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THE EFFECTS OF HOUSEHOLDS' AND FIRMS' BORROWING CONSTRAINTS ON ECONOMIC GROWTH

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Abstract

This paper considers an endogenous growth model with asymmetric information between lenders and borrowers, that leads to credit-rationing a proportion of borrowers. However, in contrast to the existing literature, both firms and consumers in this model face borrowing constraints. Nonetheless, the borrowing constraints facing a firm and those encountered by a consumer have opposing effects on growth. Relaxing borrowing constraints on firms is growth-promoting as more funds become available for productive investment. In contrast, relaxing borrowing constraints facing consumers has a detrimental effect as funds are diverted from productive investment to consumption. Such an adverse effect offsets the externality effect present in the production function that would otherwise ensure perpetual growth. Furthermore, it is shown that the interaction between households' and firms' borrowing constraints may give rise to endogenous cycles.

Resumo

Este artigo considera um modelo de crescimento endógeno com informação assimétrica entre credores e devedores, a qual conduz a racionar o crédito a uma parte dos devedores. No entanto, em contraste com a literatura existente, tanto as empresas como as famílias enfrentam restrições ao crédito. De qualquer forma, as restrições ao crédito enfrentadas pelas empresas e pelas famílias têm efeitos opostos sobre o crescimento. Mitigar as restrições enfrentadas pelas empresas promove o crescimento pois mais fundos se tornam disponíveis para investimento produtivo. Em contraste, relaxar as restrições ao crédito enfrentadas pelas famílias tem efeitos negativos sobre o crescimento pois são desviados fundos de investimento produtivo para consumo. Este efeito adverso neutraliza o efeito de externalidade presente na função de produção que, na ausência de crédito ao consumo, asseguraria crescimento perpétuo. É também demonstrado que a interacção entre restrições ao crédito às famílias e às empresas pode dar origem a ciclos endógenos.

1. Introduction

In recent years, a number of studies have been proposed with the objective of evaluating the effects of borrowing constraints on economic growth. Examples of such studies include De Gregorio (1993, 1996) and De Gregorio and Kim (2000). These studies are of the view that borrowing constraints depress the accumulation of human and physical capital which drives economic growth. In the above studies, however, agents are subjected to a borrowing constraint that has been imposed exogenously on them.

In contrast, another field of research has proposed in recent years that it is possible to explain the origin of such borrowing constraints as an endogenous outcome of the economic environment. According to this group of literature, informational asymmetry between lenders and borrowers in an economy gives rise to credit rationing. In consequence, some economic agents become subjected to some form of borrowing constraints. Additionally, these studies propose that the incidence of credit rationing hinders economic growth by way of creating friction in transferring funds between borrowers and lenders. Examples of such research include Azariadis and Smith (1996), Bencivenga and Smith (1993), Bose and Cothren (1996, 1997) and Ma and Smith (1996). Further, these studies view financial development as occurring when forces from within, or from outside, the economy are able to mitigate the level of informational friction between borrowers and lenders, in such a way that firms gain more access to savings and are able to channel more resources to the productive use.

With little exception, the focus of the above studies has always been on the borrowing constraint of the firms in an economy. This is despite the fact that there exists a large volume of evidence suggesting the existence of borrowing constraints on consumers in an economy. For example, Bayoumi (1993b), Campbell and Mankiw (1990) and Sarno and

Taylor (1998) established that by including liquidity constraints[1] for the households, one was able to obtain better estimates for the consumption function. Attanasio and Weber (1994) and Caporale and Williams (2001) have found that consumption functions that were developed in the 1980s under the assumption of perfect capital markets have failed to track the pattern of consumption behaviour, particularly for the United Kingdom, United States and Nordic countries. Further, Koskela, Loikkanen and Virén (1992), Miles (1992) and Muelbauer and Murphy (1990) have identified the presence of borrowing constraints for mortgage credit and went on to investigate effects of borrowing constraints on housing demand and house prices.

In the light of the above evidence that households, like firms, are also subjected to borrowing constraints, one is inclined to raise the following questions: (1) are these borrowing constraints influenced by the financial development in an economy? and, (2) what is the growth effect of relaxing these constraints? Researchers generally answer the first question in an affirmative way. It is generally believed that the financial liberalisation, which occurred in many industrialised countries during the 1980s, did relax the borrowing constraints facing the household, and gave rise to a consumption boom and a decrease in savings. Based on this belief, many studies have included one or more proxy variables for financial deregulation while investigating consumption and savings behaviour (e.g. Bayoumi, 1993a, and Bandiera et al, 2000[2]).[3]

In answering the second question, some researchers have expressed the view that opportunities for the households to finance consumption through borrowing remain limited in the presence of a borrowing constraint. As a result, such borrowing constraints do promote

[1] The role of financial deregulation is accounted for by allowing a fraction of consumers to be credit-constrained (defined as those whose consumption expenditures are entirely financed out of current income), and making that fraction vary with a proxy for financial deregulation.

[2] Bayoumi (1993a) finds that financial deregulation had a significant contribution in the decline of personal savings, whereas Bandiera et al (2000) do not obtain clear-cut results. Nevertheless it is more supportive of a negative than a positive impact of the implementation of financial reforms on savings.

[3] Some of these studies further estimate the impact of financial deregulation on the responsiveness of savings to other variables (e.g. Bayoumi, 1993a). Financial liberalisation is expected to increase the sensitivity of consumption to variables such as real interest rates and wealth since, when agents are not entirely free to borrow against future income, current income is almost the single determinant of consumption expenses.

savings in an economy; and by way of relaxing these constraints, financial development generates an adverse growth effect (Japelli and Pagano, 1994).

Based on the above observations, it is then possible to identify two conflicting views regarding the effect of financial development on economic growth. While one view suggests that financial development is able to generate positive growth effects by relaxing the borrowing constraints facing firms, the other view points to its detrimental growth effect that may arise as a result of relaxing the borrowing constraint of the households. Surprisingly enough, no attempt has been made in the existing literature to consider both these two effects simultaneously while investigating the link between financial and economic development. The work in this paper aims to address this deficit in the literature.

In doing so, I consider an overlapping generations model with an externality in the production function. Borrowers in this model, in contrast to those in the existing literature, consist of both consumers and firms, and each group of borrowers face borrowing constraints that arise due to an informational asymmetry between borrowers and lenders. Being endogenously determined, economic development causes both type of borrowing constraints to relax and give rise to two opposite growth effects. On one hand, by relaxing a firm's borrowing constraint, more funds are made available for productive investments. This effect is growth enhancing. On the other hand, the household's borrowing constraint loosens up as its income increases along the path of economic development, causing diversion of resources from productive investment to consumption. This creates a detrimental effect on economic growth. In the presence of this adverse consumption effect, the economy looses the prospect of perpetual growth that is otherwise present in an endogenous growth model (AK model).

In my model, the severity of the borrowing constraint facing households decreases along the path of economic development. Therefore, it is possible that when the economy reaches a certain level of maturity, the volume of resources diverted towards consumption can be so large that the future capital stock available for productive purposes may actually decrease relative to the current period. This shrinkage of the economy, in turn, may tighten the borrowing constraint of the consumers in the following period and therefore may improve the growth prospect of the economy. Such line of events raises the possibility of endogenous cycles. In my analysis, it is possible to characterise the situations under which such cycles may arise. The prospect that endogenous cycles may arise as result of an interaction between households' and firms' borrowing constraints is a consequence that has not been considered in the existing literature, and is one of the major contributions of this paper. The remainder of the paper is organised as follows: Section 2.2 offers a description of the model's structure. In Section 2.3 I analyse the capital accumulation path for the economy and section 2.4 concludes.

2. The Model

2.1. Environment

In this paper, I present a model that is a modified version of that proposed by Bose and Cothren (1996, 1997). A two periods overlapping generation model with zero population growth is considered, in which each young generation is viewed as a continuum of agents, half of whom are lenders and the other half are borrowers.

Borrowers are not all alike, however. A group of young borrowers are divided into two categories – consumer-borrowers and firm-borrowers. This distinction has been made on the basis of the purpose for which a young borrower seeks external funding. For the sake of convenience, the mass of consumer-borrowers and firm-borrowers are each normalised to one. Further, it is assumed that within each group, borrowers fall into two types: a high-risk type (type H) and a low risk type (type L). A type H borrower has a higher probability of default, and I assume that λ fraction of borrowers are of type H within each group of borrowers.

Each consumer-borrower has access to a home production technology that can either be run in the first, or the second period of his life. By operating a home production technology in the first period of his life, a consumer-borrower is able to obtain $\beta^i, i = H, L,$ amount of output. To ensure the single crossing property, I assume that $\beta^L > \beta^H$. Alternatively, if a consumer-borrower born at time t waits until his adulthood to run such technology, he is able to obtain a return that is proportionate to the market wage, w_t.[4] In particular, I assume that in such an event, a type i consumer borrower is able to obtain γw_t volume of output with a probability p^i, where $0 < \gamma < 1$, i = H, L, and $0 \le p^H < p^L \le 1$. With a probability, $1-p^i$, this home production technology yields no return. Thus, there exists some externality from the market to the home production and it takes one period for such externality effect to trickle down. A consumer-borrower is, however, interested only in his young age consumption. Hence, he may wish to run the home production during adulthood borrowing against adult income, since by doing that he is able to attain a higher level of consumption. I assume that in an event in which credit is not granted, a consumer-borrower must run his home production while in the first period of his life in order to make resources available for consumption.

While young, each firm-borrower is endowed with an investment project that is able to transform one unit of time t output into Q units of time t+1 capital, with $p^i, i = H, L$ probability.[5] With a probability, $1-p^i$, the investment project yields no return. Young firm-borrowers must resort to external finance to be able to run the investment project, as this group of agents do not have any source of income during the first period of their lives.

[4] For the assumption that there is a productivity spillover from the market to the home production, see justification in Bose and Pereira, forthcoming.

Irrespective of the outcome of the investment project in the first period of his life, each firm-borrower is able to produce output in his old age. A firm-borrower is able to rent capital and hire labour at a competitively determined rental rate ρ_{t+1} and w_t, respectively. Using k amount of capital and L amount of labour, an adult firm is able to produce output, y_t, according to the production function:

$$y_t = \tau^{\alpha} k_t^{\theta} L_t^{1-\theta} \quad (1)$$

where τ represents the average capital stock per firm and, for simplicity, I assume $\alpha = 1-\theta$. Therefore, there exists an externality in the production function as in Romer (1986). In addition, it is assumed that when credit is denied, a low risk (Type-L) firm-borrower is able to run a home production technology in the first period of his life, yielding β^L. In contrast, however, no such outside opportunity is available for a high-risk firm-borrower.

In this model, each young lender is endowed with one unit of labour that is supplied inelastically to the market for the competitively-determined wage rate, w_t. Each lender only values his old age consumption for which provision can be made in two ways. Firstly, a lender is able to invest his earnings, w_t, in a technology that yields $Q\varepsilon$ units of capital in period t+1 per unit invested in period t and rent this amount to firm-borrowers in his adult life. Alternatively, a young lender is able to lend his earnings to a borrower in return for a market-determined interest rate. It is assumed that ε is sufficiently smaller than p^H so that lending takes place. Finally, I normalise the population of young lenders to 2. In the next section the details of the credit market are presented.

[5] Denoting both consumers' and firms' probabilities of success by p^i is meant to economise on notation and does not have any implications in my results.

2.2. The Credit Market

Although lenders can differentiate between a consumer-borrower and a firm-borrower, both consumers' types and firms' types with regard to risk are private information. Under such circumstance, it is assumed that each lender offers a set of loan contracts and borrowers have complete knowledge about the types of loan contracts offered by each lender. If a lender's contract is not dominated by those of any other lender, the lender is approached by a potential borrower. I assume that each potential borrower can apply only to one lender.[6] The credit market equilibrium at time t is defined to be a set of loan contracts such that there is no incentive for any lender to offer an alternative set of contracts, taking the rental rate of capital and the offers of other lenders as given. Further, competition in the credit market is such that lenders earn zero economic profit on each contract.

As is well known, in such a menu contract type of model, the only equilibrium that can exist is a separating equilibrium (Rothschild and Stiglitz, 1976). Further, in such equilibrium, separation between the borrowers is induced by offering the high-risk borrowers their first best contract and by offering low risk borrowers a contract that entails credit rationing a fraction of low-risk applicants. Therefore, in equilibrium, the contracts take the form $C_H = (q_j^H, R_{t+1}^H)$ and $C_L = (q_j^L, R_{t+1}^L, \pi_{jt})$, where q_j^i denotes the loan amount, R^i is the interest rate, π represents the probability of receiving loan, and $j = c, f$ represent consumer-borrower and firm-borrower, respectively.

It is easy to verify (following Bencivenga and Smith, 1993 and Bose and Cothren, 1996,1997) that under the circumstance where, under competition, lenders are maximising the utility of the loan applicants, and when utility of an applicant is increasing in the loan amount, lenders would offer loan quantities to consumer-borrowers that are equivalent to the present

[6] I make this assumption to bind the loan size in the presence of a linear technology of capital production.

value of their second period income, i.e., $q_c^i = \frac{\gamma w_t}{R_{t+1}^i}$. By a similar line of argument, it is easy to establish that $q_f^i = w_t$. Furthermore, from the zero profit constraint of a lender, one is able to derive the interest rates offered by a lender:

$$R_{t+1}^i = \frac{Q\varepsilon\rho}{p^i} \tag{2}$$

Given the above, the offered contracts take the form: $C_c^H = \left(\frac{\gamma w_t p^H}{Q\varepsilon\rho}, \frac{Q\varepsilon\rho}{p^H}\right)$ and $C_c^L = \left(\frac{\gamma w_t p^L}{Q\varepsilon\rho}, \frac{Q\varepsilon\rho}{p^L}, \pi_{ct}\right)$, for high and low-risk consumer-borrowers; $C_f^H = \left(w_t, \frac{Q\varepsilon\rho}{p^H}\right)$ and $C_f^L = \left(w_t, \frac{Q\varepsilon\rho}{p^L}, \pi_{ft}\right)$, for high and low-risk firm-borrowers. In this model, the separation of borrowers is achieved by distorting the first best contract of the low risk borrowers, as a low risk borrower has no incentive to be considered as a high risk one. Thus, each lender posts contracts C_c^H and C_f^H, which are the first best attainable contracts by a type H consumer-borrower and by a type H firm-borrower, subject to the zero profit constraint of the lender. In contrast, the lender must distort C_c^L and C_f^L contracts acceptable to low risk borrowers, in such a way that the type H consumer-borrower and type H firm-borrower are at least as well off as by accepting C_c^H and C_f^H respectively. Within my framework, this can be achieved by rationing a fraction of low risk borrowers in both groups. To determine the optimal level of credit rationing for the low risk consumer-borrowers, the following problem is then solved:

$$Max \quad \pi_{ct} \frac{\gamma w_t p^L}{Q\varepsilon\rho} + (1-\pi_{ct})\beta^L \tag{3}$$

$$s.t. \quad \frac{\gamma w_t p^H}{Q\varepsilon\rho} \geq \pi_{ct} \frac{\gamma w_t p^L}{Q\varepsilon\rho} + (1-\pi_{ct})\beta^H \tag{4}$$

$$\pi_{ct} \frac{\gamma w_t p^L}{Q\varepsilon\rho} + (1-\pi_{ct})\beta^L \geq \frac{\gamma w_t p^H}{Q\varepsilon\rho} \tag{5}$$

In the above, equation (3) represents the utility of a type L consumer-borrower for the contract $C_c^L = \left(\frac{\gamma w_t p^L}{Q\varepsilon\rho}, \frac{Q\varepsilon\rho}{p^L}, \pi_{ct} \right)$, whereas, the incentive compatibility constraints for high and low risk consumer-borrowers are given by equation (4) and (5), respectively. Given that lenders are able to increase the low-risk consumer-borrowers' utility by setting π_{ct} as high as possible, (4) must bind. Hence, the probability of low risk borrowers receiving credit is given by:

$$\pi_{ct} = \frac{p^H \gamma w_t - \beta^H Q\varepsilon\rho}{p^L \gamma w_t - \beta^H Q\varepsilon\rho} \tag{6}$$

Given $p^L > p^H$, it is easy to verify that $\pi_{ct} < 1$. Furthermore, it should be noted that the participation constraint for consumer-borrowers is given by $w_t > \frac{\beta^i Q\varepsilon\rho}{\gamma p^i}$, i = H, L. These conditions imply that, both types of consumer-borrowers must be able to attain a higher level of consumption through borrowing against the second period income than what they can obtain by running the home production during the first period. For future reference, denote $w_h = \frac{\beta^H Q\varepsilon\rho}{\gamma p^H}$, $w_l = \frac{\beta^L Q\varepsilon\rho}{\gamma p^L}$ and $w_{hl} = \frac{\beta^H Q\varepsilon\rho}{\gamma p^L}$. The condition $w_t > w_h$ ensures that $\pi_{ct} > 0$. Substituting the expression for π_{ct} from equation (6) into equation (5) it is easy to verify that the incentive compatibility constraint for the type-L borrower is satisfied. Finally, I note that π_{ct} is increasing in wage:

$$\frac{\partial \pi_{ct}}{\partial w_t} = \frac{\gamma \beta^H Q\varepsilon\rho (p^L - p^H)}{(p^L \gamma w_t - \beta^H Q\varepsilon\rho)^2} > 0 \tag{7}$$

Thus, an increase in consumer-borrowers' income relaxes constraints on consumption borrowing.

Proceeding in a similar fashion, it is now possible to determine the optimal level of credit rationing to which a low risk firm-borrower will be subjected. To find the optimal value for π_{ft}, I analyse the following problem for the lender:

$$Max \quad \pi_{ft} p^L w_t \left(Q\rho_{t+1} - \frac{Q\varepsilon\rho}{p^L} \right) + (1-\pi_{ft})\beta^L \tag{8}$$

$$s.t. \quad p^H w_t \left(Q\rho_{t+1} - \frac{Q\varepsilon\rho}{p^H} \right) \geq p^H w_t \pi_{ft} \left(Q\rho_{t+1} - \frac{Q\varepsilon\rho}{p^L} \right) \tag{9}$$

$$\pi_{ft} p^L w_t \left(Q\rho_{t+1} - \frac{Q\varepsilon\rho}{p^L} \right) + (1-\pi_{ft})\beta^L \geq p^L w_t \left(Q\rho_{t+1} - \frac{Q\varepsilon\rho}{p^H} \right) \tag{10}$$

As in the previous case, equation (8) denotes the utility of a low risk firm-borrower for the contract $C_f^L = \left(w_t, \frac{Q\varepsilon\rho}{p^L}, \pi_{ft} \right)$. Equation (9) and (10) denote the incentive compatibility constraints for high and low risk firm-borrowers. Since equation (9) binds, one is able to obtain the expression for π_{ft} as

$$\pi_{ft} = \frac{1 - \frac{\varepsilon}{p^H}}{1 - \frac{\varepsilon}{p^L}} \tag{11}$$

The assumption $\varepsilon < p^H < p^L$ guarantees that $0 < \pi_{ft} < 1$. That the incentive compatibility constraint for the low risk borrower holds can easily be verified by substituting the expression for π_{ft} from equation (11) into equation (10). Finally it can be noted that the participation constraint for a low risk firm-borrower requires $w_t > \frac{\beta^L}{Q\rho(p^L - \varepsilon)} = w_f$. In contrast, a high risk firm-borrower is always eager to participate in the market in the absence of any outside opportunity.

3. Capital Dynamics

In my model, the capital stock at $t+1$ comes from the successful, funded firm-borrowers and from the lenders who converted their wages into capital after rationing the low risk consumer-borrowers and firm-borrowers. The former amounts to

$\left[\lambda p^{H} w_{t} + (1-\lambda) p^{L} w_{t} \pi_{ft}\right] Q$ and the later corresponds to $\left\{ 2w - \left[\lambda \frac{\gamma w_t}{R^H} + (1-\lambda)\frac{\gamma w_t}{R^L}\pi_{ct} \right] - \left[\lambda w_t + (1-\lambda) w_t \pi_{ft}\right] \right\} Q\varepsilon$. Given that all firm-borrowers become output producers during their adulthood, per firm capital stock is given by:

$$k_{t+1} = \left\{ 2w - \left[\lambda \frac{\gamma w_t}{R^H} + (1-\lambda)\frac{\gamma w_t}{R^L}\pi_{ct} \right] - \left[\lambda w_t + (1-\lambda) w_t \pi_{ft}\right] \right\} Q\varepsilon + \left[\lambda p^{H} w_{t} + (1-\lambda) p^{L} w_{t} \pi_{ft}\right] Q \tag{12}$$

Substituting (2), (6) and the expressions for the wage rates and the rental rates of capital (from equation 1), $w_t = (1-\theta)2^{-\theta}k_t$ and $\rho_{t+1} = \theta 2^{1-\theta}$, into (12), and denoting $A = \left[(2-\lambda)Q\varepsilon + \lambda p^H\left(Q - \frac{\gamma}{\theta 2^{1-\theta}}\right) + (1-\lambda)\pi_{ft}(p^L - \varepsilon)Q \right](1-\theta)2^{-\theta}$ and $B = (1-\lambda)\gamma p^L \frac{1-\theta}{2\theta}$, the capital accumulation path for my economy can be rewritten as:

$$k_{t+1} = Ak_t - Bk_t\pi_c(k_t) \tag{13}$$

where $\pi_{ct} = \frac{hk_t - \beta'}{lk_t - \beta'}$ with $h = p^H\gamma(1-\theta)2^{-\theta}$, $l = p^L\gamma(1-\theta)2^{-\theta}$ and $\beta' = \beta Q\varepsilon\theta 2^{1-\theta}$.

One may note that, in the absence of any consumer-borrowers, the capital accumulation path would be a linear function as would be obtained in a standard AK model. However, the presence of consumption loan diverts funds from a productive use, and therefore offsets the externality effect that is present in the output production function. This effect is captured in the term $Bk_t\pi_c$. Further, a close inspection of (13) reveals that the capital accumulation path is represented by a hyperbolic curve with an asymptote given by $k_{hl} = \frac{w_{hl}}{(1-\theta)2^{-\theta}}$. Since the participation constraints on consumers and firms define the domain as $k_t > max\ (k_h, k_l, k_f)$, where $k_h = \frac{w_h}{(1-\theta)2^{-\theta}}$, $k_l = \frac{w_l}{(1-\theta)2^{-\theta}}$ and $k_f = \frac{w_f}{(1-\theta)2^{-\theta}}$, and both k_h and k_l are larger than k_{hl}, only the segment of the function where $k_t > k_{hl}$ needs to be considered. To obtain a deeper insight into the capital dynamics, its first and second derivatives are deduce as:

$$\frac{\partial k_{t+1}}{\partial k_t} = A - B\frac{hlk_t^2 - 2h\beta' k_t + \beta'^2}{(lk_t - \beta')^2} \tag{14}$$

$$\frac{\partial^2 k_{t+1}}{\partial k_t^2} = -B\frac{2\beta'^2 (h-l)}{(lk_t - \beta')^3} \tag{15}$$

Over the domain of analysis, the second derivative is always positive. Therefore, the capital accumulation path is convex. Studying the first derivative I find that it decreases for values of $k_{hl} < k < k_m$ and increases for values of $k > k_m$. The value of k_m can be calculated by setting the first derivative equal to zero. This gives:

$$k_m = k_{hl}(1+\Omega_2) \tag{16}$$

where $\Omega_2 = \left(\frac{B(p^L - p^H)}{Ap^L - Bp^H}\right)^{0.5}$

Note that as k_t tends to infinity, k_{t+1} tends to $\left(A - B\frac{p^H}{p^L}\right)k_t$. Therefore, to ensure that there exists a steady state, one requires:

$$A - B\frac{p^H}{p^L} < 1 \tag{17}$$

Given this condition, there exists a steady state expressed by:

$$k_{ss} = \frac{(1-A+B)\beta'}{(1-A)l + Bh} \tag{18}$$

Denoting $\Omega_1 = \frac{1-A+B}{1-A+B\frac{p^H}{p^L}}$ the steady state capital stock can be rewritten as:

$$k_{ss} = k_{hl}\Omega_1 \tag{19}$$

One may, however, recognise that the value of the steady state can be either greater or less than k_m, giving rise to two possible capital dynamics leading to the steady state. These two scenarios are illustrated in Figures 1 and 2 (Appendix A). In Figure 1, the case is shown where $k_m < k_{ss}$, which corresponds to a smooth convergence to the steady state. Figure 2 corresponds to the case where the inequality holds in the reverse direction. In such case, one observes volatility in the capital dynamics. Intuition underlying this cyclical behaviour is easy to understand. Beyond a critical value of capital stock, the fraction of the loanable funds channelled to consumption ($\frac{\lambda\gamma}{R^H} + (1-\lambda)\frac{\gamma}{R^L}\pi_{ct}$) would exceed the fraction of the loanable funds channelled to investment ($\lambda + (1-\lambda)\pi_{ft}$). This is so because the former is an increasing function of the wage rate, whereas the latter is a constant. Suppose that the capital stock increases above such critical value. In such a situation, the next period's capital stock would decrease. This decrease in capital stock would depress the demand for consumption loans in the following period and more resources would become available for productive investment causing the capital to increase in that period. This cyclical behaviour of capital stock will continue with decreasing amplitude until the capital stock converges to its steady state. In Appendix B, I show that if condition (17) holds, there never exists a situation where such volatility may lead the economy to diverge from the steady state.

To avoid the above scenario, one would require $k_m < k_{ss}$, (as shown in Fig. 2.1) which amounts to:

$$\Omega = \Omega_1 - \Omega_2 > 1 \qquad (20)$$

Simple comparative statistics (see Appendix C) yield that an economy with more productive firms (high value of Q), will have higher chances of experiencing a smooth convergence to the steady state. A similar result is obtained for a high value of capital productivity (reflected by a high value of ρ) in the output production function. This can be verified by noting that Ω is increasing both in Q and in ρ:

$$\frac{\partial\Omega}{\partial Q}=\left[(2-\lambda)\varepsilon+\lambda p^{H}+(1-\lambda)\frac{(p^{H}-\varepsilon)p^{L}}{p^{H}}\right](1-\theta)2^{-\theta}B(p^{L}-p^{H})\cdot$$

$$\left[\frac{\frac{1}{p^{L}}}{(1-A+B\frac{p^{H}}{p^{L}})^{2}}+\frac{0.5\,\Omega_{2}^{-0.5}p^{L}}{(Ap^{L}-Bp^{H})^{2}}\right]>0$$

and

$$\frac{\partial\Omega}{\partial\rho}=\frac{\gamma(1-\theta)2^{\theta-2}(p^{L}-p^{H})}{\theta^{2}}\cdot$$

$$\left[\frac{(A-1)(1-\lambda)+\lambda B\frac{p^{H}}{p^{L}}}{(1-A+B\frac{p^{H}}{p^{L}})^{2}}+0.5\,\Omega_{2}^{-0.5}p^{L}\frac{A(1-\lambda)p^{L}+\lambda Bp^{H}}{(Ap^{L}-Bp^{H})^{2}}\right]>0$$

In contrast, however, an increase in the productivity of home production technology is likely to make the economy more prone to cyclical fluctuation. This can be verified by inspecting the influence of γ on Ω:

$$\frac{\partial\Omega}{\partial\gamma}=\frac{(1-\theta)(p^{L}-p^{H})}{2\theta}\cdot$$

$$\left[-\frac{(A-1)(1-\lambda)+\lambda B\frac{p^{H}}{p^{L}}}{(1-A+B\frac{p^{H}}{p^{L}})^{2}}-0.5\,\Omega_{2}^{-0.5}p^{L}\frac{A(1-\lambda)p^{L}+\lambda Bp^{H}}{(Ap^{L}-Bp^{H})^{2}}\right]<0$$

4. Conclusion

In the existing literature, a large amount of attention has been devoted to understanding how financial development is able to promote economic growth by relaxing the borrowing constraint that firms encounter in a rudimentary state of financial development. At the same time, economists have drawn attention to the fact that financial development may have a detrimental effect on growth performance since it diverts resources towards consumption by relaxing the borrowing constraint of households. The objective of this paper has been to evaluate the link between financial development and economic growth while taking into consideration the above two effects simultaneously. My analysis has shown that by way of relaxing the borrowing constraints of the households, financial development can offset the positive externality effects in a production function. Further the presence of consumption loan may give rise to a situation in which an economy may periodically oscillate between good and bad outcomes on its way to the steady state. Such volatility is more likely to be present, however, in economies that are less productive. A certain or an unanticipated increase in future income is also able to render the capital dynamics more volatile.

APPENDIX

Appendix A: Smooth and volatile convergence

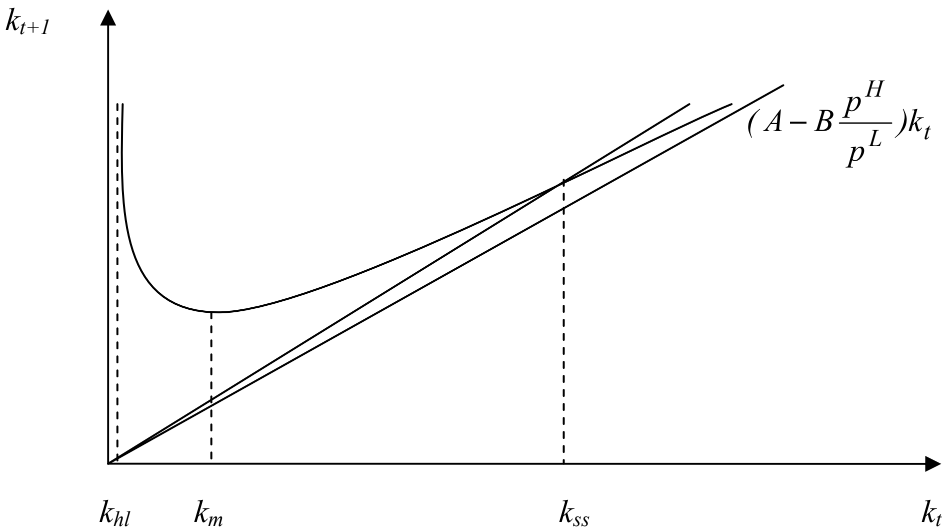

Figure 1 - Smooth Convergence

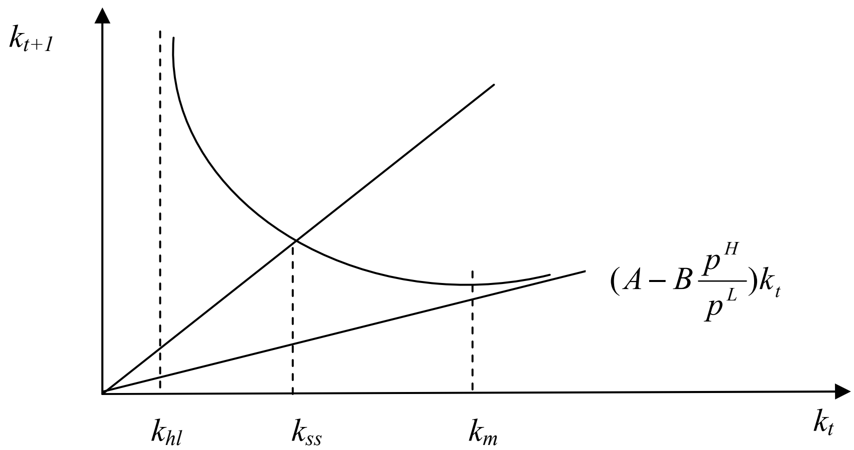

Figure 2 - Convergence with Volatility

Appendix B: Proof of cyclical convergence

In order to prove that in the scenario where $k_m > k_{ss}$ convergence is a certain outcome, it is necessary to show that the capital accumulation path in the steady state is less sloped than the 45-degree line:

$$\frac{\partial k_{t+1}}{\partial k_t}(k_{ss}) = A - B\frac{hlk_{ss}^2 - 2h\beta' k_{ss} + \beta'^2}{(lk_{ss} - \beta')^2} < 1$$

Manipulation of this expression gives:

$$-l\left[(1-A)l + Bh\right]k_{ss}^2 + 2\beta'\left[(1-A)l + Bh\right]k_{ss} - \beta'^2(1 - A + B) < 0$$

Next, substituting (18) in this inequality I obtain:

$$\frac{-l\left[(1-A+B)\beta'\right]^2}{(1-A)l + Bh} + \beta'^2(1-A+B) < 0$$

Finally, dropping the denominator, which can be done because setting it positive is equivalent to condition (17), and further manipulation leads to:

$$\beta'^2 B(h-l)(1-A+B) < 0$$

This is always true since $h < l$, from $p^H < p^L$ and $1\text{-}A\text{+}B > 0$, from (17).

Appendix C: Determination of derivatives' signs

In order to know how the values of Q, ρ and γ influence condition (20), I calculate the derivative of Ω with respect to each of those parameters.

a)

Given that $\frac{\partial A}{\partial Q} = \left[(2-\lambda)\varepsilon + \lambda p^H + (1-\lambda)\frac{(p^H-\varepsilon)p^L}{p^H}\right](1-\theta)2^{-\theta} > 0$ and $\frac{\partial B}{\partial Q} = 0$

I have:

$$\frac{\partial \Omega_1}{\partial Q} = \frac{\frac{\partial A}{\partial Q}(1-\frac{p^H}{p^L})B}{(1-A+B\frac{p^H}{p^L})^2} > 0$$

and

$$\frac{\partial \Omega_2}{\partial Q} = 0.5\,\Omega_2^{-0.5}\frac{-\frac{\partial A}{\partial Q}p^L B(p^L-p^H)}{(Ap^L-Bp^H)^2} < 0$$

Hence $\frac{\partial \Omega}{\partial Q} > 0$

b)

$$\frac{\partial \Omega_1}{\partial \rho} = \frac{\left(-\frac{\partial A}{\partial \rho}+\frac{\partial B}{\partial \rho}\right)(1-A+B\frac{p^H}{p^L}) - \left(-\frac{\partial A}{\partial \rho}+\frac{\partial B}{\partial \rho}\frac{p^H}{p^L}\right)(1-A+B)}{(1-A+B\frac{p^H}{p^L})^2}$$

Since the sign of this expression is not identifiable, I substitute $\frac{\partial A}{\partial \rho} = \frac{\lambda p^H \gamma(1-\theta)2^{\theta-2}}{\theta^2} > 0$ and $\frac{\partial B}{\partial \rho} = \frac{-(1-\lambda)p^L\gamma(1-\theta)2^{\theta-2}}{\theta^2} < 0$ into it to give:

$$\frac{\partial \Omega_1}{\partial \rho} = \frac{\frac{\gamma(1-\theta)2^{\theta-2}}{\theta^2}\left[(A-1)(1-\lambda)p^L + \lambda Bp^H\right]\left(1-\frac{p^H}{p^L}\right)}{(1-A+B\frac{p^H}{p^L})^2} > 0$$

Looking now at the derivative of Ω_2 it is easy to see that it is negative:

$$\frac{\partial \Omega_2}{\partial \rho} = 0.5\,\Omega_2^{-0.5}\,\frac{\frac{\partial B}{\partial \rho}(p^L - p^H)(Ap^L - Bp^H) - \left(\frac{\partial A}{\partial \rho}p^L - \frac{\partial B}{\partial \rho}p^H\right)B(p^L - p^H)}{(Ap^L - Bp^H)^2} < 0$$

Therefore, $\frac{\partial \Omega}{\partial \rho} > 0$.

c)

$$\frac{\partial \Omega_1}{\partial \gamma} = \frac{\left(-\frac{\partial A}{\partial \gamma} + \frac{\partial B}{\partial \gamma}\right)(1 - A + B\frac{p^H}{p^L}) - \left(-\frac{\partial A}{\partial \gamma} + \frac{\partial B}{\partial \gamma}\frac{p^H}{p^L}\right)(1 - A + B)}{(1 - A + B\frac{p^H}{p^L})^2}$$

As in the previous case I need to substitute $\frac{\partial A}{\partial \gamma} = -\frac{\lambda p^H (1-\theta)}{2\theta} < 0$ and $\frac{\partial B}{\partial \gamma} = \frac{(1-\lambda) p^L (1-\theta)}{2\theta} > 0$ to be able to identify the sign of the derivative:

$$\frac{\partial \Omega_1}{\partial \gamma} = \frac{-\frac{(1-\theta)}{2\theta}\left[(A-1)(1-\lambda)\,p^L + \lambda B p^H\right]\left(1 - \frac{p^H}{p^L}\right)}{(1 - A + B\frac{p^H}{p^L})^2} < 0$$

The sign of $\frac{\partial \Omega_2}{\partial \gamma}$ is straightforwardly identifiable:

$$\frac{\partial \Omega_2}{\partial \gamma} = 0.5\,\Omega_2^{-0.5}\,\frac{\frac{\partial B}{\partial \gamma}(p^L - p^H)(Ap^L - Bp^H) - \left(\frac{\partial A}{\partial \gamma}p^L - \frac{\partial B}{\partial \gamma}p^H\right)B(p^L - p^H)}{(Ap^L - Bp^H)^2} > 0$$

Hence, $\frac{\partial \Omega}{\partial \gamma} < 0$.

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