financial markets, a concern that led Tobin to advocate the 'Tobin tax' on international currency transactions". Moreover, the worst financial crisis of our times originated in the *unrestricted* financial markets, and every

economist as well as financial analyst agrees that the major culprit of this crisis was the lack of loan assessment or borrowers screening when granting credit and loans!

8. Finally, and perhaps more importantly, the proposition that savings mobilized by interest rate liberalization will stimulate growth in LDCs postulates two suggestions: growth of the LDCs was retarded at the time of this model's inception; and the causality runs from savings to growth.

a) Growth in the LDCs was not retarded before 1973 as the McKinnon-Shaw model would want us to believe. The LDCs were having tremendous development and growth in the 1960s and 1970s as a result of ISI (import-substitution industrialization) policies. Singh (1984) describes the 1960s and 1970s as the period of 'industrial revolution' in the LDCs that brought economic prosperity and social transformation to these countries in general and to the South Asian economies in particular. Chang (2003) shows, empirically, that the 1960s and the 1970s were actually a period of impressive economic progress in the LDCs, as opposed to what this model proposes. Comparing the two eras: the 'bad old days' from 1960– 1980 before the LDCs embraced the McKinnon-Shaw model, and the 'brave new world' from 1980– 2004 when the LDCs were swept with the liberalized policies proposed by this model, it is clear that the LDCs grew at 3% a year in per capita terms during the era of the 'bad old days' as compared to 1.7% a year (half of the previous rate) during the era of the 'brave new world' after embracing the recommendations of the McKinnon-Shaw model (Chang, 2008, p. 9).

b) The causality does not run from savings to growth as this model proposes. The plausibility of a strong correlation between savings and growth is well established. But inferring the direction of causality between the two is still debated to date. More debated is whether this causality is unidirectional: running in one direction from savings to growth or from growth to savings, or

bidirectional: running from savings to growth as well as from growth to savings. There is a vast amount of literature devoted to the saving-growth nexus. Though the majority of this literature on the saving-growth nexus (some of this literature will be discussed in the following section) finds causation running from income growth to savings – thus rejecting the McKinnon-Shaw model's proposition –there seems to be no clear verdict on the direction of causality yet[7]. For instance, the recent study of Agrawal & Sahoo (2006) finds no clear conclusion about the nature of association between savings and growth, as well as the direction of causality between the growth rate and savings rate.

While remarkable innovations in statistical methods along with improved data quality have not enabled researchers to declare the unidirectional causality between savings and growth to date, it is quite surprising and rather unconvincing that McKinnon-Shaw model postulated this unidirectional causality running from savings to growth some forty years ago!

III. Literature Review:

3.1. Literature Review of Theory:

Long before the inception of the McKinnon-Shaw model, Keynes opposed financial liberalization in general and capital account liberalization in particular,

> "Can we afford to allow a disproportionate degree of mobility to a single element in an economic system which we leave extremely rigid in several other respects? If there was the same mobility internationally in all other respects as there is nationally, it might be a different matter. But to introduce a mobile element, highly sensitive to outside influences, as a connected part of the

[7] See for example: Deaton (1991); Carroll & Weil (1994) ; Muhleisea (1997), Cardenas & Andres (1998); Sinha (1999); Sethi (1999), and Chaudhri & Wilson (2000)

machine which the other parts of which are much more rigid, may invite breakages. It is, therefore, a serious question whether it is right to adopt an international standard, which will allow an extreme mobility and sensitiveness of foreign lending, while the remaining elements of the economic complex remain exceedingly rigid. If it were as easy to put wages up and down as it is to put bank rate up and down, well and good. But this is not the actual situation. A change in international financial conditions or in the wind and weather of speculative sentiment may alter the volume of foreign lending, if nothing is done to counteract it, by tens of millions in a few weeks." (Keynes, 1930, Ch.36, as cited by Kergel, 2008, p. 13-14)

Even though it conflicted with the Keynesian teachings and the earlier neoclassical belief that high interest rates were an impediment to investment and growth, the McKinnon-Shaw model gained some limited conceptual acceptance among mainstream development economists soon after its inception. These neoclassical authors admitted, theoretically, the validity of this hypothesis, and presented various models to support it[8]. Later, after the disastrous economic consequences due to this model's implementations in Latin America, its support evaporated among those who backed it earlier, as we shall see in the following segment.

Galbis (1977) with his two-sector model shows that the interest rate liberalization raises productivity by switching capital from the less productive sector to the more productive sector and hence boosting growth.

Fry (1978),with the help of graphical illustrations, proves that financial repression contributes to inflationary pressures, lower saving levels, and slower economic growth in LDCs, while financial liberalization, in the form of higher institutional interest rates, increases incentives to save and invest and raises the average efficiency of investment. Khatkhate (1988) presents four

[8] For a survey of literature see: Kapur (1976), Galbis (1977, 1979) , Fry (1978, 1980, 1996), Cho (1980), Matheson (1980), Neil (1980), Khatkhate (1980, 1988) , Roe (1982), Gelb (1989), Balassa (1990).

key elements that warrant high interest rates in LDCs, namely: low levels of savings; scarcity of capital; abundance of labor; consistent surge in inflation. Gelb (1989) blames the repressed interest rates, below-market-clearing-levels, in LDCs for inhibiting growth through two main channels: Financial assets are often substituted with other non-productive fixed assets or invested abroad in the form of foreign assets; Capital market fragmentation that involves constraining of investment opportunities by the possibilities of self-finance, in addition to the credit rationing schemes that direct formal credit to less productive projects. As to Gupta & Lensink (1996, p. 167), they maintain that the extreme views about financial liberalization in general and interest rate liberalization in particular are simply not warranted. "As is so often the case the truth may well lie somewhere in between".

While earlier critiques of the McKinnon-Shaw model, above, seem neutral to some extent, later research papers in 1990s and 2000s on financial liberalization in the LDCs accuse this model for the economic suffering of the LDCs, and blame it for overturning an era of impressive economic growth and development transformation into an era of economic crises and downturns.

The first casualty of this model was 'the Lost Economic Decade' in Latin America. Countries such as Argentina, Brazil, Chile, and El Salvador embraced this model wholeheartedly in the late 1970s for the purpose of financial reforms by eliminating the restrictive policies they had imposed on their financial markets as well as capital flows. Unfortunately, in the 1980s, this led to widespread bankruptcies, massive government interventions, nationalization of private institutions, and low domestic savings. (Galindo et.al, 2002) Given these devastating results, Diaz-Alejandro (a neoclassical economist himself) came out forcefully in 1985 denouncing and accusing the McKinnon-Shaw model for the Latin American crisis. This is apparent by the title of his article "Good-Bye Financial Repression, Hello Financial Crash", which conveys the

message that the so-called 'financial repression' policies were far better than the financial liberalization. Strong disagreement of another mainstream economist, Stiglitz, with the McKinnon-Shaw model is evident when he says that, "Capital account liberalization in developing countries can damage the development of the domestic financial system due to macroeconomic volatility caused by external capital flows that are marked procyclical, exacerbating economic fluctuations, when they do not cause them" (Stiglitz, 2000, p. 1079). Prasad et al. (2003) conclude that "the process of capital account liberalization appears to have been accompanied in some cases by increased vulnerability to crises. Globalization has heightened these risks since cross-country financial linkages amplify the effects of various shocks and transmit them more quickly across national borders". (p. 5)

3.2. Empirical Literature Review:

While some earlier empirical work, along with McKinnon's own, did lend a limited support to its validity, the McKinnon-Shaw hypothesis could not hold for the most part of its empirical testing. The financial liberalization experiments embedded in SAPs that most LDCs were coerced to implement during the past three decades, have either failed completely or had a very limited success at a dear cost. The destabilizing consequences, brought about by the liberalization experiments, had to be dealt with by resorting to the same old repressive policies that this model was supposed to contest. Following is a brief description of some of the empirical studies done to test the validity of this hypothesis.

Bhatia and Khatkhate (1975) were among the first ones to cast doubt over the empirical validity of this hypothesis. They test the effect of increased financial intermediation on growth following liberalization, using a time-series cross-country data set for eleven African developing countries. They do not find any significant effect exerted by liberalized financial intermediation on

economic growth in these countries. Galbis who earlier supported this hypothesis theoretically (Galbis, 1977), retreats his support after its empirical testing by admitting that, "Experience of El Salvador suggests that interest rate freedom cannot be expected to be a panacea and automatically produce interest rate equilibrium in countries that have a relatively concentrated and unsophisticated financial system, which is the typical case in small, less developed countries. Positive policy actions to avoid market distortions might be required" (Galbis, 1979, p. 349). Fry (1978) is the only one who appears to back the McKinnon-Shaw model empirically, but even his work is questioned later, as we shall see. Fry (1978) estimates workings of this hypothesis using a time-series data set that was constructed from data for seven Asian LDCs over an 11-year time period and finds that the liberalized real rate of interest did have a positive effect on domestic savings and economic growth. His findings, however, have been scrutinized by later works of Giovannini (1983) and Wijnbergen (1983). Giovannini (1983) questions Fry's (1978) findings of positive responsiveness of savings to high interest rates. He does so by testing the same sample but after excluding the outlier observations from Fry's sample, such as South Korea after financial reforms; he concludes that there was no significant effect of liberalized interest rates on savings. Wijnbergen (1983) also examines the effect of interest rate liberalization on time deposits in South Korea and finds that the huge surge in these deposits occurred because of the shift in lending from the curb markets (non-bank borrowing and lending among individuals)[9] to banks, leaving the overall saving levels unchanged. Roe (1982) conducts similar tests on a time-series data set for Sri Lanka and notes that high interest rates following the financial liberalization in Sri Lanka had negative effect on domestic investment and found no evidence of improved capital allocation that could have been attributed to these high interest rates. Agarwala

[9] Curb markets are a necessary part of financial intermediation in almost all the LDCs, especially in the rural areas where access to banks is extremely hard, if not impossible.

(1983) tests this hypothesis by constructing a pooled time-series data set comprised of 31 LDCs, and does not find any significant effect of liberalized interest rates on economic growth.

Diaz-Alejandro (1985) analyzes some unintended consequences of financial liberalization in Latin America and finds no evidence of improved savings, investment, or growth following the liberalization experiments in these Latin American countries. His conclusions are very well translated by the title of his paper –"Good-Bye Financial Repression, Hello Financial Crash". Hanson and Neal (1985) construct a mix sample of 10 LDCs from Asia, Africa, and South America. While examining the level and structure of interest rates in these countries along with the inflation, they conclude that liberalized high interest rates, in and of themselves, offer no assurance that the financial sector is efficiently allocating resources. Arrieta (1988) reviews empirical work done on testing the McKinnon-Shaw hypothesis, and stresses for more research based on empirical grounds, and not theoretical ones. Khatkhate (1988) tests this hypothesis using a broader sample of 64 developing countries for a ten year period from 1971 to 1980. He finds that liberalized interest rates exert no significant influence on growth, but do exert a negative influence on complementarity relationship between capital formation and financial asset accumulation. Khatkhate (1980) also opposes the notion of higher MPK in the LDCs as compared to those of the developed countries (as portrayed by this model). He explains that higher marginal aggregate output/capital ratio in LDCs than developed countries should not be interpreted as higher marginal productivity of capital in LDCs. Since more increment of labor and land per unit of capital is employed in these LDCs, this results in higher marginal aggregate output /capital ratio.

Neal (1989) using the largest data set of its kind, 117 countries, finds that while nominal deposit interest rates have a positive influence on overall financial depth, inflation does the opposite. As

a result, inflation must be slashed in order to improve the size of the financial system. "Raising nominal deposit rates to fully offset higher inflation (the policy prescription so dearly advocated by the IMF) requires maintaining exceptionally high real deposit rates" Neal (1989, p. 33). Prasad et al. (2003, p. 3) review empirical work and its findings in relation to the McKinnon-Shaw model and conclude that, "A systematic examination of the evidence suggests that it is difficult to establish a robust causal relationship between the degree of financial integration and output growth performance". Arestis and Sawyer (2005, p. 11) summarize the reasons and events behind failure of the McKinnon-Shaw model in the LDCs, making the following statement:

> "That experience leads to the conclusion that what happened in the relevant economies was that financial liberalization typically unleashed a massive demand for credit by households and firms that was not offset by a comparable increase in the saving rate. Loan rate rose as households demanded more credit to finance purchases of consumer durables, and firms plunged into speculative investment in the knowledge that government bail-outs would prevent bank failures. In terms of bank behavior, banks increased deposit and lending rates to compensate for losses attributable to loan defaults. High real interest rates completely failed to increase savings or boost investment –they actually fell as a proportion of GNP over the period. The only type of savings that did increase was foreign savings, that is, external debt. This, however, made the 'liberalized' economies more vulnerable to oscillations in the international economy, increasing the debt/asset ratio and thus service obligations and promoting the debt crises experienced in the recent past".

Yet, proponents of the McKinnon-Shaw model do not intend to abandon it; they blame all failed experiments that resulted in financial crises on the methodology of implementation (Arestis and Sawyer, 2005). Instead, there are subsequent proposals by these proponents such as, "Gradual financial liberalization is to be preferred. In this gradual process a 'sequence of financial liberalization is recommended". (McKinnon, 1991)

However, Chile for example, did follow this gradual process and correct sequencing of liberalizing its international trade sector prior to financial liberalization, but there is not much success that can be reported (Lal, 1987). Same failed results were obtained in the case of 'reverse sequencing' –meaning liberalizing financial sector first and trade next – which took place in Uruguay, for example, but the results were the same as in Chile (Grabel, 1995).

IV. Data and Methodology:

Data Source:

The sample used for the econometric analysis in this paper is composed of 100 less developed countries (LDCs) covering annual time-series over a 25-year period from 1983 to 2007[10]. This sample is referred to as G-100. I have excluded war-torn, UN-sanctioned, and historically planned economies from the list. The rationale for applying this selection bias is the unavailability of data, or the fact that these economies either liberalized their financial sectors very late or still operate under centrally planned systems. Likewise, another sample of 22 developed economies (G-22) has been constructed covering the same annual time-series over a 25-year period from 1983 to 2007. For comparative analysis, data for some aggregates such as GDP per capita income growth, Inflation, and Savings ratios have also been retrieved for the 20-year period from 1960-1979 for both groups of countries. Notably, all countries in the sample are members of the Bretton Woods institutions (i.e., the IMF and the World Bank), thus making it mandatory for these countries to report or make available periodic data to these organizations. Consequently, all the data sets in this paper are constructed using data extracted from World Development Indicators (WDI) of the World Bank ©2009 and International Financial Statistics (IFS) and World Economic Outlook (WEO) of IMF © 2009. Additional data for key variables

[10] For a list of all the countries used constructing these samples, see appendix A.

such as per capita GDP growth rates, capital formation ratios to GDP, Openness index, and Population growth rates are also extracted from Penn World Table Version 6.3 © 2009[11].

Estimation:

Keeping in mind that most of the earlier empirical works that lend support to the McKinnon-Shaw model were performed using cross-section or panel data techniques, it was obvious, then, to follow the same techniques if their findings were to be verified or questioned in this study. Two methodologies are applied for estimation in this study using the latest version 7.0 of the EViews software: First, cross-sectional estimation is used for the purpose of comparative analysis, such as levels of interest rates, savings, growth ...etc among different groups at different time spans; Second, static panel estimation is applied using pooled cross-sectional time-series observations in order to estimate values for the OLS estimators (coefficients). Using GMM technique in place of OLS would produce exactly the same values due to the fact that we have a large number of observations in our sample.

Empirical studies on this subject rely heavily on classical linear regression models. This study does the same by using the following classical linear regression model:

$$Y_{it} = \beta_{it} X_{it} + \varepsilon_{it}$$

where Y_{it} is the dependent variable, i=1,2,...., N refers to cross-section unit (country), and t=1,2,...., T refers to time period. The betas, β_{it} , refer to unknown coefficients of independent variables that are being estimated in these regressions, and are supposed to vary across countries

[11]Penn World Table Version 6.3 © 2009 by Alan Heston, Robert Summers and Bettina Aten, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, August 2009.

and years. X_{it} is the vector of non-stochastic independent variables for country i at time t. ε_{it} is the error term that captures all the effects that are not explained by the vector X_{it}.

Variables:

The purpose of the empirics in this paper is twofold: Firstly, to estimate various functions arising from the key theoretical propositions of the McKinnon-Shaw model (outlined in Section II of this paper); Secondly, to verify whether these propositions hold their ground empirically based on the obtained empirical results. While analyzing this study's results, findings of earlier empirical works such as Fry (1978) and Gelb (1989), will also be discussed to draw comparisons. To study the effects of liberalized interest rates on macroeconomic aggregates (such as income per capita growth, savings, and factor proportional changes), all the regressions are performed by controlling for real interest rates and real deposit interest rates. While McKinnon (1973) uses the rate of interest on twelve-month time deposits adjusted for inflation as the real yield on money, Shaw (1973) uses, in addition to time deposits, real interest rates on all other financial claims such as bonds issued by government and other financial intermediaries. I have also included a third controlled variable, gross domestic credit (% GDP), used as an additional proxy for the liberalized financial sector. The regression results of this study are reported and analyzed in Section 'V'. Notably I have performed numerous regressions by controlling for some other key variables such as inflation, domestic credit to private sector, money and quasi-money ratio to GDP, and the total stock of external debt ratio to GDP. But due to time and space constraints, the results of these secondary regressions are neither reported nor analyzed here.

A brief description[12] of controlled/explanatory variables used in this study is presented below followed by the dependent/explained variables[13]:

1) [*RR*] Real interest rate (%): Lending rate adjusted for inflation using the GDP deflator.

2) [*RDR*] Real deposit rate (%): Nominal deposit rate adjusted for inflation. The deposit rate (%) is the rate paid by commercial or similar banks for demand, time, or savings deposits.

3) [*DC/Y*] Gross Domestic Credit (% of GDP): Domestic credit provided by the banking sector includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is on net basis. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions where data are available (including institutions that do not accept transferable deposits but do incur such liabilities as time and savings deposits). Examples of other banking institutions are savings and mortgage loan institutions and building and loan associations.

4) [*gY*] GDP per capita growth (annual %): Annual percentage growth rate of GDP per capita based on constant local currency. GDP per capita is gross domestic product divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

5) [*S/Y*] Gross Domestic Savings (% of GDP): Gross domestic savings are calculated as GDP less final total consumption. The expected coefficient should be significantly positive.

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[12] Sources of definitions: IMF International Financial Statistics, the World Bank, International Standard Industrial Classification (ISIC), and OECD National Accounts Data files.

[13] Letters in parentheses refer to the variable's title used in EViews regressions.

6) [*AV/Y*] Agriculture Value Added (annual % growth): Annual weighted growth rate for agricultural value added based on constant 2000 U.S. dollars. Agriculture includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The expected coefficient for this variable, according to the McKinnon-Shaw model, should be significantly positive.

7) [*IV/Y*] Industry Value Added (annual % growth): Annual growth rate for industrial value added based on constant 2000 U.S. dollars. Industry includes manufacturing and comprises value added in mining, manufacturing, construction, electricity, water, and gas. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The expected coefficient for this variable, according to the McKinnon-Shaw model, should be significantly negative.

Unit Root Tests:

When dealing with time-series data, the question of stationarity does arise. Hence, conventional wisdom dictates the use of unit root tests prior to performing any regressions. The latest versions of panel unit root tests are applied (such as Levin, Lin & Chu, Im, Pesaran and Shin W-stat, ADF Fisher Chi-square, and the PP Fisher Chi-square), departing, thus, from using the conventional unit root tests such as Augmented Dickey-Fuller (ADF). Rationale for this departure can be attributed to Taylor and Sarno (1998) who explain that the advantage of using panel unit root test over time series is that the cross-section variations, which are captured in panel tests but not in

time-series tests, add more power to the test due to the increased number of observations and their variation, resulting in more precise coefficient estimates.

The null hypothesis (H_0) for all unit root tests assumes unit root and the series or variable is said to be non-stationary. The alternative hypothesis (H_1) assumes series or variable to be stationary, having no unit root. If the null hypothesis (H_0) cannot be rejected at zero order (level), a series exhibits stationarity (unit root) at order zero (level), then first or second difference can be applied to obtain stationary series.

The results for the unit root tests are presented in table 4.A on the next page. Interestingly, the null hypothesis (H_0) is rejected for all the series (variables) at order zero (time 't_0') with p-values of zero (100% significance level). These results imply that the series used in this study are all stationary and exhibit integration of order zero I (0).

Table 4 A: Unit Root Test Statistics for the Entire Sample of 100 Countries***

	Levin, Lin & Chu Test*			Im,Pesaran&Shin W-stat**			Total Number of:
Time-Series (Variables)	Statistic	Order	P-Value	Statistic	Order	P-Value	Observations
GDP/Capita Growth (gY):	-33.8854	I(0)	0	-34.7409	I(0)	0	3223
Savings/GDP (S):	-6.94909	I(0)	0	-6.50868	I(0)	0	2805
Real Interest Rates (RR):	-19.7294	I(0)	0	-18.7202	I(0)	0	2394
Deposit Rates (DR):	-38.0862	I(0)	0	-33.0471	I(0)	0	2266
Domestic Credit (DC):	-33.3105	I(0)	0	-31.7147	I(0)	0	2768
Agr. Val. Added (AV):	-44.5897	I(0)	0	-45.6629	I(0)	0	2691
Ind. Val. Added (AV):	-29.2635	I(0)	0	-28.58	I(0)	0	2684

*Levin, Lin & Chu Test; Null Hypothesis: Unit root (assumes common/group unit root process).

**Im, Pesaran & Shin W-stat Test, Null Hypothesis: Unit root (assumes individual unit root process).

***For Unit Test results of all the individual groups/subsamples, see Appendix C.

V. Regressions Results & Analyses:

It is worth noting that the regression results presented and analyzed here are drawn from a broad cross-country database using panel data methodoligies. It is also worth emphasizing some of the limitations associated with empirical analysis based on these cross-country and panel data methodologies, as summarized by Priewe (2008):

- Even if clear-cut relationships are found between two or more variables, there will always be some countries that may have fared very well in the opposite direction;
- Economic significance is as important as statistical significance. Meager performance, no matter how statistically significant, is not enough for a new policy prescription;
- Success of an economic policy in some countries may be attributed to complex historically unique and idiosyncratic patterns that are impossible to export.

Equally important is the fact that if the countries being studied are less developed countries then these limitations get amplified. Above all, data quality[14] of the LDCs always prevents this type of studies from inferring a particular conclusion.

5.1. Savings:

The first empirical test of the McKinnon-Shaw model in this study addresses the question whether savings respond positively to the liberalized interest rates in LDCs. Earlier empirical studies and most of the recent ones have used the real rate of interest as a proxy for financial liberalization in LDCs. The real interest rate series reported by the World Bank and IMF is

[14] Inferior data quality cannot be attributed to LDCs only. For example, the real rate of interest for Canada in year 2007 was listed as 10% in the WDI of the World Bank (which was corrected later). The real rate of interest in Canada never surpassed 3% during the past 10 years.

constructed by adjusting the lending rates for inflation using the GDP deflator. It, therefore, may not explain very well the elasticity of savings to interest rates. Savings elasticity can be better explained by the deposit interest rate which is the rate paid by commercial or similar banks for demand, time, or savings deposits. This study, thus, uses an additional variable as a proxy; real deposit rate (RDR), that is the deposit rate (DR) adjusted for inflation. The following model is then used to estimate the effects of liberalized interest rates on savings[15].

$$S_t/Y_t = \beta_0 + \beta_1 RR_t + \beta_2 RDR_t + \varepsilon_t \qquad (5.1)$$

Where S_t/Y_t represents gross domestic savings (% of GDP).

According to the first proposition of the McKinnon-Shaw model, savings respond positively to the liberalized interest rates. All coefficients (betas) in our estimation should, therefore, appear significantly positive. Strikingly, this is not the case. The resulting coefficients appear significantly negative, contradicting the McKinnon-Shaw hypothesis. Table 5A shows regression results for the 100 sample countries from simple bivariate and multivariate regression models.

Table 5A: Results for Gross Savings (% GDP) regressed on Real Lending and Real Deposit Rates:

Group -100 (LDCs)

	Simple Model		Complex Model	
Explanatory Variables (Series)	RR	RDR	RR	RDR
Coefficients	-0.099	-0.006	-0.101	-0.003
t-statistics	-5.862	-2.839	-5.935	-1.244
Prob.(p-value)	0.000	0.005	0.000	0.214
Standard Error	0.017	0.002	0.017	0.002
R^2	0.783	0.792	0.804	
Durbin Watson stats	0.614	0.598	0.606	

Number of observations used is 1900.

RR means Real Lending Rate of Interest and RDR means Real Deposit Interest Rate.

[15] Two types of regressions are performed: simple bivariate regressions and multivariate regressions.

It is evident from Table 5A that coefficients for both variables, RR and RDR, obtained from simple bivariate regressions are negative at 1 % significance level respectively (with p-values of zero and .005). Results for the second model show that coefficients for RR are negative at 1 % significance level. But the coefficient for RDR, negative though, loses significance (p-value .214). In light of these empirical results, we can comfortably reject the first proposition of the McKinnon-Shaw model, and infer that savings respond negatively to the real rate of interest on lending and deposit financial claims.

5.2. Credit Availability:

The second proposition of the McKinnon-Shaw model links credit availability to savings deposited at financial intermediaries. The theoretical plausibility of credit availability due to creditworthiness, and not deposits at banks, has already been established in Section III. Here I want to shed empirical light on it. Figure 5B plots the maximum values of gross domestic credit provided by banks as a ratio to GDP (%) and gross domestic savings as ratio to GDP (%) over 25 years, 1983 to 2007, in the G-100 countries.

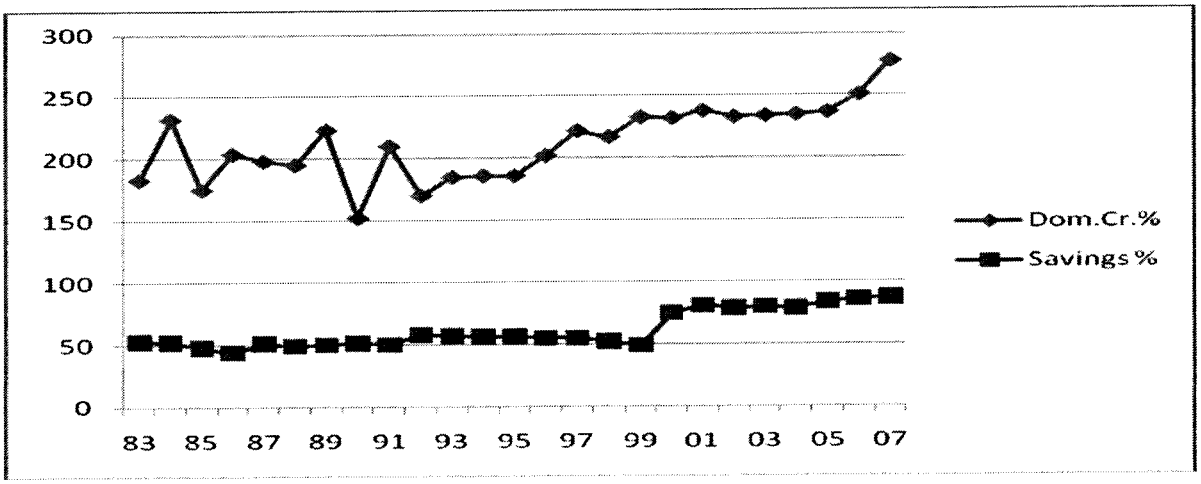


Figure 5B: Gross Domestic Credit ratio to GDP and Gross Savings ratio to GDP (Maximum Values) over 25 years (1983-2007).

It can be readily observed that the two aggregates do not seem to be moving in tune. Credit seems to be more volatile than savings. In the years when domestic credit reached its peaks, savings do not seem to match those peaks. In fact, the opposite can be observed; savings are going up when domestic credit is falling down.

The years - 1984, 1989, 2005, 2006, and 2007- when domestic credit reached its peak can be classified as economic booms. This confirms the theoretical inference proposed by Kaldor (1981) that creditworthiness increases during good times. The opposite can be inferred by associating the years -1985, 1990, and 2000 with economic busts.

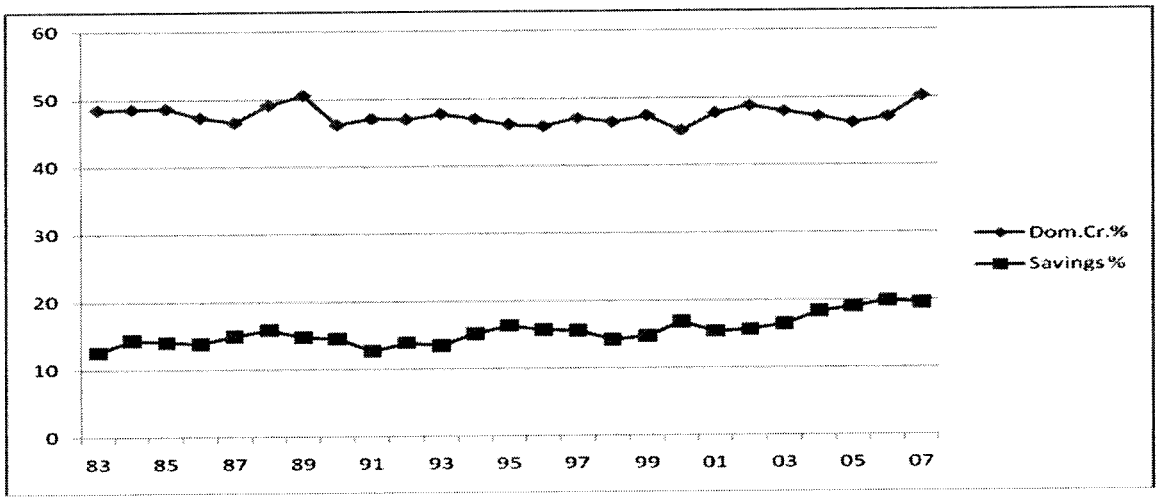


Figure 5C: Gross Domestic Credit ratoi to GDP and Gross Savings ratio to GDP (Mean Values) over 25 years (1983-2007).

Figure 5C plots movement of the mean values of gross domestic savings as a % ratio of GDP and gross domestic credit as a % of GDP over the same period, 1983 to 2007 for the same group. Both aggregates seem to have no correlation in their movement. In fact, during some years such as 1989 and 2000, we can clearly infer a negative correlation between savings and credit.

As for the regressions, I employ the same estimation model used earlier replacing DC/Y (gross domestic credit provided by banks as % of GDP) as dependent variable:

$$DC_t/Y_t = \beta_0 + \beta_1 S_t/Y_t + \beta_2 RDR_t + \beta_3 RR_t + \varepsilon_t \quad (5.4)$$

Again, all the betas, coefficients for the explanatory variables, are expected to be significantly positive if the second proposition of the McKinnon-Shaw model were to hold. The results are reported in the table 5B on the following page.

Table 5B: Results for Gross Domestic Credit (% GDP) regressed on Savings, RR and RDR:

Group-100 (LDCs Only)			
Variables (series) :	S/Y	RDR	RR
Coefficients :	-0.643	-0.006	0.003
t-statistics :	-10.999	-1.291	0.071
Prob.(p-value) :	0.000	0.197	0.943
Standard Error:	0.058	0.005	0.040
R^2 :		0.831	
Durbin Watson stats:		0.358	
S/Y: Gross Savings % of GDP. RR: Real Interest Rate. RDR: Real Deposit Rate. No. of Observations: 1650			

Table 5B above tells a different story than what is told by the McKinnon-Shaw model. The coefficient for savings is negative at the 1% level, implying a significantly negative effect of savings on domestic credit provided by banks. In fact, a 10 % increase in the ratio of gross savings (1.5% increase in the amount of gross savings if *S/Y*=15% for example)[16] will result in 6.4 % decrease in the ratio of gross domestic credit (about 3.2 % in the amount of gross credit available if *DC/Y*=50% for example)[17]. To summarize this result: if gross savings were to increase by 1%, this will result in a 3% reduction in the gross credit available. These results contradict the McKinnon-Shaw model which postulates that credit available will increase with

[16] Please note that the average gross savings as % of GDP in the LDCs (our sample) is around 15%.

[17] Please also note that the average gross domestic credit as % of GDP in the LDCs (our sample) is around 50%.

the increase of savings because savings create loans and credit. The coefficient of the real deposit rate is also negative but loses its significance at the 10% level. And finally the coefficient for real interest rate is positive but highly statistically insignificant. The McKinnon-Shaw model clearly does not hold up to empirical testing.

5.3. Optimal Factor Proportions:

The third proposition of the McKinnon-Shaw model postulates that liberalized high interest rates warrant optimal factor proportional changes in favor of labor. Since labor is abundant and capital is scarce in these LDCs, according to this model, increasing the capital cost in the form of higher interest rates, therefore, will induce a shift of investment from the capital-intensive to the labor-intensive projects.

In order to test this proposition empirically, I rely on two indicators, in addition to the real rate of interest, namely, agricultural value added as % of GDP[18] and industrial value added as % of GDP. Given the limited scope of this study, it is very hard, if not impossible, to obtain the data on the number of capital-intensive as well as labor-intensive projects in the LDCs over a 25-year period. The logic behind constructing these two variables is that if the McKinnon-Shaw model holds and the optimal factor proportions do change in favor of labor-intensive projects due to the liberalized interest rates, this should result in an increase in agriculture value added as a % of GDP, and a decrease in industrial value added as a % of GDP at the same time. To see this, each of these two variables is regressed upon the real rate of interest, RR. Since real Deposit Rate was highly insignificant, I have dropped it from the results table. But prior to analyzing regression results, the co-movement of these two variables over the studied period has been plotted in the

[18] The value added is defined, by the World Bank, as the net output of a sector after adding up all outputs and subtracting intermediate inputs. Agriculture here includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production, and Industry comprises value added in mining, manufacturing, construction, electricity, water, and gas.

following figure 5C. The average growth in agriculture sector fell to negative levels in the year of 1992, which suffices to postulate the opposite of what the McKinnon-Shaw model proposes.

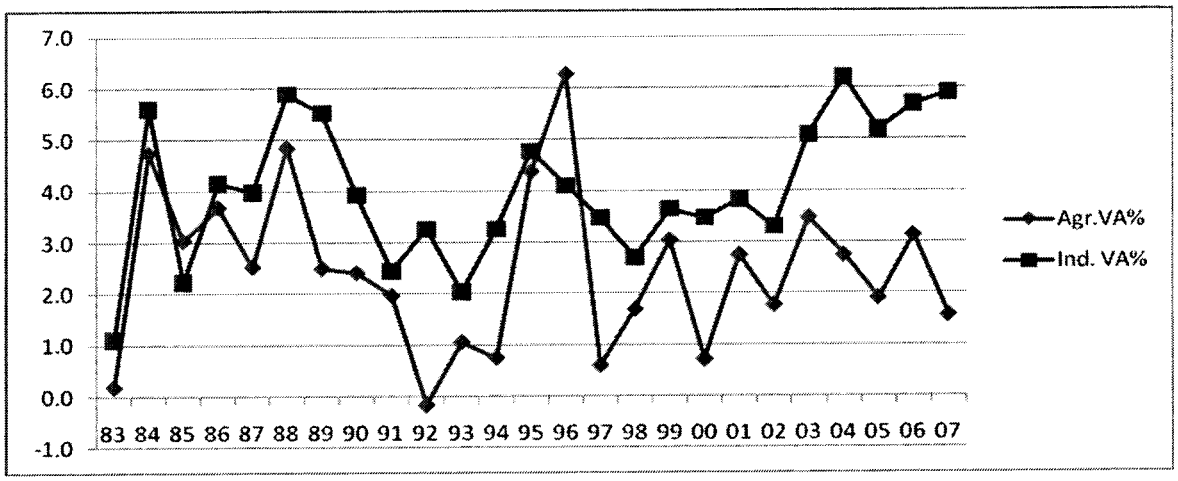


Figure 5C: Mean Values for Agricultural Value Added and Industrial Value Added ratios to GDP (annual % growth).

If the optimal sector proportions favor labor over capital intensity as promised by the McKinnon-Shaw model, then liberalized real interest rates, RR, should exert a positive effect on AV/ Y, agriculture value added, and a negative effect on IV/Y, industry value added. The coefficients for RR should, thus, appear significantly positive for the former and negative for the latter.

Table '5 F' presents the regression results for both AV/Y and IV/Y. In the case of AV, agriculture value added, coefficient for real interest rates RR does appear positive at 5% significance level, hence, supporting the McKinnon-Shaw model. In the case of IV/Y, industry value added, however, coefficient for real interest rate is highly significant and positive, contradicting the McKinnon-Shaw model. These results infer that an increase of 10% in real interest rates will translate into 4.7% increase in the ratio of agriculture value added as % of GDP. Similarly an increase of 10% in real interest rates will result in 5.5% increase in the ratio of industry value added as % of GDP, which is .8% more than the increase in agriculture value added. The factor proportional changes occurring from the liberalized real interest rates, as per our empirical investigation, favor capital-intensive projects (industry value added) and not labor-

intensive projects (agriculture value added). This is in contrast to what is promised by the McKinnon-Shaw model.

Table 5 C:	Group -100 (LDCs Only)	
Dependent Variable:	AV/Y (Agriculture)*	IV/Y (Industry)*
Independent Variables:	RR	RR
Coefficients	0.047	0.055
t-statistics	2.180	3.237
Prob. (p-value)	0.029	0.000
Standard Error	0.021	0.017
R^2	0.085	0.174
Durbin-Watson stat	2.583	1.739
AV/Y is Agriculture Value added as % of GDP	IV/Y is Industrial Value added as % of GDP	
*Total number of observations used in both regressions is 1625.		

5.4. Growth:

Finally, and perhaps more importantly, the proposition that savings mobilized by interest rate liberalization will stimulate growth in LDCs postulates two suggestions: growth of the LDCs was retarded at the time of this model's debut; and the causality runs from savings to growth.

Growth Before & After:

To validate the claim that growth was retarded in the LDCs due to the financial repression, I have constructed Table 5G on the next page that compares three-year average growth rates of per capita income in the 100 sample countries – the LDCs – between two eras: the era of financial repression, as described by the McKinnon-Shaw model, from 1960 to1978, and the era of financial liberalization from 1985 to 2002.

It is apparent from the results in table 5G that prior to the financial liberalization paradigm, these LDCs were on the right development path. They consistently maintained average growth rates of

2% to 3%. After financial liberalization, however, growth rates seem to be retarded and more volatile. The averages have fallen to under 2%.

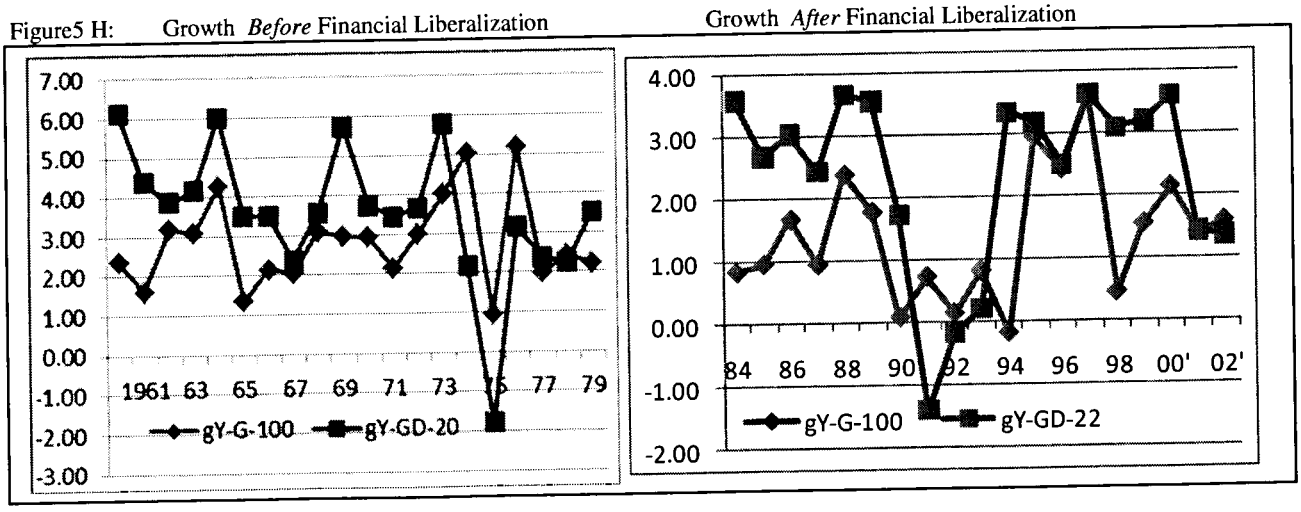
Table 5 D: 3-Year Average GDP/capita Growth Rates in 100 Sample LDCs:

Before Financial Liberalization		After Liberalization	
Year	Growth	Year	Growth
1960-1962	2.31%	1985-1987	1.18%
1963-1965	2.74%	1988-1990	1.41%
1966-1969	2.50%	1991-1993	0.57%
1970-1972	2.76%	1994-1996	1.73%
1973-1975	3.26%	1997-1999	1.87%
1976-1978	2.55%	2000-2002	1.71%

Source: World Development Indicators©2009 The World Bank Group

Furthermore, when compared to growth rates in developed economies, LDCs were performing well before liberalizing their financial markets: To show this, I have mapped figure 5H that plots the average growth rates of per capita GDP in our sample of 100 LDCs and 22 developed countries for the two 20-year periods: from 1960 to 1979 which is labeled '*Before*' when financial sectors were 'repressed' according to the McKinnon-Shaw model, and from 1984 to 2002 which is labeled '*After*' when financial markets got liberalized in LDCs. This figure clearly suggests that growth was not retarded in LDCs before the inception of McKinnon-Shaw model. In fact, this model contributed to retarding growth in LDCs which is evident from the fact that the gap between the growth rates of two groups, LDCs and developed countries, has widened as it appears in the '*After*' portion of the figure 5H below.

Figure5 H: Growth *Before* Financial Liberalization Growth *After* Financial Liberalization



VI. Concluding Remarks:

This paper investigated the responsiveness of savings, credit availability, and factor proportions to the liberalized interest rates in LDCs. It did so by estimating aggregate functions stemming from the McKinnon-Shaw model, namely the correlation between these aggregates and liberalized interest rates. The sample used in these estimations was constructed from a panel dataset of 100 less developed and 22 advanced countries.

Needless to say that this study has its shortcomings as is the case with any empirical analysis based on cross-country and panel data methodologies. The case study of a particular country, on the other hand, can crystallize empirical findings and provide clear and firm conclusions on controversial hypotheses such as the one studied here.

Though there are limitations associated with the empirical work of this study, the following conclusions are drawn:

Savings are negatively correlated to the liberalized interest rates in LDCs. This contradicts the first key proposition of the McKinnon-Shaw model of positive correlation.

Deposits at banks are not the sole creator of credit. It is the creditworthiness of borrowers that matters most in order for banks to issue credit. In fact, there is no correlation between savings and credit availability, as has been shown in the empirical section of this study. This links up with the demand-led nature of money.

Liberalizing interest rates in LDCs has not resulted in optimal factor proportional change in favor of labor. Capital-intensive projects (proxied by industry value added) still fare better than labor-intensive (proxied by agriculture value added) in LDCs.

Finally, growth in LDCs does not seem retarded prior to 1970s as has been claimed by the McKinnon-Shaw model. This study finds that growth in LDCs seems to have deteriorated after embracing the policy prescription of this model.

I, therefore, conclude that Hyman P. Minsky (1986, p. 257) was right when he said:

"Finance cannot be left to free markets".

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Appendix A: List of Countries:

1. **G-100** (Group of 100 Less Developed Countries):

Angola	Lesotho	Macao	Syria
Bahrain	Liberia	Togo	Thailand
Barbados	Libya	Tonga	Tunisia
Belize	Macao	Trinidad &Tobago	Algeria
Benin	Madagascar	Uganda	Argentina
Brunei	Mauritania	Vanuatu	Bolivia
Cape Verde	Moldova	Bangladesh	Brazil
Central African Rep.	Mongolia	Bhutan	Burundi
Comoros	Mozambique	Botswana	Zaire
Congo, Republic of	Namibia	Chile	Ecuador
Cyprus	Niger	Egypt	Ghana
Djibouti	Nigeria	Ethiopia	Guatemala
Dominica	Oman	Fiji	Ginea
El Salvador	Papua New Guinea	India	Haiti
Equatorial Guinea	Rwanda	Indonesia	Honduras
Gabon	Samoa	Malaysia	Jamaica
Gambia, The	Sao Tome and Principe	Maldives	Kenya
Greece	Senegal	Mali	Malawi
Grenada	Singapore	Mauritius	Paraguay
Guinea-Bissau	Solomon Islands	Morocco	Peru
Hong Kong	St. Kitts & Nevis	Nepal	Sierra Leone
Israel	St. Lucia	Pakistan	Tanzania
Jordan	St.Vincent & Grenadines	Philippines	Uruguay
Kuwait	Suriname	South Africa	Venezuela
Laos	Swaziland	Sri Lanka	Zambia

2. **G-22** (Group of 22 Advanced Developed Countries):

Australia	Czech Republic	Germany	Luxembourg	Slovak Republic	UK
Austria	Denmark	Ireland	Netherlands	Spain	USA
Belgium	Finland	Italy	New Zealand	Sweden	
Canada	France	Japan	Norway	Switzerland	

Appendix B: Regression Outputs:

1. For Table 5A: Gross Domestic Savings % to GDP regressed on Real Interest Rates:

Dependent Variable: S/Y				
Method: Pooled Least Squares				
Date: 04/24/10 Time: 15:26				
Sample: 1983 2007				
Included observations: 25				
Cross-sections included: 95				
Total pool (unbalanced) observations: 1851				
Cross sections w-out valid obs. dropped				
Variable	Coefficient	Std. Error	t-Statistic	p-value
C	0.170297	0.00232	73.4009	0
RR	-0.099343	0.016946	-5.862324	0
Fixed Effects (Cross)				
AGO--C	0.108603			
...	...			
ZMB--C	-0.039835			
Fixed Effects (Period)				
1983--C	-0.037462			
...	...			
2007--C	0.029324			
	Effects Specification			
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.782919	Mean dependent var.		0.16291
Adjusted R-squared	0.767996	S.D. dependent var.		0.17402
S.E. of regression	0.08382	Akaike info criterion		-2.0576
Sum squared resid	12.16178	Schwarz criterion		-1.6996
Log likelihood	2024.352	Hannan-Quinn criter.		-1.9256
F-statistic	52.4621	Durbin-Watson stat		0.61405
Prob(F-statistic)	0			

2. For Table 5A: Gross Domestic Savings % to GDP regressed on Real Deposit Interest Rates:

Dependent Variable: S/Y				
Method: Pooled Least Squares				
Date: 04/27/10 Time: 19:28				
Sample: 1983 2007				
Included observations: 25				
Cross-sections included: 92				
Total pool (unbalanced) observations: 1841				
Cross sections without valid observations dropped				
Variable	Coefficient	Std. Error	t-Statistic	p-value
C	0.162099	0.001808	89.64814	0
RDR	-0.005824	0.002051	-2.839307	0.0046
Fixed Effects (Cross)				
AGO--C	0.110326			
....	....			
ZMB--C	-0.029338			
Fixed Effects (Period)				
1983--C	-0.033205			
....	....			
2007--C	0.045148			
	Effects Specification			
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.792258	Mean dependent var.		0.162303
Adjusted R-squared	0.77828	S.D. dependent var.		0.164635
S.E. of regression	0.077522	Akaike info criterion		-2.21507
Sum squared resid	10.36065	Schwarz criterion		-1.86438
Log likelihood	2155.97	Hannan-Quinn criter.		-2.08576
F-statistic	56.67888	Durbin-Watson stat		0.598459
Prob(F-statistic)	0			

3. For Table 5A: Gross Domestic Savings % to GDP regressed on Real Lending Rates and Real Deposit Rates of Interest:

Dependent Variable: S/Y				
Method: Pooled Least Squares				
Date: 05/04/10 Time: 17:30				
Sample: 1983 2007				
Included observations: 25				
Cross-sections included: 90				
Total pool (unbalanced) observations: 1674				
Cross sections without valid observations dropped				
Variable	Coefficient	Std. Error	t-Statistic	p-value
C	0.174336	0.002658	65.58238	0
RR	-0.101195	0.017052	-5.934568	0
RDR	-0.002696	0.002166	-1.244285	0.2136
Fixed Effects (Cross)				
AGO--C	0.091958			
....	....			
ZMB--C	-0.041694			
Fixed Effects (Period)				
1983--C	-0.043751			
....	....			
2007--C	0.045426			
	Effects Specification			
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.803589	Mean dependent var.		0.166458
Adjusted R-squared	0.788956	S.D. dependent var.		0.168659
S.E. of regression	0.077481	Akaike info criterion		-2.21024
Sum squared resid	9.347177	Schwarz criterion		-1.83121
Log likelihood	1966.967	Hannan-Quinn criter.		-2.06981
F-statistic	54.916	Durbin-Watson stat		0.605534
Prob(F-statistic)	0			

4. For Table 5B: Gross Domestic Credit % to GDP regressed on Gross Domestic Savings % to GDP, Real Lending Rates, and Real Deposit Rates of Interest:

Dependent Variable: DC/Y				
Method: Pooled Least Squares				
Date: 08/05/10 Time: 19:05				
Sample: 1983 2007				
Included observations: 25				
Cross-sections included: 90				
Total pool (unbalanced) observations: 1650				
Cross sections without valid observations dropped				
Variable	Coefficient	Std. Error	t-Statistic	p-value
C	0.597514	0.011666	51.21983	0
S/Y	-0.642705	0.05843	-10.99959	0
RDR	-0.006266	0.004855	-1.290835	0.197
RR	0.002839	0.039904	0.07114	0.9433
Fixed Effects (Cross)				
AGO--C	-0.42756			
...	...			
ZMB--C	0.008375			
Fixed Effects (Period)				
1983--C	-0.049554			
...	...			
2007--C	0.059543			
	Effects Specification			
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.831056	Mean dependent var.		0.489576
Adjusted R-squared	0.818272	S.D. dependent var.		0.414417
S.E. of regression	0.176664	Akaike info criterion		-0.56087
Sum squared resid	47.84518	Schwarz criterion		-0.17735
Log likelihood	579.7136	F-statistic		65.00865
Durbin-Watson stat	0.358236	Prob(F-statistic)		0

5. For Table 5C: Agriculture Value Added % to GDP regressed on Real Rates of Interest:

Dependent Variable: AV/Y				
Method: Pooled Least Squares				
Date: 04/24/10 Time: 15:30				
Sample: 1983 2007				
Included observations: 25				
Cross-sections included: 93				
Total pool (unbalanced) observations: 1799				
Cross sections without valid observations dropped				
Variable	Coefficient	Std. Error	t-Statistic	p-value
C	0.021913	0.002574	8.511979	0
RR	0.04076	0.019264	2.115868	0.0345
Fixed Effects (Cross)				
AGO--C	0.117396			
....	....			
ZMB--C	0.0198			
Fixed Effects (Period)				
1983--C	-0.011164			
....	....			
2007--C	-0.01057			
	Effects Specification			
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.081306	Mean dependent var.		0.024847
Adjusted R-squared	0.017363	S.D. dependent var.		0.092802
S.E. of regression	0.091993	Akaike info criterion		-1.87087
Sum squared resid	14.22574	Schwarz criterion		-1.51045
Log likelihood	1800.85	Hannan-Quinn criter.		-1.73782
F-statistic	1.271546	Durbin-Watson stat		2.610632
Prob(F-statistic)	0.030181			

6. For Table 5C: Industry Value Added % to GDP regressed on Real Rates of Interest:

Dependent Variable: IV/Y				
Method: Pooled Least Squares				
Date: 04/24/10 Time: 15:29				
Sample: 1983 2007				
Included observations: 25				
Cross-sections included: 93				
Total pool (unbalanced) observations: 1799				
Cross sections without valid observations dropped				
Variable	Coefficient	Std. Error	t-Statistic	p-value
C	0.040489	0.0021	19.29519	0
RR	0.050113	0.0157	3.191426	0.0014
Fixed Effects (Cross)				
AGO--C	0.085895			
….	….			
ZMB--C	-0.020351			
Fixed Effects (Period)				
1983--C	-0.019548			
….	….			
2007--C	0.010258			
	Effects Specification			
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.167833	Mean dependent var.		0.0441
Adjusted R-squared	0.109913	S.D. dependent var.		0.07948
S.E. of regression	0.074985	Akaike info criterion		-2.2797
Sum squared resid	9.451837	Schwarz criterion		-1.9193
Log likelihood	2168.605	Hannan-Quinn criter.		-2.1467
F-statistic	2.897677	Durbin-Watson stat		1.762
Prob(F-statistic)	0			

Appendix C: Unit Root Test Outputs (For Table 4A):

1. [gY] Per Capita Income Growth:

Group unit root test: Summary				
Series: GYAGO, GYBHR, GYBRB, ... GYBRN..				
Date: 04/24/10 Time: 13:25				
Sample: 1983 2007				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 4				
Newey-West automatic bandwidth selection and Bartlett kernel				
			Cross-	
Method	Statistic	Prob.**	sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-33.8854	0	138	3223
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-34.7409	0	138	3223
ADF - Fisher Chi-square	1583.77	0	138	3223
PP - Fisher Chi-square	1718.65	0	138	3263

2. [RR]: Real Rate of Interest:

Group unit root test: Summary				
Series: RRAGO, RRBHR, RRBRB, RRBLZ, RRBEN, ...				
Date: 04/24/10 Time: 13:27				
Sample: 1983 2007				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 4				
Newey-West auto bandwidth selection and Bartlett kernel				
			Cross-	
Method	Statistic	Prob.**	sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-19.729	0	126	2394
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-18.72	0	124	2388
ADF - Fisher Chi-square	1063.93	0	126	2394
PP - Fisher Chi-square	899.758	0	126	2439

3. [S/Y]: Gross Savings Ratio to GDP:

Group unit root test: Summary				
Series: SAGO, SBHR, SBRB, SBLZ, SBEN,....				
Date: 04/24/10 Time: 13:28				
Sample: 1983 2007				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 4				
Newey-West auto bandwidth selection and Bartlett kernel				
			Cross-	
Method	Statistic	Prob.	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.94909	0	129	2805
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.50868	0	129	2805
ADF - Fisher Chi-square	494.939	0	129	2805
PP - Fisher Chi-square	387.319	0	129	2854

4. [DR]: Deposit Rate of Interest:

Group unit root test: Summary				
Series: DRAGO, DRBHR, DRBRB, DRBLZ, DRBEN, DRBMU, DRBRN, ...				
Date: 04/24/10 Time: 13:34				
Sample: 1983 2007				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 4				
Newey-West autobandwidth selection and Bartlett kernel				
			Cross-	
Method	Statistic	Prob.	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-38.0862	0	115	2266
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-33.0471	0	115	2266
ADF - Fisher Chi-square	1532.79	0	115	2266
PP - Fisher Chi-square	1378.55	0	115	2311

5. [DC/Y]: Gross Domestic Credit Ratio to GDP:

Group unit root test: Summary				
Series: DCAGO, DCBHR, DCBRB, DCBLZ, DCBEN, DCBMU, DCBRN,....				
Date: 04/24/10 Time: 13:32				
Sample: 1983 2007				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 4				
Newey-West auto bandwidth selection and Bartlett kernel				
			Cross-	
Method	Statistic	Prob.	sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-33.3105	0	133	2768
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-31.7147	0	133	2768
ADF - Fisher Chi-square	1466.93	0	133	2768
PP - Fisher Chi-square	1704.39	0	133	2811

6. [AV/Y]: Agriculture Value Added Ratio to GDP:

Group unit root test: Summary						
Series: AVAGO, AVBHR, AVBRB, AVBLZ, AVBEN, ...						
Date: 05/03/10 Time: 19:12						
Sample: 1983 2007						
Exogenous variables: Individual effects						
Automatic selection of maximum lags						
Automatic lag length selection based on SIC: 0 to 4						
Newey-West automatic bandwidth selection and Bartlett kernel						
			Cross-			
Method	Statistic	Prob.**	sections	Obs		
Null: Unit root (assumes common unit root process)						
Levin, Lin & Chu t*	-44.5897	0	126	2691		
Null: Unit root (assumes individual unit root process)						
Im, Pesaran, Shin W-stat.	-45.6629	0	125	2688		
ADF - Fisher Chi-square	2051.58	0	126	2691		
PP - Fisher Chi-square	2308.67	0	126	2730		

7. [IV/Y]: Industry Value Added Ratio to GDP:

Group unit root test: Summary					
Series: IVAGO, IVBHR, IVBRB, IVBLZ, IVBEN, IVBMU, IVBRN, IVCPV, IVCAF, IVCOM, IVCOG, IVCYP, IVDJI, IVDMA, IVSLV, IVGNQ, IVERI, IVGAB, IVGMB, IVGRC, IVGRD, IVGNB, IVHKG, IVIRN, IVISR, IVJOR, IVKIR, IVKOR, IVKWT, IVLAO, IVLSO, IVLBR, IVLBY, IVMAC, IVMDG, IVMLT, IVMHL, IVMRT, IVMEX, IVMDA, IVMNG, IVMNE, IVMOZ, IVNAM, IVNER, IVNGA, IVOMN, IVPLW, IVPAN, IVPNG, IVQAT, IVRWA, IVWSM, IVSTP, IVSAU, IVSEN, IVSGP, IVSLB, IVKNA, IVLCA, IVVCT, IVSDN, IVSUR, IVSWZ, IVTGO, IVTON, IVTTO, IVTUR, IVUGA, IVARE, IVVUT, IVYEM, IVBGD, IVBTN, IVBWA, IVCHL, IVEGY, IVETH, IVFJI, IVIND, IVIDN, IVMYS, IVMDV, IVMLI, IVMUS, IVMAR, IVNPL, IVPAK, IVPHL, IVZAF, IVLKA, IVSYR, IVTHA, IVTUN, IVDZA, IVARG, IVBOL, IVBRA, IVBDI, IVZAR, IVECU, IVGHA, IVGTM, IVGIN, IVHTI, IVHND, IVJAM, IVKEN, IVMWI, IVPRY, IVPER, IVSLE, IVTZA, IVURY, IVVEN, IVZMB, IVAUS, IVAUT, IVBEL, IVCAN, IVCZE, IVDNK, IVFIN, IVFRA, IVGER, IVIRL, IVITA, IVJPN, IVLUX, IVNLD, IVNZL, IVNOR, IVSVK, IVESP, IVSWE, IVCHE, IVGBR, IVUSA					
Date: 05/03/10 Time: 19:13					
Sample: 1983 2007					
Exogenous variables: Individual effects					
Automatic selection of maximum lags					
Automatic lag length selection based on SIC: 0 to 3					
Newey-West automatic bandwidth selection and Bartlett kernel					
			Cross-		
Method	Statistic	Prob.**	sections	Obs	
Null: Unit root (assumes common unit root process)					
Levin, Lin & Chu t*	-29.2635	0	127	2684	
Null: Unit root (assumes individual unit root process)					
Im, Pesaran and Shin W-stat	-28.58	0	126	2681	
ADF - Fisher Chi-square	1284.4	0	127	2684	
PP - Fisher Chi-square	1388.95	0	127	2734	
** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.					