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# FINANCIAL INTERMEDIATION, ENTREPRENEURSHIP AND ECONOMIC GROWTH

**Wenli Cheng**[*†]

**Abstract:** This paper presents a simple general equilibrium model of financial intermediation, entrepreneurship and economic growth. In this model, the role of financial intermediation is to pool savings and to lend the pooled funds to an entrepreneur, who in turn invests the funds in a new production technology. The adoption of the new production technology improves individual real income. Thus financial intermediation promotes economic growth through affecting individuals' saving behaviour and enabling the adoption of a new production technology.

**Key words:** financial intermediation, entrepreneurship, economic growth

**JEL classification:** G21, D90, O40

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† Department of Economics, Monash University, June 2007

## FINANCIAL INTERMEDIATION, ENTREPRENEURSHIP AND ECONOMIC GROWTH

### 1. Introduction

There is a growing theoretical and empirical literature suggesting that financial development plays a positive role in economic growth (see, for example, Greenwood and Jovanovic, 1990, Bencivenga and Smith, 1991, King and Levine 1993a, 1993b, Greenwood and Smith, 1997, Levine, 1997, Levine and Zervos, 1998, McCaig and Stengos, 2005). But how does financial development enhance growth? This paper develops a simple general equilibrium model in which financial intermediation enhances income growth by influencing the rate of capital formation and technological innovation (Levine 1997). In particular, the function of financial intermediation in our model is to pool savings to fund an entrepreneur's investment in a new production technology. The new technology is assumed to be available but its implementation requires a sum of capital that is larger than personal savings achievable by an entrepreneur. Thus financial intermediation enables a technological innovation rather than an invention.

Our model formalises two often-neglected insights. First, by pooling funds, financial intermediaries play an important role in permitting the implementation of new technologies, as pointed out by Bagehot (1873, p10)

> *"We have entirely lost the idea that any undertaking likely to pay, and seen to be likely, can perish for want of money;…A citizen of London in Queen Elizabeth's time … would have thought that it was no use inventing railways (if he could have understood what a railway meant), for you would have not been able to collect the capital with which to make them."*

Second, capital rather than technological advance per se is often the binding constraint on economic growth. Indeed, most of the products that were first manufactured during the early periods of the Industrial Revolution had been invented much earlier; and what caused the delay in the implementation of many of the existing inventions were the large capital requirements (Hicks, 1969).

In our model, the availability of financial intermediation is a determinant of technological choice, and the entrepreneur is the "initiator" of the implementation of new technology. In this sense our model is related to the literature that links technological choice to the cost of trading in financial markets (Bencivenga *et al*., 1995), and also related to the literature that emphasises the entrepreneur's innovative activities in the presence of financial intermediation (King and Levine, 1993b). Our model however has two distinctive technical features.

First, it is "methodologically individualistic" as it treats all individuals as consumer-producers and explicitly and simultaneously models individual consumption, production, and saving decisions for all agents in the economy. Secondly, financial intermediation is endogenised in the sense that only under certain conditions (namely that the new technology is sufficiently more productive relative to the old technology; capital goods associated with the new technology can be easily converted from savings; and that time preference is sufficiently weak), will financial intermediation occur in general equilibrium. If these conditions do not hold, the equilibrium involves financial autarky.

We present our model in section 2 below and offer some concluding remarks in section 3.

## 2. A Model of Intermediation, Entrepreneurship and Growth

### 2.1. The economic environment

Consider an economy with $m$ individuals who live for 2 periods ($t$ = 1, 2). All individuals derive utility from consumption of a single good X and have the same utility function:

$$U = c_1 + \theta c_2$$

where $c_i$ ($i$ = 1,2) is quantity of good X consumed at time $i$; $\theta<1$ is the individual's time preference parameter; large $\theta$ indicates weak time preference.

Each individual is endowed with 1 unit of labor in each period and labor cannot be transferred inter-temporally. Good X can be produced at home using only labor ($l$):

$$X_h = al$$

Or it can be produced in a factory with employed labor ($E$), capital ($K$), and an entrepreneurial input ($l_E$)

$$X_f = \begin{cases} AK^{\alpha}E^{\beta} & (\alpha + \beta < 1,\ K > Ra) \quad if\, l_E = 1 \\ 0 & if\, l_E < 1 \end{cases}$$

The entrepreneurial input captures the time and energy devoted by the entrepreneur to utilising capital funds, hiring workers and organising production. It is assumed that to run a factory successfully, the entrepreneur needs to devote all his labour endowment to it, that is, factory production can take place only if $l_E = 1$.

Capital is accumulated from savings at the end of the period 1 after good X is produced. Each unit of good X saved can be converted into $R$ unit of capital. It is assumed that the minimum amount of capital required for factory production is greater than the maximum saving a single individual can make at $t$ = 1, i.e., $K \geq Ra$. Thus, to adopt the factory production technology, it is necessary to pool savings of multiple individuals, and lend them to the entrepreneur. This task is carried out by a financial intermediary (the banker), and requires the time and energy of the banker, denoted by the banker's input, $l_B$. It is also assumed that to run a bank successfully, the banker has to devote all his labor endowment to it, i.e., $l_B = 1$.

### 2.2 The case without financial intermediation

In the absence of a financial intermediary, only home production technology can be used, and the economy is characterised by autarky. An individual's decision problem is:

$$\max_{c_1, c_2} U = c_1 + \theta c_2 \qquad (\theta < 1)$$

$$\begin{aligned} s.t. \quad & x_1 = al_1 \\ & x_2 = al_2 \\ & l_1 = l_2 = 1 \\ & c_1 + c_2 = x_1 + x_2 \\ & c_1 \leq x_1 \end{aligned}$$

where $x_i$ ($i$ = 1,2) is good X produced in period $i$; $l_i$ ($i$ = 1,2) is labor endowment in period $i$. We assume that individuals can store goods for later consumption without incurring storage costs. Solving this problem we obtain: $c_1{}^* = c_2{}^* = a$

Since technology is the same in both periods, and labor is not transferable across time, time preference dictates that individuals will not save in period $t$ = 1. The individual utility (real income) level over the two periods is $U_A* = (1+\theta)a$.

## 2.3. The case with financial intermediation and entrepreneurship

In the presence of financial intermediation and entrepreneurship, savings may be pooled by the banker, and the funds borrowed and invested in factory production by the entrepreneur. Since savings are not made until the end of period 1, all individuals use the home production technology to produce good X in period 1. In period 2, however, individuals may engage in different activities. We group the individuals into four different categories according to their period 2 activities:

(1) *Consumer-home producers (“home producers”)*, who employ the home production technology to produce X for self consumption, and fund additional consumption from savings plus interests.

(2) *Consumer-factory workers (“factory workers”)*, who work in a factory in exchange for a wage, and receive additional funds from their savings plus interests.

(3) *Consumer-banker (“the banker”)*, who collects deposits from home producers and factory workers, lends the funds (including his own savings) to the entrepreneur, and retains the difference between the payment to depositors and repayment from the entrepreneur.

(4) *Consumer-entrepreneur (“the entrepreneur”)*, who invests in factory production technology using funds borrowed from the banker and his own savings, and hires factory workers to produce good X. He obtains the residual production after making wage payments to factory workers and loan repayment to the banker.

We assume that entry into banking and factory production is free so that neither the banker nor the entrepreneur behaves monopolistically. The interrelationships between four categories of individuals are illustrated in Figure 1.

The decision problems for the four types of individuals and the solutions are presented in table 1.

There are two possible equilibria. If $r_d* \leq (1-\theta)/\theta$, the equilibrium is the same as that of the model without financial intermediation. If $r_d* > (1-\theta)/\theta$, the equilibrium involves financial intermediation. Since financial intermediation only occurs in equilibrium within the parameter set defined by $r_d{}^* > (1-\theta)/\theta$, financial intermediation is endogenously determined. For example, starting from an initial set of parameters that satisfies $r_d{}^* \leq (1-\theta)/\theta$, changes in parameters may lead to $r_d{}^* > (1-\theta)/\theta$. This will cause the equilibrium to shift from one without financial intermediation to one with finance intermediation. In other words, financial intermediation can endogenously emerge.

The equilibrium with financial intermediation is characterised as follows. First, all individuals' utility levels are maximised, and the market for good and the market for loans clear. From the loan market clearing condition, $L^d = K^* = Rma = L^s$, we obtain the equilibrium rate of loan interest: $r_L{}^* = (Rm)^{\frac{\alpha+\beta-1}{1-\beta}} A^{\frac{1}{1-\beta}} \alpha\beta^{\frac{\beta}{1-\beta}} a^{\frac{\alpha-1}{1-\beta}}$. Clearly $r_L{}^*$ is negatively related to capital availability (as indicated by *R, m, a*) and positively related to capital productivity (as indicated by *A, α, β*).

Assuming that the number of workers employed by the entrepreneur is less than the total number of individuals available to work in a factory, the equilibrium utility level of home producers and that of factory workers are equalised due to labor mobility between home and factory. From this condition we obtain the equilibrium wage rate, $w^* = a$. In addition, the equilibrium utility of the banker and that of the entrepreneur are equalised due to free entry to both activities. This condition gives us the equilibrium rate of deposit interest, $r_d{}^* = [1/(m-2)a][(m-2)ar_L{}^* - \pi^* - a]$,

where $\pi^* \equiv A(K^*)^{\alpha}(E^*)^{\chi} - (1+r_L{}^*)K^* - w^*E^* - w^*$ is the equilibrium level of profit of the entrepreneur. The profit will be driven down to zero if all individuals can potentially become the entrepreneur. Otherwise if only "talented" people (i.e., the banker and the entrepreneur in our model) can become the entrepreneur, then the profit can be positive even in equilibrium until, for example, still newer technology is adopted, in which case "creative destruction" will displace the old equilibrium and eliminate the profit associated with the factory production technology. Our model however does not capture that dynamic. It is easy to see that the difference between loan and deposit interest rates covers the entrepreneurial profit and the banker's labor input valued at the equilibrium wage rate.

It is straightforward to show that provided $r_d* > (1-\theta)/\theta$ the equilibrium with financial intermediation and entrepreneurship produces higher utility for all individuals compared to the equilibrium without financial intermediation. In the case with zero entrepreneurial profit the equilibrium condition becomes $(Rm)^{\frac{\alpha+\beta-1}{1-\beta}} A^{\frac{1}{1-\beta}} \alpha\beta^{\frac{\beta}{1-\beta}} a^{\frac{\alpha-1}{1-\beta}} - (1/(m-2) > (1-\theta)/\theta$ which is more likely to hold if: (1) productivity associated with the factory production technology is high (*A, α, β* are large) and the productivity associated with home production technology is low (*a* is small); (2) savings can be efficiently converted to capital goods (*R* is large); and (3) individual time preference is low (θ is large). This implies that financial intermediation and entrepreneurship will more likely promote economic growth the more efficient the new technology is relative to old technology, the more easily savings can be converted to capital goods, and the more willing individuals are to sacrifice current consumption for future consumption. In the case of zero entrepreneurial profit, the utility level of the banker and the entrepreneur is $\theta a(2+r_L*)$, where $r_L* = (Rm)^{\frac{\alpha+\beta-1}{1-\beta}} A^{\frac{1}{1-\beta}} \alpha\beta^{\frac{\beta}{1-\beta}} a^{\frac{\alpha-1}{1-\beta}}$; and the utility level of the home producer and the factory workers is $\theta a(2+r_d*)$, where $r_d* = [1/(m-2)a][(m-2)ar_L*-a]$.

## 3. Concluding remarks

This paper presents a simple general equilibrium model of financial intermediation, entrepreneurship and economic growth. In this model, the role of financial intermediation is to pool savings and to lend the pooled funds to an entrepreneur, who in turn invests the funds in a new production technology. The adoption of the new production technology improves individual real income. Thus financial intermediation enhances income growth through affecting individuals' saving behaviour and enabling the adoption of a new production technology.

It may be argued that financial intermediation is not required for the adoption of a new production technology because the entrepreneur may borrow directly from individuals. Our model rules out this possibility as the entrepreneur is resource constrained so that he cannot engage in both the activity of pooling funds and organising production. The separation of pooling funds and organising production may also be justified if part of the banker's role is to monitor the entrepreneur on the behalf of all depositors (Diamond, 1984).

In this model, the banker is a pure financial intermediary, and there is no money multiplier effect. Future research may extend the model to investigate the implications of fractional-reserve banking on investment and growth.

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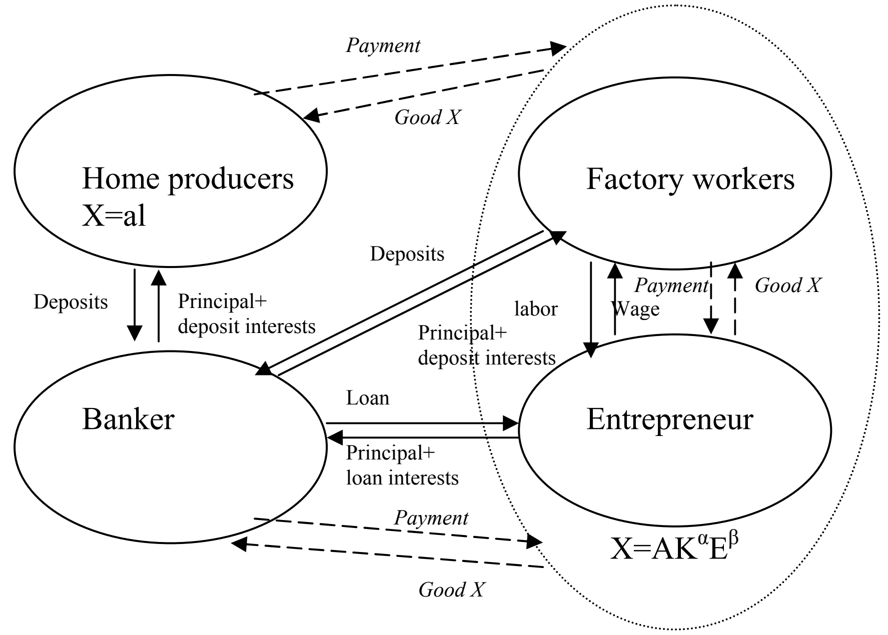


**Figure 1. An economy with financial intermediation and entrepreneurship**

**Table 1. Individual decision problems and solutions**

| | Decision problems | Solutions |
|---|---|---|
| Home producers | $\max_{c_1,c_2} U = c_1 + \theta c_2$<br>$s.t.\quad x_1 = al_1$<br>$x_1 = c_1 + s_1$<br>$s_1(1+r_d) + x_2 = c_2$<br>$l_1 = l_2 = 1$<br>$c_1 \le x_1$<br>where $s_1$ is savings in $t = 1$, $r_d$ is deposit interest rate. The price of good X is normalised to be 1 | If $r_d > (1-\theta)/\theta$<br>$c_1* = 0,\ c_2* = 2a + r_d$,<br>$U_{HP}* = \theta(2a + r_d)$<br>If $r_d \le (1-\theta)/\theta$<br>$c_1* = a,\ c_2* = a$,<br>$U_{HP}* = a(1+\theta)$ |
| Factory workers | $\max_{c_1,c_2} U = c_1 + \theta c_2$<br>$s.t.\quad x_1 = al_1$<br>$x_1 = c_1 + s_1$<br>$s_1(1+r_d) + wl_2 = c_2$<br>$l_1 = l_2 = 1$<br>$c_1 \le x_1$<br>where $w$ is the wage rate. | If $r_d > (1-\theta)/\theta$<br>$c_1* = 0,\ c_2* = a(1+r_d) + w$,<br>$U_{FW}* = \theta[a(1+r_d) + w]$<br>If $r_d \le (1-\theta)/\theta$<br>$c_1* = a,\ c_2* = a$,<br>$U_{FW}* = a(1+\theta)$ |
| Banker | $\max_{c_1,c_2} U = c_1 + \theta c_2$<br>$s.t.\quad x_1 = al_1$<br>$x_1 = c_1 + s_1$<br>$D_1 + s_1 = L_1$<br>$(1+r_L)L_1 - (1+r_d)D_1 = c_2$<br>$l_1 = l_2 = 1$<br>$c_1 \le x_1$<br>where $D_1$ is deposits collected, $L_1$ is loans made. $r_d$ and $r_L$ are the deposit and loan interest rates, respectively. We assume that $r_L > r_d$ if $l_2 = 1$, and $r_L = 0$ if $l_2 \le 1$ | If $r_L > (1-\theta)/\theta$<br>$c_1* = 0$,<br>$c_2* = (r_L - r_d)D_1 + (1+r_L)a$<br>$U_B* = \theta[(r_L - r_d)D_1 + (1+r_L)a]$<br>If $r_L \le (1-\theta)/\theta$<br>$c_1* = a,\ c_2* = a$,<br>$U_B* = a(1+\theta)$ |

| | | |
|---|---|---|
| Entrepreneur | $\max_{c_1,c_2} U = c_1 + \theta c_2$<br>$s.t.\quad x_1 = al_1$<br>$x_1 = c_1 + s_1$<br>$K = R(L_1 + s_1) > Ra$<br>$x_2 = \begin{cases} AK^{\alpha}E^{\beta} \quad (\alpha+\beta<1) & if\, l_2 = 1 \\ 0 & if\, l_2 < 1 \end{cases}$<br>$x_2 - (1+r_L)L_1 - wE = c_2$<br>$l_1 = l_2 = 1$<br>$c_1 \le x_1$ | If $r_L > (1-\theta)/\theta$<br>$c_1{*} = 0,$<br>$c_2{*} = AK{*}^{\alpha} E{*}^{\beta} - (1+r_L)(K{*} - a) - wE{*}$<br>$U_E{*} = \theta[AK{*}^{\alpha} E{*}^{\beta} - (1+r_L)(K{*} - a) - wE{*}]$<br>*where*<br>$K^* = (\alpha A)^{\frac{1}{1-\alpha-\beta}} (\frac{\beta}{\alpha w})^{\frac{\beta}{1-\alpha-\beta}} (1+r_L)^{\frac{\beta-1}{1-\alpha-\beta}} > Ra$<br>$E^* = (\alpha A)^{\frac{1}{1-\alpha-\beta}} (\frac{\beta}{\alpha w})^{\frac{1-\alpha}{1-\alpha-\beta}} (1+r_L)^{\frac{\alpha}{1-\alpha-\beta}}$<br>If $r_L \le (1-\theta)/\theta$<br>$c_1{*} = a,\ c_2{*} = a,$<br>$U_E{*} = a(1+\theta)$ |